Educational Evaluation and Policy Analysis
March 2014, Vol. 36, No. 1, pp. 20–43
DOI: 10.3102/0162373713493130

Classmates With Disabilities and Students' Noncognitive Outcomes

Michael A. Gottfried
Loyola Marymount University

The increasing trend of placing students with disabilities in general education classrooms has raised questions among researchers, policymakers, practitioners, and parents about classmate peer effects on all students. However, little is known about the peer effects of classmates with disabilities on the outcomes of other students in the classroom; no research has evaluated these peer effects on other students' noncognitive outcomes though they are highly predictive of schooling and lifelong success. The purpose of this study is to fill this research gap by using quasi-experimental methods on a nationally representative data set (i.e., Early Childhood Longitudinal Study–Kindergarten Class) of elementary school students to examine the peer effects of classmates with disabilities on five noncognitive scales for classmates without disabilities. The findings indicate that students with a greater number of classmates with disabilities have higher externalizing and internalizing behavioral problems and lower frequencies of self-control, approaches to learning, and interpersonal skills. The findings are differentiated by disability category of a student's classmates and are moderated by individual and contextual factors. Implications for policy and practice are addressed.

Keywords: *peer effects, special education, moderating effects, economics of education*

Under the Individuals With Disabilities Education Act (IDEA), students with disabilities are expected to be educated in the least restrictive environment based on the unique needs of each individual. With this, recent trends in U.S. schooling have witnessed an increase in the number of students with disabilities being placed in general education classrooms (U.S. Department of Education, 2012). To date, approximately 14% of students with disabilities in U.S. public schools receive special education services, and of this group, more than half of these students receive more than 80% of their entire schooling from within the general education classroom (U.S. Department of Education, 2012). Given that the proportion of students with disabilities has grown over recent decades (Cohen, 2006) as is the proportion of students with disabilities receiving the majority of their instruction from within the general education classroom (U.S. Department of Education, 2012), an increasing number of students, with and without disabilities, may thereby be affected.

This trend of placing an increasingly larger number of students with disabilities in general education classrooms has raised questions among policymakers, practitioners, and parents about the effects that this practice has not only on students with disabilities but also on their classmates without disabilities (i.e., through peer effects). The ultimate direction of this peer effect remains inconclusive, however, because since the introduction of IDEA, there has been much philosophical debate without much empirical evidence to match. The debate arises because having classmates with disabilities can theoretically positively or negatively affect the

outcomes of other students through direct and indirect mechanisms.

On one side, there may be positive peer effects of classmates with disabilities on the outcomes of students without disabilities via these direct and indirect mechanisms. For instance, being exposed to classmates with disabilities can directly improve the interpersonal skills of classmates without disabilities by affording the latter with opportunities to interact with diverse students and to increase their understanding of individual differences (Williams & Downing, 1998). Inclusive policies could also indirectly improve the outcomes of classmates without disabilities—notably through changes in resource allocations. For instance, additional supports and services are often provided to classrooms containing students with disabilities (Lipsky & Gartner, 1995), so that general education classrooms gain resources that they otherwise would not have received (Hanushek, Kain, & Rivkin, 2002). Some legal mandates may also require teacher aides to be in the classroom to assist students with disabilities (Schwab & Gelfman, 2005; Winters & Greene, 2007). By increasing the number of qualified adults in the room, this presence of an additional teacher may improve the outcomes for all students (Cipani, 1995; Tauber, 2007).

On the other hand, classmates with disabilities in general education classrooms might exert negative effects on the outcomes of other students, again directly and indirectly. Students with disabilities often exhibit higher incidences of externalizing behaviors than students without disabilities (Daniel & King, 1997; Morgan-D'Atrio, Northup, LaFleur, & Spera, 1996), are suspended at twice the rates of their classmates without disabilities (Ergenbright, 2010), and take a disproportionate amount of teachers' time and attention with respect to classroom management (Downing, Eichinger, & Williams, 1997; Greene, Beszterczey, Katenstein, Park, & Goring, 2002). Under these circumstances, classmates with disabilities might negatively affect the outcomes of other students through direct mechanisms (such as by inducing disorderly behaviors from their classmates without disabilities through their own disruptive actions), or through indirect mechanisms (such as by redirecting teachers' attention to managing these students with disabilities, thereby leaving teachers with less time to foster the achievement and social/developmental skills of other students).

Despite the volume of research in special education, however, there are three notable gaps that this present study addresses. First, the empirical research has focused predominantly on the outcomes of students with disabilities in general education classrooms, with very few exceptions focusing on their classmates (see, for example, Fletcher, 2009, 2010; Hanushek et al., 2002). As such, it remains uncertain how the effects of classmates with disabilities affect other members in that same classroom, and policy implications cannot be properly drawn without knowing the effects of classroom contexts on all students.

In the scant empirical research that does exist on the peer effects of classmates with disabilities, the literature has focused exclusively on achievement (see, for example, Friesen, Hickey, & Krauth, 2010; Hanushek et al., 2002). Most relevant is the work of Fletcher (2009, 2010), who utilizes the same data set as in this current study. In the study, he examines the peer effect of classmates who have been classified as having serious emotional or behavioral disorders (EBD) on achievement outcomes of non-EBD students. The author finds in both studies that having peers with EBD decreases reading and math achievement for classmates without disabilities during kindergarten and first grade. Hence, the case for assessing the peer effects of classmates with disabilities has been established. In addition, doing so for young schoolchildren has proven to be especially critical so that research can identify risk factors before students enter into secondary education where the ramifications of peer influences become increasingly harmful to future outcomes.

However, nothing is known about the peer effects of classmates with disabilities on the *noncognitive outcomes* of other students. It is true that recent federal and state policies do emphasize accountability through achievement and testing. However, because young children spend a large part of their formative years in classroom settings, the classroom environment

itself becomes the primary means by which young children not only learn information but also simultaneously develop noncognitive skills (Haycock, 1999; Sanders & Rivers, 1996; Wenglinsky, 2002). Hence, these noncognitive skills (i.e., defined in this study as problem behaviors and social skills) are as critical as achievement to examine: They have been shown to be high correlates of academic achievement (Duckworth & Seligman, 2005, 2006), lifetime economic earnings (Heckman & Rubinstein, 2001), future occupational status (Waddell, 2006), and long-term health behaviors (Chiteji, 2010; Heckman, 2008). Prior to this present study, there has not been any large-scale assessment of the peer effects of classmates with disabilities on the noncognitive development of other students in the same classroom though it is highly supported that early noncognitive skill formation has significant lifelong implications. Indeed, the direct and indirect mechanisms described above make it highly likely that a relationship would in fact exist between having classmates with disabilities and students' noncognitive outcomes.

Based on this major gap in the literature, this study puts forth the following first research question:

Research Question 1: Are there peer effects of having classmates with disabilities on the noncognitive outcomes of members of the same classroom? Are these results generalizable across multiple noncognitive scales?

A second critical gap in the research has been a lack of any examination of the moderating role of critical contextual factors in the assessment of the peer effects of classmates with disabilities. For instance, though there are multiple categories of disabilities recognized by IDEA, much of previous research on the peer effects of classmates with disabilities has not distinguished among different types of disabilities or alternatively has only focused their analyses on one single disability type. However, research suggests that some disabilities are more detrimental to students' abilities to function in school (Bradley, Doolittle, & Bartolotta, 2008; Kern, Hilt-Panahon, & Sokol, 2009), and they are thus worth exploring in relation to their comparative effects on other classmates. A second research question is put forth as follows:

Research Question 2: How do the effects differ by classmate disability classification?

Finally, many studies in the special education literature have methodological limitations, such as small sample sizes, limited generalizability, a lack of statistical controls for various student and classroom inputs, or a complete lack of classroom identification information (thereby making it a difficult if not impossible task to identify actual classmates). As noted by Odom et al. (2005), it is often difficult to apply quantitative methods to special education research because the relatively small number of students with disabilities necessitates large samples to have adequate statistical power to detect effects. Thus, it is not uncommon to find single-subject designs, case studies, and qualitative approaches within special education research. While such studies add to a theoretical and conceptual understanding about the potential peer effects of classmates with disabilities, the inferences that can be drawn from these studies are also limited. Thus, the final research question asks:

Research Question 3: Are the findings robust to multiple methodological approaches based on nationally representative data?

The data set used in this study is longitudinal, comprehensive, and contains classroom identification information for each student in every wave of data collection as well as detailed information on the disability classifications of a student's classmates. Hence, the analyses in this study can rely on quasi-experimental methods upheld as valid in the quantitative education research (Schneider, Carnoy, Kilpatrick, Schmidt, & Shavelson, 2007) and specifically in the education literature focusing on classroom peer effects (Ammermueller & Pischke, 2006; Fletcher, 2010; Gottfried, 2011).

Given these three research questions, this study is the first empirical investigation to evaluate the peer effect of having classmates with disabilities on noncognitive outcomes, while also being the first to account for a wider range of classmate disability classifications as well as test for the moderating effects of classroom contextual factors. Quantifying the extent to which classmates with disabilities affect noncognitive skill formation in early education is significant, such that policies and practices can be designed early on in schooling to combat negative peer effects or support positive peer effects based on a more complete description of student attainment. That is, this present research is significant because it extends the evaluation of the effects of classroom contexts beyond achievement (i.e., prior studies) to an assessment of noncognitive outcomes (i.e., this study), the latter of which has been supported by an interdisciplinary body of research as critical to a lifetime of success.

Method

Data Set

This study relies on a comprehensive, longitudinal data set developed by the National Center for Educational Statistics (NCES). The data are sourced from the Early Childhood Longitudinal Study–Kindergarten Class (ECLS-K), which is a nationally representative sample of students, teachers, and schools. The ECLS-K used a three-stage stratified sampling design, in which geographic region represented the first sampling unit, public and private school represented the second sampling unit, and students stratified by race/ethnicity represented the third sampling unit. Hence, the children in ECLS-K are representative of a diversity of school types, socioeconomic levels, and racial/ethnic backgrounds across the United States.

Information was first collected from kindergartners (as well as parents, teachers, and school administrators) from approximately 1,000 kindergarten programs in the fall and spring of the 1998–1999 school year. This is a panel study where the initial sample has currently been followed up through Grade 8, with data follow-up collection on the full sample in the spring of Grades 1, 3, 5, and 8. This study utilizes data collected at spring of kindergarten and first grade.

The exclusion of middle grades (i.e., Grades 5 and 8) was necessary in this evaluation: It is in middle school where students begin alternating classrooms with each academic period (oftentimes, each hour), and hence it becomes difficult to isolate a classroom peer effect when students experience multiple classroom peer groupings within a single school day. On the other hand, because early elementary school students are typically taught within self-contained classrooms throughout the school day and school year, identification of the classroom peer effect can be accomplished (Gottfried, 2012). Moreover, the noncognitive scales (described below) were constructed in the same format in elementary school. However, the noncognitive instruments changed after elementary school, hence making comparisons difficult.

In addition, Grade 3 is removed from the sample, as consistent with Fletcher (2010) and Cho (2012), for several key reasons. First, after Grades K and 1 were observed, there was a large amount of mobility starting in Grade 3 in the sample, which reduces the efficacy of using school fixed effects as described below. Second, as supported in Cho (2012), the ECLS-K survey does not include data for second grade. Hence, unlike data from kindergarten and Grade 1, there is a 2-year gap between Grades 1 and 3, thereby making it impossible to control for second-grade characteristics in a third-grade model.

In addition, the focus on kindergarten and first grade is theoretically significant: Both grades have been identified in the research as extremely critical schooling years on both academic and developmental outcomes (see Pianta & Walsh, 1996). Prior research supports that these 2 years are extremely critical for setting the trajectory for future outcomes, throughout the schooling pipeline and beyond (Juel, 1988; Pianta & Walsh, 1996; Smith, 1997). Furthermore, it has been possible to correlate academic and behavioral characteristics of children in kindergarten and first grade to future abilities or inabilities to succeed in school (Spira, Bracken, & Fischel, 2005). Hence, the learning context of these significant and formative years of early

education has implications for how very early sources of schooling success and risk can influence educational and lifelong outcomes.

There are a total of $N = 20{,}690$ student observations in this study in what is referred to as the "full sample."[1] The full sample is composed of students without disabilities from two survey waves, with data sourced from the spring of each respective school year: The kindergarten sample has $n = 10{,}770$; and the first-grade sample has $n = 9{,}910$. The analyses in this study are limited to first-time kindergartners only and children who had nonmissing information on noncognitive outcomes in both waves.[2] It is key that the sample is restricted to include only those students who do not have disabilities, so that it becomes feasible to identify peer effects of their classmates with disabilities. As a test of robustness, the sample was further limited to test the effect of having classmates with disabilities only on those students who do not have disabilities and also were never tested for disabilities. The results from this ancillary analysis were consistent with the results going forward presented in this article.

Outcome Variables

Table 1 provides means and standard deviations for the noncognitive outcomes used in this study. Consistent with prior research utilizing ECLS-K to evaluate noncognitive outcomes for students in early elementary school (e.g., Herbst & Tekin, 2010; Jennings & DiPrete, 2010; Morgan, Frisco, Farkas, & Hibel, 2010; Neidell & Waldfogel, 2010), this study relies on a modified version of the *Social Skills Rating System* (SSRS; Gresham & Elliott, 1990) to measure a child's behavior/socioemotional development. Correlational and factor analyses support these original measures' construct validity (Feng & Cartledge, 1996; Furlong & Karno, 1995). NCES modified the original scales and created its own *Teacher Social Rating Scale* (SRS). Meisels, Atkins-Burnett, and Nicholson (1996) provided detail on these modifications from SSRS to the ECLS-K SRS.

Five teacher-rated SRS scales are utilized in this study, delineated into two categories: problem behaviors and social skills. Problem behaviors include two SRS scales: (a) externalizing behaviors and (b) internalizing behaviors. The externalizing behaviors scale measures the frequency with which a child argues, fights, gets angry, acts impulsively, and disturbs ongoing activities. The internalizing behaviors scale rates the presence of anxiety, loneliness, low self-esteem, and sadness.

Social skills include three SRS scales: (a) level of self-control, (b) approaches to learning, and (c) interpersonal skills. The self-control scale measures the frequency of the student's ability to control his or her temper, respect others' property, accept peer ideas, and handle peer pressure. The approaches to learning scale rates a child's frequency of organization, eagerness to learn new things, independent work ability, adaptability to change, persistence in completing tasks, and ability to pay attention. Finally, the interpersonal skills scale measures the frequency by which a child has been getting along with people, forming and maintaining friendships, helping other children, showing sensitivity to the feelings of others, and expressing feelings, ideas, and opinions in positive ways.

Each construct is continuous, as it averages a series of questions for each scale rated from 1 (*never*) to 4 (*very often*). Note that a high score of self-control, approaches to learning, and interpersonal skills reflects a favorable outcome (i.e., social skills scales), whereas a high score on externalizing or internalizing scales reflects an unfavorable outcome (i.e., problem behavior scales). While these scales are teacher-rated and might potentially be subjective based on students in a classroom in any particular year, these scales nonetheless have high construct validity as assessed by test–retest reliability, internal consistency, interrater reliability, and correlations with more advanced behavioral constructs. In fact, these scales are considered to be the most comprehensive social skill assessment that can be widely administered in large surveys such as the ECLS-K (Demaray, Ruffalo, Carlson, Busse, & Olson, 1995). Note that student self-description scales are not available in early elementary school in the ECLS-K data set.

Independent Variables

Table 1 also presents mean and standard deviation values for the independent variables

TABLE 1
Descriptive Statistics for Students Without Disabilities.

	Full sample		Kindergarten		Grade 1	
	M	*SD*	*M*	*SD*	*M*	*SD*
Outcomes (teacher-rated)						
Externalizing behavior problems	1.65	0.63	1.65	0.63	1.64	0.63
Internalizing behavior problems	1.56	0.50	1.55	0.50	1.57	0.50
Level of self-control	3.20	0.61	3.20	0.62	3.19	0.61
Approaches to learning	3.12	0.69	3.16	0.67	3.07	0.70
Interpersonal skills	3.13	0.64	3.15	0.63	3.12	0.64
Key variable						
Number of classmates with disabilities	1.73	2.46	1.90	2.86	1.54	1.91
Student demographic information						
Lagged math achievement score	24.18	9.08	20.10	7.39	28.62	8.65
Age (months)	80.52	7.49	74.64	4.31	86.92	4.30
Female	0.51	0.50	0.51	0.50	0.51	0.50
Black	0.14	0.34	0.13	0.34	0.14	0.35
Hispanic	0.16	0.37	0.16	0.37	0.16	0.37
Asian	0.05	0.23	0.05	0.22	0.06	0.23
Other	0.06	0.23	0.06	0.24	0.05	0.22
Family income (less than 25K per year)	0.21	0.41	0.19	0.39	0.25	0.43
Classroom data						
Class size	20.78	4.83	20.78	5.11	20.78	4.51
Percent class: White	0.63	0.34	0.63	0.33	0.63	0.35
Percent class: boys	0.51	0.22	0.51	0.11	0.52	0.30
Percent class: below grade level in reading	0.19	0.16	0.16	0.14	0.22	0.17
Teacher data						
Male	0.02	0.14	0.02	0.12	0.02	0.15
Years of teaching experience	13.45	8.57	12.47	6.54	14.52	10.24
Has M.A. degree (or higher)	0.34	0.46	0.32	0.45	0.35	0.48
Number of years teaching students with disabilities	0.46	2.09	0.48	2.18	0.45	1.98
Number of courses in special education	1.85	1.80	1.93	1.82	1.77	1.77
Has different standards for students with disabilities	0.54	0.49	0.54	0.50	0.53	0.49
School-level data						
School size (0–149 students)	0.06	0.24	0.07	0.26	0.04	0.21
School percent minority	0.35	0.34	0.34	0.33	0.36	0.35
Private	0.22	0.41	0.22	0.42	0.21	0.41
No retention policies for students with disabilities	0.52	0.50	0.47	0.50	0.57	0.49
Urban	0.38	0.49	0.39	0.49	0.37	0.48
Rural	0.13	0.34	0.13	0.33	0.14	0.34
n	20,690		10,770		9,910	

utilized in this study. The key variable in this analysis is the total number of classmates with disabilities in a student's classroom. Previous research has also utilized counts of classmates with controls for class size (as opposed to percentage of class), and the same approach is used here (Cho, 2012; Fletcher, 2010; Gottfried, 2012). The number of classmates with disabilities is sourced from the spring teacher survey in each wave. Each teacher was asked to report the total

number of children in the classroom with a diagnosed disability. The question was presented in the same format in kindergarten and first grade.

The first several sets of analyses in this study present this class count as an aggregate measure of the total number of classmates with any disability. However, the survey question that immediately followed this head count question asked the teacher to report each student's disability based on disability classifications. In subsequent analyses in this study, the analyses are broken into five subcategories, including EBD, learning and communication (speech and language) impairments, mental or developmental delays, physical impairments (i.e., vision, hearing, orthopedic), and severe impairments (i.e., autism, deaf-blindness, and traumatic brain injury). It is not possible to extract any additional disability information for students classified as having "other health impairments," "multiple disabilities," or "other." As such, students who are only classified as these are not included in this subsequent analysis.

A range of additional child-, classroom-, and school-level variables are included as additional explanatory variables in the estimation. Child-level variables include one-wave lagged math achievement scaled score,[3] age, gender, race, and family income. Note that an ancillary specification tested changes in the peer effects coefficients from using fall kindergarten math scores for all models' lagged scores (i.e., in spring kindergarten and spring Grade 1) rather than one-wave lagged scores (i.e., fall kindergarten for the spring kindergarten model, and spring kindergarten for the spring Grade 1 model). The results were not altered by this modification.

Prior research has suggested that several classroom attributes may serve as protective factors in noncognitive developmental outcomes and are hence included as control variables in this study. They include class size (see, for example, Dee & West, 2012), gender breakout of the classroom (see, for example, Hoxby, 2000), and academic characteristics of one's classmates (see, for example, Gottfried, Gottfried, Bathurst, & Guerin, 1994). As consistent with Fletcher (2010), the percentage of White students in the classroom is also included as a control variable.

Teacher characteristics include teacher race, years of experience, and an indicator for graduate level degree. However, given that this study evaluates the effect of classmates with disabilities, it is crucial to incorporate additional teacher measures, including the total number of years that the teacher has spent teaching students with disabilities, the number of courses that the teacher has taken in special education, and whether a teacher has different educational standards for students with disabilities.

School-level variables include size of the school as measured by the level of enrollment, percentage of the student body that is of racial/ethnic minority, public or private school, an indicator for whether school policies dictate if students with disabilities can be retained, and indicators for urbanicity. Note that because this sample includes only those students without disabilities, all schools that exclusively serve students with disabilities are excluded from the analysis by default. Consistent with prior studies measuring peer effects using ECLS-K data (e.g., Fletcher, 2010), dummy variables are utilized to indicate missing classroom or teacher control variables and missing information was replaced with sample mean values.

Table 2 presents partial correlation coefficients and their significance levels between the classroom count of students with disabilities and other independent variables. Importantly, the lower portion of the table suggests that in the sample, there are extremely low correlation values between classroom and teacher characteristics and number of students with disabilities. Thus, while there may be statistical significance on some of these values, the practical significance is minimal given that most correlations approximate to zero: Classrooms with higher numbers of students with disabilities do not appear to be meaningfully related to other observable characteristics of classrooms or teachers. This issue is further explored in the proceeding subsection.

Table 2 also presents very small correlation values between additional covariates and the classroom count of students with disabilities. For instance, there is approximately zero correlation between student characteristics and the number of his or her classmates with disabilities. This suggests that student background is

TABLE 2

Correlations Between Classroom Count of Students With Disabilities and Other Independent Variables: Full Sample.

Student demographic information	
Lagged math achievement score	–0.02***
Age (months)	0.03***
Female	0.01**
Black	–0.01
Hispanic	–0.01**
Asian	–0.02***
Other	0.03***
Family income (less than 25K per year)	–0.03***
Classroom data	
Class size	0.13***
Percent class: White	0.01
Percent class: boys	–0.02***
Percent class: below grade level in reading	0.17***
Teacher data	
Male	–0.04***
Years of teaching experience	0.03***
Has MA degree (or higher)	–0.01
Number of years teaching students with disabilities	0.02***
Number of courses in special education	0.04***
Has different standards for students with disabilities	0.03***
School-level data	
School size (0–149 students)	0.00
School percent minority	–0.01
Private	–0.09***
No retention policies for students with disabilities	0.02***
Urban	–0.05***
Rural	0.02**

*$p < .10$. **$p < .05$. ***$p < .01$.

not systematically related to the number of classmates with disabilities. There are low correlation values between other characteristics in the table and the number of classmates with disabilities. Again, this suggests that there is nothing systematic in the relationships between the number of classmates with disabilities and the set of independent variables that would appear bias the data in any particular direction.

Analytic Approach

Baseline model. To examine the peer effect of having classmates with disabilities, this study begins with a linear regression model, presented as follows:

$$NC_{ijkt} = \beta_0 + \beta_1 P_{-ijkt} + \beta_2 I_{ijkt} + \beta_3 C_{jkt} + \beta_4 T_{jkt} + \beta_5 S_{kt} + \varepsilon_{ijkt} \quad (1)$$

where NC is one of five noncognitive SRS scales for student i in classroom j in school k in survey wave t. Note that this model represents an analysis based on utilizing observations from the full sample. In subsequent regressions, the analysis is broken out by kindergarten and Grade 1 samples, thereby allowing the wave t indicator to be dropped from the analysis. However, going forth in this section, the wave indicator remains present in the descriptions of the models.

Empirically, the sets of independent variables, described by the model, are estimated as follows. The key independent variable, P, is the count of classmates with disabilities. Recall that the sample only includes students without disabilities, and thus, this variable would not overlap with any individual-level disabilities. At the student level, the sets of independent variables include I, a vector of a student's characteristics.

At the classroom level, the model assigns the following inputs: *C* are classroom control variables (e.g., class size), and *T* are teacher control variables (e.g., gender). Finally, there are school-level control variables in vector *S*, such as school size.

The error term ε includes all unobserved determinants of the outcome. Empirically, this latter component is estimated with Huber/White/sandwich robust standard errors, adjusted for classroom clustering as consistent with prior peer effects research using ECLS-K (see, for example, Cho, 2012; Fletcher, 2010; Neidell & Waldfogel, 2010).

Accounting for unobserved heterogeneity. An estimation issue that might arise with the empirical specification as described thus far is that there may be unobserved school factors that are correlated with the number of classroom peers with disabilities and the individual-level outcomes of those students in the sample (Fletcher, 2010). As a result, a second specification in this study includes school-level fixed effects:

$$NC_{ijkt} = \beta_0 + \beta_1 P_{-ijkt} + \beta_2 I_{ijkt} + \beta_3 C_{jkt} + \beta_4 T_{jkt} + \delta_k + \varepsilon_{ijkt} \quad (2)$$

where δ_k are school fixed effects for school *k*. By holding constant those omitted school-specific factors, such as school educational investments, organizational practices, aggregate parental involvement, and inclusion policies, the principal source of variation used to identify the classmate effect occurs across classrooms within each school. Note that school-level variables drop away in this model.

Even with the use of school fixed effects, the models thus far have been constructed under the assumption that unobserved school variables are time-invariant. However, there is the possibility that time-varying unobserved school-level factors, such as changing school quality, may be influencing the number of disabled classmates as well as noncognitive outcomes. To account for such differences over time, a final model will include school-by-year fixed effects:

$$NC_{ijkt} = \beta_0 + \beta_1 P_{-ijkt} + \beta_2 I_{ijkt} + \beta_3 C_{jkt} + \beta_4 T_{jkt} + \delta_{kt} + \varepsilon_{ijkt} \quad (3)$$

where δ_{kt} are school-year fixed effects for school *k* in year *t*. This final, most stringent model (which can only be run on the full sample of observations) would make it highly unlikely that variations in the unobserved time-varying within-school, within-year environment would bias the estimated peers effects of having classmates with disabilities.

The use of school fixed effects has been established in the literature as appropriate for assessing peer effects on noncognitive outcomes using the ECLS-K data set (see, for example, Neidell & Waldfogel, 2010). Hence, this is the specification upheld in this study as well. Fletcher (2010) utilized student fixed effects when assessing the impact of classmates with EBD on achievement outcomes; however, because achievement is a standardized measure based on item response theory (IRT), it was possible to exploit this within-student variation over time. The focus on noncognitive outcomes makes it difficult to use and interpret student fixed effects.[4] The issue is that noncognitive outcomes are teacher-rated scales as described above, so that in each wave of data collection a new teacher is rating the student on these scales. Thus, unlike the IRT scaled achievement scores, the noncognitive outcomes do not have the same scaled-score properties that would allow for student fixed effects or vertical growth analyses.

That being said, it is important to address the possibility (though not certainty) that school administrators may be nonrandomly assigning students to classrooms in part based on individual ability and behavior as well as based on the number of classmates with disabilities. However, previous work in peer effects using the ECLS-K data set does not find the presence of nonrandom sorting in early education. For instance, Neidell and Waldfogel (2010) demonstrated that in the early elementary school waves of ECLS-K, there is little evidence of within-school/within-grade sorting, neither based on individual ability nor on individual behavior. Also utilizing the ECLS-K data set, Aizer (2008) demonstrated that there is little within-school sorting when it comes to the sorting of classmates with attention deficit disorders in conjunction with individual and teacher characteristics.

Briefly, this present study examines a similar sorting issue. All evidence presented here is consistent with the conclusions in Neidell and Waldfogel (2010) and Aizer (2008), in which there is a lack of evidence of within-school sorting. To begin, Table 3 examines whether there is sorting of classmates with disabilities by presenting the average number of classmates with disabilities delineated by student, classroom, teacher, and school characteristics for students in Grade 1, under the assumption that if there were going to be more sorting, it would happen in Grade 1 compared with in kindergarten (the results for kindergarten are similar to those presented for Grade 1). In this table, the set of *t*-statistics (in absolute value form) presents a test of means between the current row and the reference group, as indicated under each variable. The first *t*-statistic is unadjusted. The second *t*-statistic has been adjusted for school fixed effects, as these are supported as being more appropriate for descriptive statistics of ECLS-K data used to evaluate classroom contexts (Neidell & Waldfogel, 2010). Comparing the unadjusted versus adjusted *t*-statistics, it is clear that there are no statistically significant differences in the number of classmates with disabilities across any of the characteristics once accounting for school fixed effects. Only one is statistically different, though there is no practical significance as the difference between the two groups is 0.07 students. Hence, given the complete drop in significance once accounting for between-school variance, this table supports the use of school fixed effects models.

Table 4 also examines the possibility of the sorting of nondisabled students within schools based on the number of classmates with disabilities. Each column's dependent variable (notated at the top of each column) represents a student characteristic upon which school administrators would most probabilistically sort students, given the possibility of having classmates with disabilities: ability, age, gender, and disruptive behavior. For the kindergarten analysis in the first block of columns, ability and disruptive behavior outcome measures are extrapolated from the fall kindergarten survey—that is, so that if there were evidence of sorting, then the number of classmates with disabilities would have a significant effect on these lagged variables measured at kindergarten entry (Neidell & Waldfogel, 2010). An analogous set-up is conducted in Grade 1, with spring kindergarten measures utilized for lagged student ability and lagged disruptive behavior outcomes. Across all columns in this table, there is no evidence that the number of classmates with disabilities is related to any student outcome. Hence, in ECLS-K, schools do not appear to be sorting students to classrooms based on initial (or previous) ability or behavior, or based on age or gender in these early years of education. In sum, then, the evidence presented in Tables 3 and 4 uphold that school fixed effects are the most appropriate for an analysis of classroom peer effects with this data set.[5]

Results

Baseline Results

Table 5 presents coefficient estimates and standard errors adjusted for classroom clustering for the specifications examining the effect of having classmates with disabilities on the five ECLS-K SRS outcomes. These models are based on Equation (1). The sample used to produce the results in this table is the full sample, which recall includes all student observations (for students without disabilities) across both waves.

The coefficients on the number of classmates with disabilities are statistically significant for all five noncognitive outcomes. Students who have a greater number of classmates with disabilities also tend to have greater externalizing and internalizing behavioral issues and tend to have lower frequencies of self-control, approaches to learning, and interpersonal skills. Indeed, the table indicates that the magnitude is similar in value across all noncognitive scales, thereby showing a consistency in the model used in the analysis.

The measure of effect sizes in this study, as supported by many education empiricists in nonexperimental studies, is the standardized beta coefficient (e.g., Caldas 1993; Hoxby, 2000; McEwan, 2003). The relationship between the number of classmates with disabilities and the five noncognitive outcomes corresponds to an effect size of approximately -0.02σ or -0.04σ across all statistically significant outcomes. The

TABLE 3

Number of Classmates With Disabilities, Broken Out by Category: Grade 1 Sample.

	M	*SD*	*t*-statistic	Adjusted *t*-statistic
Student				
Lagged math achievement score				
At or below 25th percentile (reference)	1.67	2.05		
26th to 50th percentile	1.57	1.89	2.76	1.62
51st to 75th percentile	1.51	1.84	3.46	1.38
76th percentile or higher	1.43	1.82	4.88	1.30
Age				
At or below 25th percentile (reference)	1.47	1.91		
26th to 50th percentile	1.56	1.94	0.06	1.47
51st to 75th percentile	1.53	1.82	0.03	0.78
76th percentile or higher	1.59	1.95	0.10	1.42
Gender				
Male (reference)	1.55	1.92		
Female	1.53	1.90	2.13	0.02
Race				
White (reference)	1.63	1.92		
Black	1.56	2.10	1.73	1.40
Hispanic	1.27	1.77	1.09	0.04
Asian	1.28	1.79	1.65	0.52
Family income				
Less than 25K per year (reference)	1.58	1.95		
Greater than 25K per year	1.53	1.86	4.80	1.57
Classroom				
Class size				
At or below 25th percentile (reference)	1.37	1.74		
26th to 50th percentile	1.40	2.99	0.91	1.18
51st to 75th percentile	1.83	2.04	1.23	0.75
76th percentile or higher	1.56	2.12	0.95	0.22
Percent class: White				
At or below 25th percentile (reference)	1.75	1.22		
26th to 50th percentile	1.66	1.93	1.84	0.42
51st to 75th percentile	1.68	2.00	2.26	2.24[a]
76th percentile or higher	1.60	1.90	1.60	1.32
Percent class: boys				
At or below 25th percentile (reference)	1.36	1.71		
26th to 50th percentile	1.44	1.86	0.49	1.07
51st to 75th percentile	1.75	2.07	0.26	1.51
76th percentile or higher	1.63	1.96	1.03	0.67
Percent class: below grade level in reading				
At or below 25th percentile (reference)	1.20	1.73		
26th to 50th percentile	1.40	1.71	0.70	0.86
51st to 75th percentile	1.62	1.89	2.98	0.34
76th percentile or higher	1.95	2.19	3.43	0.27
Teacher				
Gender				
Male (reference)	1.04	1.27		
Female	1.55	1.92	0.91	0.69
Years of teaching experience				
At or below 25th percentile (reference)	1.45	1.90		
26th to 50th percentile	1.43	1.82	0.73	1.41
51st to 75th percentile	1.69	2.02	0.52	0.22
76th percentile or higher	1.59	1.86	0.40	0.64

(continued)

TABLE 3 (CONTINUED)

	M	*SD*	*t-statistic*	*Adjusted t-statistic*
Master's degree				
No M.A. (reference)	1.48	1.90		
M.A. or higher	1.65	1.91	0.20	0.56
Number of years teaching students with disabilities				
At or below 25th percentile (reference)	1.49	1.86	NA	NA
26th to 50th percentile	1.49	1.86	NA	NA
51st to 75th percentile	1.49	1.86	NA	NA
76th percentile or higher	1.82	2.01	0.59	0.30
Number of courses in special education				
At or below 25th percentile (reference)	1.43	1.84		
26th to 50th percentile	1.50	1.91	0.22	0.43
51st to 75th percentile	1.49	1.88	1.48	0.89
76th percentile or higher	1.77	2.00	2.39	0.18
Standards for students with disabilities				
Different standards (reference)	1.70	2.52		
Same standards	1.74	1.95	2.63	1.35
School				
School size (0 to 149 students)				
0 to 149 students (reference)	1.75	2.05		
Greater than 149 students	1.52	1.90	5.17	0.69
Percent minority				
Less than 10% (reference)	1.62	1.99		
Greater than 10%	1.49	1.85	0.75	0.19
Retention policies for students with disabilities				
Present (reference)	1.57	1.89		
Not present	1.49	1.93	2.60	0.02
Degree of urbanicity				
Suburban (reference)	1.27	1.71		
Urban	1.75	1.87	2.59	1.44
Rural	1.69	2.03	1.77	1.07

[a]Adjusted *t*-statistic has a statistically significant difference in means at the $p < .10$ level or lower.

magnitudes of these effect sizes are in-line and consistent with previous nonexperimental research on peer effects (e.g., Ammermueller & Pischke, 2006; Fletcher, 2010; Hoxby, 2000).

Briefly examining the control variables in Table 5 provides the following results. In the direction as expected, compared with girls, boys tend to exhibit higher externalizing and internalizing behavioral problems and lower frequencies of self-control, approaches to learning, and interpersonal skills. The results across all five noncognitive outcomes are also delineated by race and age. There is less consistency across the results for the covariates pertaining to the classroom control variables. As for teacher characteristics, the lack of consistent significance aligns with many studies, including Argys, Rees, and Brewer (1996) and Nye, Konstantopoulos, and Hedges (2004). Finally, like classroom characteristics, some school-level variables are significant throughout the table, but not consistently so.

Accounting for School Heterogeneity

Table 6 presents the results from using school fixed effects models on full and separate grade samples. Each entry is the result from a unique analysis: It represents the coefficient and standard error on the number of classmates with disabilities based on the sample indicated in the subsection heading.

Although R^2 values are not presented for the sake of clarity, the inclusion of school fixed effects improves the explained portion of the variance of the noncognitive outcomes evaluated in this study, as consistent with the findings in Table 3. R^2 values are available upon request. In conjunction with the increases in R^2 from baseline to school fixed effects models, the

TABLE 4
Predicting Student Outcomes and Characteristics.

	Kindergarten				Grade 1			
	Fall K math achievement	Age	Gender	Fall K externalizing problem behaviors	Spring K math achievement	Age	Gender	Spring K externalizing problem behaviors
Number of classmates with a disability	0.02 (0.03)	0.02 (0.03)	0.00 (0.00)	0.00 (0.00)	–0.09 (0.05)	–0.01 (0.03)	0.00 (0.00)	0.00 (0.00)
Student characteristics	Y	Y	Y	Y	Y	Y	Y	Y
Classroom characteristics	Y	Y	Y	Y	Y	Y	Y	Y
Teacher characteristics	Y	Y	Y	Y	Y	Y	Y	Y
School Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
n	10,560	10,560	10,560	10,560	9,910	9,910	9,910	9,910
R^2	.20	.19	.08	.21	.38	.25	.12	.23

Note. Robust Huber-White standard errors adjusted for clustering within classrooms are in partentheses. All regressions include a constant.
$^{*}p < .10$. $^{**}p < .05$. $^{***}p < .01$.

TABLE 5

Peer Effects of Classmates With Disabilities on Noncognitive Outcomes: Full Sample.

	Problem behaviors				Social skills					
	Externalizing		Internalizing		Self-control		Approaches to learning		Interpersonal skills	
Key variable										
Number of classmates with a disability	0.01**	(0.00)	0.01**	(0.00)	−0.01***	(0.00)	−0.01*	(0.00)	−0.01***	(0.00)
Effect size	0.02		0.03		−0.03		−0.02		−0.04	
Model controls										
Student demographic information										
Lagged math achievement score	−0.01***	(0.00)	−0.01***	(0.00)	0.01***	(0.00)	0.03***	(0.00)	0.01***	(0.00)
Age (in months)	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)	0.01***	(0.00)	0.00	(0.00)
Female	−0.26***	(0.01)	−0.04***	(0.01)	0.21***	(0.01)	0.30***	(0.01)	0.25***	(0.01)
Black	0.16***	(0.02)	−0.03**	(0.02)	−0.14***	(0.02)	−0.11***	(0.02)	−0.13***	(0.02)
Hispanic	−0.07***	(0.02)	−0.05***	(0.01)	0.04**	(0.02)	0.04***	(0.02)	0.02	(0.02)
Asian	−0.15***	(0.02)	−0.09***	(0.02)	0.12***	(0.02)	0.17***	(0.02)	0.05**	(0.02)
Other	0.06***	(0.02)	0.03*	(0.02)	−0.05**	(0.02)	−0.03	(0.02)	−0.08***	(0.02)
Classroom data										
Class size	0.00***	(0.00)	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)
Percent class: White	0.02	(0.03)	0.07**	(0.03)	−0.03	(0.04)	−0.05	(0.04)	−0.04	(0.04)
Percent class: boys	−0.07***	(0.01)	−0.01	(0.02)	0.07***	(0.02)	0.08***	(0.02)	0.06***	(0.02)
Percent class: below reading level for grade	0.09**	(0.04)	0.07**	(0.04)	−0.12***	(0.04)	−0.14***	(0.04)	−0.12***	(0.04)
Teacher data										
Male	0.04	(0.04)	0.03	(0.04)	−0.03	(0.04)	−0.04	(0.04)	−0.04	(0.05)
Year of teaching experience	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)
Has M.A. degree (or higher)	−0.01	(0.01)	0.01	(0.01)	0.00	(0.01)	0.00	(0.01)	−0.01	(0.01)
Number of years teaching students with disabilities	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)	−0.01	(0.00)
Number of courses in special education	0.00	(0.00)	0.01**	(0.00)	0.00	(0.00)	0.00	(0.00)	0.01*	(0.00)
Has different standards for students with disabilities	−0.01	(0.01)	0.01	(0.01)	0.02	(0.01)	0.01	(0.01)	0.00	(0.01)
School-level data										
School is less than 149 students	0.02	(0.03)	−0.07**	(0.03)	0.03	(0.04)	0.04	(0.04)	0.05	(0.04)
Percentage of school: minority	0.00	(0.00)	0.00*	(0.00)	0.00*	(0.00)	0.00*	(0.00)	0.00	(0.00)
Private school indicator	0.07***	(0.02)	0.07***	(0.02)	−0.11***	(0.02)	−0.11***	(0.02)	−0.11***	(0.02)
No retention policies for students with disabilities	0.02*	(0.01)	0.00	(0.01)	−0.01	(0.01)	−0.01	(0.01)	−0.01	(0.01)
Urban	−0.01	(0.01)	−0.01	(0.01)	0.02	(0.02)	0.01	(0.02)	0.04**	(0.02)
Rural	−0.04**	(0.02)	−0.04**	(0.02)	0.00	(0.02)	0.04*	(0.02)	0.04	(0.02)
n	20,690		20,690		20,690		20,690		20,690	
R^2	.09		.06		.09		.24		.11	

Note. Robust Huber-White standard errors adjusted for clustering within classrooms are in partentheses. All regressions include a constant. Regressions also include additional control variables: level of family income (scale ranges from 1 to 7), an indicator for grade/wave, and additional indicator variables for other categories of school size. These coefficients are available upon request.

*$p < .10$. **$p < .05$. ***$p < .01$.

TABLE 6

Peer Effects of Classmates With Disabilities on Noncognitive Outcomes: All Samples.

	Full sample			Kindergarten		Grade 1	
	Baseline (estimates from Table 3)	School fixed effects	School-year fixed effects	Baseline	School fixed effects	Baseline	School fixed effects
Dependent variable							
Problem behaviors							
Externalizing behavior problems	0.01** (0.00)	0.01** (0.00)	0.01*** (0.00)	0.01** (0.00)	0.01** (0.00)	0.01 (0.00)	0.01 (0.00)
Internalizing behavior problems	0.01** (0.00)	0.01*** (0.00)	0.01*** (0.00)	0.01** (0.00)	0.01* (0.00)	0.01*** (0.00)	0.01*** (0.00)
Social skills							
Level of self-control	−0.01*** (0.00)	−0.01*** (0.00)	−0.01*** (0.00)	−0.01* (0.00)	−0.01** (0.00)	−0.01** (0.00)	−0.02*** (0.00)
Approaches to learning	−0.01* (0.00)	−0.01* (0.00)	−0.01* (0.00)	0.00 (0.00)	0.00 (0.00)	−0.01** (0.00)	−0.01* (0.00)
Interpersonal skills	−0.01*** (0.00)	−0.01*** (0.00)	−0.01*** (0.00)	−0.01*** (0.00)	−0.01*** (0.00)	−0.01*** (0.00)	−0.01*** (0.00)
n	20,690	20,690	20,690	10,770	10,770	9,910	9,910

Note. Robust Huber-White standard errors adjusted for clustering within classrooms are in partentheses. All regressions include a constant. Regressions also include additional control variables: level of family income (scale ranges from 1 to 7), missing variable dummies for those missing values replaced with the sample mean. All school-level variables drop away from the regression with the inclusion of school fixed effects. All other variables remain in the model.

*$p < .10$. **$p < .05$. ***$p < .01$.

TABLE 7

Peer Effects of Classmates With Disabilities on Noncognitive Outcomes: Designation by Classmate Disability.

	Disability of classmate									
	Emotional/ behavioral disorders		Learning/ communication impairments		Mental/ developmental delays		Physical impairments		Severe impairments	
Dependent variable										
Problem behaviors										
Externalizing behavior problems	0.04***	(0.02)	0.01**	(0.00)	0.02**	(0.01)	0.02***	(0.01)	−0.03	(0.02)
Internalizing behavior problems	0.06***	(0.01)	0.01**	(0.00)	0.02***	(0.01)	0.01**	(0.01)	0.02	(0.02)
Social skills										
Level of self-control	−0.04***	(0.01)	−0.01***	(0.00)	−0.01**	(0.01)	−0.02**	(0.01)	−0.02	(0.03)
Approaches to learning	−0.04***	(0.01)	−0.01**	(0.00)	−0.01	(0.01)	0.00	(0.01)	−0.03	(0.03)
Interpersonal skills	−0.03*	(0.01)	−0.02***	(0.00)	−0.01**	(0.01)	−0.01	(0.1)	−0.04	(0.03)
n	20,690		20,690		20,690		20,690		20,690	

Note. Robust Huber-White standard errors adjusted for clustering within classrooms are in partentheses. All regressions include a constant. Regressions also include additional control variables: level of family income (scale ranges from 1 to 7), missing variable dummies for those missing values replaced with the sample mean. All school-level variables drop away from the regression with the inclusion of school fixed effects. All other variables remain in the model.

*$p < .10$. **$p < .05$. ***$p < .01$.

Likelihood Ratio test also favors this latter more restrictive specification.

Examining first those results for the full sample in three leftmost columns, the estimates show a consistency in interpretation between baseline and school and school-year fixed effects analyses: A greater number of classmates with disabilities implies greater problem behaviors (externalizing and internalizing) and worsened social skills (self-control, approaches to learning, and interpersonal skills) for those other students in that same classroom. The fact that the coefficient estimates remain statistically significant and similar in magnitude across all three approaches in the full sample suggests that a consistent effect on noncognitive outcomes continues to be prevalent from having classmates with disabilities, even after controlling for unobservable school and school-year characteristics and observable student, teacher, and classroom factors.

Within each analysis broken out by grade, the results also show a great amount of consistency between baseline and school fixed effects models as well as with the full sample models. There are some minor differences, such as the fact that externalizing problem behaviors are only exacerbated in kindergarten whereas approaches to learning skills are only worsened in Grade 1. That being said, however, the overall interpretation is consistent throughout the table. Hence the conclusion of the analyses continues to uphold that being in classrooms with a larger number of classmates with disabilities poses a greater risk in terms noncognitive outcomes for those other students.

Addressing Heterogeneity in Disability

Table 7 separately examines the results by peer disability classification. The intention of this analysis is to determine whether different subsets of classmates with disabilities differentially affect their peers' noncognitive outcomes. Each cell is the estimate on the number of classmates who are classified into a disability group indicated in the column heading. The model uses school fixed effects, and the full sample is used.

Table 7 indicates that the results differ based on disability category and by noncognitive outcome; hence, differentiating between these categories and between all five scales is critical. First, the largest effects are exhibited by the number of classmates with EBD in the first column. Not only are all estimates statistically significant for each noncognitive scale but also the magnitudes of these effects are double or triple the statistically significant effects found in any other disability category. This result is

logical and consistent with the literature: Prior research has suggested that students with EBD are found to be some of the most challenging to include in general education classroom settings (MacMillian, Gresham, & Fornes, 1996) due to the fact that behavioral issues tend to disrupt the classroom and slow down the regular pace of teaching and instruction (Figlio, 2007; Lazear, 2001).

The effect of having a larger number of classmates with disabilities also persists in the next three disability categories: learning/communication impairments, mental/developmental delays, and physical impairments. Of all of the categories, there are no significant effects of having classmates with severe impairments, which recall includes autism, blind-deafness, and traumatic brain injury. This might be explained by the fact that students with these high-needs disabilities tend to have aides or additional support staff devoted entirely to them, even if they are taught from within the general education classroom. Hence, though they may be contained within this general educational environment, their influence on the outcomes of other students in the room may be limited given that they may have separated learning experiences and hence may not have peer interactions or group experiences in the same way that classmates in the other four disability categories might (i.e., a classmate with EBD).

An ancillary analysis replaced the classroom counts of classmates by disability category with intervals of counts (i.e., 1, 2–5, 6 or more). Although not presented, the results demonstrate that it is often (but not always) the case that having just one classmate with a particular disability is not statistically significant. It is only when students have two or more classmates in these disabilities categories do the effects become significant. Hence, being in a classroom with only one classmate with a particular disability may not worsen the noncognitive outcomes for other students in the room. It is only at higher counts of classmates with disabilities do the outcomes cause a decline in noncognitive development.

A second and related finding is that the results generally worsen by threshold level. The point estimates at each threshold become increasingly larger at a nonlinear rate for each noncognitive outcome. For instance, depending on the disability type in Table 7, the peer effect is exacerbated when students have two or more classmates with disabilities and then worsens even further when students have six or more classmates with disabilities. Hence, these results suggest that having larger numbers of classmates with disabilities becomes increasingly detrimental to student outcomes.

Moderating Effects of Context

Thus far, the analyses in this study have demonstrated that the number of classmates with disabilities—measured aggregately as well as broken out by disability category—may have negative implications for the noncognitive outcomes of other students in the same classroom. That being said, however, a logical extension of these findings is to determine what is useful for policy and practice.

As such, the question remains as to the degree to which these peer effects might be moderated by individual factors or the classroom context. Examining these factors is important, as schools can use this information to make compensatory changes based on the allocation of students with disabilities in general education classrooms. To do so, the analyses from Table 7 are rerun, but now incorporate an interaction between an indicator for having a classmate with a specific disability and a series of individual, classroom, or teacher characteristics as denoted by the column heading. In other words, the specification is laid-out as follows:

$$NC_{ijkt} = \beta_0 + \beta_1 P_{-ijkt} * F_{ijkt} + \beta_2 P_{-ijkt} + \beta_3 F_{ijkt} + \beta_4 I_{ijkt} + \beta_5 C_{jkt} + \beta_6 T_{jkt} + \delta_k + \varepsilon_{ijkt} \quad (4)$$

where F_{ijkt} represents an individual-, classroom-, or teacher-level contextual factor.

The values presented in Table 8 are standardized beta effect sizes based on statistically significant coefficients of the interaction, β_1. Only statistically significant results are presented. Improvements in noncognitive outcomes occur as follows: A negative effect size suggests a reduction in problem behaviors, and a positive effect size suggests an improvement in social skills. In this way, positive moderating effects

TABLE 8

Contextual Effects of Having Classmates With Disabilities: Effect Sizes.

	Peer disability interacted with factor in column heading						
	Math ability	Age	Percent of classroom: boys	Percent of classroom: below reading	Years of teaching experience	Years of teaching special education	Teacher course credits in special education
Outcome: Externalizing							
Peer disability							
Emotional/behavioral disorders	−0.01*		0.07*	0.03**			
Learning/communication impairments		0.16*			−0.04**		
Mental/developmental delays						−0.03***	
Physical impairments							
Severe impairments	−0.05***				−0.03*		
Outcome: Internalizing							
Peer disability							
Emotional/behavioral disorders			0.10***	0.03*			−0.03*
Learning/communication impairments							
Mental/developmental delays							
Physical impairments							
Severe impairments							
Outcome: Self-control							
Peer disability							
Emotional/behavioral disorders				−0.04***			
Learning/communication impairments					0.04*		0.01***
Mental/developmental delays	0.04**					0.02***	0.02*
Physical impairments							
Severe impairments	0.04*	−0.15*			0.04*		
Outcome: Approaches to learning							
Peer disability							
Emotional/behavioral disorders	0.05***		−0.03**				
Learning/communication impairments	0.04**						0.03*
Mental/developmental delays	0.07***					0.02**	
Physical impairments					0.05***		0.04**
Severe impairments					0.06***	0.02**	
Outcome: Interpersonal skills							
Peer disability							
Emotional/behavioral disorders	0.04*			−0.03*			
Learning/communication impairments							
Mental/developmental delays	0.05**			−0.02*			0.04***
Physical impairments					0.04**		
Severe impairments	0.04*				0.05**		
n	20,690	20,690	20,690	20,690	20,690	20,690	20,690

would arise with higher individual academic ability, younger age for grade, lower percentage of boys in the classroom, lower percentage of the classroom that is below grade level in reading, a greater number of years of general teaching experience, a greater number of years of special education teaching experience, and a greater number of special education teaching course credits.

The results indicate that there are indeed a multitude of individual, classroom, and teacher-moderating factors that may aid in reducing problem behaviors or improving social skills resulting from having classmates with specific disabilities. In fact, the results are distinct by classmate disability, and thus the differentiation between these disability categories once again proves to be significant. For instance, there are the greatest numbers of significant effects for those students whose classmates have EBD. These results are prevalent across each noncognitive scale. There are the fewest statistically significant contextual factors that may improve noncognitive outcomes for students having classmates with physical impairments.

Overall, the findings in Table 8 are distinguishable by individual, classroom, and teacher characteristics: Not just one, but rather many factors are significant in improving noncognitive outcomes for students without disabilities in the classroom. Indeed, in the table, there appears to be two moderating factors with the greatest representation of statistically significant effects. First, being a student with higher individual academic ability tends to reduce the negative effect from having classmates with disabilities (i.e., this column contains the most number of statistically significant effect sizes). Second, the table suggests that across peer disability categories and noncognitive outcomes, students with more experienced teachers tend to have reduced negative peer effects from having classmates with disabilities. There are additional moderating effects worth nothing. As the percentage of students reading below grade level decreases, it becomes easier to reduce the negative peer effect that students with disabilities may have exerted on other students' noncognitive outcomes. More teacher training in special education also can reduce problem behaviors or improve social skills in classrooms with students with disabilities, depending on the specific disability category of a student's classmates. On the other hand, being younger and having fewer boys in the classroom appear to be the least prevalent at moderating any negative peer effect.

Discussion

This study has contributed unique insight into the interplay between peers with disabilities, classroom contexts, and socioemotional development. Prior to this study, little research had quantified the precision by which there may be a peer effect of classmates with disabilities exerted on other students in the classroom: None had considered the effects on noncognitive skill formation. This study has filled this critical gap by documenting that the effects of having classmates with disabilities do in fact exist across multiple noncognitive outcomes (i.e., problem behaviors and social skills) and are present across multiple peer disability classifications. The relationship between having classmates with disabilities and the five SRS noncognitive scales was evaluated with a nationally representative and comprehensive data set of elementary school children. In this way, the results derived from using these data can generalize to the needs of elementary school children across the United States. Moreover, conducting this research for kindergarten and first-grade students not only has its methodological advantages (i.e., children are contained in a single classroom through the day and year) but also theoretical and policy implications as how the classroom context influences early development.

Methodologically, there was a robustness in the methods used in this study, as demonstrated across two main approaches. The first approach relied on a baseline assessment based on observable characteristics. Importantly, the initial results provided formative evidence that having more classroom peers with disabilities may increase externalizing and internalizing problem behaviors and decrease self-control, approaches to learning, and interpersonal skills.

A second empirical approach incorporated fixed effects to examine within-school, between-classroom variation. The magnitudes and statistical significance levels of the results were consistent with baseline models. Thus, the

interpretation and conclusions remained in-line throughout this article, even with the inclusion of more complex models.

Hence, the findings in this study provide support for the second of two mechanisms described in the introduction of this article. Increased problem behaviors and worsened social skills may be related to the fact that classmates with disabilities may induce disorderly behaviors from their peers through their own disruptive actions (i.e., demonstrated by the large effects of classmates with EBD as seen in Table 7), or through indirect mechanisms, such as by diverting teachers' time away from fostering the noncognitive skills of other students (i.e., demonstrated by an improvement in noncognitive outcomes for those students whose teachers have more experience or training as seen in Table 8).

That said, however, additional analyses provided insight into the policy implications of these findings and hence provided strategies that schools could implement when considering classmates with disabilities and peer effects. In Table 8, a set of results identified specific contextual factors that practitioners could use to make compensatory changes to the general educational classroom based on the presence of classmates with disabilities. The findings highlighted significant contextual factors that may have differential effects based on the specific disability category of a student's classmates as well as the noncognitive outcomes assessed. Therefore, identifying classmates by disability category rather than relying solely on an aggregate class count as well as relying on multiple measures of student attainment proved to be critical—not only in this specific set of analyses but also throughout this article.

Given these findings, there are several additional policy implications. First, this article contributes new insight by demonstrating that in addition to the previously established effects of classmates with disabilities on achievement, there is also a prevalent effect on noncognitive development. Hence, with this study, researchers and policymakers can guide school practices to more efficiently address how to improve the classroom context not only by focusing on academic achievement but also on noncognitive outcomes that are highly correlated with school, economic, health and general lifetime success.

Second, the findings of this study demonstrate that relying on aggregate counts of students with disabilities only provided a partial depiction of these peer effects. Without accounting for a precise disability category, relying only on aggregate classmate information would not permit policymakers and practitioners to acquire the requisite details to determine particular peer effects, such as which classmate disability poses a greater risk for other students. Thus, by evaluating more detailed data—in terms of disability category—in conjunction with aggregate measures, schools can determine the sources of risk in each unique classroom environment and make adjustments accordingly.

A related third implication underscores the importance of relying on contextual information in conjunction with peer variables so that research findings can develop policy. A final analytical step in this study differentiated outcomes by student, classroom, and teacher characteristics. This exercise proved to be significant: There was a differential effect of classmates with disabilities based on various moderating contextual factors. Hence, researchers and practitioners can incorporate these differences in understanding and remedying the extent to which one set of classmates may affect the outcomes of other students. It is often the case in research on classroom peer effects that the classroom context is ignored. This study supports that it is necessary to take into account.

Finally, focusing on kindergarten and first grade is crucial (Pianta & Walsh, 1996). This analysis has not only documented that classmate effects are critical to noncognitive development in any single school year but also that the effect is persistent across multiple years of early education. With the robust estimates of the effects of classmates with disabilities presented in this study, elementary schools can utilize this information to design supportive learning environments. This can be done early in schooling, rather than delaying and only taking action to improve noncognitive development when students are in middle or high schools where the ramifications of worsened problem behaviors or social skills may have become exacerbated.

Conclusion

This study supports that a peer effect of having classmates with disabilities affects noncognitive outcomes in elementary school. In addition to bringing forward new evidence in an underresearched area, this study has demonstrated that the consequences of classmate effects are not specific to any single disability group per se; rather, peer effects were present across multiple noncognitive outcomes based on multiple disability categories of classmates.

Grounded on strengths of this study, future research could yield additional insight in several meaningful ways. First, this research has examined noncognitive outcomes thereby contributing unique insight to a field predominantly focused on achievement. Because the outcomes of this study were teacher-rated noncognitive scales, future research might examine the effects of classmates with disabilities on student-rated noncognitive outcomes (if possible to acquire) or on school-related health outcomes of students without disabilities, such as increased attention deficit disorders, which may arise from a greater level of disruption and frequent remediation in the classroom.

Second, there are many advantages to evaluating students within a large-scale nationally representative data set. That being said, differential results and interpretations may arise from the evaluation of specific school systems. An example of a potential research extension with district data may be to test the effects of having classmates diagnosed with disabilities versus having classmates tested but not diagnosed with disabilities. This information, however, was not provided for classmates in the ECLS-K data set, but may be available within a single district. In addition, it would be possible to conduct grade-level analyses with entire cohorts of data from a district—something that is not possible with ECLS-K. Research extensions such as these, thus, would allow for the models used in this study to be implemented on additional multilevel, longitudinal data to assess the generalizability of the new findings emanating from this study.

Finally, while it is a challenge to identify a peer effect in middle and high schools because students frequently shift classrooms, there is nonetheless work that can be accomplished. For instance, when possible, evaluating grade-level measures over time or the effects within specific class subjects would yield new results and insight. Furthermore, by examining elementary, middle, and high school observations in conjunction with one another, it may be possible to evaluate the extent to which classmate effects continue to affect noncognitive outcomes over time. Doing so will continue to ensure student success.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This research was supported by a grant from the American Educational Research Association which receives funds for its "AERA Grants Program" from the National Science Foundation under NSF Grant DRL-0941014. Opinions reflect those of the author and do not necessarily reflect those of the granting agencies.

Notes

1. Note that the sample sizes have been rounded to the nearest 10th, per the requirements of using the restricted Early Childhood Longitudinal Study–Kindergarten Class (ECLS-K) data set.

2. Approximately 11% of the sample was missing data on all five outcomes. Ancillary tests of means confirmed that students with missing information on noncognitive outcomes are no different from students with complete information on noncognitive outcomes.

3. One-wave lagged values for the kindergarten model are sourced from survey date from the fall of kindergarten.

4. Fletcher (2010) does find a statistically significant effect of classmates with emotional or behavioral disorder (EBD) on achievement with school and student fixed effects models. Hence, this provides some confidence that if, hypothetically, student fixed effects models were possible to assess with noncognitive outcomes, a similar statistically significant pattern might arise under multiple fixed effects models.

5. An additional test of robustness regressed the number of classmates with disabilities on all classroom and teacher covariates in a given school year,

controlling for other independent variables in the model. However, there was a lack of statistical significance, thereby further confirming a lack of within-school, within-grade sorting in this sample.

References

Aizer, A. (2008). *Peer effects and human capital accumulation: The externalities of ADD* (NBER Working Paper 14354). Cambridge, MA: National Bureau of Economic Research.

Ammermueller, A., & Pischke, J. (2006). *Peer effects in European primary schools: Evidence from PIRLS* (Discussion Paper No. 06-027). Mannheim, Germany: ZEW.

Argys, L. M., Rees, D. I., & Brewer, D. J. (1996). Detracking America's schools: Equity at zero cost? *Journal of Policy Analysis and Management, 15*, 623–645.

Bradley, R., Doolittle, J., & Bartolotta, R. (2008). Building on the data and adding to the discussion: The experiences and outcomes of students with EBD. *Journal of Behavioral Education, 17*, 4–23.

Caldas, S. J. (1993). Reexamination of input and process factor effects in public school achievement. *Journal of Educational Research, 86*, 206–214.

Chiteji, N. (2010). Time-preference, non-cognitive skills and well-being across the life course: Do non-cognitive skills encourage healthy behavior? *American Economic Review, 100*, 200–204.

Cho, R. M. (2012). Are there peer effects associated with having English Language Learner (ELL) classmates? Evidence from the Early Childhood Longitudinal Study Kindergarten Cohort (ECLS-K). *Economics of Education Review, 31*, 629–643.

Cipani, E. (1995). Inclusive education: What do we know and what do we still have to learn? *Exceptional Children, 61*, 498–500.

Cohen, M. (2006). Looking ahead to the adult years. In J. S. Handleman & S. L. Harris (Eds.), *School-age education programs for children with autism: The in-between years* (pp. 305–325). Austin, TX: Pro-Ed.

Daniel, L. G., & King, D. A. (1997). Impact of inclusion education on academic achievement, student behavior and self-esteem, and parental attitudes. *Journal of Educational Research, 91*, 67–80.

Dee, T. S., & West, M. R. (2012). The non-cognitive returns to class size. *Educational Evaluation and Policy Analysis, 33*, 23–46.

Demaray, M. K., Ruffalo, S. L., Carlson, J., Busse, R. T., & Olson, A. E. (1995). Social skills assessment: A comparative evaluation of six published rating scales. *School Psychology Review, 24*, 648–671.

Downing, J., Eichinger, J., & Williams, L. (1997). Inclusive education for students with severe disabilities: Comparative views of principals and educators at different levels of implementation. *Remedial and Special Education, 18*, 133–142.

Duckworth, A. L., & Seligman, M. E. P. (2005). Self-discipline outdoes IQ in predicting academic performance of adolescents. *Psychological Science, 16*, 939–944.

Duckworth, A. L., & Seligman, M. E. P. (2006). Self-discipline gives girls the edge: Gender in self-discipline, grades, and achievement test scores. *Journal of Educational Psychology, 98*, 198–208.

Ergenbright, K. (2010, August 10). Special education students disciplined twice as often. *The Texas Tribune*. Retrieved from http://www.texastribune.org/texas-education/texas-education-agency/special-ed-students-disciplined-twice-as-often/

Feng, H., & Cartledge, G. (1996). Social skill assessment of inner city Asian, African, and European American students. *School Psychology Review, 25*, 228–239.

Figlio, D. N. (2007). Boys named Sue: Disruptive children and their peers. *Education Finance and Policy, 2*, 376–394.

Fletcher, J. (2010). Spillover effects of inclusion of classmates with emotional problems on test scores in early elementary school. *Journal of Policy Analysis and Management, 29*, 69–83.

Fletcher, J. M. (2009). The effects of inclusion on classmates of students with special needs: The case of serious emotional problems. *Education Finance and Policy, 4*, 278–299.

Friesen, J., Hickey, R., & Krauth, B. (2010). Disabled peers and academic achievement. *Education Finance and Policy, 5*, 317–348.

Furlong, M. J., & Karno, M. (1995). Review of the social skills rating system. In J. C. Conoley & J. C. Impara (Eds.), *Twelfth mental measurements yearbook* (pp. 697–969). Lincoln, NE: Buros Institute of Mental Measurement.

Gottfried, A. W., Gottfried, A. E., Bathurst, K., & Guerin, D. (1994). *Gifted IQ: Early developmental aspects*. New York, NY: Plenum.

Gottfried, M. A. (2011). Absent peers in elementary years: The negative classroom effects of unexcused absences on standardized testing outcomes. *Teachers College Record, 113,* 1597–1632.

Gottfried, M. A. (2012). Peer effects in urban schools: Assessing the impact of classroom composition on student achievement. *Educational Policy*. Advance online publication. doi:10.1177/0895904812467082

Greene, R. W., Beszterczey, S. K., Katenstein, T., Park, K., & Goring, J. (2002). Are students with ADD more stressful to teach? *Journal of Emotional and Behavioral Disorders, 10*, 79–89.

Gresham, F. M., & Elliott, S. N. (1990). *The social skills rating system*. Circle Pines, MN: American Guidance Service.

Hanushek, E., Kain, J., & Rivkin, S. (2002). Inferring program effects for special populations: Does special education raise achievement for students with disabilities? *Review of Economics and Statistics, 84*, 584–599.

Haycock, K. (1999). Good teaching matters: How well-qualified teachers can close the gap. *Thinking K–16, 3*, 1–14. Washington, DC: The Education Trust.

Heckman, J. J. (2008). Schools, skills, and synapses. *Economic Inquiry, Western Economic Association International, 46*, 289–324.

Heckman, J. J., & Rubinstein, Y. (2001). The importance of noncognitive skills: Lessons from the GED testing program. *American Economic Review, 91*, 145–149.

Herbst, C. M., & Tekin, E. (2010). Child care subsidies and child development. *Economics of Education Review, 29*, 618–638.

Hoxby, C. (2000). The effects of class size on student achievement: New evidence from population variation. *Quarterly Journal of Economics, 115*, 1239–1285.

Jennings, J. L., & DiPrete, T. A. (2010). Teacher effects on social and behavioral skills in early elementary school. *Sociology of Education, 83*, 135–159.

Juel, C. (1988). Learning to read and write: A longitudinal study of 54 children from first through fourth grades. *Journal of Educational Psychology, 80*, 437–447.

Kern, L., Hilt-Panahon, A., & Sokol, N. G. (2009). Further examining the triangle tip: Improving support for students with emotional and behavioral needs. *Psychology in the Schools, 46*, 18–32.

Lazear, E. P. (2001). Educational production. *Quarterly Journal of Economics, 116*, 777–803.

Lipsky, D. K., & Gartner, A. (1995). National study on inclusion: Overview and summary report. *National Center on Educational Restructuring and Inclusion Bulletin, 2*(2), 1–8.

MacMillian, D. L., Gresham, F. M., & Fornes, S. R. (1996). Full inclusion: An empirical perspective. *Behavioral Disorders, 21*, 145–159.

McEwan, P. (2003). Peer effects on student achievement: Evidence from Chile. *Economics of Education Review, 60*, 131–141.

Meisels, S. J., Atkins-Burnett, S., & Nicholson, J. (1996). *Assessment of social competence, adaptive behaviors, and approaches to learning* (Working Paper Series, National Center for Education Statistics). Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement.

Morgan, P. L., Frisco, M. L., Farkas, G., & Hibel, J. (2010). A propensity score matching analysis of the effects of special education services. *Journal of Special Education, 43*, 236–254.

Morgan-D'Atrio, C., Northup, J., LaFleur, I., & Spera, S. (1996). Toward prescriptive alternatives to suspensions: A preliminary evaluation. *Behavior Disorders, 21*, 190–200.

Neidell, M., & Waldfogel, J. (2010). Cognitive and noncognitive peer effects in early education. *The Review of Economics and Statistics, 92*, 562–576.

Nye, B., Konstantopoulos, S., & Hedges, L. (2004). How large are teacher effects? *Educational Evaluation and Policy Analysis, 26*, 237–257.

Odom, S. L., Brantlinger, E., Gersten, R., Horner, R. H., Thompson, B., & Harris, K. R. (2005). Research in special education: Scientific methods and evidence-based practices. *Exceptional Children, 71*, 137–148.

Pianta, R., & Walsh, D. (1996). *High-risk children in schools: Constructing sustaining relationships*. New York, NY: Routledge.

Sanders, W., & Rivers, J. (1996). *Cumulative and residual effect of teaching on future student academic achievement*. Knoxville: University of Tennessee Value-Added Research and Assessment Center.

Schneider, B., Carnoy, M., Kilpatrick, J., Schmidt, W. H., & Shavelson, R. J. (2007). *Estimating causal effects using experimental and observational designs*. Washington, DC: American Education Research Association.

Schwab, N., & Gelfman, M. (Eds.). (2005). *Legal issues in school health services: A resource for school administrators, school attorneys, school nurses*. North Branch, MN: Sunrise River Press.

Smith, S. (1997). A longitudinal study: The literacy development of 57 children. In C. Kinzer, K. Hinchman, & D. Leu (Eds.), *Inquiries in literacy theory and practice* (pp. 250–264). Chicago, IL: National Reading Conference.

Spira, E. G., Bracken, S. S., & Fischel, J. E. (2005). Predicting improvement after first-grade reading difficulties: The effects of oral language, emergent literacy, and behavior skills. *Developmental Psychology, 41*, 225–234.

Tauber, R. T. (2007). *Classroom management: Sound theory and effective practice*. Portsmouth, NH: Greenwood Publishing Group.

U.S. Department of Education, National Center for Education Statistics (2012). *Digest of education statistics, 2011*. Washington, DC: Author.

Waddell, G. R. (2006). Labor-market consequences of poor attitude and low self-esteem in youth. *Economic Inquiry, 44*(1), 69–97.

Wenglinsky, H. (2002). The link between teacher classroom practices and student academic performance. *Education Policy Analysis Archives, 10*, Article 12.

Williams, L. J., & Downing, J. E. (1998). Membership and belonging in inclusive classrooms: What do middle school students have to say? *Journal of the Association for Persons With Severe Handicaps, 23*, 98–110.

Winters, M. A., & Greene, J. P. (2007). Debunking a special education myth. *Education Next, 7*(2), 67–71.

Author

MICHAEL A. GOTTFRIED, Ph.D., is an assistant professor in the School of Education at Loyola Marymount University. He utilizes large-scale, longitudinal datasets to address issues in the economics of education and in educational policy.

Manuscript received August 3, 2012
Revision received March 26, 2013
Accepted April 9, 2013