Examining the Inclusion of Students with Disabilities and Teacher Attrition

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To Mike, for his unlimited support, patience, and encouragement

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Chapter I
Introduction

Teacher attrition, when a teacher leaves teaching or transfers to a new school, has high costs to schools. These costs can be measured financially and with respect to student outcomes. Estimates of the financial cost of attrition to districts suggest that districts spend about $9,000 to $23,000 per teacher per year when a teacher leaves a school district (Milanowski & Odden, 2007). This financial cost is problematic, but more worrisome is the impact of teacher attrition on student achievement. Teachers who leave teaching or move schools are more likely to be replaced by beginning teachers (Henry, Bastian, & Fortner, 2011) who are, on average, less effective than more experienced teachers (Boyd, Lankford, Loeb, Rockoff, & Wyckoff, 2008; Henry et al., 2011; Henry, Fortner, & Bastian, 2012; Rivkin, Hanushek, & Kain, 2005; Rockoff, 2004). Teacher attrition is also detrimental to student learning by disrupting the instructional cohesion within schools (Ronfeldt, Loeb, & Wyckoff, 2013). Unfortunately, teacher attrition is a widespread problem throughout the United States.

National estimates of teacher attrition suggest that 16–17% of teachers leave teaching or move schools each year (Boe, Cook, & Sunderland, 2008; NCES, 2014). Teacher attrition exacerbates or creates teacher shortages in subjects such as special education in many parts of the United States (U.S.; Ingersoll, 2001), leading some researchers and policymakers to characterize teacher attrition as a national crisis (e.g., Sutcher, Darling-Hammond, & Carver-Thomas, 2016). Consider an average school district in North Carolina (NC) with 334 teachers. Using the national estimates of teacher attrition, in a single school year, 26 teachers leave teaching and 30 teachers move to a different school. If each teacher instructs, on average, 20 students, than teacher attrition rates could impact approximately 1,120 students each year in one district alone. Though not all teacher attrition is undesirable, such as when low performing

teachers leave the career (Henry et al., 2011), the high rates of attrition are problematic for schools and student achievement in the U.S.

Predictors of Teacher Attrition

Teacher Characteristics

Due to the pervasive nature of teacher attrition, researchers have examined teacher and school level variables that are related to attrition. The associations between teacher characteristics and attrition are most widely studied (Borman & Dowling, 2008). Teachers with fewer years of experience have, on average, higher rates of attrition (Boyd, Grossman, Lankford, Loeb, & Wyckoff, 2008; Feng, 2009; Hanushek, Kain, & Rivkin, 2004; Sass, Flores, Claeys, & Perez, 2012). Teacher certification area appears to be related to attrition, with science, math, and special education certified teachers having higher average attrition rates than teachers with certification in other areas (Henry et al., 2012; Ingersoll, 2001; Sass et al., 2012). How a teacher is prepared is also related to attrition. Teachers who obtain certification through traditional preparation programs are more likely to stay in teaching than teachers who obtain certification through alternative preparation programs, such as Teach for America (Kane, Rockoff, & Staiger, 2008; Redding & Smith, 2016). Survey results from a nationally representative sample of teachers suggest that teachers who took more education courses during their preparation had, on average, lower attrition rates (Kelly, 2004). Together, these studies suggest that teacher training and learning on the job may decrease the likelihood of teacher attrition. Additional studies have examined how teacher race, gender, academic achievement, and other demographic characteristics are associated with attrition but these have inconsistent results (Borman & Dowling, 2008; Boyd et al., 2008; Goldhaber & Cowan, 2014; Sass et al., 2012). Teachers with

experience and better training may be better prepared to handle the daily job demands of the teaching profession.

School Working Conditions

Teachers do their work within the contexts of schools that operate in different ways and serve different groups of students. School working conditions are conceptualized as both the aggregate characteristics of students within a school and other aspects of the working environment such as supports to teachers, school leadership, and school climate (Simon & Johnson, 2015). Schools with lower average student achievement, larger percentages of minority students, and larger percentages of economically disadvantaged students have, on average, higher teacher attrition rates (Boyd et al., 2008; Feng, 2009; Hanushek et al., 2004; Loeb, Darling-Hammond, & Luczak, 2005). However, these aggregate student characteristics are highly correlated with undesirable working conditions. Likely, teachers do not leave high poverty, high minority, and low achieving schools at higher rates because they are "fleeing" certain types of students, as suggested by Hanushek et al., but because of these undesirable working conditions (Simon & Johnson, 2015).

Working conditions outside of the aggregate characteristics of students in a school have been conceptualized by Simon and Johnson (2015) as including: administrative support such as principals that include teachers in decision making, who create well-managed schools, and are involved in instructional leadership; collegial support such as collaborative and supportive environments in which teachers share the same goals; and school culture such as shared approaches to student discipline and family involvement. Schools with better working conditions, or teacher ratings of these characteristics, tend to have lower rates of teacher attrition (Borman & Dowling, 2008; Ingersoll, 2001; Johnson & Birkeland, 2003; Johnson, Kraft, &

Papay, 2012; Kelly, 2004; Loeb et al., 2005; Redding & Smith, 2016; Smith & Ingersoll, 2004). For example, Johnson et al. used survey data from teachers in Massachusetts to estimate the association between school working conditions and teacher reported intentions to leave teaching, after accounting for the aggregate characteristics of students within schools. Specifically, they examined factor scores related to teacher ratings of colleagues, community support, facilities, governance, principals, professional expertise, resources, time, and school culture. When these factors were considered as one variable, a one unit increase in teacher ratings of working conditions was associated with a 60–74% decrease in the odds of intentions to move schools or leave teaching, on average, after accounting for student and teacher demographics. Each individual working condition was associated with teachers' intentions to stay in their schools. Clearly, the schools in which teachers work influence their decisions about leaving teaching or moving schools.

Classroom Characteristics

Despite recognizing the importance of schools, the existing literature on predictors of teacher attrition fails to recognize that teachers within a school may work with different students, in terms of achievement levels (Clotfelter, Ladd, & Vigdor, 2006) and disability status (Gilmour & Henry, in preparation). It may be that the academic and behavioral characteristics of the students a teacher instructs influences teaching and decisions to remain in teaching. Prior research examining the impact of the students a teacher instructs on the probability of attrition has focused on demographic and behavioral characteristics of students (Feng, 2009). Using a sample of beginning teachers in Florida, Feng found that a one unit change in the average discipline incidents per student in teachers' classes was associated with an average increase in the odds of moving within district of 8%, a 14% increase in the odds of moving to another

district, and an 8% increase in the odds of leaving teaching in Florida. These results suggest that the types of students in a teacher's class could be related to attrition if the students exhibit characteristics, such as problem behavior, that increase the job demands on teachers. Unfortunately, very few studies have examined the association between the characteristics of students a teacher instructs and attrition.

The sparse literature on how students in teachers' classes may be related to attrition has not examined students with disabilities (SWDs). These students may increase job demands due to their lower academic skills (Morgan, Farkas, & Wu, 2009; Morgan, Farkas, & Wu, 2011; Schulte & Stevens, 2015; Schulte, Stevens, Elliott, Tindal, & Nese, 2016; Wanzek, Otaiba, & Petscher, 2014) and greater risk for problem behavior (Institute for Education Sciences, 2006; Reschly & Christenson, 2006; U.S. Department of Education Office for Civil Rights, 2014). Prior research suggests that SWDs may change the job demands on teachers and that teachers may not have the resources, in terms of training, to moderate the increased job demands due to these students. Given that over 60% of SWDs spend 80% or more of their school day in general education classrooms (Kena et al., 2015), it is worthwhile to investigate the association between teaching SWDs and teacher attrition.

Theory of Change

In Figure 1, I presented the proposed theory of change underlying the association between the percentage of SWDs in teachers' classes and the odds of attrition. Studies of teacher characteristics and school working conditions suggest that increases in job demands, for example, working in schools that serve large proportions of economically disadvantaged students, are associated with attrition (Borman & Dowling, 2008). The presence or absence of resources, such as principal leadership or teacher training through traditional preparation,

described in more detail below, are also related to attrition (Simon & Johnson, 2015). The job demands-resources model (Demerouti, Nachreiner, Baker, & Schaufeli, 2001; Hakanen, Bakker, & Schaufeli, 2006), represented inside the dashed box in Figure 1, is a useful theory for understanding these associations. This model suggests that high job demands and low job resources can lead to employee burnout. Burnout is characterized by increased emotional exhaustion, increased depersonalization, and decreased feelings of personal accomplishment (Maslach, Jackson, & Leiter, 1996). While burnout was not specifically examined in the studies reviewed above, burnout is associated with teacher attrition or intent to leave teaching (Billingsley, 2004; Gersten, Keating, Yovanoff, & Harniss, 2001; Goddard & Goddard, 2006; Martin, Sass, & Schmitt, 2012; Singh & Billingsley, 1996). I briefly reviewed the literature supporting each pathway in Figure 1 before addressing how this theory of change is related to SWDs.

Increased Demands and Burnout

Many studies of teacher burnout have focused on the increased job demands associated with student behavior problems (Aloe, Shisler, Norris, Nickerson, & Rinker, 2014). This association is represented by path B in Figure 1. In Aloe et al.'s meta-analysis of 19 studies regarding teacher burnout and student behavior, teacher emotional exhaustion and student misbehavior were correlated at .44, depersonalization and misbehavior were correlated at .36, and personal accomplishment and misbehavior were correlated at -.31. The increased demands on teachers due to student behavior problems may not directly cause teacher burnout but may lead to ongoing stress which is then associated with burnout (Abel & Sewell, 1999; McCormick & Barnett, 2011). McCormick and Barnett evaluated how teacher perceived stressors were associated with teacher reported burnout in a sample of 416 teachers from Australia. In this

sample, a one standard deviation increase in teacher perceived stress due to student behavior was associated with a 0.52 standard deviation change in depersonalization, a 0.67 standard deviation change in emotional exhaustion, and -0.13 standard deviation change in personal accomplishment after accounting for other stressors. Student behavior problems in the classroom may increase job demands and lead to prolonged stress or burnout for teachers.

In contrast to student behavior, little research evidence suggests that low student academic achievement is associated with teacher burnout. Teachers may, however, respond negatively to the increased demands of teaching associated with academic pressures in high-stakes environments, though this evidence is mixed. For example, von der Embse (2016) and his colleagues surveyed over 6,000 teachers from four states to examine how high-stakes testing was associated with teacher reported stress. Teachers across the four states appeared to react similarly to working in high-stakes environments; the average association between the use of student test scores for accountability purposes and teacher reported stress ranged from .23–.38, depending on the specific type of reported stress. Other researchers have not identified changes in teacher reported stress or burnout due to high-stakes testing (Grissom, Nicholson-Crotty, & Harrington, 2014). Perhaps research has not identified an association between low achievement and teacher burnout because teachers feel more capable at handling student academic deficits over behavioral challenges.

Burnout and Teacher Attrition

Burnout and prolonged exposure to stress may be related to teacher intentions to leave teacher or actual attrition (path C in Figure 1; Billingsley, 2004; Gersten et al., 2001; Goddard & Goddard, 2006; Weisberg & Sagie, 1999). Stress and burnout are frequently used interchangeably in the teacher attrition literature in the U.S., with most studies asking teachers

about their stress levels. Cross and Billingsley (1994) surveyed 658 special education teachers about variables that influenced their intentions to remain in teaching. In their path analyses, stress was negatively associated with both job satisfaction and commitment to teaching, two variables associated with intentions to remain in teaching. Other work has more directly investigated the link between stress or burnout and attrition. For example, Miller and colleagues (1999) found that teachers who transferred out of special education or left teaching had higher levels of perceived stress than teachers who remained in teaching special education. These studies in samples of teachers in the U.S. have primarily examined stress and attrition in special education teachers, however, studies of general education teachers in other countries have more explicitly examined burnout and suggest a positive association between burnout and attrition (Goddard & Goddard, 2006; Weisberg & Sagie, 1999).

Resources as Mediators and Moderators of Burnout

The job demands-resources model notes that resources, defined by Demerouti et al. (2001) as "those physical, psychological, social, or organizational aspects of the job that may do any of the following: (a) be functional in achieving work goals; (b) reduce job demands at the associated physiological and psychological costs; (c) stimulate personal growth and development" (p. 501), may moderate or mediate the association between job demands and burnout. For example, in a school, physical resources might be the size of the classrooms, presence of textbooks, or access to technology. Psychological resources include teacher experience, training, and self-efficacy in teaching. Social resources include collaborations among teachers and social networks within schools. Organizational aspects, most frequently examined in relation to attrition, include administrative support, instructional leadership, and the school culture. A small number of studies have empirically examined the job demands-resources model

in schools. Hakanen and colleagues (2006) used structural equation modeling to validate the job demands-resources model with a large sample of Finnish teachers. These researchers found that teacher self-reported information about the school working climate mediated the association between job demands and burnout. The mediating role of job resources is represented by the dashed arrows in Figure 1.

Other research groups have noted that job resources and job demands may interact, suggesting that job resources may moderate the association between job demands and burnout (Demerouti et al., 2001). In education, experience or training, which are associated with self-efficacy (Corona et al., 2016), are important potential moderators of the association between job demands and burnout. Self-efficacy captures how capable a teacher feels at doing her job successfully (Brouwers & Tomic, 2000). Many researchers have examined the direct association between self-efficacy and burnout (e. g., Brouwers & Tomic, 2000; Ruble, Usher, & McGrew, 2011), but self-efficacy could theoretically act as a moderator between job demands and burnout. For example, Dicke and her colleagues (2014) examined teacher self-efficicacy in classroom management as a moderator and mediator of emotional exhauastion in a sample of 1,227 teacher candidates in Germany. The results of their structural equation models suggested that self-efficacy both mediated and moderated the association between emotional exhaustion and teacher ratings of classroom disturbances. Additionally, teachers who report that they are more prepared to handle the job requirements of teaching tend to have lower levels of burnout (Pas, Bradshaw, & Hershfeldt, 2012). Teachers who believe they are more capable of handling increased job demands due to student behavior may experience a different association between job demands and burnout than teachers with lower self-efficacy. This proposed moderation is represented by path D in Figure 1.

Job Demands-Resources Model and Attrition

Studies of teacher attrition in the U.S. have not directly evaluated the job demands-resources model as a possible underlying model for teacher attrition, but studies of predictors of teacher attrition lend support to this model. Attrition rates are higher when teachers work in schools that serve higher percentages of low achieving, economically disadvantaged, or minority students (Boyd et al., 2008; Feng, 2009; Hanushek et al., 2004). The job demands-resources model would suggest that the increase in attrition rates are due the unmeasured burnout caused by the job demands associated with working with these populations of students. Furthermore, school working conditions appear to mediate the association between working with more disadvantaged students and attrition (Johnson et al., 2012), supporting the role of resources in mediating the association between increased job demands, burnout, and attrition.

The research regarding teacher-level variables associated with attrition also supports the job demands-resources model as an underlying model for understanding teacher attrition. Years of experience may be associated with lower attrition rates (Boyd et al., 2008; Sass et al., 2012) because the skills gained through experience may moderate burnout associated with increased job demands. Teachers who completed traditional teacher preparation programs (Redding & Smith, 2016), or more courses related to teaching (Kelly, 2004), may have lower attrition rates because these teachers learned important skills that help to moderate the association between burnout and job demands. Importantly, not all teacher attrition is negative. Some research suggests that less effective teachers are more likely to leave teaching (Henry et al., 2011) further supporting that teachers with less resources, in this case the skills for improving student outcomes, may leave teaching due to unmeasured burnout. The lower attrition rates of

experienced, trained teachers and the higher attrition rates of less effective teachers suggests that teachers with more skills may be more adept at handling the job demands of teaching.

Teacher Attrition and Students with Disabilities

Increased job demands and SWDs (Path A, Figure 1). Students with disabilities are at greater risk for behavior problems and are behind their peers academically (Morgan, Farkas, Tufis, & Sperling, 2008; Nelson, Babyak, Gonzalez, & Benner, 2003). Behavior problems may interrupt instruction, making it harder for teachers to complete their lessons. Teachers may not know how to address problem behavior; prior research suggests that many teachers are unprepared in classroom management (Greenberg, Putman, & Walsh, 2014; Reiff, Evans, & Cass, 1991). Low student academic achievement could also interrupt teacher instruction and increase the demands on teachers as teachers adjust the content and delivery of instruction to address the needs of low performing students. Additionally, SWDs may require specialized instruction that is challenging to provide in typical classrooms (Fuchs et al., 2015). Despite the increase in job demands that could be due to the low academic achievement of SWDs, most studies have focused on how student behavior impacts their peers and teachers.

The potential of students who exhibit problem behavior to increase job demands is reflected in the survey and qualitative literature reporting that general education teachers are less accepting of the inclusion of students with problem behaviors in their classrooms (Martin, Lloyd, Kauffman, & Coyne, 1995; Olson, Chalmers, & Hoover, 1997; Soodak, Podell, & Lehman, 1998; Westling, 2010). However, few quantitative studies have examined how teachers change their behaviors in response to having students who exhibit problem behavior in their classrooms. Carr, Taylor, and Robinson (1991) examined how 12 pre-service teachers changed their instruction when working with preschool students who exhibited challenging behavior, such as

tantrums and aggression. They observed and recorded the teachers' behaviors when working with students who exhibited challenging behavior and students who did not exhibit challenging behavior. The teachers were more likely to engage in non-instructional activities when working with students who had a history of problem behavior, suggesting that teachers responded to student behavior by decreasing the instructional tasks that previously prompted problem behavior. The teachers were also less likely to issue task demands to the students who exhibited problem behavior than the students who did not exhibit problem behavior. Other studies suggest that teachers may provide less instruction to and demands on students who have behavior disorders and/or exhibit problem behavior, likely to avoid instigating problem behavior (Van Acker, Grant, & Henry, 1996; Wehby, Symons, Canale, & Go, 1998).

More recent quantitative studies of how students with behavior problems influence classrooms have focused on the impact of students with behavior problems on their peers without disabilities, rather than their teachers. Using a nationally representative sample of kindergarten students, Gottfried and colleagues (2016) examined the association between having a classmate with a behavior disorder and the absences of students without disabilities in the came class. The results of their regressions, that included school fixed effects, suggested that having a classmate with a behavior disorder was associated with an average increase in absences of 0.44 days for students without disabilities. The average odds of a student being classified as chronically absent were 1.42 times higher for students without disabilities who had a classmate with a behavior disorder compared to students without a classmate with a behavior disorder. Additional work by Gottfried (2014), using the same dataset, identified a small decrease in students without disabilities' social skills and an increase in their problem behaviors when they had classmate with an identified behavior disorder. Other work supports an association between having a

classmate who exhibits problem behavior and later negative behavioral outcomes for students without disabilities (Thomas, Bierman, Powers, & The Conduct Problems Prevention Research Group, 2011). Increases in absences and increases in student problem behavior associated with the inclusion of classmates with behavior disorders leads to more job demands on teachers as they manage the increase of problem behavior in the class and work to catch students up who missed content due to absences.

Classrooms may be influenced academically due to the inclusion of students with disabilities or students who exhibit challenging behavior. Existing studies that exclude students with disabilities suggest that having higher achieving classmates is, on average, positively associated with a student's academic outcomes (Hanushek, Kain, Markman, & Rivkin, 2003; Henry & Rickman, 2007; Hoxby, 2002). A few studies have specifically examined how classmates with disabilities are related to the academic achievement of students without disabilities (Fletcher, 2010; Fletcher, 2009; Gottfried & Harven, 2015; Hanushek, Kain, & Rivkin, 2002). Fletcher (2010) examined the association between having a classmate with a behavior disorder in kindergarten or first grade and average math and reading assessment outcomes. The results of regressions with student fixed effects suggested that having a classmate with a behavior disorder was associated with a -0.04 average change in reading and a -0.06 change in math for the classmate without a disability, after controlling for family characteristics and time varying student characteristics. The results from other studies support the negative association between classmates with behavioral disorders and the academic outcomes of their peers without disabilities (Fletcher, 2009; Gottfried & Harven, 2015). In contrast, Hanushek and his colleagues (2002) did not identify a negative association between the inclusion of a classmate with a disability and the academic outcomes of students without disabilities. This finding could

be due to the use of older data or grouping all students with disabilities together rather than examining the impact of students with behavior disorders specifically. The associations between student achievement, or student behavior, and having a classmate with a disability could reflect the burnout experienced by a teacher due to the increased job demands of having a student with a disability, specifically a behavior disorder, in the class.

Special education teachers. The studies reviewed above have focused on general education classrooms and general education teachers, but the large numbers of SWDs spending time in general education settings may change job demands for special education teachers as well. Special education teachers in Lloyd and Weis's 2002 study expressed challenges to meeting the instructional needs of SWDs because inclusion left few opportunities for providing students with individualized instruction. The challenges of providing adequate individualized instruction and services to SWDs in inclusive settings were echoed in the qualitative work of Eisenman and colleagues (2011) who interviewed high school special education teachers about their experiences providing special education support to SWDs in a consultative role to general education teachers. Salend and Duhaney's (1999) review of how inclusion has impacted special education teachers further supports the challenges to educating SWDs who spend much of their day in general education classrooms. The multiple roles of special education teachers within schools and the limited time to provide individualized instruction to SWDs could lead to increased demands on special education teachers.

Teacher resources and the instructional needs of SWDs. Despite the large number of SWDs spending a portion of their school days in general education classrooms (Kena et al., 2015), general education teachers may not have the resources, more specifically the teaching skills, to address the academic and behavioral needs of these students. Scruggs and Mastropieri's

1996 review of teacher perceptions of including SWDs in general education classrooms identified that most teachers reported that they needed more training and supports in regards to working with SWDs. Despite the dated nature of this review, it appears that general education teachers still report that they feel unprepared to meet the needs of SWDs in their classrooms (Idol, 2006; Jenkins & Ornelles, 2009; Ornelles, Cook, & Jenkins, 2007).

Recent research regarding general education teachers and inclusion has primary relied on qualitative interviews, with small numbers of teachers, or surveys. Of the 255 general education teachers surveyed by Yasutake and Lerner (1996), 42% reported that inclusion was not workable in their classrooms and 24% were concerned that the needs of SWDs could not be met in a general education classroom. Similarly, general education teachers in Hawaii reported that they had less confidence in their abilities to teach SWDs than students without disabilities, a result that did not vary by years of teaching experience (Jenkins & Ornelles, 2009). In a small study of inclusion, 20% of the teachers at four secondary schools surveyed by Idol (2006) reported that they needed more practice in working with SWDs, despite multiple years of implementing inclusive practices. These studies considered SWDs as one category, but teacher attitudes towards inclusion appear to vary by disability category.

Other research in this area has focused on investigating teacher attitudes and skills for working with students with specific disabilities. For example, the five general education middle school teachers interviewed by Ornelles et al. (2007) about challenges to including students with learning disabilities reported that they felt unprepared to meet the needs of these students. Ornelles et al. focused on general education teachers who had students with learning disabilities in their classes, but most studies of disability specific attitudes towards inclusion have focused on students who exhibit challenging behavior. In an earlier study, ten teachers interviewed by

Olson, Chalmers, and Hoover (1997) who were supportive of inclusion overall reported that they felt inclusion was not appropriate when the student with a disability exhibited problem behavior. Similarly, teachers in Idol's (2006) study were less supported of including students with behavior disorders in their classrooms than including students with other disabilities. Soodak et al. (1998) also reported that the 188 teachers they surveyed in New York were hostile towards the inclusion of students with behavior disorders.

The lack of support reported by teachers for working with students who exhibit problem behavior, and in some studies specifically students with behavior disorders, could be related to a lack of training in classroom management. Studies of certification requirements and teacher preparation programs suggest that general education teachers may take very few courses related to working with SWDs (Reiff et al., 1991) or in classroom management (Greenberg et al., 2014). Results from surveys and qualitative research reflect teachers' lack of preparation in these areas. Westling (2010) surveyed 38 special education teachers and 32 general education teachers regarding their attitudes and skills for working with students who exhibit challenging behavior. Fifty percent of all of the teachers reported that they had received inadequate preparation in handling student behavioral problems and 44% of the general education teachers reported that student behavior problems made them think about quitting teaching. Lohrmann and Bambara (2006) interviewed 14 general education elementary school teachers regarding the inclusion of SWDs who exhibited problem behavior in their classrooms. Nearly all of the teachers reported that they had little experience or training in working with these students. In a more recent study, Segall and Campbell (2012) surveyed 196 teachers about their knowledge and use of strategies for supporting students with autism and found that general education teachers were less knowledgeable of strategies for working with these students than special education teachers. The

misalignment between general education teacher skills and training and the needs of SWDs, particularly those who exhibit problem behavior, is apparent from this body of research.

Special education teachers. The inclusion of SWDs in general education classrooms may result in a misalignment between the training of special education teachers and the roles these teachers are expected to fulfill in inclusive schools. Tankersley and colleagues (2007) interviewed special education teachers who worked with students with learning disabilities in inclusive settings. In this study, teachers reported that they felt more integrated into the overall school environment, but felt they were often relegated to the role of a classroom aide. Perhaps more importantly, they felt less capable of using their specific skills when serving SWDs in general education classrooms. Additionally, interviewed teachers reported that they did not have the time to fulfill all the roles now expected of them. The authors concluded that while special educators may support the inclusion of SWDs in general education classrooms, these same teachers questioned their abilities to provide the necessary services to these students.

Weiss and Lloyd (2002) interviewed and observed six secondary level special education teachers to better categorize the roles of special education teachers in co-taught classrooms. In co-teaching classrooms, special education teachers provided non-instructional support by monitoring student behavior, taught small groups of SWDs in the same room or pull-out settings, or provided a small amount of instruction to the entire class before leaving the classroom. Teachers expressed that they had little training to fulfill all the roles that they were expected to perform. Special education teachers may not have the resources, in terms of training and experience, needed to provide individualized instruction to SWDs in inclusive settings.

Training as a Moderating Resource

In Figure 1, I presented a hypothesized theory of change suggesting that SWDs may be related to attrition through the increased demands to teachers associated with these students that, in turn, leads to burnout. However, as shown by path D, resources, such as teacher's skills, may moderate the hypothesized association between SWDs and burnout and attrition. Teachers who have specific training and knowledge for working with SWDs, as indicated by certification, may not experience the increased job demands associated with working with SWDs potentially experienced by general education teachers. In the following sections, I reviewed the literature on the specific skills teachers with special education certification may have that could moderate the association between teaching SWDs and burnout.

Special education certification. Teachers who are certified in special education may have more training in specific instructional and behavioral strategies identified as effective for SWDs (Brownell, Sindelar, Kiely, & Danielson, 2010) that translate into improved outcomes for SWDs (Brownell et al., 2009; Feng & Sass, 2013). Brownell and her colleagues (2009) examined the association between beginning teacher knowledge of reading instructional strategies and observed classroom practices and the reading outcomes of students with learning disabilities. The measures of teacher knowledge of instruction of reading and classroom practices were focused on practices identified as effective for instruction SWDs, primarily a teacher directed and explicit approach to instruction in contrast to a constructivist approach to teaching. Skills in classroom management were positively associated with student gains in oral reading fluency suggesting that beginning teachers with more skills in addressing problem behavior, frequently associated with disability status, were more effective at working with these students. Using a large state dataset to examine the relation between teacher characteristics and outcomes for

SWDs, Feng and Sass (2013) reported that special education certification was associated with a 0.03 SD increase in math outcomes for SWDs compared to SWDs assigned to a teacher without special education certification. Special education teacher certification also appears to attenuate the association between having a classmate with a behavior disorder and absences of their classmates without disabilities (Gottfried et al., 2016). These studies show that the specific skills signaled by special education certification may attenuate an association between SWDs and teacher attrition. The resources, in this case the training in specific instructional strategies and behavioral management, had by special education certified teachers likely moderate the demands due to the needs of SWDs.

However, studies of teacher attrition indicate that special education certified teachers have higher probabilities of attrition than teachers without special education certification (Boe et al., 2008; Ingersoll, 2001; Kelly, 2004). This finding could suggest that the resources indicated by special education certification do not fully attenuate the association between the increased demands of working with SWDs and burnout that leads to attrition. Conversely, these higher attrition rates could mean that other aspects of being a special education certified teacher, outside of the students that a teacher instructs, are related to attrition (e.g., fulfilling co-teaching or consultation roles, increased paperwork due to IEPs, etc.). Special education teachers report that they are more likely to leave teaching when their job design does not match their skills (Gersten et al., 2001) and aspects of the job unrelated to teaching such as completing paperwork and principal support (Brownell, Smith, McNellis, & Miller, 1997).

Dual certification. Theoretically, dual certified teachers, teachers certified in special education and a content area, might be expected to have the content knowledge of general education teachers and the training in specific instructional and behavioral interventions

expected of special education teachers. As a response to the expanded inclusion of SWDs in general education classrooms in the 1990s, researchers on teacher preparation called for more programs offering dual certification in general and special education (Hinders, 1995; Jenkins, Pateman, & Black, 2002; Kearney & Durand, 1992; Kerns, 1996). These studies of dual-certification generally focused on the extent to which these programs were implemented or how programs were implemented. More recent research has focused on dual-certification in relation to the highly-qualified provision under the No Child Left Behind Act (NCLB). Dual certified teachers may have obtained certification in a content area by passing a state certification exam in order to obtain highly-qualified status (Brownell et al., 2010), but these requirements vary by state.

Very little research has focused on dual certified teachers. The existing studies have examined differences in attitudes towards inclusion and preparation experiences between general education, special education, and dual certified teacher candidates using surveys. These studies find that dual certified teacher candidates report that they are, on average, more supportive of inclusion, feel more prepared to implement inclusion, and have more opportunities for field work in inclusive classrooms than general education teacher candidates (Gehrke & Cocchiarella, 2013; Kim, 2011; Shippen, Crites, Houchins, Ramsey, & Simon, 2005). For example, Shippen et al. surveyed pre-service teachers about their hostility towards and comfort with inclusion. They found that the 68 pre-service teachers enrolled in the dual-certification program were less hostile towards inclusion and more comfortable implementing inclusive practices than pre-service teachers enrolled in the special education or general education certification program.

Unfortunately, little is known about in-service dual certified teachers. The studies of pre-service teachers indicate that dual certified teachers report feeling more prepared and having

more training to work with both SWDs and students without disabilities. However, if dual certified teachers obtain a content area certification simply through the passing of a licensure exam (i.e., not receiving specific training), they may not have the specific content area knowledge and knowledge for teaching that content area as general education teachers (Brownell et al., 2010) who went through a general education certification program. If dual certification signals preparation in both content area and specific skills for working with SWDs, dual certified teachers may be the most prepared to work in inclusive classrooms.

Summary of Literature Review

Teacher attrition is widely studied in education due to the detrimental effects of attrition on student achievement (Ronfeldt et al., 2013). Studies have identified teacher level variables, such as training and years of experience, and school level variables, such as the aggregate characteristics of students in a school and working conditions, that are related to attrition (Borman & Dowling, 2008b; Simon & Johnson, 2015). The results of these studies, and others, support the job demands-resources model as an underlying theory of change for understanding predictors of attrition. As job demands increase, teachers become burned out, which leads to attrition. But this association between demands and burnout can be attenuated by school and teacher resources.

This model would suggest that teaching SWDs, who may have greater academic and behavioral needs, would be associated with attrition, especially for teachers without the training for working with these students. Qualitative work suggests that general education teachers may not feel prepared to meet the needs of these students, especially students who exhibit challenging behavior (Martin et al., 1995; Olson et al., 1997; Scruggs & Mastropieri, 1996; Westling, 2010). Special education certified teachers and dual certified teachers may be better prepared to meet

the needs of these students but may struggle to provide the intensive interventions needed by these students in inclusive settings (Eisenman et al., 2011; Tankersley et al., 2007). Students with disabilities are educated by both general and special education teachers, but quantitative work has not examined if working with these students is associated with teachers' career decisions and if these associations are attenuated by training and knowledge of working with SWDs, indicated by special education certification.

Research Questions

The purpose of this study was to examine if there is an association between the percentage of SWDs teachers instruct and teacher attrition. Specifically, I addressed three research questions. First, is there an association between the average percentage of SWDs in teachers' classes and attrition (total attrition and leaving), after controlling for teacher, classroom, and school characteristics? Due to the unique needs of SWDs, I hypothesized that the average percentage of SWDs in teachers' classes would be associated with an increase in the odds of attrition. In this first research question I examined SWDs as a single group. This initial grouping, all SWDs together, was consistent with education policy reporting practices. For example, subgroup reporting under the No Child Left Behind Act and the reauthorization of this act as the Every Student Succeeds Act requires that schools disaggregate student performance for SWDs as one group.

The practice of analyzing SWDs as a single group may mask meaningful differences across disability categories. Students with disabilities vary in the severity of their academic and behavioral deficits. The second research question addressed this heterogeneity by asking, what is the association between the average percentage of students with specific disabilities in teachers' classes and attrition after controlling for teacher, classroom, and school characteristics? I

hypothesized that an increase in the percentage of students with emotional/behavioral disorder (which I referred to as behavior disorders throughout this paper), intellectual disabilities, or autism was associated with an average increase in the odds of teacher attrition. I based this hypothesis on the existing literature connecting student behavioral needs to attrition and teacher reports of less acceptance and skill with working with students with these disabilities (Feng, 2009; Martin et al., 1995; Scruggs & Mastropieri, 1996). The demands to teachers posed by students with these conditions may be greater than the job demands due to students with disabilities less associated with behavioral deficits, such as speech/language impairments or learning disabilities.

The job demands-resources model suggests that associations between the percentage of SWDs or students with specific disabilities in teachers' classes and attrition is likely moderated by available resources. In this study, I examined certification as an indicator of the resources that come with additional training. The final research question asked, are the associations between the average percentage of SWDs or students with specific disabilities in teachers' classes and the odds of teacher attrition moderated by special education certification or dual certification, after controlling for teacher, classroom, and school characteristics? Preparation may be associated with lower levels of burnout (Pas et al., 2012) that could be related to lower probabilities of attrition. Certification acts as an indicator for preparation. I hypothesized that the association between the average percentage of SWDs in teachers' classes and attrition may be negative for teachers certified in special education. That is, as the percentage of SWDs increases, teachers with special education certification may be less likely to leave or move as their specific skills for working with these students moderates the association between increased job demands and burnout. Dual certified teachers may have the resources to work with SWDs and general

education students. I hypothesized that there may not be an association between the percentage of SWDs that dual certified teachers instruct and attrition.

Contributions of this Study

There is a large body of research regarding variables associated with teacher attrition. These studies seem to support a model of teacher attrition that includes the job demands-resources model: if job demands increase without necessary resources teachers may become burned out and leave teaching or move schools. This model would support that teachers who instruct students with more academic and behavioral needs, but do not have the skills to work with these students, would be more likely to leave teaching or move schools. This study contributes to the teacher attrition literature by examining the association between the percentage of SWDs a teacher instructs and the probability of attrition. Specifically, this study contributes by examining SWDs as a group and by disability category further allowing an examination of the applicability of the job resources-demands model in teacher attrition by examining if students with disabilities that are associated with great behavioral deficits are more related to attrition than disabilities less associated with these deficits. Further, it examines if teachers with more skills in working with SWDs, teachers who are certified or dual certified in special education, react differently to having these students in their classes.

In addition, this study also contributes to the literature by quantitatively examining how the inclusion of SWDs impacts teachers. Prior research on inclusion has generally attempted to evaluate how inclusion is related to the achievement of SWDs (e.g., Carlberg & Kavale, 1980; Cole, Waldren, & Maid, 2004; Cosier, Causton-Theoharis, & Theoharis, 2013; Manset & Semmel, 1997) or the impact of inclusion on peers without disabilities (Gottfried, 2014; Gottfried & Harven, 2015; Gottfried et al., 2016). This research is of great importance, but seems

limited as inclusive practices are likely to impact educators as well. Understanding if the inclusion of SWDs in classrooms is related to teacher attrition and moderated by teacher certification recognizes that the inclusive experiences of both SWDs and their peers without disabilities are mediated by their teachers. This work provides more information about if teachers may need access to additional resources when working with some types of students and motivates future research focused on supporting all types of teachers who work with SWDs.

Chapter II
Methods

Data Source

I addressed these questions using existing data from NC. The Department of Public Instruction in NC collects student, teacher, and school level data in a partnership with the University of North Carolina's Education Policy Initiative at Carolina (EPIC). Data collected from NC public schools are compiled by EPIC staff and uploaded onto a secure server maintained by EPIC. The system is supported in part by a grant from the Institute of Education Sciences (R305E150017). Users access the data after receiving approval from EPIC. This study was part of the research project titled *An Evaluation of Turning around North Carolina's Lowest Performing Schools: A State Partnership* (UNC IRB Protocol Number 15-2835).

I used this extant panel data linking students to teachers and teachers to schools from three school years, 2009/10, 2010/11, and 2012/13. I did not include data from the 2011/12 school year because the dataset did not include the primary disability label for all students with disabilities. I used data in the school year following the Great Recession (2009/10) because schools laid-off unprecedented numbers of teachers during the economic downturn (Kraft, 2015).

Context. Teachers in NC experienced a number of reforms over the years included in this sample. North Carolina received a Race to the Top (RTTT) grant in 2010 resulting in changes to procedures for improving the lowest-performing schools, improving teaching quality, adopting college and career ready standards, and creating data systems to support instruction (Marks, Fuller, Guthrie, Henry, & Stallings, 2015). Additional bonuses were awarded in 2012 for individual teachers who had students with high levels of growth. However, teachers reported that they were unaware of these bonuses or did not understand how the bonuses were awarded

(Lauen & Kozlowski, 2014). In addition to accessing rewards based on evaluation scores, teachers with low scores could be dismissed from public school teaching.

Teachers in NC have fewer work protections than teachers in many states due to the illegality of collective bargaining (North Carolina School Boards Association, accessed 2016). While tenure laws were already flexible in NC, these laws changed under RTTT. Teachers in NC were provided contracts for one, two, or four schools years. Under these new changes, teachers were only given multi-year contracts if they had received a rating of proficient or higher on their evaluations. Beginning teachers, those with less than three years of experience, are only given one year contracts. The state legislature made additional changes to teacher tenure and pay in 2013. They eliminated bonus pay for Master's degrees and eliminated all tenure protections, allowing schools to revoke tenure from teachers with multi-year contracts (however, the North Carolina Supreme Court ruled that revoking tenure was illegal in April 2016). These changes allowed schools more flexibility with teacher layoffs than in other states or years prior to 2013.

Sample

Teachers. I included teachers in regular public schools who taught kindergarten through twelfth grade. About 100,000 school employees were designated as teachers by the state each year. About 96,000 of these employees designated as teachers worked in one school. Of these designated teachers at one school, around 87,000 teachers were linked to students. A small number of teachers were missing certification status (0.4% of the observations) and further excluded from my sample. I excluded teachers who worked at special schools, such as juvenile detention centers or special education schools. I summarized the sample development procedure in Figure 2. The final teacher sample sizes by year are presented in Table 1.

The final sample used for the analyses included 127,581 teachers. Some teachers were included in the dataset for multiple years and had multiple observations. For example, a teacher could have two observations if she was employed as a teacher in NC in 2009/10 and 2010/11. Because teachers were included in the dataset over multiple years, the dataset included 246,751 teacher-by-year observations. Twenty-nine percent of the teachers in this dataset had one observation, 23.97% of teachers were observed twice, and 46.57% of teachers were observed three times. These teachers were nested within 2,310 schools with 11% of teachers nested in multiple schools due to moving schools across years. Figure 3 illustrates the nesting of the structure with observations nested in teachers and teachers nested in schools.

Table 2 presents the demographics of this sample. Each teacher was included once in the calculations of means and percentages across the demographic variables. The teachers in this sample were primarily white and female. They had an average of 11 years of experience and the majority of teachers completed teacher preparation within NC. Just over 6% of teachers were certified in special education only and 4.5% of teachers were dually certified in special education and a content area. The demographic characteristics of teachers in this sample were similar to the characteristics of teachers at the national level (Goldring, Gray, & Bitterman, 2013).

These teachers taught different types of students in different schools. Table 3 includes the average percentage of characteristics of students in these teachers' classes. Nearly 18% of the students in teachers' classes were receiving special education services. On average, 51.5% of the students in teachers' classes were white, 26.71% were Black, and 13.03% of students were Hispanic. Over half of the students in teachers' classes were economically disadvantaged. School characteristics are presented in Table 4. Most schools were elementary schools. Over half (55.7%) of the schools were located in rural settings, 26.8% of schools were in cities, 13.59% of

schools were in suburbs, and the remaining 14.33% percentage of schools were in towns. The mean percentage of students classified as economically disadvantaged was 59.2%. Schools in NC were more rural than schools throughout the U.S. but served a similar percentage of economically disadvantaged students (Gray, Bitterman, & Goldring, 2013).

Measures

Dependent variables. Teacher attrition consists of (1) when a teacher moves from one school to another school or (2) when a teacher leaves teaching altogether (Borman & Dowling, 2008). In this study, I examined both total attrition and leaving. These dependent variables have different implications for teacher labor markets and schools. Total attrition is the sum of moving and leaving; both types of attrition result in the loss of a teacher to a school. This loss of a teacher has implications for student achievement as schools recruit and hire replacement teachers who are, on average, less experienced. The loss of a teacher impacts student achievement through a disruption to instructional programs (Ronfeldt et al., 2013) and within school churn as teachers who stayed in the school may be required to teach different grades or subjects to fill a teaching vacancy (Hanushek, Rivkin, & Schiman, 2016). Leaving has implications for teacher labor markets. When a teacher leaves teaching altogether she is potentially lost from the pool of possible replacement teachers thus contributing to teacher shortages. Examining leaving is particularly when it comes to special education teachers as most school principals report difficulties with filling special education teacher vacancies throughout the country (Boe, 2006; Katsiyannis, Zhang, & Conroy, 2003).

To create the two dependent variables of interest, leaving or total attrition, I classified teachers into three categories, **leaving**, **moving**, or **staying**, using NC pay files from 2009/10, 2010/11, 2011/12, 2012/13, and 2013/14. The NC pay files included each teacher who was paid

in each pay period during a school year and at which school each teacher was employed during that pay period. I classified a teacher as *staying* if the teacher was in one school for all pay periods in one school year and was in the same school during any pay period in the following school year. For example, a teacher in School A for all pay periods in the 2009/10 school year and in School A for any pay period in the 2010/11 school year would be classified as staying. I classified a teacher as *leaving* if the teacher was in one school for all pay periods in one school year and was not paid at all during the following school year by NC public schools. I classified a teacher as *moving* if the teacher was in one school for all pay periods in one school year and was not in the same school for any periods the following school year, but was still paid by NC public schools during any pay period. Table 1 presents the percentage of total attrition, leavers, movers, and stayers each year.

In my analyses examining leaving, I coded teachers classified as leaving as 1 and teachers who were not classified as leaving, teachers who stayed or moved, as 0. The main limitation of examining this variable is that teachers labeled as leavers could still be teaching in private schools or out of state. In these cases, the estimates here would overestimate teacher leaving. However, research suggests that very few teachers appear to switch to out of state positions (Goldhaber, Grout, Holden, & Brown, 2015). I referred to these teachers as leaving though they may have in fact moved to a private school to teach or a school outside of NC. Additionally, I did not examine if these teachers who left only left for short term spells, such as when a teacher takes time off for maternity leave. When I examined total attrition, teachers classified as leaving and teachers classified as movers were coded as 1 and teachers classified as staying were coded as 0. As shown in Table 1, there was an increase in the amount of total

attrition over the years in this dataset with a slightly higher percentage of teachers leaving than moving.

Independent variables for RQ1. In RQ1, I examined the association between the percentage of SWDs in teachers' classes and the odds of attrition. The variable of interest in RQ1 was the average percentage of SWDs in teachers' classes in a given school year. I calculated this variable using five steps:

1. I linked students to teachers by school year using classroom roster data that included unique identifiers for both students and teachers.
2. I calculated the total number of students in each class linked to each teacher in a given school year.
3. I calculated the total number of students with IEPs in each class in a given school year. I used the receipt of special education services as an indication of student disability status.
4. I divided the number of students with IEPs by the total number of students in the class and multiplied this proportion by 100. This resulted in a variable that is interpreted as the percentage of SWDs in a class.
5. I averaged the percentage of SWDs in a class across all the classes in a given school year where the teacher was the instructor of record.

I chose to average across classes rather than using classes nested in teachers to account for some error in the roster files where students may not be correctly linked to teachers or teachers are assigned to an impossibly large number of classes due to school error in using class codes. Additionally, averaging across classes ensured that each teacher was weighted equally in my analyses.

Parameterization of the average percentage of SWDs. Prior quantitative studies have not focused on the association between the average percentage of SWDs in teachers' classes and attrition. I could not assume that the association was linear so I evaluated how transformations of the independent variable improved model fit. First, I fit the model assuming a linear association between the average percentage of SWDs in teachers' classes and the log odds of attrition. I recorded the BIC, AIC, and log likelihood of this model. I then fit the model adding, first, a quadratic transformation of the average percentage of SWDs and, second, a cubic transformation of the average percentage of SWDs. The inclusion of the quadratic transformation improved model fit ($\chi^2[1] = 70.13; p < .001$). The model including the cubic transformation failed to converge. Finally, I examined the distribution of the average percentages of SWDs in teachers' classes and the percentage of total attrition across the distribution. Based on these visual inspections, I created categories of the average percentage SWDs in teachers' classes:

1. No SWDs
2. Category 1- above zero and equal to or less than 10%
3. Category 2- above 10% and equal to or less than 20%
4. Category 3- above 20% and equal to or less than 40%
5. Category 4- above 40% and equal to or less than 80%
6. Category 5- above 80% and less than 100%
7. All SWDs (100%)

I coded these categories as six binary variables with no SWDs as the comparison group. The model with the categorical parameterization of the average percentage of SWDs in teachers' classes fit the data better than the model that included the quadratic transformation of the average percentage of SWDs in teachers' classes according to the likelihood ratio test AIC and BIC.

Based on these model fitting procedures, I used the categorical variables in my analyses. The number of observations in each category are presented in Table 5.

Independent variables for RQ2. In RQ2, I examined the association between the average percentage of students with specific disabilities in teachers' classes and the odds of attrition. I calculated the average percentage of students with specific disabilities in teachers' classes in a given school year using the approach described above. The administrative student demographic files included dummy variables indicating each student's main disability eligibility area, if the student was eligible for special education services. These eligibility areas included learning disability, speech/language impairment, other health impairment, intellectual disability, autism, behavioral disorder, hearing impairment, multiple disabilities, orthopedic impairment, vision impairment, developmental delay, and traumatic brain injury. North Carolina uses eligibility criteria for each disability as outlined in IDEA and students are found eligible for special education with a main disability categorization by IEP teams also as outlined in IDEA. I calculated the percentage of students with specific disabilities by summing the number of students with each disability, dividing this sum by the class size, and multiplying by 100 to obtain a percentage. Finally, I averaged this percentage of students with a specific disability across the classes where the teacher was listed as the teacher of record.

I focused my analyses for RQ2 on the association between the average percentage of students with learning disabilities, speech/language impairments, other health impairments, autism, intellectual disabilities, or behavior disorders in teachers' classes and the odds of attrition. Students were less frequently identified with hearing impairments, multiple disabilities, orthopedic impairments, vision impairment, developmental delay, or traumatic brain injury. I grouped students with these disabilities into one group labeled "other" and did not examine the

association between the average percentage of students in this group and teacher attrition. I included the average percentage of students with "other" disabilities in the models as a control variable.

Parameterization of the average percentage of students with specific disabilities. I divided the continuous variables of the average percentage of students with specific disabilities into categories using the classifications described above. This approach allowed for consistency across the two research questions but resulted in some categories with small sample sizes. The sample sizes for each disability category are reported in Table 5.

Moderators. In RQ3, I examined if the association between attrition and the percentage of SWDs, as a group or by disability category, was moderated by teacher certification. I used certification as an indicator for professional training to work with SWDs. The job demands-resources model would suggest that teachers with more training to work with SWDs might respond differently to working with large percentages of these students than teachers without training, as indicated by certification. Specifically, I examined certification in special education or dual certification in special education as a moderator. There are two types of dual certification in special education. Teachers may be dual certified in special education and a content area because they completed a teacher preparation program that focused on both general education and special education. Teachers may have completed an additional degree to become dual certified. Teachers who obtained dual certification through schooling, I classified as *dual certified*. Other teachers may have obtained dual certification by taking a state certification exam in either a content area or special education. Teachers who obtained dual certification through taking a test I classified as *test dual certified*.

The licensure datasets from NC included the area in which a teacher was certified to teach and how the teacher obtained certification. I classified teachers as special education certified if the teacher was only certified in special education. I classified teachers as dual certified if teachers were certified in special education and another area when teachers obtained both certifications from completing a teacher preparation program. I classified teachers as test dual certified if the teacher was certified in special education and another area but one of the certifications was obtained by taking a licensure exam instead of completing a university program. I created dummy variables indicating if the teacher was special education certified, dual certified, or test dual certified. Of note, in NC a special education teacher is required to pass a content licensure exam to be considered "highly qualified" if she is the only teacher of record for the content area class.

Control variables. Past research on teacher attrition has identified teacher and school characteristics that are associated with teacher attrition (Borman & Dowling, 2008). I controlled for teacher characteristics, aggregate characteristics of students in teachers' classrooms, and school characteristics to better isolate the association between the average percentage of SWDs in teachers' classes and attrition.

Teacher control variables. I included in my models variables indicating teacher race, gender, certification, entry into teaching (e.g., Teach for America), academic achievement, and years of experience. These variables are summarized in Table 2. Teacher race and gender were reported by the teacher to NC and included in teacher files. I dummy coded race to indicate if the teacher was Black, Hispanic, or from another minority group. The comparison group was white teachers. Gender was dummy coded with one indicating that the teacher was male.

Teacher certification area and entry into teaching were available from datasets regarding teacher licensure. I created dummy codes indicating if the teacher was certified in English, science, math, social studies, or other areas. The "other" certification designation included certification in art, music, physical education, or foreign language. The comparison group for certification was teachers certified in elementary education. I classified teacher entry into teaching into five categories: out of state preparation, Teach for America, other alternative entry, visiting teacher, unclassified entry to teaching, or in state preparation. I created dummy variables for each of these categories using in state preparation as the comparison group.

Academic achievement was a composite score provided by the state of state licensure exams, PRAXIS, SAT, and GRE. Scores on each test were standardized within test and year based on the sample of teachers in NC. These standardized scores were then averaged for each teacher in each year to create an overall score representing the teacher's relative academic achievement. The dataset from NC only included this composite score, not the scores from individual assessments.

Prior research also suggests that years of experience is a strong predictor of teacher attrition with teachers leaving at higher rates during their first years in the profession (Feng, 2009; Hanushek et al., 2004; Sass et al., 2012). I used the teacher years of experience from NC pay files to create binary variables indicating years of experience because years of experience has a non-linear association with the odds of attrition (Boe, Cook, & Sunderland, 2008). I included three dummy variables indicating if the teacher was in her first, second, or third year of teacher. I also created a dummy variable to indicate if the teacher had 30 or more years of experience. I created these categories by examining the percentage of teachers leaving or moving

over experience and based on categories with similar attrition rates identified in prior research (Hanushek et al., 2004).

Classroom control variables. For each year of data, I calculated the aggregate characteristics of students in teachers' classes and averaged across the number of classes the teachers instructed in a given school year using the same approach described above to calculate the average percentage of SWDs in teachers' classes. I included these classroom control variables in the models, despite mixed evidence regarding the association between some classroom characteristics and teacher attrition (Billingsley, 2004; Borman & Dowling, 2008), to eliminate potential student demographic variables that could confound the association between the percentage of SWDs in teachers' classes and attrition. The classroom control variables are summarized in Table 3. I calculated the average percentage of Black, Hispanic, Asian, and other minority students in a teacher's class by linking student demographic data provided by NC to roster files. I also calculated the average percentage of male students, students qualifying for free/reduced lunch, English language learners, and gifted students. Qualification for free/reduced lunch was used as an indicator of economic disadvantage. I used the roster files to determine the average class size a teacher instructs. The distribution of class sizes was skewed due to some very large classes that were typically marching band, electives, or study halls. I also included the average of the average absences per pupil across a teacher's classes.

School control variables. I included school level variables in the analyses. These school level characteristics include dummy variables indicating if the school was a middle school (grades 6-8), high school, elementary school, or a different grade combination (such as a K-8 school), with elementary school as the reference group. I also included a dummy variables for the school area designation provided by the National Center for Educational Statistics. These

designations were urban, town, rural, or suburban. I used suburban as the reference category. The school level datasets also include the state accountability classification. I included indicators for if the school exceeded, met, or did not meet state growth goals with met as the comparison group. I also included an indicator for if the school received Title I funding. I included a continuous variable with state recorded violent acts per 100 students and the grand mean centered total per pupil expenditure in hundreds. Prior studies of school level variables associated with attrition have examined school level aggregates of student characteristics. I include the percentage of Black, Hispanic, Asian, and other minority students in the school and the percentage of students qualifying for free/reduced lunch as an indicator of economic disadvantage. I treated school level variables as time invariant. If a school changed designation on a binary variable I used 0.5 or .33 in each category and I averaged the continuous variables (such as percentage of Black students) over the three years of data. I did not account for school working conditions through the inclusion of control variables, but I addressed this omission in my analytical approach to addressing each research question.

Correlations. I examined the pairwise correlations between the control variables and independent variables to eliminate any potentially collinear variables. Table 6 shows the correlations between teacher control variables using one observation per teacher. Nearly all correlations were significant but small, to nearly zero, in magnitude. The correlations between classroom variables were also nearly all significant but some were higher in magnitude than the teacher control variables. These correlations are shown in Table 7. Classes with students with intellectual disabilities, learning disabilities, behavior disorders, or other health impairment were moderately correlated. Categories of classes with percentages of students with speech/language disorders were less often correlated with classrooms with other types of disabilities. Average

classes with all SWDs were correlated with the percentage of male students (r=.27, p<.05), economically disadvantaged students (r=.11, p<.05), and average absences per pupil (r=.19, p<.05). Average classes with a small percentage of students with other health impairment were correlated with the class size (r=.19, p<.05), percentage of gifted students in the class (r=.15, p<.05), and negatively correlated with the percentage of Black students (r=-.10, p<.05). All categories of classrooms with students with intellectual disabilities were negatively correlated with class size and positively correlated with absences. Classrooms categorized by moderate percentages of students with learning disabilities were negatively correlated with class size and positive correlated with the percentage of male students. The largest correlations at the classroom level were between student demographic characteristics such as the average percentage of English Language Learners and the average percentage of Hispanic students (r=.79, p<.05). Overall, these correlations suggest that there were differences between classrooms in student body composition that should be accounted for in the analyses but classroom composition did not appear to be confounded with the categories of the average percentage of SWDs or students with specific disabilities in teachers' classes.

I examined the correlations between school level variables and these are presented in Table 8. Elementary schools more often received Title 1 funding (r=.54, p<.05) and were negatively correlated with violent acts per pupil (r=-.54, p<.05). High schools were negatively correlated with the percentage of economically disadvantaged students (r=-.29, p<.05). Schools in cities had higher proportions of Black and Hispanic students. City schools and the percentage of Black and Hispanic students were correlated with the percentage of economically disadvantaged students. Overall, the correlations were low to moderate but did not suggest collinearity between school level variables.

Missing data. One school was missing school level data so I excluded it from the sample. Additionally, 0.68% of teachers were missing gender, 21.13% of teachers were missing race, 14.93% of teachers were missing an aggregate test score, and 1.69% of teachers were missing years of experience. I handled these missing data by using chained multiple imputation to create 20 full datasets in Stata 14 (Allison, 2001). I averaged across the datasets for the continuous variables (test score and years of experience) and selected the mode for categorical variables in order to create a single complete dataset. The descriptive characteristics of the imputed variables are shown in Table 9 and include the descriptive characteristics from the original dataset. The values from the imputed sample appeared similar to those from the original sample.

Analyses

Researchers examining teacher attrition have used hazard modeling to estimate whether a teacher remains in teaching at a specific time point or when teachers leave teaching (Willett & Singer, 1991). In this study, I examined if teaching SWDs was associated with the odds attrition. In order to address this question, I fit a series of multilevel logistic models to the data rather than using hazard modeling. I systematically built up models to investigate how specific variables were related to attrition and included. In the final model, I used school fixed effects to eliminate unmeasured time invariant school characteristics, such as working conditions that could be associated with both attrition and the assignment of SWDs to teachers. Consistent results across the models that included school fixed effects allowed me to evaluate the robustness of my results as each model accounts for different potentially omitted variables that could influence the association between the percentage of SWDs and attrition. I outlined my modeling approach for each research question in the following sections. In all models, I used $p<.05$ as the cutoff for statistical significance.

Models addressing RQ1. In the first research question, I examined if the categories of the average percentage of SWDs in teachers' classes were associated with an average increase in the odds of teacher total attrition or leaving. I ran two models to address this question: (1) using the dependent variable of total attrition and (2) using the dependent variable of leaving. In Model 1, I used a multilevel model with observations nested within teachers and teachers nested in schools. I did not include classrooms nested within teachers because classroom characteristics were averaged at the teacher level for each year. Thus, within a year of observation teachers did not have any variability in average classroom characteristics. Model 1 included dummy variables for the category of the average percentage of SWDs in a teacher's classes and dummy variables for each school year to account for changes in attrition across school years. This model was:

$$logit(y_{ijk}) = \gamma_{000} + \gamma_{100}ALLSWD_{ijk} + \gamma_{200}SWD5_{ijk} + \gamma_{300}SWD4_{ijk} + \gamma_{400}SWD3_{ijk} +$$

$$+\gamma_{500}SWD2_{ijk} + \gamma_{600}SWD1_{ijk} + \gamma_{700}10/11_{ijk} + \gamma_{800}11/12_{ijk} + U_{00k} + V_{0jk}$$

$$U_{00k} \sim N(0, \psi_{00})$$

$$V_{0jk} \sim N(0, \psi_{11}) \quad (1)$$

where:

$logit(y_{ijk})$ is the log odds of attrition for teacher *j* leaving in school *k* at time *i*;

exp (γ_{000}) is the odds of of attrition where all predictors are 0;

exp (γ_{100}) is the multiplicative change in the odds of attrition associated with an average percentage of SWDs of 100%;

$ALLSWD_{ijk}$ indicates if the average percentage of SWDs in a class for teacher *j* in school *k* at time *i* is 100%;

exp (γ_{200}) is the multiplicative change in the odds of attrition associated with an average percentage of SWDs greater than 80% and less than 100% (Category 5);

$SWD5_{ijk}$ indicates if the average percentage of SWDs in a class for teacher *j* in school *k* at time *i* is greater than 80% and less than 100% (Category 5);

exp (γ_{300}) is the multiplicative change in the odds of attrition associated with an average percentage of SWDs greater than 40% and less than 80% (Category 4);

$SWD4_{ijk}$ indicates if the average percentage of SWDs in a class for teacher *j* in school *k* at time *i* is greater than 40% and less than 80% (Category 4);

exp (γ_{400}) is the multiplicative change in the odds of attrition associated with an average percentage of SWDs greater than 20% and less than 40% (Category 3);

$SWD3_{ijk}$ indicates if the average percentage of SWDs in a class for teacher *j* in school *k* at time *i* is greater than 20% and less than 40% (Category 3);

exp (γ_{500}) is the multiplicative change in the odds of attrition associated with an average percentage of SWDs greater than 10% and less than 20% (Category 2);

$SWD2_{ijk}$ indicates if the average percentage of SWDs in a class for teacher *j* in school *k* at time *i* is greater than 10% and less than 20% (Category 2);

exp (γ_{600}) is the multiplicative change in the odds of attrition associated with an average percentage of SWDs greater than 0% and less than 10% (Category 1);

$SWD1_{ijk}$ indicates if the average percentage of SWDs in a class for teacher *j* in school *k* at time *i* is greater than 0% and less than 10% (Category 1);

exp (γ_{700}) is the multiplicative change in the odds of attrition associated with the school year 2010/11;

$10/11_{ijk}$ indicates if the data for teacher *j* in school *k* at time *i* is from the 2010/11 school year;

exp (γ_{800}) is the multiplicative change in the odds of attrition associated with the school year 2011/12;

$11/12_{ijk}$ indicates if the data for teacher *j* in school *k* at time *i* is from the 2011/12 school year;

U_{00k} is the random school effect; and

V_{0jk} is the random teacher effect.

The random effects were assumed to be independent and identically distributed and independent of the covariates. This model provided an estimate of the average association between the category of the average percentage of SWDs in a class and the multiplicative change in the odds of attrition controlling for differences in attrition across years and accounting for nested observations. I fit this model, and all subsequent models unless noted, using the program *gllamm* in Stata 14 (Rabe-Hesketh, Skrondal, & Pickles, 2005). The model included robust standard errors in all models to address potential model misspecification (Raudenbush & Bryk, 2001). I exponentiated the coefficients and interpreted them as odd ratios for ease of interpretation. The coefficients represent the multiplicative change in the odds of attrition, which I referred to as the change in the odds of attrition for parsimony.

In Model 2, I added teacher characteristics to Model 1 to account for differences between teachers. In Model 1 any association between the category of the average percentage of SWDs in teachers' classes and the odds of attrition could be due to differences in the characteristics of teachers assigned to teach SWDs. I compared the fit of Model 1 and Model 2 using a likelihood-ratio test and the AIC and BIC to examine how the addition of teacher related variables improves the model fit. Model 2 provided information about the average association between the category of the percentage of SWDs in a teachers' classes and the change in the odds of attrition after controlling for observed differences between teachers and yearly differences in attrition.

In Model 3, I added other classroom characteristics and school level control variables to Model 2. I compared the fit of Model 3 to the fit of Model 2. The results of Model 3 provided an

estimate of the association between the category of the average percentage of SWDs in a teacher's class and the change in the odds of attrition after controlling for teacher, class, and school level variables. However, this model did not account for variables unobserved in this dataset, such as school working conditions, that could be related to attrition.

The final model for RQ1, Model 4, included a school fixed effect to address unobserved time invariant differences across schools that may be related to teacher attrition. I eliminated the school characteristics and school random effects from Model 3 and added school fixed effects. This model would not converge using *gllamm* or the multilevel modeling program *me* in Stata 14 but did converge using *xtlogit* also in Stata 14. The coefficients on the category of the average percentage of SWDs in a class was now interpreted as the change in the odds of attrition associated with the category of the average percentage of SWDs in a class compared to other teachers in the same school during the same year after controlling for teacher and class characteristics. The sample used for Model 4 eliminates 19 schools (137 observations) in which all teachers have the same value for the dependent variable. Because the sample had changed, the fit of Model 4 could not be compared to the fit of the other models. Model 4 acted as a check against omitted variable bias due to time invariant differences across schools, such variations across schools in how they identify students for special education services. Table 10 summarizes the models used to address RQ1.

Models addressing RQ2. SWDs are a heterogeneous group and any association between the average percentage of SWDs in teachers' classes and the odds of attrition may vary by the types of disability labels had by the students. In RQ2, I examined how the categories of the average percentage of students with specific disabilities in teachers' classes were associated with a change in the odds of attrition. I repeated the model building approach described to address

RQ1, but included the categorical parameterization of the average percentage of students with each disability in teachers' classes as the predictors of interest, instead of grouping all SWDs together. In this model, $ALLSWD_{ijk}$, $SWD5_{ijk}$, $SWD4_{ijk}$, $SWD3_{ijk}$, $SWD2_{ijk}$, and $SWD1_{ijk}$ were replaced by variables for the category of the average percentage of students with each specific type of disability. I summarized the models for RQ2 in Table 11.

Models addressing RQ3. Research question 3 examined if the association between the categories of the average percentage of SWDs or students with specific disabilities in teachers' classes and the odds of total attrition or leaving was moderated by teacher training in working with SWDs, as indicated by special education certification, dual certification, or test dual certification. First, I added interactions between special education certification, dual certification, and test dual certification and the categories of the average percentage of SWDs, grouped together, to Model 3 (Table 11). This model converged without any problems in *gllamm*.

Second, I analyzed how special education certification, dual certification, or test dual certification moderated the association between the average percentage of students with specific disabilities and the odds of attrition (total attrition and leaving). I ran these models despite some main effects not being statistically significant in the models for RQ1 and RQ2. I added interactions between the three certification areas of interest and the percentage of students with specific disabilities categories to Model 7 (Table 12). This approach added an additional 108 parameters to the model and the model did not converge using *gllamm*. I took two alternative approaches to running these models. First, I entered the interactions between certification status and categories of students with specific disabilities into Model 7, the model including teacher, classroom, and school characteristics, each disability at a time. For example, I ran Model 7 with the interactions between certification categories and the category of the percentage of students

with autism, but did not include any of the other interactions between certification and categories of students with other disabilities. This approach converged using *melogit* when the dependent variable was total attrition for autism, intellectual disabilities, and speech impairments. When the dependent variable was leaving, this approach converged in *melogit* for autism, other health impairment, learning disabilities, behavior disorders, and speech/language impairments. The models would not converge for learning disabilities, other health impairment, and behavior disorders for total attrition and intellectual disabilities for leaving.

To obtain estimates of the interactions that would not converge for the first approach, I ran Model 7 separately for samples of teachers with special education certification, dual certification, test dual certification, or no special education certification. This approach provided descriptive differences between groups but not statistical tests of the interactions. After using each approach to address RQ3, the coefficients on some interaction categories were not estimable due to all teachers in that category experiencing the same outcome (all staying or leaving). It is possible that there were difficulties in estimating these models due to the small sample sizes in some of the interaction categories. These sample sizes are presented in Table 12, Table 13, and Table 14. I graphed all results to better examine evidence of interactions despite some small sample sizes.

Chapter III
Results

In this study, I addressed three research questions: (1) Is there an association between the average percentage of SWDs in teachers' classes and the average odds of attrition?; (2) Does this association vary by student disability label?; and (3) Does training, as indicated by certification, moderate the association between the average percentage of SWDs or students with specific disabilities in teachers' classes and the average odds of attrition? I addressed these questions by fitting a series of multilevel models using data from public school teachers in NC over three years. I first presented the results from the analyses for RQ1, for both outcomes (total attrition and leaving), before reporting the results from RQ2 and RQ3. I then presented supplemental analyses and robustness checks to support the validity of the results.

Is there an association between the average percentage of SWDs in teachers' classes and the odds of attrition? (RQ1)

Total Attrition. I used a model building approach to examine the association between the average percentage of SWDs in teachers' classes and total attrition, both leaving teaching and moving schools. Model 1 included the categories of the average percentage of SWDs in teachers' classes, a year fixed effect, teacher random effect, and school random effect. The results are reported in Table 15. An average percentage of 100% SWDs was associated with a 30% increase in the average odds of attrition compared to teachers without any SWDs their classes ($p<.001$). Teaching classrooms with average percentages of SWDs in Category 1, Category 2, and Category 3 was associated with an average decrease in the odds of attrition compared to teachers without any SWDs in their classrooms. In Model 2, I added teacher characteristics as control variables. Table 16 reports the full results in both logits and as odds ratios. The association between the 100% SWDs category and the average odds of attrition was no longer statistically

significant. After accounting for teacher characteristics, including special education certification, teachers who taught classes of all SWDs did not have a different odds of attrition than teachers without any SWDs in their classes. Similar to Model 1, teachers of classrooms in the first three categories still had lower odds of attrition than teachers without any SWDs, after accounting for teacher characteristics. This negative association was also significant for Category 5. The addition of teacher characteristics to the model significantly improved the model fit ($\chi^2[24] = 3189.4; p < .001$). I added the average characteristics of teachers' students in a given year and school characteristics to Model 3. These additional controls resulted in a better fitting model than Model 2 ($\chi^2[27] = 678.4; p < .001$). As shown in Table 17, the coefficients on Category 1, Category 2, Category 3, and Category 4 were still significant. Teachers who taught classrooms with an average percentage of SWDs in one of these categories had, on average, lower odds of attrition than teachers without any SWDs in their classes after accounting for teacher characteristics, classroom characteristics, and school characteristics. This decrease in the odds of attrition ranged from 15% to 28%.

I included school fixed effects and excluded the school control variables in the final model for this dependent variable and research question. This allowed me to compare two teachers within the same school, thus accounting for time invariant differences between schools that could be related to attrition. I reported the coefficients of interest in Table 18. I did not include the model fit indices as the sample had changed to exclude schools with no variable on total attrition. Due to the change in samples, Model 4 was not directly comparable to the prior models. The results from Model 4 were very similar to the results from Model 3. Teachers with percentages of SWDs in the first four categories had lower odds of attrition than similar teachers in their same schools who did not instruct any SWDs. These decreases in the odds of attrition

ranged from 13 to 26%. This supports that the results reported in Model 3 were unlikely to be due to unmeasured differences between schools.

I graphed the results from Models 1–4 in Figure 4 to visually show the changes and consistencies across model results. The bars signify the change in the odds of attrition associated with the category of the average percentage of SWDs in teachers' classes. These categories and the corresponding percentages are listed on the y-axis. The x-axis is on a logarithmic scale.

Leaving. I examined the dependent variable of leaving separately from total attrition as this variable may have more implications for the understanding teacher labor markets. Model 1 included the categories of the average percentage of SWDs in teachers' classes but did not include any control variables. The results from this model are presented in Table 19. Teachers in the lower categories of the average percentage of SWDs in their classes had, on average, lower odds of leaving than teachers without any SWDs in their classes. In Model 2, I added teacher characteristics to the model. The addition of these variables significantly improved the fit of the model ($\chi^2[24] = 5567.2; p < .001$) and resulted in a small decrease in the association between Category 1, Category 2, and Category 3 and the average odds of leaving (Table 20). Teachers in one of these categories had, on average, a 13%, 20%, and 7% decrease in the odds of attrition than teachers without any SWDs in their classes, after controlling for teacher characteristics. These results remained consistent after the addition of classroom and school characteristics to Model 3 (Table 21) and Category 5 was associated with a statistically significant change in the odds of leaving. Similar to the above analyses, Model 3 fit the data Model 2 ($\chi^2[27] = 486.9; p < .001$). The size of the coefficients were similar after the addition of school fixed effects in Model 4 (Table 22). Figure 5 presents graphs of the conditional odds-ratios of leaving from each model.

Does this association vary by disability category? (RQ2)

Total attrition. The results from the analyses for RQ1 suggested that teachers who taught students with and without disabilities had, on average, lower odds of attrition. In RQ2, I examined if this association was different when disability categories were examined separately instead of grouping all SWDs together. In the first model, I included the categories of the average percentage of students with learning disabilities, speech/language impairments, other health impairments, autism, intellectual disabilities and behavior disorders as the independent variables of interest. I included the categories of the average percentage of students with other disabilities as a control variable. In these models, the coefficients are interpreted as the average change in the odds of attrition for teachers with classes with the category of the percentage of students with a specific disability compared to teachers without any SWDs in their classes, after accounting for the percentage of students with other disabilities in their classes. Model 6 fit better than Model 5 ($\chi^2[24] = 3165.8; p < .001$) and the addition of school and classroom characteristics in Model 7 further improved the fit ($\chi^2[27] = 652; p < .001$).

Learning disabilities. Model 5 did not include any teacher, classroom, or school control variables; the results are reported in Table 23. Teachers in Category 4 and Category 5 for learning disabilities had, on average, 1.21 (p=.004) and 1.57 (p=0.032) times the odds of attrition than teachers without any SWDs in their classes. Teachers in Category 1 for learning disabilities had, on average, lower odds of attrition (0.95; p=.035) than teachers without any SWDs in their classes. I added teacher control variables in Model 6 (Table 24). The association between the higher categories of the average percentage of students with learning disabilities in teachers' classes and the odds of attrition was no longer statistically significant. The odds of attrition for teachers in Category 1 was 7% (p=.002) lower than teachers without any SWDs in their classes.

This association between Category 1 for learning disabilities and a decrease in the odds of attrition was consistent after the addition of classroom and school controls in Model 7 (Table 25) and school fixed effects in Model 8 (Table 26). Figure 6 shows the change in the average odds of attrition associated with each category of the average percentage of students with learning disabilities in teachers' classes for each model.

Speech/language impairments. Teachers with average classes of students with speech/language impairments in Category 1, Category 2, or Category 3, had, on average, lower odds of attrition than teachers without any SWDs in their classrooms in Model 5 (Table 23). The associations between these categories and attrition remained statistically significant in Model 6 after adding teacher control variables, and after including teacher, classroom, and school control variables (Model 7). In the school fixed effects model (Model 8) Category 1, Category 2, and Category 3 of the percentage of students with speech/language impairments were associated with a decrease in the odds of attrition. However, there was a positive association between Category 5 and the odds of attrition. Category 5 for speech/language impairments was associated with an average change in the odds of 1.85 compared to the odds of attrition for a teacher without any SWDs. The consistency in the results for the first three categories across all models is shown in Figure 7.

Other health impairments. Figure 8 shows the coefficients for the categories of the average percentage of students with other health impairments from each model. There was a positive association between Category 4 and Category 5 other health impairments and the odds of attrition in Model 5. Teaching an average class entirely of students with other health impairments was associated with a 2.63 change in the odds of attrition compared to teachers without any SWDs in their classes. This association was only slightly attenuated by the addition

of teacher control variables in Model 6. In Model 6, the other associations between the categories of percentage of students with other health impairments and attrition were no longer statistically significant. In Model 7, with teacher, classroom, and school characteristics, teaching a classroom all students with other health impairments was associated with teacher attrition, about a 2.19 increase in the odds compared to a teacher without any SWDs, but this coefficient was no longer statistically significant (p=.053). This coefficient diminished slightly in the school fixed effects model to 2.05 but became statistically significant.

Autism. In Model 5, the model without any control variables, teaching an average class with all students with autism was associated with a 1.61 average change in the odds of attrition and teaching an average class of students with autism in Category 1 was associated with a 0.86 change in the odds of attrition compared to teachers without any SWDs in their classes. Unlike other health impairments, the association between an average class with all students with autism and the odds of attrition was no longer statistically significant after the addition of control variables to the model (Model 6). In Model 6, Category 1 was associated with a 0.88 change in the odds of attrition compared to a teacher without any SWDs. This association was slightly attenuated after the addition of classroom and school variables (Model 7, Table 25) and remained significant in the school fixed effects model. Figure 9 presents the results for autism.

Intellectual disabilities. In the first model for RQ2 that only included the categories of the average percentage of students with specific disabilities, only the category for all students with intellectual disability was significantly associated with teacher attrition. It remained significant in Model 6 after the addition of teacher control variables. Teaching a class with all students with intellectual disabilities was associated with a 2.22 change in the odds of attrition compared to the odds for teachers without any SWDs in their classes. This large association

decreased to a 1.83 change in the odds with the addition of classroom and school controls. In this model, Category 2 and Category 4 were associated with a statistically significant 0.89 and 0.85 change in the average odds of attrition. The association for Category 2 and for average classes of all students with intellectual disabilities decreased slightly but remained significant in the school fixed effect model. The changing magnitude and statistical significance of the coefficients across models is presented in Figure 10.

Behavior disorders. In the first model without control variables, all categories of the percentage of students with behavior disorders, except Category 1, were significantly associated with a change in the odds of attrition. The change in odds ranged from 1.33 for Category 2 to 7.41 for classes in which all students had behavior disorders. These coefficients were attenuated by the addition of teacher control variables in Model 6. Comparing two similar teachers, teachers in Category 2, Category 3, Category 4, Category 5, and 100% behavior disorders had statistically significantly higher odds of attrition than teachers without any SWDs in their classes. However, these associations were no longer significant for Category 2, Category 4, and Category 5 after the addition of classroom and student controls in Model 7. The results from Model 8, with school fixed effects, attenuated the association between teaching all students with behavior disorders and attrition. The results addressing total attrition for categories of the percentage of students with behavior disorders are presented in Figure 11.

Leaving. On average, teachers with a small average percentage of SWDs, when grouped together, had lower odds of leaving than teachers without any SWDs in their classes. In RQ2, I examined how teacher percentages of students with specific disabilities were associated with leaving. In reporting the results, I concentrated on the statistically significant associations with the full model results reported in Table 27, Table 28, Table 29, and Table 30. The model

including teacher, classroom, and school variables best fit the data. Again, each category is interpreted as the association between the category and leaving after accounting for the other categories of specific disabilities in teachers' classes.

Learning disabilities. None of the categories of the average percentage of students with learning disabilities in teachers' classes were associated with the average odds of leaving in Model 5 or in Model 6 after the addition of teacher control variables. Category 1 was associated with a 0.93 change in the average odds of attrition compared to teachers without any SWDs in their classrooms after accounting for teacher, classroom, and school characteristics (Model 7). This association remained statistically significant in the model with school fixed effects. These results are summarized in Table 31 and Figure 12.

Speech/language impairments. The first three categories (Category 1, Category 2, and Category 3) of the average percentage of students with speech/language impairments in teachers' classes were associated with a decrease in the average odds of leaving in the model without any teacher control variables (Model 5). Figure 13 presents the coefficients by category for each model. In Model 6, Category 1 was associated with a 0.94 average change in the odds of leaving and Category 2 was associated with a 0.91 change in the odds of leaving compared to a teacher without any SWDs, after accounting for teacher characteristics. These categories did not have a statistically significant association with leaving after adding classroom and school variables in Model 7 or school fixed effects in Model 8.

Other health impairments. None of the categories of the average percentage of students with other health impairments were associated with a change in the average odds of leaving. Shown in Figure 14, these small and non-statistically significance coefficients were consistent across all models.

Autism. In the first model, without control variables, the association between the average percentage of students with autism in teachers' classes and the average odds of leaving was only statistically significant for Category 1. This association for Category 1 was statistically significant after the addition of teacher control variables in Model 6 but was small in magnitude: Category 1 was associated with a 0.91 change in the average odds of leaving compared to a teacher without any SWDs. This association between Category 1 for autism and the odds of leaving remained across models with additional controls and school fixed effects (Figure 15).

Intellectual disabilities. The directions and magnitudes of the associations between the category of the average percentage of students with intellectual disabilities in teachers' classes and the average odds of leaving were similar across all models, as shown in Figure 16. Only the 100% category had a statistically significant association with leaving, a 1.67 change in the odds compared to a teacher without any SWDs. This result was only statistically significant in Model 6, the model that included teacher controls but did not include classroom or school controls. After accounting for demographic characteristics of the students and school characteristics, none of the categories of the percentage of students with intellectual disabilities in teachers' classes were associated with leaving.

Behavior disorders. In Model 5, shown in the first quadrant of Figure 17, all categories of the average percentage of students with behavior disorders in teachers' classes and leaving were positive but only the coefficients for 100% and Category 2 were statistically significant. Category 2 was associated with a 1.30 change in the odds of leaving compared to a teacher without any SWDs in a class. The 100% category was associated with an average change in the odds of leaving of 2.64 compared to a teacher without any SWDs. The association for the 100% category remained statistically significant in Model 6 after the addition of teacher control

variables and increased slightly to a 2.67 change in the odds. Category 1 and Category 2 both had statistically significant associations with leaving in Model 6, an average change of 1.05 and 1.22 in the odds respectively. The coefficient for 100% decreased slightly to 2.30 after additional controls for classroom and school characteristics were included in the model and Category 1 and Category 2 were no longer statistically significant. The coefficient on the 100% category further decreased to 2.11 in the model with school fixed effects but this was not statistically significant (p=.11).

Are the associations between the percentage of SWDs or students with specific disabilities and attrition moderated by training as indicated by certification in special education? (RQ3)

The final research question examined if the association between the average percentage of SWDs, or students with specific disabilities, in teachers' classes and attrition, both total attrition and leaving, was moderated by special education certification, dual certification, or test dual certification. Some of the main effects of the variables included in the interactions were not significant in the above models but I included these interactions in order to investigate my hypotheses. I examined how the three certification areas of interest interacted with the categories of the average percentage of SWDs in teachers classes, for total attrition and leaving, by adding the interactions to Model 3, the model including teacher, classroom, and school covariates. These models converged in *gllamm* with all interactions in one model for each outcome.

For specific disability categories, I used multiple estimation approaches because of difficulties with model convergence. I entered the interactions between specific disability categories and certification separately to Model 7, the model with teacher, classroom, and school covariates. For example, I added to Model 7 interactions between the categories of the average

percentage of students with learning disabilities and special education certification, dual certification, and test dual certification. I did not include interactions for any other disability categories. Then I ran a separate model including interactions between the categories of the average percentage of students with speech/language impairments and special education certification, dual certification, and test dual certification. I proceeded in this fashion for each disability label. These models converged in *melogit* for autism, intellectual disabilities, and speech/language impairments for total attrition. These models converged in *melogit* for autism, other health impairments, learning disabilities, speech/language impairments, and behavior disorders when the outcome was leaving.

The interaction models on the full sample did not converge for learning disabilities, behavior disorders, and other health impairments when the outcome was total attrition. In order to identify possible interactions, I followed the approach outlined in Gottfried et al. (2016) for obtaining coefficients for each group of teachers. I divided the sample into four groups: special education certified teachers, dual certified teachers, test dual certified teachers, and teachers without and special education certification. I ran Model 7 on each sample separately using *melogit*. These results do not provide a statistical test of differences across groups but do provide descriptive information that can be used to support my hypotheses for RQ3. I presented these results by disability category below and note in the accompanying figures and tables when there was not a significance test of the interaction. These figures are interpreted slightly differently than the graphs representing the results from RQ1 and RQ2.

Grouping SWDs. When students with disabilities were all grouped together, there was evidence that special education certification moderated the association between the category of the average percentage of SWDs in teachers' classes and total attrition. These results are graphed

in Figure 18 and the results are reported in Table 31. The association between the category of the average percentage of SWDs in teachers' classes and total attrition was lower for special education certified, dual certified, and test dual certified teachers than general education teachers. These interactions were all statistically significant for special education teachers, but most were not statistically significant for dual certified or test dual certified teachers. As shown in Figure 18, for general education teachers the average odds of attrition increased as the average percentage of SWDs in their classes increased.

The interaction results from the same model predicting leaving were different. Nearly all categories of the average percentage of SWDs in teachers' classes were negatively associated with the average odds of leaving for all categories of teachers (Figure 19). Only one of the interactions was statistically significant (special education certification and Category 4, Table 32).

Learning disabilities. I ran the interaction analyses on separate samples of special education certified teachers, dual certified teachers, test dual certified teachers, and teachers who were not certified in special education. The change in the odds of attrition for general education teachers in each category of the average percentage of students with learning disabilities in their classes changed from a negative association to a positive, as the percentage of students with learning disabilities increases (Figure 20). However, only the association between attrition and Category 1 was statistically significant (Table 33). There were only two general education teachers in Category 5 and both left teaching so I was unable to estimate a coefficient for this category.

The association between the category of the percentage of students with learning disabilities in special education teachers' classes and the change in the average odds of attrition

was more negative as the percentage of students with learning disabilities in the category increased. For example, special education teachers in Category 2 had, on average, a 0.68 (p=.006) change in the odds of attrition compared to special education teachers without any students with disabilities in their classes, after controlling for teacher, classroom, and school characteristics but teachers in Category 5 had, on average a 0.31 (p<.001) change in the odds of attrition (Table 33). None of the categories of the average percentage of students with learning disabilities in dual certified or test dual certified teachers' classes had a statistically significant association with the odds of attrition (Figure 20).

The interaction model converged when I examined leaving as the dependent variable. This model included interactions between the certification types and each category of the average percentage of students with learning disabilities in a class as well as teacher, classroom, and school variables. Only the interaction between dual certification and Category 4 and the interaction between test dual certification and Category 4 were statistically significant (Table 34). The association between Category 4 learning disabilities and leaving was 0.52 times the odds lower (p=.003) for dual certified teachers and 0.51 times the odds lower (p=.05) for dual test certified teachers than for teachers without any special education certification. The main effects of Category 1 and Category 4 were statistically significant. General education teachers in Category 1 had 0.93 (p=.009) times the odds of leaving than a general education teachers without any SWDs in their classes, on average after accounting for teacher, classroom, and school characteristics. On average, general education teachers in Category 4 had 1.48 (p=.02) the odds of attrition compared to a general education teacher without any SWDs. Figure 21 shows the conditional average odds of leaving for each category of the average percentage of students with learning disabilities and leaving for each type of teacher. Note that Figure 21 is scaled differently

than Figure 20 to accommodate the very large, but statistically insignificant, coefficient on Category 5. This unusually large coefficient is likely due to problems with estimating a coefficient on the small number of teachers in Category 5 for learning disabilities (*n*=2).

Speech/language impairments. The results presented here for the association between the category of the average percentage of students with speech/language impairments and total attrition were from models run on separate samples of teachers (special education certified, dual certified, test dual certified, and no special education certification). For special education certified teachers, dual certified teachers, and dual test certified teachers, none of the categories of the average percentage of students with speech/language impairments had a statistically significant association with attrition, after accounting for teacher, classroom, and school characteristics (Table 35). The 100% category was not estimable for dual certified teachers because there was only one teacher in that category. The 100% category, Category 4 and Category 5 were not estimable for test dual certified teachers because of all positive or zero outcomes (Figure 22). The associations between the Category 1, Category 2, Category 3, and Category 5 and the average odds of attrition were statistically significant for general education teachers. For teachers uncertified in special education, the conditional average odds of attrition increased as the average percentage of students with speech/language impairments in teachers' classes increased (Figure 22).

I ran one complete model examining the interactions between teacher certifications and the category of the average percentage of students with speech/language impairments when the dependent variable was leaving. Some coefficients (special education certification and 100%, dual certified and 100%, dual test certified and 100%, dual test certified and Category 4, and dual test certified and Category 5) were not estimable because there was no variation in leaving

within the group. The full results are presented in Table 36 and graphed in Figure 23. None of these results were statistically significant.

Other health impairments. To examine the interaction between certification and the category of the average percentage of students with other health impairments in teachers' classes, I ran the analyses predicting total attrition on subsamples instead of including all interactions in one model. There were no statistically significant associations between the categories of students with other health impairments and total attrition for special education certified teachers, dual certified teachers, or test dual certified teachers (Table 37). Some coefficients were not estimable; these are noted in Table 37. There were statistically significant associations between the category of the average percentage of students with other health impairments and attrition for general education teachers. Figure 24 shows the conditional change in the average odds of attrition for general education teachers in each category. The associations change from small and negative, for categories representing a small percentage of students with other health impairments in general education teachers' classes, to large and statistically significant, for categories associated with a greater percentage of students with other health impairments in teachers' classes.

I ran one model including all of the interactions between certification and the categories of the percentage of students with other health impairments to address leaving as the dependent variable. For general education teachers, Category 5 was associated with a large increase in the odds of attrition compared to teachers without any SWDs in their classes after controlling for teacher, classroom, and school characteristics. This is shown in Figure 25 but is censored due to the very large magnitude. This association was smaller for special education certified teachers. This interaction between Category 5 and special education certification was the only statistically

significant interaction. The coefficients on Category 5 for special education and general education teachers were unusually high; this could be due to small sample sizes (18 special education teachers and one general education teacher).The full results, noting inestimable categories, are provided in Table 38.

Autism. The model predicting total attrition that included all of the interactions between the category of the average percentage of students with autism in teachers' classes and teacher certification converged. For general education teachers, Category 1 was associated with a 0.90 (p<.001) change in the odds of attrition compared to teachers without any SWDs, after accounting for teacher, classroom, and school characteristics. This association moved to above 1 as the average percentage of students with autism increased, shown in Figure 26. Category 5 was associated with an 8.98 (p=.001) change in the odds of attrition for general education teachers. Of note, only 16 general education teachers were in Category 5. These associations were less positive for special education and dual certified teachers certified and for higher categories for dual test certified teachers. However, many of these interactions were not statistically significant (Table 39).

The association between leaving and the category of the average percentage of students with autism in general education teachers' classes was only statistically significant for Category 1. Category 1 was associated with a 0.93 (p=.005) change in the odds of leaving compared to teachers without any SWDs in their classes. None of the coefficients from the interactions were statistically significant when predicting leaving. These results are reported in Table 40 and graphed in Figure 27.

Intellectual disabilities. I ran one model including all of the interactions between certification and the categories of the average percentage of students with intellectual disabilities

in teachers' classes predicting total attrition. Figure 28 shows the average conditional change in the odds of leaving for teachers without special education certification. As the categories associated with a higher percentage of students with intellectual disabilities increases, so do the odds of attrition. However, only the change in the odds associated with Category 2 and 100% were statistically significant (Table 41). The interaction between Category 1 and test dual certified was statistically significant (p=.002). The association between Category 1 and attrition was 2.00 higher the odds for test dual certified teachers than general education teachers in that category. The interactions between Category 4 and special education certification were statistically significant (p=.011) with special education certification attenuating the association between Category 4 and attrition.

The first three categories of the average percentage of students with intellectual disabilities in teachers' classes were associated with a small decrease in the odds of leaving for all types of teachers, but none of these differences were statistically significant. Category 5 was associated with a statistically significant large decrease in the odds of leaving for general education teachers compared to teachers without any SWDs in their classes and after accounting for teacher, classroom, and school characteristics (Table 42). This association decreased to nearly nothing for special education certified teachers, as in Figure 29. Category 5 for general education in this figure is censored due to the magnitude in the change in the odds that was not statistically significant. None of the other interactions were statistically significant.

Behavior disorders. I examined if certification moderated the association between the average percentage of students with behavior disorders and attrition with models fit to separate samples of teachers by certification category. The coefficients associated with each category are graphed in Figure 30. For general education teachers, Category 5 was not estimable. In the

sample of general education teachers Category 2, Category 3, Category 4, and 100% were associated with an increase in the odds of attrition but this association was not statistically significant (Table 43). For dual certified teachers, each category was associated with a higher odds of attrition than dual certified teachers without any SWDs in their classes but this association was only statistically significant for Category 4 and 100%. The direction and size of the associations were similar for test dual certified teachers (Figure 30) and special education certified teachers (Figure 30), but none of these associations were statistically significant.

The model predicting leaving converged when it included all the interactions between categories of students with behavior disorders and certifications, allowing for significant tests of the interactions. These results are graphed in Figure 31 and presented in Table 44. None of the main effects were statistically significant. Only the interaction between special education certification and behavior disorders was statistically significant but the very large coefficient suggests problems such as collinearity or little variation in the outcome for the 50 teachers in this category.

Other Models and Assumption Checks

I completed three additional analyses to help assess the robustness of the results reported above. First, I examined whether the changes in the coefficients for the fixed effects models addressing RQ1 and RQ2 were due to differences in the sample. The fixed effects models did not include schools where all teachers left, moved, or stayed. I reran Model 3 only using the sample that was included in the fixed effects analyses (Model 4). I compared the coefficients on the categories of the average percentage of SWDs in teachers' classes from Model 3 run on the subsample to the coefficients from Model 3 using the full sample. I reran Model 7 predicting total attrition and leaving by specific disability. The coefficients of interest were nearly identical

from the models run on the fixed effects sample and the models run on the full sample. This suggests that the changes observed in the fixed effects models were not due to sample differences.

Second, I plotted the conditional random effects from Model 7, the model including the categories of the average percentage of students with specific disabilities in teachers' classes, teacher, classroom, and school controls. I plotted the residuals to evaluate evidence of outliers. The conditional school level random effects for Model 7 predicting total attrition had a mean of zero and a slight right skew suggesting the presence of outliers. The conditional school level random effects for Model 7 predicting leaving appeared to be normally distributed with a mean of zero. The histograms of these random effects are presented in Figure A1 of Appendix A. The conditional teacher level random effects, aggregated at the school level, for total attrition had a slight right skew suggesting the presence of outliers. The random effects for leaving appeared to be normally distributed (Figure A2 of Appendix A). These plots of random effects support the assumption of the multilevel model that the random effects are homoscedastic and normally distributed. I plotted the conditional school random effects against the teacher random effects, aggregated at the school level, for total attrition in Figure A3 of Appendix A. There appeared to be a positive association between the teacher and school random effects. This suggested that the random effects may not be conditionally independent, other variables that were not included in the model may account for some of the differences in total attrition between teachers and schools.

Third, based on the plots described above, I excluded potential outliers from the analyses and reran Model 7 to determine if outlying schools were influential on the results. I dropped schools with random effects estimates above two based on examining histograms and scatter

plots. The coefficients for the categories of the percentage of students with specific disabilities in teachers' classes from the sample excluding potential outliers were similar in magnitude as the results from the full sample and all of the same coefficients were statistically significant. These results are presented to Table A1 in Appendix A. This suggested that outliers were likely not influencing the results reported above from the full sample.

Chapter IV
Discussion

Prior research on teacher attrition suggests that teachers are more likely to leave teaching or move schools when they face challenging working conditions, both due to characteristics of students (Hanushek et al., 2004) and organizational supports (Johnson et al., 2012). Teacher resources, such as their training or on the job learning, may moderate these associations (Boyd et al., 2008; Redding & Smith, 2016; Sass et al., 2012). One underlying theory of change that might explain these associations is the job demands-resources model. Increased job demands, without additional resources, lead to burnout that may lead to attrition. One potential source of increased job demands is the inclusion of students with disabilities in the classroom. In this study, I addressed three questions associated with this issue. First, is teaching SWDs associated with teacher turnover? Second, does the association vary based on disability categories? Third, does teacher certification moderate the association between SWDs and teacher attrition? In this discussion, I first briefly reviewed the main findings. Next, I discussed what these findings suggest for thinking about teacher attrition and supporting the job demands-resources model as the underlying theory of change. Finally, I presented the limitations of this study and areas for future research.

Summary of Main Findings

In this study, I examined if teaching SWDs was associated with a change in the odds of total attrition or leaving. These students, on average, may have more academic and behavioral needs than their peers without disabilities, resulting in an increase in job demands on teachers, leading to an increased risk of attrition. This association could be moderated by a teacher level resource: training in special education as indicated by special education certification. I fit

multilevel models to data from nearly all teachers in NC over three years to examine these associations.

In the first research question, I examined SWDs as a group, following the approach typically used in education policy. I found that when teachers' average classes included a mix of SWDs and students without disabilities, this composition was associated with decrease in the odds of total attrition and leaving compared to teachers without any SWDs in their classes. These results were robust to the inclusion of teacher, classroom, and school characteristics. The coefficients remained negative and statistically significant after including school fixed effects. Teachers who had classrooms in Category 1, Category 2, Category 3, and Category 5, had a 10-20% decrease in the odds of attrition compared to teachers without any SWDs in their classes.

To examine this finding more specifically, I analyzed the data using specific disability categories as the variable of interest instead of grouping all SWDs together. Teachers with classes of small percentages of students with learning disabilities, speech/language impairments, autism, or intellectual disabilities had, on average, lower odds of total attrition than teachers without any SWDs in their classes after accounting for teacher, classroom, and school characteristics. With the exception of the lowest categories of the average percentage of students with behavior disorders, teaching students with behavior disorders was positively associated with the odds of total attrition, although some of these coefficients were not statistically significant after the addition of school fixed effects. The 100% category for behavior disorders, intellectual disabilities, and other health impairment had a strong, positive association with the odds of total attrition in even the most constrained model, the model with school fixed effects. Very few categories of the percentage of students with specific disabilities had a statistically significant association with leaving. Category 1 for learning disabilities, speech language impairments,

autism, and intellectual disabilities was associated with a small two to four percent decrease in the odds of leaving when compared to teachers without any SWDs.

Finally, I examined interactions between the categories of the average percentage of SWDs or students with specific disabilities and three certification groups: special education certification, dual certification, and test dual certification. In the models examining leaving, the main effects of certification were not statistically significant nor were many of the categories of students with specific disabilities. Similarly, most of the statistically significant and substantively interesting results of the interaction analyses were for total attrition but not leaving. For total attrition, as general education teachers taught classes with higher percentages of SWDs, their odds of attrition increased. This pattern remained when disaggregated by disability category for learning disabilities, other health impairments, autism, and intellectual disabilities, though not all associations were statistically significant. These results lended support to an interaction. Overall, teaching more SWDs, of most labels, was associated with an increase in the odds of attrition for general education teachers but not for teachers with any type of special education certification. However, the interaction was not supported for the percentage of students with behavior disorders in teachers' classes. For all teachers, higher percentage of students with behavior disorders was associated with a substantial increase in the odds of attrition.

Decrease in the Odds of Attrition Associated with Inclusive Classrooms

In RQ1, I investigated the association between the category of the average percentage of SWDs in teachers' classes and the odds of attrition. I hypothesized that there would be a positive association between the average percentage of SWDs in teachers' classes and the odds of attrition. The results showed that an association existed but in the opposite direction from my hypothesis: when teachers taught a mixture of students with and students without disabilities,

considered inclusive classrooms, they had, on average, lower odds of attrition than teachers without any SWDs in their classes.

What could underlie these counterintuitive results? There were four plausible explanations. First, it could be that the students who were included with their peers without disabilities did not exhibit significant learning and behavioral deficits. The results from RQ2 suggested that teaching students with learning disabilities or speech/language impairments was associated with a decrease in the odds of attrition. The correlations (Table 7) showed that students with learning disabilities or speech/language impairments tended to be in inclusive classrooms. The negative association between the average percentage of SWDs and attrition was likely due to the composition of the SWD group: the majority of SWDs in this sample were labeled with learning disabilities or speech/language impairments. Students with these disabilities who were also educated in inclusive classrooms may not increase the job demands on teachers, as reflected by teachers' reports that they are more willing to teach students with less severe disabilities (Scruggs & Mastropieri, 1996). These disabilities may also be associated primarily with academic deficits rather than behavioral deficits. Perhaps teachers feel prepared to address the academic needs of students over the behavioral needs.

Second, these results could be due to the sorting of students to teachers based on unobserved teacher characteristics. If more dedicated teachers were more willing to teach inclusive classrooms, this could explain the observed negative association. Unfortunately, this possibility would be hard to address with existing datasets. Researchers could design studies that measure plausible teacher characteristics associated with attrition and student assignment such as attitudes towards SWDS, self-efficacy, or dedication to teaching. Even if a study attempted to measure these characteristics, the results could still reflect sorting. Only a longitudinal study with

random assignment of students to teachers could parse out sorting as the cause of the negative associations observed here.

Third, teachers whose classrooms included a mix of students with and without disabilities may have access to additional resources not available to teachers who teach classrooms that were entirely students without disabilities or entirely SWDs. Resources could include co-teachers or paraprofessionals. An additional resource, at the student level, could be pullout instruction for SWDs. Pullout instruction for SWDs might ease some of the instructional burden on the teacher of record and result in a smaller class size while the SWDs are removed from the classroom. These resources could mediate the increased job demands that could result from working with SWDs. Prior qualitative research suggests that teachers are more accepting of SWDs when the inclusion of these students is accompanied by additional supports (Giangreco, Dennis, Cloninger, Edelman, & Schattman, 1993; Olson et al., 1997).

Fourth, these teachers of inclusive classrooms may be less isolated than teachers who have self-contained (general education or special education) classrooms. A teacher with at least one SWD may be expected to consult or collaborate with special education teachers and other school-based professionals, such as speech/language pathologists or school psychologists. Participation in IEP meetings would provide an opportunity to interact with other school professionals and get to know the student's family members. Lortie (2002) famously characterized teaching as an isolated practice, taking place in an "egg-crate." This isolation is not positive. Schools where teachers report more collaboration and peer support tend to have lower attrition rates (Ingersoll, 2001; Johnson et al., 2012). Perhaps teaching a mix of students with and without disabilities breaks down the isolation between teachers by promoting collaboration.

The Importance of Schools as a Protective Factor

Many other researchers have noted how the aggregate characteristics of students in a school and other working conditions attenuate or increase the odds of teacher attrition (Borman & Dowling, 2008; Simon & Johnson, 2015). The results from this study suggested that measured and unmeasured characteristics of schools mediated the association between the percentage of SWDs, and especially students with specific disabilities, in teachers' classes and total attrition. For example, Category 2 behavior disorders was associated with a 1.23 average change in the odds of total attrition after accounting for teacher characteristics. This association dropped to 1.16 after the addition of classroom and school characteristics. It further decreased after the addition of school fixed effects and was no longer statistically significant. I reran Model 3 without the school level variables to ensure that the change in the coefficients and model fit was not due to classroom level variables alone. The results suggested that the addition of school level covariates improved model fit above the inclusion of classroom level variables.

The differences between schools in the association between teaching SWDs and attrition have three plausible explanations. First, it could reflect differences in how schools labeled students with disabilities. If schools with higher attrition rates were also more likely to label students as having behavior disorders the results observed could be due to these differences in labeling across schools. Second, the results could suggest differences in how schools grouped SWDs. Some schools might group the most challenging or least challenging students together which would inflate the associations between percentages of students with specific disabilities and attrition. Third, and most likely based on prior research, differences due to schools were likely due to variables unmeasured in these analyses. Working conditions related to colleagues, community support, facilities, teacher leadership, instructional leadership, teacher recognition,

resources, culture, and time attenuate the association between working in high poverty schools and attrition (Johnson et al., 2012; Simon & Johnson, 2015). It may be that working conditions also attenuated the association between teaching students with disabilities and attrition. The importance of these working conditions was further supported by the differences between models examining total attrition and those examining leaving. The largest changes after the addition of school characteristics and school fixed effects occurred when examining total attrition. This finding could suggest that teachers might move from one school to another to access different working conditions.

Students with Behavior Disorders and Intellectual Disabilities

In the analyses considering SWDs as one group and the analyses by disability label, the 100% SWD category was, in most cases, associated with a statistically significant increase in the odds of total attrition in the first model that did not include any control variables. After accounting for special education certification in the subsequent models, this association decreased and, for SWDs as a group and some disability categories, was no longer statistically significant. However, the 100% category for behavior disorders and intellectual disabilities remained a statistically significant predictor of total attrition after the addition of teacher, classroom, and school covariates. The 100% category for other health impairments was also a statistically significant predictor of attrition in the school fixed effects models. The magnitude of these associations was meaningful: a class of all students with behavior disorders was associated with a 2.92 change in the odds of total attrition, a class of all students with intellectual disabilities was associated a 1.63 change in the odds of total attrition, and a class of all students with other health impairments was associated with a 2.05 change in the odds of total attrition. The continued statistical significance and size of the coefficients across models suggested that

teaching entire classrooms of students with these disabilities was consistently related to attrition across settings. It is likely that the students with these disabilities who were grouped into one classroom were the most challenging students within these labels. This issue might be particularly true for students with other health impairments. This disability category includes very heterogeneous students, ranging from students with attention deficit/hyperactivity disorder to diabetes. Additionally, the results of RQ3 showed that certification did not moderate the association between teaching large numbers of students with behavior disorders or intellectual disabilities and total attrition. Working with these students appeared particularly challenging.

Behavior disorders are characterized by weakness in developing interpersonal relationships, inappropriate behaviors or feelings, and depressive symptomologies that impact a student's academic outcomes (IDEA). Most frequently students identified with behavior disorders exhibit externalizing behaviors such as aggression and noncompliance (Lane, Kalberg, Lambert, Crnobory, & Bruhn, 2010). These behaviors are often paired with very low academic achievement (Reid, Gonzalez, Nordness, Trout, & Epstein, 2004). Student behavior seems an important predictor of teacher attrition as evidenced by the positive association between the average percentage of students with behavior disorders and attrition across nearly all categories. At the school level, recent analyses by Kraft, Marinell, and Yee (2016) using data from New York City middle schools found that a one SD increase in teacher ratings of schools' safety and order was associated with a 1–2 percentage point decrease in the probability of total attrition. The results from the current analyses suggested that teacher perceptions of safety within the classroom are likely also associated with attrition, if the externalizing behaviors often exhibited by students with behavior disorders were causing teachers to feel unsafe. This idea is supported by the classroom level analyses by Feng (2009) who identified a 1.08–1.13 change in the odds of

beginning teacher attrition associated with a one unit change in the average discipline incidents per student in a teacher's classes.

The challenges of working with students with behavior disorders are also reflected in earlier qualitative work. Special education and general education teachers report that they are supportive of including most students with disabilities in general education settings, but not those students who exhibit problem behavior (Idol, 2006; Olson et al., 1997; Scruggs & Mastropieri, 1998). This trend could reflect teachers lack of classroom management skills more generally or their lack of skills for specifically intervening on challenging behavior (Westling, 2010). Teaching classes made up of more than 10% students with behavior disorders might also be more challenging as the peers without disabilities tend to exhibit more problem behavior than if there were no students with behavior disorders in the classroom (Gottfried, 2014). The current analyses suggested that students with behavior disorders were impacting teachers in addition to their peers. Luckily few students are identified with behavior disorders, suggesting that many teachers may not have these students in their classes. However, more students have behavior disorders than are actually identified with the label (Forness, Freeman, Paparella, Kauffman, & Walker, 2012), suggesting that teachers may interact with students exhibiting similarly problematic behavior but who have not been formally identified with a disability.

Support for the Job Demands-Resources Model

I relied on an expanded version of the job demands-resources model as the theory of change connecting SWDs and teacher attrition. I hypothesized that teaching more SWDs was associated with increased job demands that would lead to burnout and attrition, but that job demands might be moderated by certification status. Contrary to my hypothesis, when SWDs were grouped together teaching, classrooms that included SWDs and students without disabilities

was associated with a small but statistically significant decrease in the odds of attrition. Unfortunately, I did not measure job demands, burnout, or other resources available to teachers in inclusive classrooms. Teaching a classroom with students with and without disabilities might not increase job demands or these teachers may be provided with more resources to ameliorate the increased demands. Without more measures, the results from the first research question may not support the job demands-resources model.

The results from the analyses by disability category, addressing RQ2, may lend more support to the underlying theory of change. Teaching more students with disabilities associated with challenging behavior and academic deficits was related to total attrition, suggesting an increase in job demands leading to burnout, though these variables were unmeasured. Notably, past research on the job demands-resources model have identified an association between teacher burnout and student behavior (Aloe et al., 2014; McCormick & Barnett, 2011). The large association between teaching students with behavior disorders and teacher attrition provided further support to this association. Many of the associations between the percentage of students with specific disabilities in teachers' classes and attrition were attenuated by school level variables and the school fixed effects suggesting that the resources that vary between schools may temper the job demands related to teaching students in need of the most intensive supports.

The results from the interaction analyses lend some additional support for the job demands-resources model. As the percentage of SWDs increased, the change in the odds of attrition went from a decrease to and an increase for teachers without special education certification. For teachers with special education certification, when SWDs were grouped together, as well as for speech/language impairment and learning disability, the odds of attrition decreased as the teachers had classrooms with higher percentages of these students. This

supports that certification, used as an indicator of training, may moderate the increased job demands due to teaching greater percentages of SWDs. The results from dual certified and test dual certified were not consistent or clear.

Limitations

These results should be interpreted while considering the limitations of the study. These data are from one state and the findings may not generalize to other settings. Four limitations are due to the variables available in the dataset. First, I could not completely test the underlying theory of change because the dataset did not include important components of the model, such as job demands and burnout. I only focused on teacher certification as a resource. It is likely that other teacher and school level resources could also moderate or mediate the association between the percentage of SWDs or students with specific disabilities and attrition. Second, the teacher random effect suggests a large amount of variability in attrition due to unobserved characteristics of teachers. Teachers might be assigned to teach students based on features of the teacher, such as caring or connecting to SWDs and these characteristics could be associated with attrition. Some of these issues could be addressed in the future by using hazard analysis with longitudinal data. Third, the dataset does not include information about the supports provided to teachers within their classrooms. It could be that teaching a mixture of students with or without disabilities could come with a host of resources or increase collaboration between teachers. Unfortunately, I could not test this hypothesis with the current dataset. Fourth, I used certification as an indicator of a teacher's special education training. This was a coarse indicator as training likely varies across certification programs. A teacher who obtained certification from a teacher preparation program that included coursework on classroom management, intensive interventions, and multiple semesters of student teaching may be better prepared for the

challenges of teaching than a teacher who obtained certification from a teacher preparation focused primarily on theory and a short practicum in the classroom.

Limitations also arise due to my parameterization of the average percentage of SWDs and students with specific disabilities in teachers' classes. Turning a continuous variable into a categorical variable results in a loss of statistical power. This categorization resulted in small sample sizes in some categories. This approach was especially problematic for running the interaction models to address RQ3. The results could be sensitive to where I placed the cut-points for these categories. Despite these problems, the parameterization of the predictor of interest helped with the interpretability of the results and was a flexible approach to modeling the non-parametric association between the average percentage of SWDs or students with specific disabilities and the log-odds of total attrition or leaving.

Future Directions

Many of the experiences that students have at school are mediated through their teachers. Prior research on the classroom settings in which SWDs are educated have focused on how placement impacts SWDs and their peers without disabilities (e.g., Carlberg & Kavale, 1980; Cole et al., 2004; Cosier et al., 2013; Gottfried, 2014; Gottfried & Harven, 2015; Gottfried et al., 2016; Manset & Semmel, 1997). Earlier work acknowledged that successful placement options for SWDs relied heavily on the attitudes of teachers toward the inclusion of SWDs in general education settings (e.g., Jenkins & Ornelles, 2009; Scruggs & Mastropieri, 1996). These qualitative studies suggested that teachers were supportive of the inclusion of most SWDs in general education classrooms if these placements came with additional resources. Importantly, these studies did not quantitatively examine the impact that SWD placement had on teachers.

In this study, I examined if teaching SWDs or students with specific disabilities was associated with total attrition or leaving. The results suggested that there was an association, although the direction of the association varied. In some cases, this association was desirable but somewhat counterintuitive: teaching a mix of students with and without disabilities was associated with a decrease in the odds of attrition. In other cases the association was less desirable but intuitive: teaching students with behavior disorders was associated with an increase in the odds of attrition. These results provide suggestions for practice and future research.

Classroom management supports. The largest associations identified in these analyses were the those between teaching an average percentage of students with behavior disorders over 10% and the odds of attrition for teachers with and without special education certification. Providing teachers with more skills in classroom management and individualized behavior interventions could be the key to attenuating this association. Many teachers do not exhibit strong classroom management skills nor is classroom management consistently included in teacher preparation (Greenberg et al., 2014; Reiff et al., 1991).

Fortunately, research has identified effective classroom management and behavior interventions (Simonsen, Fairbanks, Briesch, Myers, & Sugai, 2008). School-wide systems such as School-wide Positive Behavior Interventions and Supports are associated with decreases in problem behavior at the school level (Bradshaw, Mitchell, & Leaf, 2010). In addition and in consort with school-wide systems, teachers can change their instruction to include behavior specific praise (Sutherland, Wehby, & Copeland, 2000), more opportunities to respond (Sutherland & Wehby, 2001), and active supervision (De Pry & Sugai, 2002). However, students with behavior disorders may need more intensive and individualized interventions developed from functional behavior assessments. Training on these systems, strategies, and interventions

should be included in all teacher preparation program and part of on-going, supportive in-service teacher professional development.

Teaching the most challenging students. Even with appropriate training in supporting student behavior, teaching students with some types of disabilities may simply be more challenging or lead to more burnout. Most of the observed statistically significant associations came from models examining total attrition, not leaving. This suggests that many teachers are not leaving teaching due to working with students who have more significant disabilities but they are moving to different schools. The results suggested that the association between teaching students with specific disabilities and total attrition varied, to some extent, both within and between schools. However, some categories, such as 100% students with behavior disorders, were consistently associated with large increases in the odds of attrition. If students with behavior disorders are more exposed to a revolving door of teachers this could have negative consequences for their academic achievement.

Future research should examine what types of interventions help to support teachers who work with the most challenging students and prevent these teachers from moving or leaving. Some schools implementing school-wide systems of behavior support have hired coaches or behavior support staff (Bradshaw, Pas, Goldweber, Rosenberg, & Leaf, 2012). Studies of these staff supports should examine how this attenuates teacher burnout, as a proximal outcome, and attrition, as a more distal outcome.

Another approach might be to create a system that allows teachers of these students to take a break from classroom teaching and take on other roles within a school, similar to a Peer Assistance and Review process (Johnson et al., N. D.). Special education teachers who are identified as providing high quality instruction to SWDs, or who are particularly skilled in

classroom management, could leave the classroom for one school year every three years. They would spend the year coaching beginning teachers or general education and special education teachers who are struggling with classroom management or with providing effective instruction to SWDs. There is some evidence that this approach leads to improved student academic outcomes (Taylor & Tyler, 2012). If the special education teacher is not deemed an appropriate coach, the teacher could leave the classroom for a year and take on more of the administrative duties related to special education, such as managing IEPs and re-evaluations. A special education specific Peer Assistance and Review process might be an innovative way to address the challenges of working with some groups of SWDs.

Who leaves? Training teachers on classroom management and providing supports to teachers working with the most challenging students could result in a decrease in attrition, but it not all attrition is negative. Some teachers might be more likely to leave when teaching students with certain types of disabilities because they dislike working with these students or are ineffective at instructing these students. If schools value teachers who believe in the learning of all students despite their disability status, schools might want teachers who do not share these beliefs to leave teaching. Future studies examining the association between teaching SWDs and attrition should examine the characteristics of the teachers who leave and who move. Some attrition may be healthy and necessary.

Dual certified teachers. The moderator results from RQ3 regarding teachers with dual certification and test dual certification did not follow consistent patterns, in contrast to the results for general education and special education certified teachers. This could be due to small sample sizes, but it may also reflect heterogeneity in *how* teachers obtain dual certification or test dual certification and *who* obtains dual certification or test dual certification. Of note, the main effects

of dual certification and test dual certification suggested that dual certified teachers had similar odds of total attrition as general education teachers but test dual certified teachers had higher odds of total attrition than general education teachers. Test dual certified teachers had lower odds of leaving than general education teachers, suggesting that the higher total attrition rates for this group of teachers is due to moving schools. Perhaps teachers who make the effort to take additional licensure exams may be doing so to gain credentials to help them take jobs in better schools. Very little research has focused on these groups of teachers despite some states, such as Pennsylvania, moving to a certification system that requires dual certification for all teachers of SWDs. More research is warranted to examine how dual certified teachers are prepared and if they are more effective teachers for students with and without disabilities than teachers without training in general and special education.

Understanding the underlying processes to design interventions. The results of these analyses direct the way for future studies to identify variables influencing the observed results that can be used to design interventions to support teachers. I did not assess teacher job demands or burnout, though these variables played an important role in the theory of change. Future work could assess the robustness of this theory of change using the Schools and Staffing Survey (NCES, 2014) and Teacher Follow-up Survey. The SASS includes questions could be used as proxies for burnout (for example, the extent to which teachers agree or disagree that they are generally satisfied with being a teacher at their school [Q63q]; the extent to which teachers agree or disagree that they think about staying home from school because they are too tired to go [Q65g]), job demands (for example, if the teacher has been threatened to be injured by a student in their current school within the past 12 months [Q27b]), and the characteristics of the students a teacher instructs, including disability status. The Teacher Follow-Up Survey provides

longitudinal data linking these survey results to information about teacher attrition. The SASS also includes questions regarding resources available to teachers at their schools (for example, the extent to which teachers agree or disagree that they are given the support they need to teach students with special needs [Q63o]). These data could be used to test the full theory of change while replicating the results of the current analyses on a nationally representative sample and identifying specific school resources that mediate the increase in job demands likely due to teaching students with some types of disabilities.

The most surprising results of the current study suggested that teaching a mix of students with and without disabilities was associated with a decrease in the odds of teacher attrition. Understanding this result will likely require primary data collection to investigate if this association is replicated in other settings and if it is due to (1) the types of teachers or students assigned to these classrooms, (2) the supports provided to these teachers, or (3) increased collaboration or involvement when teachers mix different types of students. These questions could be examined with quantitative and qualitative data and could be a novel use of social network analysis to examine if the networks teachers develop change over time in response to teaching SWDs. Variations between and within schools in the number of connections between teachers and the strength of ties with special education teachers could be used to design interventions that strengthen social networks. The counterintuitive results from the current study warrant more investigation.

Conclusion

The expanded inclusion of SWDs in general education settings sparked a body of, primarily, qualitative and survey research in the early 1990s examining how general education and special education teachers felt about teaching SWDs in general education settings (Scruggs

& Mastropieri, 1996). This line of research declined with the shift in focus to student outcomes, with more studies focusing on the impact of educational settings on student outcomes. More recently, researchers have focused on how SWDs in general education classrooms impact the academic and emotional outcomes of their peers without disabilities. These studies have failed to recognize that outcomes for SWDs, and their peers without disabilities, are related to their teachers. This study examined how teachers respond to teaching SWDs and students without disabilities by examining the association between the average percentage of these students in teachers' classes and the change in the odds of attrition.

The results suggested that teacher mobility was responsive to the percentage of SWDs or students with specific disabilities that they instruct. However, the direction of these associations was, in some cases, surprising. Teachers with average classes of a mixture of SWDs and students without disabilities had, on average, lower odds of attrition than teachers without any SWDs in their classes. Unsurprising was the increase in odds of attrition associated with teaching more students with behavior disorders. Future research must consider the importance of teachers as mediating the experiences of SWDs in their educational placements.

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Table 1

Number of certified classroom teachers observed each year and the percentage of teachers that stayed, left, or moved each year.

Year	N	% Stayers	% Leavers	% Movers	% Total Attrition
2009/10	81,078	86.82	7.09	6.09	13.18
2010/11	83,440	84.80	7.90	7.30	15.20
2012/13	82,233	82.03	9.01	8.96	17.97

Note. N indicates the number of teachers.

Table 2
Teacher demographics (n=127,581).

Variable	Percent or Mean (SD)
Years of experience	11.14 (9.73)
Teacher test score	0.17 (0.69)
Male	20.31
White	82.27
Black	13.26
Hispanic	1.59
Asian	0.71
Native American	0.95
Other minority	1.22
Special education only certification	6.04
Dual certification	4.51
Test dual certification	0.76
English certification	14.76
Science certification	9.46
Social studies certification	12.71
Math certification	10.64
Other certification	33.30
Out of state prepared	29.69
Teach for America	0.84
Other alternative entry	14.34
Visiting teacher	0.87
Unclassified entry to teaching	5.43

Note. SD= Standard deviation

Table 3

Classroom characteristics averaged by year per teacher (n=246,751).

Variable	Mean %	SD	Range
Students with disabilities	17.93	25.13	0 – 100
SLI	2.85	6.31	0 – 100
LD	6.55	10.88	0 – 100
OHI	3.28	7.08	0 – 100
Autism	1.59	7.91	0 – 100
ID	2.81	10.18	0 – 100
BD	0.78	4.21	0 – 100
Other disability	1.84	7.66	0 – 100
Students without disabilities	79.14	25.67	0 – 100
White	51.50	28.49	0 – 100
Black	26.71	24.06	0 – 100
Hispanic	13.03	14.86	0 – 100
Asian	2.38	5.57	0 – 100
Other race	5.21	8.71	0 – 100
Male	51.82	15.12	0 – 100
Economically disadvantaged	54.60	24.97	0 – 100
English language learner	7.88	13.78	0 – 100
Gifted	10.70	15.33	0 – 100
Class size*	17.39	7.15	1 – 439
Absences per pupil**	8.18	3.79	0 – 132

Note. Teachers may have multiple years of classroom data and all years are included in the descriptive statistics. *Class size reflects mean class size not a percentage. The large classes are primarily due to marching band and other electives. **Absences per pupil reflects the mean absences per pupil not a percentage. SLI=Speech/language impairment. LD= learning disability, OHI= other health impairment, ID= intellectual disability, BD= behavior disorder, SD= standard deviation

Table 4
School characteristics (n=2,310)

Variable	Percentage/Mean Percentage	SD	Range
Elementary school	56.06		
Middle school	18.79		
High school	21.43		
Elementary and middle	4.98		
Other grade configuration	0.43		
Suburb	13.59		
Rural	55.71		
City	26.80		
Town	14.33		
Met growth goals	44.98		
Exceeded growth goals	44.37		
Did not meet growth goals	21.43		
Title 1	53.85		
White	52.71	27.19	0.24 – 100
Asian	2.18	3.74	0 – 67.80
Black	26.93	23.34	0 – 97.50
Hispanic	12.82	11.11	0 – 74.42
Other	5.37	7.22	0 – 95.73
Economically disadvantaged	59.22	23.83	0 – 100
Total per pupil expenditure	89.95	34.54	13.86 – 1443.40
Acts of violence per 1000	6.14	7.71	0 – 93.35

Note. Some school locations, grade level, and growth designations changed over time. For these schools are coded between 0-1 depending on the proportion of years with the specific designation. These percentages are rounding school coded as .5 to 1. This is also why the percentages do not add to 100. SD=standard deviation

Table 5
Sample sizes for each SWD category.

Disability	ALL (100%)	CAT5 (80-99%)	CAT4 (40-79.99%)	CAT3 (20-39.99%)	CAT2 (10-19.99%)	CAT1 (.01-9.99%)	NONE (0%)
SWD	12,707	6,026	5,686	27,899	68,989	100,231	25,213
LD	179	347	6,019	8,868	28,505	129,264	73,569
SLI	211	91	708	2,738	14,205	99,278	129,520
OHI	86	28	1,910	5,793	10,786	119,439	108,709
AU	635	391	1,048	1,831	3,757	59,153	179,936
ID	263	594	4,133	4,658	6,581	57,716	172,806
BD	71	64	539	839	2,127	53,508	189,603

Note. Sample includes 246,751 observations. SWD=Students with disabilities; LD= learning disabilities; SLI= speech/language impairments; OHI= other health impairments; AU= autism; ID= intellectual disabilities;BD= behavior disorders; CAT= category.

Table 6

Correlations between teacher characteristics.

	Test score	First year	Second year	Third year	Thirty+	Out of State	TFA	Alt. Entry	Unclass.	Visiting
Test score	1.00									
First year	0.07	1.00								
Second year	0.06	-0.11	1.00							
Third year	0.05	-0.09	-0.07	1.00						
Thirty+	-0.09	-0.09	-0.07	-0.06	1.00					
Out of State	0.08	-0.05	-0.04	-0.01	0.00	1.00				
TFA	0.04	0.12	0.08	0.01	-0.02	-0.06	1.00			
Alt. Entry	-0.03	-0.01	0.02	0.04	-0.09	-0.27	-0.04	1.00		
Unclass.	-0.04	-0.04	-0.03	-0.02	0.08	-0.16	-0.02	-0.10	1.00	
Visiting	0.00	0.01	0.04	0.04	-0.02	-0.06	-0.01	-0.04	-0.02	1.00
Male	0.03	0.02	0.00	0.00	0.03	0.00	0.00	0.08	0.06	0.01
Black	-0.33	-0.01	-0.01	0.00	0.04	-0.10	0.00	0.18	0.05	-0.02
Asian	-0.02	0.03	0.01	0.01	-0.01	0.02	0.02	0.00	0.00	0.09
Hispanic	-0.03	0.01	0.02	0.01	-0.02	0.02	0.01	0.02	0.00	0.26
Native	-0.08	0.00	0.00	0.00	0.00	-0.04	-0.01	0.04	0.02	-0.01
Other Min.	-0.01	0.03	0.03	0.03	-0.02	-0.01	0.02	0.01	-0.01	0.09
Test Dual	0.00	-0.02	-0.01	0.00	-0.01	-0.03	0.02	0.12	-0.01	-0.01
Dual	0.02	-0.01	-0.01	-0.01	0.02	0.12	-0.02	-0.08	-0.02	-0.02
SPED	-0.04	-0.03	-0.01	-0.01	-0.01	-0.04	-0.01	0.13	-0.02	-0.01
Eng.	0.03	-0.02	-0.02	-0.02	0.07	0.05	0.01	-0.01	-0.04	-0.02
Sci.	0.03	0.01	0.00	0.00	0.00	0.01	0.03	0.07	-0.03	-0.01
Math	0.04	0.03	0.01	0.00	0.00	0.00	0.03	0.03	-0.04	0.00
SS	0.03	-0.01	-0.01	-0.01	0.04	0.04	0.00	-0.02	-0.03	-0.03
Other	-0.04	-0.09	-0.07	-0.04	0.11	-0.04	-0.05	0.00	0.09	0.03

Note. TFA=Teach for America, Alt. = alternative, Unclass.= entry into teaching was unclassified, Min.= minority, Test Dual= test dual certification, Dual = certification in content area and special education, SPED= certified in special education, Eng.= certified in English, Sci.= certified in science, Math= certified in math, SS= certified in special education, Other= certified in another area

Table 6 (continued)

Correlations between teacher characteristics.

	Male	Black	Asian	Hisp.	Native	Other Min.	Test Dual	Dual	SPED	Eng.	Sci.	Math	SS	Oth.
Test score														
First year														
Second year														
Third year														
Thirty+														
Out of State														
TFA														
Alt. Entry														
Unclass.														
Visiting														
Male	1.00													
Black	-0.01	1.00												
Asian	0.00	-0.03	1.00											
Hispanic	0.00	-0.05	-0.01	1.00										
Native	0.00	-0.04	-0.01	-0.01	1.00									
Other Min.	0.00	-0.04	-0.01	-0.01	-0.01	1.00								
Test Dual	0.00	0.01	0.00	-0.01	0.00	0.00	1.00							
Dual	-0.06	-0.03	0.00	-0.01	-0.01	-0.01	-0.02	1.00						
SPED	-0.04	0.07	0.00	-0.02	0.00	0.00	-0.02	-0.06	1.00					
Eng.	-0.06	-0.01	-0.01	-0.02	-0.01	-0.01	0.04	0.04	-0.11	1.00				
Sci.	0.08	-0.03	0.02	-0.02	0.01	0.00	0.00	-0.03	-0.08	0.01	1.00			
Math	0.06	-0.01	0.03	-0.02	0.00	0.00	0.03	0.00	-0.09	0.01	0.18	1.00		
SS	0.15	-0.03	-0.01	-0.03	-0.01	-0.01	0.03	0.02	-0.10	0.25	0.06	0.02	1.00	
Other	0.13	-0.02	-0.01	0.07	-0.01	-0.02	-0.02	-0.06	-0.12	-0.06	-0.10	-0.11	-0.10	1.00

Note. TFA=Teach for America, Alt. = alternative, Unclass.= entry into teaching was unclassified, Min.= minority, Test Dual= test dual certification, Dual = certification in content area and special education, SPED= certified in special education, Eng.= certified in English, Sci.= certified in science, Math= certified in math, SS= certified in special education, Other= certified in another area

Table 7

Pairwise correlations between classroom characteristics (averaged at the teacher level by year).

	ALL SWD	CAT1 SWD	CAT2 SWD	CAT3 SWD	CAT4 SWD	CAT5 SWD	ALL AU	CAT1 AU	CAT2 AU	CAT3 AU	CAT4 AU	CAT5 AU
ALL SWD	1.00											
CAT1 SWD	-0.19	1.00										
CAT2 SWD	-0.15	-0.52	1.00									
CAT3 SWD	-0.08	-0.30	-0.22	1.00								
CAT4 SWD	-0.04	-0.13	-0.10	-0.05	1.00							
CAT5 SWD	-0.04	-0.13	-0.10	-0.06	-0.02	1.00						
ALL AU	0.21	-0.04	-0.03	-0.02	-0.01	0.00	1.00					
CAT1 AU	-0.03	-0.07	0.15	0.07	0.02	0.03	-0.03	1.00				
CAT2 AU	0.21	-0.10	-0.06	0.02	0.06	0.16	-0.01	-0.07	1.00			
CAT3 AU	0.22	-0.07	-0.05	-0.02	0.05	0.11	0.00	-0.05	-0.01	1.00		
CAT4 AU	0.19	-0.05	-0.04	-0.02	0.05	0.06	0.00	-0.04	-0.01	-0.01	1.00	
CAT5 AU	0.12	-0.03	-0.02	-0.01	-0.01	0.06	0.00	-0.02	0.00	0.00	0.00	1.00
ALL OTH	0.17	-0.03	-0.02	-0.01	0.00	0.00	0.00	-0.02	0.00	0.00	0.00	0.00
CAT1 OTH	-0.05	-0.03	0.13	0.05	0.00	0.01	-0.03	0.19	0.00	-0.02	-0.02	-0.01
CAT2 OTH	0.15	-0.11	-0.01	0.05	0.03	0.10	-0.01	-0.03	0.08	0.07	0.06	0.08
CAT3 OTH	0.19	-0.08	-0.06	0.02	0.08	0.11	-0.01	-0.02	0.10	0.11	0.13	0.00
CAT4 OTH	0.18	-0.07	-0.05	-0.03	0.12	0.10	0.00	-0.02	0.09	0.12	0.04	0.00
CAT5 OTH	0.08	-0.03	-0.02	-0.01	0.00	0.07	0.00	-0.01	0.05	0.00	0.00	0.00
ALL OH	0.08	-0.02	-0.01	-0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00
CAT1 OH	-0.17	0.06	0.23	0.06	-0.05	-0.09	-0.05	0.27	-0.05	-0.05	-0.05	-0.03
CAT2 OH	0.16	-0.17	-0.05	0.17	0.11	0.15	-0.01	0.03	0.10	0.06	0.03	0.01
CAT3 OH	0.30	-0.13	-0.10	0.00	0.09	0.27	-0.01	0.03	0.13	0.08	0.02	-0.01
CAT4 OH	0.23	-0.07	-0.05	-0.03	0.05	0.14	0.00	0.00	0.06	0.02	0.00	0.00
CAT5 OH	0.04	-0.01	-0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00

Note. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. SWD= students with disabilities; AU= autism; OTH= other disabilities; OH=other health impairments

Table 7 (continued)

Pairwise correlations between classroom characteristics (averaged at the teacher level by year).

	ALL SWD	CAT1 SWD	CAT2 SWD	CAT3 SWD	CAT4 SWD	CAT5 SWD	ALL AU	CAT1 AU	CAT2 AU	CAT3 AU	CAT4 AU	CAT5 AU
ALL SLI	0.09	-0.02	-0.02	-0.01	0.02	0.01	0.00	-0.02	0.00	0.00	0.00	0.00
CAT1 SLI	-0.18	0.07	0.15	0.00	-0.05	-0.11	-0.04	0.11	-0.07	-0.06	-0.05	-0.03
CAT2 SLI	-0.05	-0.11	0.14	0.09	-0.01	-0.03	-0.01	-0.08	-0.02	-0.02	-0.01	-0.01
CAT3 SLI	-0.01	-0.07	-0.01	0.14	0.04	0.01	-0.01	-0.04	0.00	0.01	0.00	0.00
CAT4 SLI	0.01	-0.04	-0.03	-0.01	0.16	0.09	0.00	0.00	0.01	0.01	0.00	0.00
CAT5 SLI	0.01	-0.02	-0.01	-0.01	0.02	0.08	0.00	-0.01	0.00	0.00	0.00	0.00
ALL ID	0.13	-0.03	-0.02	-0.01	0.00	0.00	0.00	-0.02	0.00	0.00	0.00	0.00
CAT1 ID	-0.08	-0.08	0.20	0.09	-0.01	-0.02	-0.03	0.24	-0.02	-0.03	-0.03	-0.01
CAT2 ID	0.11	-0.14	-0.05	0.16	0.10	0.11	-0.01	0.02	0.08	0.05	0.05	0.03
CAT3 ID	0.21	-0.11	-0.09	0.04	0.16	0.17	-0.01	0.01	0.10	0.12	0.09	-0.01
CAT4 ID	0.36	-0.11	-0.08	-0.05	0.04	0.20	-0.01	0.00	0.16	0.17	0.03	-0.01
CAT5 ID	0.17	-0.04	-0.03	-0.02	0.00	0.05	0.00	0.00	0.04	0.00	0.00	0.00
ALL LD	0.11	-0.02	-0.02	-0.01	0.00	0.00	0.00	-0.02	0.00	0.00	0.00	0.00
CAT1 LD	-0.22	0.31	0.14	-0.12	-0.10	-0.14	-0.05	0.18	-0.07	-0.07	-0.06	-0.04
CAT2 LD	-0.02	-0.28	0.17	0.31	0.03	0.00	-0.02	0.05	0.01	0.00	-0.01	-0.01
CAT3 LD	0.16	-0.16	-0.11	0.18	0.17	0.18	-0.01	0.03	0.09	0.06	0.01	-0.01
CAT4 LD	0.34	-0.13	-0.10	-0.06	0.10	0.33	-0.01	0.03	0.11	0.03	0.00	-0.01
CAT5 LD	0.12	-0.03	-0.02	-0.01	0.00	0.05	0.00	0.00	0.01	0.00	0.00	0.00
ALL BD	0.07	-0.01	-0.01	-0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00
CAT1 BD	-0.05	-0.07	0.14	0.09	0.01	0.02	-0.03	0.24	0.00	-0.02	-0.03	-0.02
CAT2 BD	0.13	-0.08	-0.04	0.03	0.05	0.13	0.00	0.01	0.07	0.03	0.01	0.00
CAT3 BD	0.12	-0.05	-0.04	0.00	0.04	0.08	0.00	0.00	0.04	0.04	0.01	0.00
CAT4 BD	0.12	-0.04	-0.03	-0.02	0.04	0.06	0.00	-0.02	0.02	0.01	0.00	0.00
CAT5 BD	0.05	-0.01	-0.01	-0.01	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00

Note. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. SWD= students with disabilities; AU= autism; SLI= speech/language impairments; ID= intellectual disabilities; LD= learning disabilities; BD= behavior disorders

Table 7 (continued)

Pairwise correlations between classroom characteristics (averaged at the teacher level by year.

	ALL SWD	CAT1 SWD	CAT2 SWD	CAT3 SWD	CAT4 SWD	CAT5 SWD	ALL AU	CAT1 AU	CAT2 AU	CAT3 AU	CAT4 AU	CAT5 AU
% Black	0.09	-0.06	0.00	0.03	0.03	0.07	0.02	-0.02	0.02	0.01	0.01	0.01
% Hispanic	-0.05	-0.01	0.01	-0.01	-0.01	-0.03	-0.02	-0.06	-0.02	-0.02	-0.02	-0.01
% Oth. min.	0.00	-0.02	0.02	0.01	0.00	0.00	0.00	-0.02	-0.01	-0.01	0.00	0.00
Class size	-0.37	0.19	0.16	-0.03	-0.15	-0.22	-0.09	0.06	-0.14	-0.13	-0.11	-0.07
% Male	0.27	-0.16	0.00	0.05	0.08	0.16	0.11	0.05	0.10	0.09	0.11	0.08
% Gifted	-0.16	0.15	-0.05	-0.08	-0.07	-0.10	-0.03	0.07	-0.06	-0.05	-0.04	-0.03
% Econ. Dis.	0.11	-0.15	0.06	0.08	0.05	0.08	-0.01	-0.08	0.03	0.02	0.00	-0.01
% ELL	-0.03	-0.03	0.01	-0.01	-0.01	-0.01	-0.02	-0.07	-0.01	-0.01	-0.01	-0.01
Absences	0.19	-0.10	-0.02	0.07	0.07	0.12	0.01	0.03	0.06	0.05	0.04	0.02

Note. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. SWD= students with disabilities; AU= autism. Oth. Min= other minority; Econ. Dis.=economically disadvantaged; ELL= English language learner

Table 7 (continued)

Pairwise correlations between classroom characteristics (averaged at the teacher level by year).

	ALL OTH	CAT1 OTH	CAT2 OTH	CAT3 OTH	CAT4 OTH	CAT5 OTH	ALL OH	CAT1 OH	CAT2 OH	CAT3 OH	CAT4 OH	CAT5 OH
ALL OTH	1.00											
CAT1 OTH	-0.02	1.00										
CAT2 OTH	-0.01	-0.08	1.00									
CAT3 OTH	0.00	-0.06	-0.01	1.00								
CAT4 OTH	0.00	-0.05	-0.01	-0.01	1.00							
CAT5 OTH	0.00	-0.02	0.00	0.00	0.00	1.00						
ALL OH	0.00	-0.01	0.00	0.00	0.00	0.00	1.00					
CAT1 OH	-0.04	0.14	-0.09	-0.06	-0.06	-0.03	-0.02	1.00				
CAT2 OH	-0.01	0.00	0.05	0.05	0.02	0.00	0.00	-0.21	1.00			
CAT3 OH	-0.01	0.00	0.06	0.06	0.01	0.00	0.00	-0.15	-0.03	1.00		
CAT4 OH	0.00	-0.01	0.02	0.02	0.00	0.00	0.00	-0.09	-0.02	-0.01	1.00	
CAT5 OH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	1.00
ALL SLI	0.00	-0.02	0.00	0.00	0.00	0.00	0.00	-0.03	-0.01	0.00	0.00	0.00
CAT1 SLI	-0.03	0.13	-0.06	-0.05	-0.05	-0.02	-0.02	0.13	-0.07	-0.09	-0.06	-0.01
CAT2 SLI	-0.01	-0.01	0.03	0.00	-0.01	0.00	0.00	-0.14	-0.03	-0.03	-0.02	0.00
CAT3 SLI	0.00	-0.02	0.03	0.02	0.02	0.00	0.00	-0.07	-0.01	-0.01	-0.01	0.00
CAT4 SLI	0.00	0.00	0.04	0.05	0.02	0.00	0.00	-0.02	0.00	-0.01	0.00	0.00
CAT5 SLI	0.00	0.00	0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00
ALL ID	0.00	-0.02	0.00	0.00	0.00	0.00	0.00	-0.03	-0.01	-0.01	0.00	0.00
CAT1 ID	-0.02	0.19	-0.04	-0.03	-0.04	-0.01	-0.01	0.30	0.01	0.00	-0.01	0.00
CAT2 ID	-0.01	0.01	0.04	0.04	0.05	0.03	0.00	0.00	0.10	0.10	0.05	0.00
CAT3 ID	-0.01	0.00	0.06	0.08	0.09	0.00	0.00	-0.04	0.10	0.14	0.05	0.00
CAT4 ID	-0.01	-0.01	0.12	0.14	0.05	0.00	0.00	-0.06	0.13	0.09	0.01	0.00
CAT5 ID	0.00	0.00	0.06	0.00	0.00	0.00	0.00	-0.02	0.01	-0.01	0.00	0.00

Note. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. SLI= speech/language impairments; ID= intellectual disabilities.

Table 7 (continued)

Pairwise correlations between classroom characteristics (averaged at the teacher level by year).

	ALL OTH	CAT1 OTH	CAT2 OTH	CAT3 OTH	CAT4 OTH	CAT5 OTH	ALL OH	CAT1 OH	CAT2 OH	CAT3 OH	CAT4 OH	CAT5 OH
ALL LD	0.00	-0.02	0.00	0.00	0.00	0.00	0.00	-0.03	-0.01	0.00	0.00	0.00
CAT1 LD	-0.04	0.09	-0.11	-0.09	-0.08	-0.03	-0.02	0.38	-0.07	-0.12	-0.08	-0.01
CAT2 LD	-0.01	0.00	-0.02	-0.01	-0.01	-0.01	-0.01	0.11	0.07	0.00	0.01	0.01
CAT3 LD	-0.01	-0.01	0.04	0.06	0.02	-0.01	0.00	-0.04	0.11	0.17	0.16	0.00
CAT4 LD	-0.01	0.00	0.07	0.05	0.00	0.00	0.00	-0.10	0.17	0.36	0.12	0.00
CAT5 LD	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.05	-0.01	0.00	0.00
ALL BD	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	-0.02	0.00	0.00	0.00	0.00
CAT1 BD	-0.02	0.15	-0.04	-0.03	-0.04	-0.02	-0.01	0.30	0.04	0.02	0.00	0.00
CAT2 BD	0.00	0.00	0.03	0.02	0.00	0.00	0.00	-0.03	0.08	0.13	0.06	0.01
CAT3 BD	0.00	-0.01	0.02	0.01	0.01	0.00	0.00	-0.03	0.04	0.10	0.09	0.00
CAT4 BD	0.00	-0.02	0.01	0.02	0.00	0.00	0.00	-0.03	0.04	0.08	0.05	0.00
CAT5 BD	0.00	0.00	0.01	0.00	0.00	0.00	0.00	-0.01	0.02	0.00	0.00	0.00
% Black	0.01	0.02	0.02	0.01	0.02	0.01	0.00	0.01	0.03	0.04	0.01	0.00
% Hispanic	0.00	0.01	0.00	-0.01	0.00	0.00	-0.01	-0.10	-0.04	-0.03	-0.03	0.00
% Oth. min.	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	-0.01	-0.01	0.00
Class size	-0.08	0.06	-0.10	-0.13	-0.12	-0.04	-0.04	0.19	-0.15	-0.21	-0.14	-0.02
% Male	0.02	0.01	0.07	0.08	0.07	0.02	0.02	-0.02	0.11	0.15	0.10	0.02
% Gifted	-0.03	-0.07	-0.09	-0.07	-0.06	-0.02	-0.01	0.15	-0.06	-0.09	-0.05	-0.01
% Econ. Dis.	0.01	0.03	0.06	0.04	0.03	0.00	-0.01	-0.10	0.05	0.06	0.03	0.01
% ELL	-0.01	0.01	0.01	-0.01	-0.01	-0.01	-0.01	-0.14	-0.03	-0.01	-0.02	-0.01
Absences	0.05	0.03	0.04	0.06	0.08	0.04	0.02	0.05	0.10	0.11	0.07	0.02

Note. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. LD= learning disabilities; BD= behavior disorders. Oth. Min= other minority; Econ. Dis.=economically disadvantaged; ELL= English language learner

Table 7 (continued)

Pairwise correlations between classroom characteristics (averaged at the teacher level by year).

	ALL SLI	CAT1 SLI	CAT2 SLI	CAT3 SLI	CAT4 SLI	CAT5 SLI	ALL ID	CAT1 ID	CAT2 ID	CAT3 ID	CAT4 ID	CAT5 ID
ALL SLI	1.00											
CAT1 SLI	-0.02	1.00										
CAT2 SLI	-0.01	-0.20	1.00									
CAT3 SLI	0.00	-0.09	-0.03	1.00								
CAT4 SLI	0.00	-0.04	-0.01	-0.01	1.00							
CAT5 SLI	0.00	-0.02	0.00	0.00	0.00	1.00						
ALL ID	0.00	-0.03	-0.01	0.00	0.00	0.00	1.00					
CAT1 ID	-0.02	0.15	-0.07	-0.04	-0.01	-0.01	-0.02	1.00				
CAT2 ID	0.00	-0.07	-0.03	-0.01	0.00	0.00	-0.01	-0.09	1.00			
CAT3 ID	0.00	-0.08	-0.03	-0.01	0.00	0.00	0.00	-0.08	-0.02	1.00		
CAT4 ID	0.00	-0.10	-0.03	-0.01	-0.01	0.00	0.00	-0.07	-0.02	-0.02	1.00	
CAT5 ID	0.00	-0.04	-0.01	-0.01	0.00	0.00	0.00	-0.03	-0.01	-0.01	-0.01	1.00
ALL LD	0.00	-0.02	-0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00
CAT1 LD	-0.03	0.11	-0.10	-0.06	-0.03	-0.01	-0.03	0.21	-0.03	-0.07	-0.10	-0.04
CAT2 LD	-0.01	0.01	-0.02	-0.02	0.00	0.00	-0.01	0.07	0.04	0.01	0.03	-0.01
CAT3 LD	-0.01	-0.06	-0.03	0.00	0.01	0.00	-0.01	0.00	0.09	0.13	0.12	-0.01
CAT4 LD	0.00	-0.10	-0.03	-0.01	-0.01	0.00	-0.01	0.01	0.12	0.11	0.01	-0.01
CAT5 LD	0.00	-0.03	-0.01	0.00	0.00	0.00	0.00	0.00	0.01	-0.01	0.00	0.00
ALL BD	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00
CAT1 BD	-0.02	0.07	-0.10	-0.05	-0.02	-0.01	-0.02	0.27	0.04	0.02	-0.01	-0.02
CAT2 BD	0.00	-0.05	-0.02	-0.01	0.00	0.00	0.00	0.00	0.07	0.08	0.07	0.00
CAT3 BD	0.00	-0.04	-0.01	0.00	0.00	0.00	0.00	-0.01	0.03	0.06	0.03	0.00
CAT4 BD	0.00	-0.04	-0.01	0.00	0.00	0.00	0.00	-0.02	0.02	0.02	0.00	0.00
CAT5 BD	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. SLI= speech/language impairments; ID= intellectual disabilities; LD= learning disabilities; BD= behavior disorders.

Table 7 (continued)

Pairwise correlations between classroom characteristics (averaged at the teacher level by year).

	ALL SLI	CAT1 SLI	CAT2 SLI	CAT3 SLI	CAT4 SLI	CAT5 SLI	ALL ID	CAT1 ID	CAT2 ID	CAT3 ID	CAT4 ID	CAT5 ID
% Black	-0.02	-0.02	-0.05	-0.03	-0.01	-0.01	0.03	0.11	0.06	0.07	0.08	0.05
% Hispanic	-0.01	0.04	0.02	0.00	-0.01	0.00	0.00	-0.03	-0.03	-0.04	-0.04	-0.01
% Oth. min.	-0.01	0.03	0.04	0.04	0.00	0.00	0.00	0.04	0.00	0.01	0.02	0.00
Class size	-0.06	0.26	0.05	-0.01	-0.05	-0.01	-0.06	0.06	-0.15	-0.19	-0.21	-0.08
% Male	0.03	-0.04	0.00	0.01	0.03	0.02	0.02	0.02	0.08	0.09	0.10	0.03
% Gifted	-0.02	-0.01	-0.10	-0.06	-0.03	-0.01	-0.02	-0.03	-0.06	-0.08	-0.09	-0.03
% Econ. Dis.	-0.04	0.05	0.06	0.03	-0.01	-0.01	0.03	0.12	0.06	0.08	0.10	0.05
% ELL	-0.01	0.03	0.05	0.01	-0.01	0.00	0.00	-0.04	-0.02	-0.02	-0.02	-0.01
Absences	-0.05	-0.14	-0.06	-0.02	-0.03	-0.02	0.03	0.07	0.11	0.13	0.15	0.04

Note. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. SLI= speech/language impairments; ID= intellectual disabilities. Oth. Min= other minority; Econ. Dis.=economically disadvantaged; ELL= English language learner

Table 7 (continued)

Pairwise correlations between classroom characteristics (averaged at the teacher level by year).

	ALL LD	CAT1 LD	CAT2 LD	CAT3 LD	CAT4 LD	CAT5 LD	ALL BD	CAT1 BD	CAT2 BD	CAT3 BD	CAT4 BD	CAT5 BD
ALL LD	1.00											
CAT1 LD	-0.03	1.00										
CAT2 LD	-0.01	-0.38	1.00									
CAT3 LD	-0.01	-0.20	-0.07	1.00								
CAT4 LD	0.00	-0.17	-0.06	-0.03	1.00							
CAT5 LD	0.00	-0.04	-0.01	-0.01	-0.01	1.00						
ALL BD	0.00	-0.02	-0.01	0.00	0.00	0.00	1.00					
CAT1 BD	-0.01	0.20	0.09	0.03	0.02	0.00	-0.01	1.00				
CAT2 BD	0.00	-0.04	0.02	0.09	0.11	0.01	0.00	-0.05	1.00			
CAT3 BD	0.00	-0.04	0.01	0.08	0.04	0.00	0.00	-0.03	-0.01	1.00		
CAT4 BD	0.00	-0.04	0.01	0.03	0.00	0.00	0.00	-0.02	0.00	0.00	1.00	
CAT5 BD	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	1.00
% Black	0.01	-0.01	0.03	0.04	0.04	0.00	0.02	0.09	0.05	0.04	0.05	0.03
% Hispanic	0.00	-0.07	0.00	0.00	-0.01	0.01	-0.01	-0.05	-0.03	-0.02	-0.02	-0.01
% Oth. min.	0.00	-0.01	-0.01	0.00	0.01	0.00	0.00	-0.02	0.00	0.00	0.00	-0.01
Class size	-0.06	0.22	-0.01	-0.17	-0.22	-0.05	-0.03	0.04	-0.11	-0.09	-0.08	-0.03
% Male	0.03	-0.09	0.06	0.12	0.16	0.04	0.04	0.05	0.08	0.08	0.09	0.04
% Gifted	-0.02	0.19	-0.04	-0.08	-0.10	-0.02	-0.01	0.03	-0.04	-0.03	-0.03	-0.01
% Econ. Dis.	0.01	-0.12	0.08	0.09	0.09	0.02	0.02	0.02	0.05	0.04	0.04	0.02
% ELL	0.01	-0.10	0.00	0.01	0.02	0.01	-0.01	-0.08	-0.02	-0.02	-0.02	-0.01
Absences	0.03	-0.03	0.07	0.10	0.09	0.01	0.05	0.13	0.09	0.08	0.08	0.02

Note. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. LD= learning disabilities; BD= behavior disorders. Oth. Min= other minority; Econ. Dis.=economically disadvantaged; ELL= English language learner

Table 7 (continued)

Pairwise correlations between classroom characteristics (averaged at the teacher level by year).

	% Black	% Hispanic	% Oth. min.	Class size	% Male	% Gifted	% Econ. Dis.	% ELL	Absences
% Black	1.00								
% Hispanic	-0.06	1.00							
% Oth. min.	-0.05	-0.08	1.00						
Class size	-0.10	-0.04	0.00	1.00					
% Male	0.04	0.00	0.00	-0.11	1.00				
% Gifted	-0.20	-0.19	-0.05	0.16	-0.12	1.00			
% Econ. Dis.	0.47	0.37	0.11	-0.19	0.09	-0.45	1.00		
% ELL	-0.05	0.79	-0.06	-0.06	0.03	-0.21	0.35	1.00	
Absences	0.17	-0.04	0.05	-0.26	0.13	-0.16	0.22	-0.06	1.00

Note. Oth. Min= other minority; Econ. Dis.=economically disadvantaged; ELL= English language learner

Table 8

Pairwise correlations between school characteristics.

	Elem.	MS	Elem./MS	High	Oth. grades	Suburb	City	Town	Rural	Title 1	Violent acts	Per pupil exp.
Elem.	1.00											
MS	-0.54	1.00										
Elem./MS	-0.20	-0.08	1.00									
High	-0.58	-0.23	-0.12	1.00								
Oth. grades	-0.07	-0.03	-0.02	-0.03	1.00							
Suburb	0.08	0.00	-0.06	-0.06	0.00	1.00						
City	0.05	-0.01	-0.07	-0.01	-0.02	-0.12	1.00					
Town	0.01	0.01	-0.03	0.01	0.01	-0.14	-0.23	1.00				
Rural	-0.09	0.00	0.13	0.04	0.01	-0.30	-0.57	-0.38	1.00			
Title 1	0.54	-0.23	0.10	-0.48	-0.02	-0.03	0.03	0.05	-0.01	1.00		
Violent acts	-0.54	0.23	-0.04	0.47	-0.02	-0.06	0.13	-0.03	-0.06	-0.27	1.00	
Per pupil exp.	0.09	-0.11	0.03	-0.04	0.10	-0.05	0.04	0.02	-0.01	0.19	-0.02	1.00
Exceeds	-0.03	0.03	0.01	0.00	-0.01	0.03	0.08	-0.07	-0.06	-0.06	-0.02	-0.04
Meets	0.06	-0.01	0.01	-0.07	-0.01	-0.02	0.01	0.01	0.00	0.02	-0.02	0.04
Not Met	-0.02	-0.05	-0.05	0.09	0.03	-0.03	-0.09	0.07	0.06	0.03	0.04	0.02
% Asian	0.02	-0.01	-0.06	0.00	0.09	0.07	0.27	-0.07	-0.25	-0.14	-0.04	-0.08
%Black	-0.03	0.02	-0.03	0.05	-0.02	-0.17	0.37	0.08	-0.26	0.20	0.20	0.18
%Hispanic	0.17	-0.04	-0.06	-0.15	-0.01	0.00	0.19	-0.03	-0.14	0.27	0.02	0.08
% Other min.	0.05	-0.03	0.06	-0.06	-0.02	-0.02	-0.03	0.08	-0.01	0.11	-0.06	0.03
% Econ. Dis.	0.25	-0.04	0.07	-0.29	-0.04	-0.10	0.04	0.12	-0.02	0.64	-0.04	0.26

Note. Elem.= elementary school (grades K-5); MS= middle school (grades 6-8); High= high school (grades 9-12); Oth. Grades= school has different grade configuration; exp. =expenditures Oth. Min= other minority; Econ. Dis.=economically disadvantaged

Table 8 (continued)

Pairwise correlations between school characteristics.

	Exceeds	Meets	Not Met	% Asian	%Black	%Hispanic	% Other min.	% Econ. Dis.
Exceeds	1.00							
Meets	-0.54	1.00						
Not Met	-0.32	-0.30	1.00					
% Asian	0.15	-0.08	-0.07	1.00				
%Black	-0.09	0.01	0.07	-0.03	1.00			
%Hispanic	-0.02	0.04	-0.06	-0.01	0.04	1.00		
% Other min/	-0.02	-0.01	0.06	-0.03	0.00	-0.05	1.00	
% Econ. Dis.	-0.17	0.03	0.11	-0.22	0.48	0.37	0.16	1.00

Note. Econ. Dis.=economically disadvantaged

Table 9

Comparison of variables from the original sample and the sample with imputed data for missing teacher characteristics.

Variable	Original Sample	Imputed Sample
Years of experience	11.86 (9.38)	11.86 (9.37)
Male	21%	21%
Test score	0.12 (0.74)	0.13 (0.70)
White	83.19%	83.26%
Black	12.66%	12.66%
Asian	0.63%	0.62%
Hispanic	1.42%	1.40%
Native American	0.98%	0.97%
Other ethnicity	1.12%	1.10%

Table 10

Models addressing the relation between the category of the average percentage of SWDs teachers' classes and the odds of attrition (RQ1).

	Model 1a	Model 1b	Model 2a	Model 2b	Model 3a	Model 3b	Model 4a	Model 4b
	Total	Leaving	Total	Leaving	Total	Leaving	Total	Leaving
ALL SWDs	X	X	X	X	X	X	X	X
CAT5	X	X	X	X	X	X	X	X
CAT4	X	X	X	X	X	X	X	X
CAT3	X	X	X	X	X	X	X	X
CAT2	X	X	X	X	X	X	X	X
CAT1	X	X	X	X	X	X	X	X
Teacher characteristics			X	X	X	X	X	X
Classroom characteristics					X	X	X	X
School characteristics					X	X		
Year indicators	X	X	X	X	X	X	X	X
School RE	X	X	X	X	X	X		
Teacher RE	X	X	X	X	X	X	X	X
School FE							X	X

Note. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. SWD= students with disabilities. RE= random effect; FE=fixed effect.

Table 11

Models addressing the relation between the category of the average percentage of students with specific disabilities in teachers' classes and the odds of attrition (RQ2).

	Model 5a	Model 5b	Model 6a	Model 6b	Model 7a	Model 7b	Model 8a	Model 8b
	Total	Leaving	Total	Leaving	Total	Leaving	Total	Leaving
LD ALL	X	X	X	X	X	X	X	X
LD 80 – 99.99%	X	X	X	X	X	X	X	X
LD 40 –79.99%	X	X	X	X	X	X	X	X
LD 20 – 39.99%	X	X	X	X	X	X	X	X
LD 10 – 19.99%	X	X	X	X	X	X	X	X
LD >0% – 9.99%	X	X	X	X	X	X	X	X
SLI ALL	X	X	X	X	X	X	X	X
SLI 80 – 99.99%	X	X	X	X	X	X	X	X
SLI 40 –79.99%	X	X	X	X	X	X	X	X
SLI 20 – 39.99%	X	X	X	X	X	X	X	X
SLI 10 – 19.99%	X	X	X	X	X	X	X	X
SLI >0% – 9.99%	X	X	X	X	X	X	X	X
OHI ALL	X	X	X	X	X	X	X	X
OHI 80 – 99.99%	X	X	X	X	X	X	X	X
OHI 40 –79.99%	X	X	X	X	X	X	X	X
OHI 20 – 39.99%	X	X	X	X	X	X	X	X
OHI 10 – 19.99%	X	X	X	X	X	X	X	X
OHI >0% – 9.99%	X	X	X	X	X	X	X	X
AU ALL	X	X	X	X	X	X	X	X
AU 80 – 99.99%	X	X	X	X	X	X	X	X
AU 40 –79.99%	X	X	X	X	X	X	X	X
AU 20 – 39.99%	X	X	X	X	X	X	X	X
AU 10 – 19.99%	X	X	X	X	X	X	X	X
AU >0% – 9.99%	X	X	X	X	X	X	X	X
ID ALL	X	X	X	X	X	X	X	X
ID 80 – 99.99%	X	X	X	X	X	X	X	X
ID 40 –79.99%	X	X	X	X	X	X	X	X
ID 20 – 39.99%	X	X	X	X	X	X	X	X
ID 10 – 19.99%	X	X	X	X	X	X	X	X
ID >0% – 9.99%	X	X	X	X	X	X	X	X
BD ALL	X	X	X	X	X	X	X	X
BD 80 – 99.99%	X	X	X	X	X	X	X	X
BD 40 –79.99%	X	X	X	X	X	X	X	X
BD 20 – 39.99%	X	X	X	X	X	X	X	X
BD 10 – 19.99%	X	X	X	X	X	X	X	X
BD >0% – 9.99%	X	X	X	X	X	X	X	X
Teacher characteristics			X	X	X	X	X	X
Classroom characteristics					X	X	X	X
School characteristics					X	X		
Year indicators	X	X	X	X	X	X	X	X
School RE	X	X	X	X	X	X		
Teacher RE	X	X	X	X	X	X	X	X
School FE							X	X

Note. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. SWD= students with disabilities. RE= random effect; FE=fixed effect. AU= autism; SLI= speech/language impairments; ID= intellectual disabilities; LD= learning disabilities; BD= behavior disorders

Table 12

Sample sizes for each SWD category for SPED certified teachers.

Disability	All 100%	Cat. 5 80-99%	Cat. 4 40-79.99%	Cat. 3 20-39.99%	Cat. 2 10-19.99%	Cat. 1 .01-9.99%	None 0%
SWDs	7,743	3,269	1,008	267	329	274	289
LD	73	207	3,263	2,329	1,233	1,153	4,921
SLI	21	9	40	74	204	850	11,981
OHI	37	18	1,001	2,803	2,456	2,215	4,649
AU	431	261	643	966	1,543	2,941	6,394
ID	174	415	2,620	1,845	1,411	1,670	5,044
BD	40	50	315	421	783	2,243	9,327

Note. Sample includes 13,179 observations. SWD= students with disabilities; AU= autism; SLI= speech/language impairments; ID= intellectual disabilities; LD= learning disabilities; BD= behavior disorders; OHI= other health impairments

Table 13

Sample sizes for each SWD category for dual certified teachers.

Disability	All 100%	Cat. 5 80-99%	Cat. 4 40-79.99%	Cat. 3 20-39.99%	Cat. 2 10-19.99%	Cat. 1 .01-9.99%	None 0%
SWDs	3,493	1,760	614	770	1,479	1,879	676
LD	38	114	1,834	1,436	1,264	2,496	3,489
SLI	1	3	28	97	509	2,494	7,539
OHI	15	8	616	1,569	1,420	2,753	4,290
AU	142	97	249	477	839	2,333	6,534
ID	53	147	1,028	932	777	1,599	6,135
BD	18	11	141	216	439	1,850	7,996

Note. Sample includes 10,671 observations. SWD= students with disabilities; AU= autism; SLI= speech/language impairments; ID= intellectual disabilities; LD= learning disabilities; BD= behavior disorders; OHI= other health impairments

Table 14

Sample sizes for each SWD category for test dual certified teachers.

Disability	All 100%	Cat. 5 80-99%	Cat. 4 40-79.99%	Cat. 3 20-39.99%	Cat. 2 10-19.99%	Cat. 1 .01-9.99%	None 0%
SWDs	756	472	143	160	213	234	102
LD	11	24	456	368	308	449	464
SLI	0	0	0	12	46	359	1,663
OHI	4	1	153	425	378	584	535
AU	21	17	40	83	182	556	1,181
ID	11	29	303	245	207	409	876
BD	3	1	31	51	137	553	1,304

Note. Sample includes 2,080 observations. SWD= students with disabilities; AU= autism; SLI= speech/language impairments; ID= intellectual disabilities; LD= learning disabilities; BD= behavior disorders; OHI= other health impairments

Table 15
Full results for RQ1 Model 1 predicting total attrition.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
ALL	**0.26**	**0.05**	**5.03**	**0.16, 0.37**	**1.30**	**0.06**	**1.18, 1.43**
CAT5	-0.00	0.07	-0.06	-0.13, 0.13	1.00	0.06	0.88, 1.13
CAT4	-0.03	0.06	-0.50	-0.16, 0.09	0.97	0.60	0.86, 1.09
CAT3	**-0.33**	**0.04**	**-7.88**	**-0.41, -0.25**	**0.72**	**0.03**	**0.67, 0.78**
CAT2	**-0.33**	**0.04**	**-9.16**	**-0.39, -0.26**	**0.72**	**0.02**	**0.68, 0.77**
CAT1	**-0.31**	**0.03**	**-8.88**	**-0.37, -0.24**	**0.74**	**0.02**	**0.69, 0.78**
2010/11	**0.81**	**0.04**	**21.18**	**0.73, 0.88**	**2.24**	**0.07**	**2.11, 2.39**
2012/13	**1.29**	**0.05**	**25.50**	**1.19, 1.39**	**3.65**	**0.15**	**3.37, 3.95**
Intercept	**-3.13**	**0.08**	**-41.29**	**-3.28, -2.99**	**0.04**	**0.00**	**0.04, 0.05**
Variances							
Teacher	5.51						
School	0.70						
Log likelihood	-102699						
(df)	(11)						
AIC	205420						
BIC	205534.6						
Observations	246,751						
Teachers	127,581						
Schools	2,310						

Note. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. SE= Standard error; CI= confidence interval; OR= odds ratio

Table 16
Full results for RQ1 Model 2 including teacher controls predicting total attrition.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
ALL	0.02	0.06	0.28	-0.11, 0.14	1.02	0.06	0.91, 1.14
CAT5	**-0.22**	**0.07**	**-3.07**	**-0.36, -0.08**	**0.80**	**0.05**	**0.70, 0.92**
CAT4	-0.10	0.06	-1.67	-0.22, -0.02	0.91	0.05	0.81, 1.01
CAT3	**-0.30**	**0.04**	**-7.99**	**-0.37, -0.22**	**0.74**	**0.03**	**0.69, 0.79**
CAT2	**-0.29**	**0.03**	**-8.96**	**-0.35, -0.22**	**0.75**	**0.02**	**0.71, 0.79**
CAT1	**-0.29**	**0.03**	**-9.22**	**-0.35, -0.23**	**0.75**	**0.02**	**0.71, 0.79**
SPED	**0.33**	**0.06**	**5.56**	**0.22, 0.45**	**1.39**	**0.08**	**1.25, 1.56**
Dual true	**0.22**	**0.05**	**4.37**	**0.12, 0.32**	**1.25**	**0.06**	**1.13, 1.37**
Dual test	0.12	0.09	1.29	-0.06, 0.30	1.13	0.11	0.94, 1.36
Test scores	**0.08**	**0.01**	**6.00**	**0.06, 0.11**	**1.09**	**0.02**	**1.06, 1.12**
First yr.	**0.71**	**0.04**	**19.53**	**0.64, 0.78**	**2.03**	**0.06**	**1.91, 2.16**
Second yr.	**0.55**	**0.04**	**15.42**	**0.48, 0.62**	**1.74**	**0.06**	**1.77, 2.01**
Third yr.	**0.63**	**0.03**	**18.28**	**0.57, 0.70**	**1.89**	**0.06**	**1.77, 2.01**
Thirty+ yr.	**1.44**	**0.04**	**32.49**	**1.35, 1.53**	**4.22**	**0.16**	**3.92, 4.55**
Out of state	**0.38**	**0.02**	**16.05**	**0.34, 0.43**	**1.46**	**0.03**	**1.40, 1.53**
TFA	**1.04**	**0.12**	**8.58**	**0.80, 1.27**	**2.82**	**0.29**	**2.31, 3.44**
Alt. entry	**0.31**	**0.03**	**10.82**	**0.25, 0.37**	**1.36**	**0.04**	**1.29, 1.44**
Unclass. entry	**0.10**	**0.04**	**2.38**	**0.02, 0.18**	**1.11**	**0.06**	**1.02, 1.20**
Visiting	**0.73**	**0.10**	**7.22**	**0.53, 0.93**	**2.07**	**0.20**	**1.72, 2.50**
Male	-0.02	0.03	-0.63	-0.06, 0.03	0.99	0.02	0.94, 1.03
Black	**0.11**	**0.03**	**3.48**	**0.05, 0.18**	**1.12**	**0.03**	**1.06, 1.19**
Asian	**0.22**	**0.10**	**2.20**	**0.03, 0.42**	**1.25**	**0.13**	**1.03, 1.53**
Hispanic	**0.30**	**0.07**	**4.25**	**0.16, 0.44**	**1.35**	**0.10**	**1.18, 1.56**
Native Am.	0.09	0.11	0.82	-0.12, 0.30	1.09	0.11	0.90, 1.33
Other race	**0.31**	**0.07**	**4.17**	**0.16, 0.45**	**1.36**	**0.11**	**1.17, 1.58**
English	**0.24**	**0.03**	**9.08**	**0.18, 0.29**	**1.27**	**0.03**	**1.20, 1.33**
Science	**0.14**	**0.03**	**4.50**	**0.08, 0.20**	**1.15**	**0.04**	**1.08, 1.22**
Math	**0.18**	**0.03**	**6.24**	**0.12, 0.24**	**1.20**	**0.04**	**1.13, 1.22**
Social studies	**0.07**	**0.03**	**2.70**	**0.02, 0.13**	**1.08**	**0.03**	**1.02, 1.14**
Other cert.	0.02	0.02	0.81	-0.03, 0.06	1.02	0.02	0.98, 1.06
2010/11	**0.58**	**0.03**	**18.21**	**0.88, 1.05**	**1.78**	**0.05**	**1.69, 1.87**
2012/13	**0.97**	**0.04**	**22.63**	**0.88, 1.05**	**2.63**	**0.09**	**2.46, 2.81**
Intercept	**-3.15**	**0.07**	**-45.38**	**-3.28, -3.01**	**0.04**	**0.00**	**0.04, 0.05**
Variances							
Teacher	3.03	0.23					
School	0.45	0.04					
Log likelihood	-101104.3 (35)						
AIC	202278.6						
BIC	202643.2						
Observations	246,751						
Teachers	127,581						
Schools	2,310						

Note. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. SPED= special education certification; TFA= Teach for America. SE= Standard error; CI= confidence interval; OR= odds ratio. Results in bold are statistically significant at, at least, $p<.05$.

Table 17
Full results for RQ1 Model 3 including teacher, classroom, and student controls predicting total attrition.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
ALL	-0.10	0.07	-1.48	-0.23, 0.03	0.91	0.06	0.80, 1.02
CAT5	**-0.33**	**0.07**	**-4.40**	**-0.47, -0.18**	**0.72**	**0.05**	**0.63, 0.83**
CAT4	**-0.16**	**0.06**	**-2.64**	**-0.28, -0.04**	**0.85**	**0.05**	**0.63, 0.96**
CAT3	**-0.32**	**0.06**	**-8.29**	**-0.39, -0.24**	**0.73**	**0.03**	**0.68, 0.78**
CAT2	**-0.28**	**0.03**	**-8.61**	**-0.34, -0.21**	**0.76**	**0.02**	**0.72, 0.80**
CAT1	**-0.27**	**0.03**	**-8.81**	**-0.33, -0.21**	**0.76**	**0.02**	**0.72, 0.81**
SPED	**0.30**	**0.06**	**5.04**	**0.18, 0.42**	**1.35**	**0.08**	**1.21, 1.51**
Dual true	**0.20**	**0.05**	**4.05**	**0.10, 0.30**	**1.22**	**0.06**	**1.11, 1.34**
Dual test	0.11	0.09	1.17	-0.07, 0.29	1.11	0.10	0.93, 1.33
Test scores	**0.09**	**0.01**	**6.29**	**0.06, 0.11**	**1.09**	**0.02**	**1.06, 1.12**
First yr.	**0.68**	**0.04**	**19.01**	**0.61, 0.75**	**1.97**	**0.06**	**1.86, 2.09**
Second yr.	**0.53**	**0.04**	**14.93**	**0.46, 0.60**	**1.69**	**0.06**	**1.59, 1.81**
Third yr.	**0.61**	**0.03**	**17.90**	**0.54, 0.68**	**1.84**	**0.06**	**1.73, 1.96**
Thirty+ yr.	**1.41**	**0.04**	**32.42**	**1.32, 1.49**	**4.09**	**0.15**	**3.80, 4.40**
Out of state	**0.36**	**0.02**	**15.46**	**0.32, 0.41**	**1.44**	**0.03**	**1.38, 1.50**
TFA	**0.81**	**0.12**	**7.00**	**0.59, 1.04**	**2.25**	**0.22**	**1.85, 1.74**
Alt. entry	**0.26**	**0.03**	**9.32**	**0.21, 0.32**	**1.30**	**0.04**	**1.23, 1.37**
Unclass. entry	0.08	0.04	1.87	-0.00, 0.16	1.08	0.04	1.00, 1.17
Visiting	**0.61**	**0.10**	**6.18**	**0.42, 0.81**	**1.84**	**0.17**	**1.53, 2.22**
Male	-0.03	0.03	-1.18	-0.08, 0.02	0.97	0.02	0.93, 1.02
Black	-0.01	0.03	-0.40	-0.08, 0.05	0.99	0.03	0.93, 1.05
Asian	0.16	0.10	1.61	-0.04, 0.36	1.18	0.12	0.97, 1.43
Hispanic	**0.24**	**0.07**	**3.35**	**0.10, 0.37**	**1.27**	**0.09**	**1.10, 1.46**
Native Am.	0.01	0.11	0.12	-0.19, 0.22	1.01	0.10	0.83, 1.23
Other race	**0.25**	**0.07**	**3.41**	**0.11, 0.39**	**1.28**	**0.10**	**1.10, 1.49**
English	**0.21**	**0.03**	**8.15**	**0.16, 0.26**	**1.23**	**0.03**	**1.17, 1.30**
Science	**0.13**	**0.03**	**4.17**	**0.07, 0.19**	**1.12**	**0.03**	**1.07, 1.20**
Math	**0.16**	**0.03**	**5.45**	**0.10, 0.22**	**1.17**	**0.03**	**1.11, 1.24**
Social studies	**0.06**	**0.03**	**2.27**	**0.01, 0.12**	**1.06**	**0.03**	**1.01, 1.12**
Other cert.	-0.02	0.02	0.31	-0.07, 0.02	0.98	0.02	0.94, 1.02
Avg. class % Asian	0.00	0.00	0.75	-0.00, 0.01	1.00	0.00	1.00, 1.01
Avg. class % Black	**0.00**	**0.00**	**4.48**	**-0.00, 0.01**	**1.00**	**0.00**	**1.00, 1.02**
Avg. class % Hisp.	**0.00**	**0.00**	**2.17**	**0.00, 0.01**	**1.00**	**0.00**	**1.00, 1.01**
Avg. class % Other	0.00	0.00	1.38	-0.00, 0.01	1.00	0.00	1.00, 1.01
Avg. class size	**-0.01**	**0.00**	**-4.18**	**-0.01, -0.00**	**0.99**	**0.00**	**0.99, 1.00**
Avg. class % male	-0.00	0.00	-0.47	-0.00, 0.00	1.00	0.00	1.00, 1.00
Avg. class % gifted	**0.00**	**0.00**	**4.07**	**0.00, 0.01**	**1.00**	**0.00**	**1.00, 1.00**
Avg. class % FRL	**0.00**	**0.00**	**4.89**	**0.00, 0.01**	**1.00**	**0.00**	**1.00, 1.01**
Avg. class % EL	**0.00**	**0.00**	**2.16**	**0.00, 0.01**	**1.00**	**0.00**	**1.00, 1.00**
Avg. days absent	0.01	0.00	1.87	-0.00, 0.01	1.01	0.00	1.00, 1.01
Middle school	0.04	0.06	0.65	-0.08, 0.15	1.04	0.05	0.94, 1.15

Table 17 (continued)
Full results for RQ1 Model 3 including teacher, classroom, and student controls predicting total attrition.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
Elem./Mid. school	0.10	0.10	1.08	-0.08, 0.29	1.11	0.08	0.96, 1.28
High school	0.13	0.08	1.69	-0.02, 0.27	1.12	0.07	1.01, 1.27
Other school config.	0.31	0.16	1.91	-0.01, 0.63	1.37	0.29	0.90, 2.08
City	0.04	0.06	0.65	-0.07, 0.15	1.04	0.06	0.92, 1.17
Town	**0.15**	**0.07**	**2.11**	**0.01, 0.30**	**1.17**	**0.08**	**1.03, 1.33**
Rural	**0.11**	**0.05**	**2.38**	**0.02, 0.20**	**1.12**	**0.06**	**1.01, 1.24**
Title 1	0.05	0.06	0.41	-0.06, 0.16	1.05	0.05	0.95, 1.15
Violent acts	**0.01**	**0.00**	**3.40**	**0.01, 0.02**	**1.01**	**0.00**	**1.01, 1.02**
Per pupil exp.	0.00	0.00	0.94	-0.00, 0.00	1.00	0.00	1.00, 1.00
Exceeds exp.	0.02	0.04	0.55	-0.05, 0.10	1.02	0.04	0.95, 1.10
Not met exp.	0.08	0.05	1.58	-0.02, 0.19	1.09	0.05	0.99, 1.20
School % Asian	**0.01**	**0.00**	**2.32**	**0.00, 0.02**	**1.01**	**0.01**	**0.00, 1.02**
School % Black	**0.01**	**0.00**	**6.67**	**0.01, 0.01**	**1.01**	**0.00**	**1.01, 1.01**
School % Hisp.	0.00	0.00	0.19	-0.00, 0.00	1.00	0.00	1.00, 1.00
School % Oth.	0.00	0.00	0.49	-0.00, 0.01	1.00	0.00	1.00, 1.01
School % FRL	-0.00	0.00	-0.87	-0.00, 0.00	1.00	0.00	1.00, 1.00
2010/11	**0.55**	**0.03**	**17.49**	**0.49, 0.61**	**1.73**	**0.04**	**1.64, 1.82**
2012/13	**0.89**	**0.04**	**21.32**	**0.81, 0.98**	**2.45**	**0.08**	**2.29, 2.61**
Intercept	**-3.81**	**0.12**	**-32.27**	**-4.04, -3.58**	**0.02**	**0.00**	**0.02, 0.03**
Variances							
Teacher	2.86	0.22					
School	0.32	0.04					
Log likelihood	-100765.1 (62)						
AIC	201654.2						
BIC	202300						
Observations	246,751						
Teachers	127,581						
Schools	2,310						

Note. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. SPED= special education certification; TFA= Teach for America. SE= Standard error; CI= confidence interval; OR= odds ratio; Avg.= average; exp= expectations; FRL=Free/reduced lunch. Results in bold are statistically significant at, at least, $p<.05$.

Table 18
Results for RQ1 Model 4 adding school fixed effects to Model 3 and predicting total attrition.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
ALL	-0.06	0.05	-1.39	-0.15, 0.03	0.94	0.04	0.86, 1.03
CAT5	**-0.26**	**0.06**	**-4.41**	**-0.37, -0.14**	**0.77**	**0.05**	**0.69, 0.87**
CAT4	**-0.13**	**0.05**	**-2.79**	**-0.21, -0.04**	**0.88**	**0.04**	**0.81, 0.96**
CAT3	**-0.25**	**0.05**	**-7.13**	**-0.32, -0.18**	**0.78**	**0.03**	**0.72, 0.83**
CAT2	**-0.22**	**0.03**	**-8.36**	**-0.28, -0.17**	**0.80**	**0.02**	**0.76, 0.84**
CAT1	**-0.23**	**0.02**	**-9.49**	**-0.27, -0.18**	**0.80**	**0.02**	**0.76, 0.84**
Observations	246,399						
Teachers	127,266						
Schools	2,291						

Note. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. SE= Standard error; CI= confidence interval; OR= odds ratio. Model includes classroom and teacher variables. Results in bold are statistically significant at, at least, $p<.05$.

Table 19
Full results for RQ1 Model 1 predicting leaving.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
ALL	-0.06	0.06	-0.99	-0.17, 0.06	0.95	0.05	0.85, 1.06
CAT5	**-0.24**	**0.07**	**-3.20**	**-0.38, -0.09**	**0.79**	**0.06**	**0.68, 0.91**
CAT4	-0.05	0.07	-0.66	-0.19, 0.10	0.95	0.07	0.83, 1.10
CAT3	**-0.19**	**0.04**	**-4.29**	**-0.27, -0.10**	**0.83**	**0.04**	**0.76, 0.90**
CAT2	**-0.16**	**0.04**	**-4.24**	**-0.23, -0.09**	**0.85**	**0.03**	**0.79, 0.92**
CAT1	**-0.09**	**0.04**	**-2.59**	**-0.16, -0.02**	**0.91**	**0.03**	**0.85, 0.98**
2010/11	**0.45**	**0.03**	**-14.92**	**0.38, 0.51**	**1.57**	**0.05**	**1.48, 1.67**
2012/13	**0.75**	**0.04**	**-19.21**	**0.78, 0.83**	**2.12**	**0.08**	**1.97, 2.29**
Intercept	**-3.93**	**0.08**	**-48.64**	**-4.09, -3.77**	**0.02**	**0.00**	**0.02, 0.02**
Variances							
Teacher	4.09	0.24					
School	0.27	0.02					
Log likelihood (df)	-67966.87(11)						
AIC	135955.7						
BIC	136070.3						
Observations	246,751						
Teachers	127,581						
Schools	2,310						

Note. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. SE= Standard error; CI= confidence interval; OR= odds ratio. Results in bold are statistically significant at, at least, $p<.05$.

Table 20
Full results for RQ1 Model 2 including teacher controls predicting leaving.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
ALL	0.03	0.07	0.41	-0.10, 0.16	1.03	0.07	0.90, 1.17
CAT5	-0.13	0.07	-1.73	-0.29, 0.02	0.88	0.07	0.75, 1.02
CAT4	-0.02	0.07	-0.30	-0.15, 0.11	0.98	0.06	0.87, 1.11
CAT3	**-0.14**	**0.03**	**-3.72**	**-0.22, -0.07**	**0.87**	**0.03**	**0.81, 0.94**
CAT2	**-0.11**	**0.03**	**-3.42**	**-0.17, -0.05**	**0.90**	**0.03**	**0.84, 0.95**
CAT1	**-0.07**	**0.03**	**-2.40**	**-0.13, -0.01**	**0.93**	**0.03**	**0.88, 0.99**
SPED	0.01	0.06	0.17	-0.11, 0.14	1.01	0.07	0.89, 1.15
Dual true	-0.03	0.05	-0.53	-0.13, 0.08	0.97	0.05	0.89, 1.08
Dual test	**-0.26**	**0.11**	**-2.44**	**-0.47, -0.05**	**0.77**	**0.09**	**0.62, 0.96**
Test scores	**0.07**	**0.01**	**4.56**	**0.04, 0.09**	**1.07**	**0.02**	**1.04, 1.10**
First yr.	**0.67**	**0.04**	**17.88**	**0.59, 0.74**	**1.94**	**0.07**	**1.82, 2.08**
Second yr.	**0.69**	**0.04**	**18.92**	**0.62, 0.76**	**1.99**	**0.07**	**1.86, 2.14**
Third yr.	**0.78**	**0.04**	**21.11**	**0.71, 0.85**	**2.18**	**0.08**	**2.04, 2.33**
Thirty+ yr.	**1.89**	**0.05**	**39.66**	**1.80, 1.98**	**6.62**	**0.29**	**6.07, 7.21**
Out of state	**0.60**	**0.03**	**23.60**	**0.55, 0.65**	**1.82**	**0.04**	**1.74, 1.91**
TFA	**1.86**	**0.11**	**17.74**	**1.66, 2.07**	**6.43**	**0.61**	**5.35, 7.73**
Alt. entry	**0.34**	**0.03**	**10.47**	**0.27, 0.40**	**1.40**	**0.04**	**1.32, 1.49**
Unclass. entry	**0.37**	**0.04**	**8.62**	**0.29, 0.46**	**1.45**	**0.06**	**1.33, 1.57**
Visiting	**1.11**	**0.10**	**11.55**	**0.92, 1.30**	**3.04**	**0.28**	**2.54, 3.65**
Male	-0.04	0.03	-1.64	-0.10, 0.01	0.96	0.02	0.92, 1.01
Black	0.04	0.03	1.30	-0.02, 0.10	1.04	0.03	0.98, 1.11
Asian	**0.30**	**0.10**	**2.89**	**0.10, 0.50**	**1.34**	**0.14**	**1.10, 1.64**
Hispanic	**0.18**	**0.08**	**2.30**	**0.03, 0.33**	**1.19**	**0.09**	**1.03, 1.38**
Native Am.	-0.01	0.10	-0.12	-0.21, 0.19	0.99	0.10	0.81, 1.21
Other race	**0.40**	**0.08**	**5.14**	**0.25, 0.55**	**1.49**	**0.11**	**1.27, 1.73**
English	**0.27**	**0.03**	**10.27**	**0.22, 0.32**	**1.31**	**0.03**	**1.24, 1.37**
Science	**0.19**	**0.03**	**6.02**	**0.13, 0.25**	**1.21**	**0.04**	**1.14, 1.28**
Math	**0.09**	**0.03**	**2.95**	**0.03, 0.15**	**1.09**	**0.03**	**1.03, 1.16**
Social studies	0.04	0.03	1.51	-0.01, 0.10	1.04	0.03	0.99, 1.10
Other cert.	**-0.04**	**0.02**	**-1.98**	**-0.09, -0.00**	**0.96**	**0.02**	**0.92, 1.00**
2010/11	**0.28**	**0.03**	**10.41**	**0.23, 0.33**	**1.32**	**0.03**	**1.26, 1.39**
2012/13	**0.49**	**0.03**	**15.13**	**0.43, 0.56**	**1.64**	**0.05**	**1.55, 1.74**
Intercept	**-3.86**	**0.08**	**-47.57**	**-4.02, -3.70**	**0.02**	**0.00**	**0.02, 0.02**
Variances							
Teacher	1.58	0.18					
School	0.10	0.01					
Log likelihood	-65183.27 (35)						
AIC	130436.5						
BIC	130801.1						
Observations	246,751						
Teachers	127,581						
Schools	2,310						

Note. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. SPED= special education certification; TFA= Teach for America. SE= Standard error; CI= confidence interval; OR= odds ratio. Results in bold are statistically significant at, at least, $p<.05$.

Table 21
Full results for RQ1 Model 3 including teacher controls predicting leaving.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
ALL	-0.04	0.07	-0.59	-0.19, 0.10	0.96	0.07	0.83, 1.10
CAT5	**-0.22**	**0.08**	**-2.67**	**-0.38, -0.06**	**0.80**	**0.07**	**0.69, 0.94**
CAT4	-0.08	0.07	-1.16	-0.21, 0.05	0.93	0.06	0.82, 1.05
CAT3	**-0.21**	**0.04**	**-5.20**	**-0.28, -0.13**	**0.81**	**0.03**	**0.75, 0.88**
CAT2	**-0.16**	**0.03**	**-4.70**	**-0.22, -0.09**	**0.85**	**0.03**	**0.80, 0.91**
CAT1	**-0.11**	**0.03**	**-3.52**	**-0.17, -0.05**	**0.90**	**0.03**	**0.84, 0.95**
SPED	0.02	0.06	0.25	-0.11, -.14	1.01	0.07	0.90, 1.15
Dual true	-0.02	0.05	-0.41	-013, 0.08	0.98	0.05	0.88, 1.09
Dual test	**-0.25**	**0.11**	**-2.36**	**-0.46, -0.04**	**0.78**	**0.09**	**0.63, 0.97**
Test scores	**0.07**	**0.01**	**5.09**	**0.05, 0.10**	**1.08**	**0.02**	**1.05, 1.10**
First yr.	**0.61**	**0.04**	**16.47**	**0.54, 0.68**	**1.84**	**0.06**	**1.73, 1.97**
Second yr.	**0.65**	**0.04**	**17.88**	**0.58, 0.72**	**1.91**	**0.07**	**1.78, 2.05**
Third yr.	**0.75**	**0.04**	**20.30**	**0.68, 0.82**	**2.11**	**0.07**	**1.97, 2.26**
Thirty+ yr.	**1.88**	**0.05**	**39.82**	**1.78, 1.97**	**6.52**	**0.28**	**5.99, 7.10**
Out of state	**0.58**	**0.03**	**23.05**	**0.53, 0.63**	**1.79**	**0.04**	**1.71, 1.88**
TFA	**1.60**	**0.10**	**15.83**	**1.40, 1.80**	**4.95**	**0.46**	**4.13, 5.93**
Alt. entry	**0.28**	**0.03**	**8.77**	**0.22, 0.34**	**1.32**	**0.04**	**1.25, 1.41**
Unclass. entry	**0.35**	**0.04**	**8.18**	**0.27, 0.44**	**1.42**	**0.06**	**1.31, 1.54**
Visiting	**1.03**	**0.10**	**10.59**	**0.64, 1.21**	**2.79**	**0.26**	**2.33, 3.34**
Male	**-0.07**	**0.03**	**-2.68**	**-0.12, -0.02**	**0.93**	**0.02**	**0.89, 0.98**
Black	**-0.11**	**0.03**	**-3.34**	**-0.17, -0.05**	**0.90**	**0.03**	**0.84, 0.95**
Asian	**0.22**	**0.10**	**2.12**	**0.02, 0.42**	**1.24**	**0.13**	**1.02, 1.51**
Hispanic	0.12	0.08	1.54	-0.03, 0.27	1.13	0.08	0.97, 1.30
Native Am.	-0.13	0.11	-1.20	-0.35, 0.08	0.88	0.10	0.71, 1.09
Other race	**0.33**	**0.08**	**4.30**	**0.18, 0.48**	**1.39**	**0.11**	**1.19, 1.62**
English	**0.25**	**0.03**	**9.41**	**0.11, 0.24**	**1.28**	**0.03**	**1.21, 1.35**
Science	**0.17**	**0.03**	**5.50**	**0.11, 0.24**	**1.03**	**0.03**	**0.98, 1.09**
Math	**0.06**	**0.03**	**2.07**	**0.00, 0.12**	**1.07**	**0.03**	**1.00, 1.13**
Social studies	0.03	0.03	1.11	-0.02, 0.09	1.03	0.03	0.98, 1.09
Other cert.	**-0.06**	**0.02**	**-2.41**	**-0.10, -0.01**	**0.95**	**0.02**	**0.91, 0.99**
Avg. class % Asian	0.00	0.00	1.27	-0.00, 0.01	1.00	0.00	1.00, 1.01
Avg. class % Black	**0.00**	**0.00**	**3.89**	**0.00, 0.01**	**1.00**	**0.00**	**1.00, 1.01**
Avg. class % Hisp.	0.00	0.00	1.14	-0.00, 0.00	1.00	0.00	1.00, 1.00
Avg. class % Other	0.00	0.00	0.95	-0.00, 0.00	1.00	0.00	1.00, 1.00
Avg. class size	**0.01**	**0.00**	**3.08**	**0.00, 0.01**	**1.01**	**0.00**	**1.00, 1.01**
Avg. class % male	-0.00	0.00	-0.18	-0.00, 0.00	1.00	0.00	1.00, 1.00
Avg. class % gifted	-0.00	0.00	-0.54	-0.00, 0.00	1.00	0.00	1.00, 1.00
Avg. class % FRL	**0.00**	**0.00**	**5.81**	**0.00, 0.01**	**1.00**	**0.00**	**1.00, 1.01**
Avg. class % EL	0.00	0.00	1.17	-0.00, 0.00	1.00	0.00	1.00, 1.00
Avg. days absent	0.00	0.00	1.00	-0.00, 0.01	1.00	0.00	1.00, 1.01
Middle school	0.00	0.04	0.01	-0.08, 0.08	1.00	0.04	0.93, 1.08
Elem./Mid. school	0.04	0.06	0.71	-0.07, 0.15	1.04	0.06	0.93, 1.17
High school	**0.13**	**0.05**	**2.96**	**0.05, 0.22**	**1.14**	**0.05**	**1.04, 1.25**
Other school config.	**0.47**	**0.17**	**2.79**	**0.14, 0.81**	**1.61**	**0.31**	**1.10, 2.34**
City	-0.01	0.04	-0.20	-0.09, 0.08	0.99	0.04	0.91, 1.08
Town	0.03	0.05	0.65	-0.06, 0.12	1.03	0.05	0.94, 1.13
Rural	0.04	0.04	1.16	-0.03, 0.12	1.04	0.04	0.97, 1.12
Title 1	0.06	0.04	1.57	-0.01, 0.13	1.06	0.04	0.99, 1.14
Violent acts	**0.01**	**0.00**	**3.04**	**0.00, 0.01**	**1.01**	**0.00**	**1.00, 1.01**
Per pupil exp.	0.00	0.00	0.26	-0.00, 0.00	1.00	0.00	1.00, 1.00

Table 21 (continued)
Full results for RQ1 Model 3 including teacher controls predicting leaving.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
Exceeds exp.	-0.04	0.03	-1.44	-0.09, 0.01	0.96	0.03	0.91, 1.01
Not met exp.	-0.00	0.04	-0.08	-0.08, 0.07	1.00	0.04	0.93, 1.07
School % Asian	-0.00	0.00	-0.34	-0.01, 0.01	1.00	0.00	0.99, 1.01
School % Black	**0.01**	**0.00**	**5.44**	**0.00, 0.01**	**1.01**	**0.00**	**1.00, 1.01**
School % Hisp.	0.00	0.00	1.01	-0.00, 0.00	1.00	0.00	1.00, 1.01
School % Oth.	0.00	0.00	1.39	-0.00, 0.01	1.00	0.00	1.00, 1.01
School % FRL	**-0.01**	**0.00**	**-4.94**	**-0.01, -0.00**	**1.00**	**0.00**	**0.99, 1.00**
2010/11	**0.27**	**0.03**	**10.01**	**0.22, 0.32**	**1.31**	**0.03**	**1.24, 1.37**
2012/13	**0.49**	**0.03**	**14.64**	**0.43, 0.56**	**1.64**	**0.05**	**1.54, 1.74**
Intercept	**-4.25**	**0.12**	**-36.35**	**-4.48, -4.02**	**0.01**	**0.00**	**0.01, 0.02**
Variances							
Teacher	1.53	0.17					
School	0.06	0.01					
Log likelihood	-64939.82 (62)						
AIC	13003.6						
BIC	130649.4						
Observations	246,751						
Teachers	127,581						
Schools	2,310						

Note. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. SPED= special education certification; TFA= Teach for America. SE= Standard error; CI= confidence interval; OR= odds ratio; Avg.= average; exp= expectations; FRL=Free/reduced lunch. Results in bold are statistically significant at, at least, $p<.05$.

Table 22
Results for RQ1 Model 4 adding school fixed effects to Model 3 and predicting leaving.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
ALL	-0.01	0.07	-0.10	-0.14, 0.12	0.99	0.07	0.87, 1.13
CAT5	**-0.17**	**0.07**	**-2.43**	**-0.31, -0.03**	**0.84**	**0.06**	**0.73, 0.97**
CAT4	-0.06	0.05	-1.11	-0.17, 0.05	0.94	0.05	0.85, 1.05
CAT3	**-0.18**	**0.03**	**-5.20**	**-0.24, -0.11**	**0.84**	**0.03**	**0.78, 0.90**
CAT2	**-0.13**	**0.03**	**-4.30**	**-0.10, -0.07**	**0.88**	**0.03**	**0.82, 0.93**
CAT1	**-0.10**	**0.03**	**-3.54**	**-0.15, -0.04**	**0.91**	**0.03**	**0.85, 0.96**
Observations	245,154						
Teachers	126,680						
Schools	2,254						

Note. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. SE= Standard error; CI= confidence interval; OR= odds ratio. Model includes teacher and classroom variables. Results in bold are statistically significant at, at least, $p<.05$.

Table 23
Full results for RQ2 Model 1 predicting total attrition.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
LD ALL	0.35	0.31	1.15	-0.25, 0.96	1.43	0.42	0.80, 2.55
LD CAT5	**0.45**	**0.21**	**2.14**	**0.04, 0.86**	**1.57**	**0.34**	**1.03, 2.40**
LD CAT4	**0.19**	**0.07**	**2.88**	**0.06, 0.32**	**1.21**	**0.08**	**1.06, 1.38**
LD CAT3	0.04	0.05	0.83	-0.06, 0.15	1.05	0.05	0.95, 1.16
LD CAT2	0.05	0.03	1.30	-0.02, 0.11	1.05	0.04	0.98, 1.12
LD CAT1	-0.05	0.03	-1.88	-0.11, 0.00	0.95	0.02	0.91, 1.00
SLI ALL	-0.00	0.31	-0.00	-0.61, -0.61	1.00	0.31	0.55, 1.83
SLI CAT5	0.60	0.45	1.35	-0.28, 1.48	1.83	0.79	0.78, 4.26
SLI CAT4	-0.20	0.17	-1.21	-0.53, 0.13	0.82	0.14	0.58, 1.14
SLI CAT3	**-0.35**	**0.09**	**-3.70**	**-0.53, -0.16**	**0.71**	**0.07**	**0.59, 0.85**
SLI CAT2	**-0.24**	**0.05**	**-5.36**	**-0.33, -0.15**	**0.79**	**0.03**	**0.72, 0.86**
SLI CAT1	**-0.12**	**0.02**	**-5.37**	**-0.16, -0.08**	**0.89**	**0.02**	**0.85, 0.93**
OHI ALL	**0.97**	**0.45**	**2.16**	**0.09, 1.84**	**2.62**	**1.03**	**1.21, 5.68**
OHI CAT5	**1.47**	**0.75**	**1.98**	**0.02, 2.92**	**4.35**	**2.95**	**1.15, 16.44**
OHI CAT4	**0.22**	**0.10**	**2.16**	**0.02, 0.43**	**1.25**	**0.13**	**1.03, 1.52**
OHI CAT3	0.05	0.07	-0.72	-0.08, 0.18	1.05	0.07	0.92, 1.19
OHI CAT2	-0.00	0.05	-0.01	-0.09, 0.09	1.00	0.05	0.91, 1.10
OHI .CAT1	-0.03	0.02	-1.31	-0.08, 0.02	0.97	0.02	0.93, 1.01
AU ALL	**0.48**	**0.18**	**2.63**	**0.12, 0.83**	1.61	**0.27**	**1.15, 2.25**
AU CAT5	0.23	0.22	1.03	-0.21, 0.67	1.26	0.27	0.83, 1.91
AU CAT4	0.05	0.13	0.35	-0.21, 0.30	1.05	0.14	0.81, 1.36
AU CAT3	0.18	0.11	1.71	-0.03, 0.39	1.20	0.12	0.98, 1.46
AU CAT2	-0.02	0.07	-0.30	-0.17, 0.12	0.98	0.07	0.85, 1.13
AU CAT1	**-0.15**	**0.02**	**-6.09**	**-0.20, -0.10**	**0.86**	**0.02**	**0.82, 0.90**
ID ALL	**1.12**	**0.23**	**4.88**	**0.67, 1.57**	**3.07**	**0.72**	**1.94, 4.86**
ID CAT5	0.31	0.18	1.76	-0.04, 0.66	1.37	0.23	0.98, 1.91
ID CAT4	0.11	0.08	1.39	-0.04, 0.26	1.11	0.08	0.96, 1.29
ID CAT3	0.10	0.07	1.50	-0.03, 0.23	1.11	0.07	097, 1.26
ID CAT2	-0.04	0.06	-0.77	-0.16, 0.07	0.96	0.05	0.86, 1.07
ID CAT1	0.00	0.03	0.03	-0.05, 0.05	1.00	0.02	0.96, 1.05
BD ALL	**2.00**	**0.42**	**4.73**	**1.17, 2.83**	**7.41**	**2.99**	**3.35, 16.37**
BD CAT5	**1.19**	**0.50**	**2.39**	**0.21, 2.16**	**3.28**	**1.49**	**1.35, 7.97**
BD CAT4	**0.62**	**0.18**	**3.49**	**0.27, 0.96**	**1.85**	**0.32**	**1.32, 2.60**
BD CAT3	**0.57**	**0.14**	**3.95**	**0.29, 0.85**	**1.76**	**0.24**	**1.35, 2.30**
BD CAT2	**0.29**	**0.09**	**3.39**	**0.12, 0.46**	**1.34**	**0.12**	**1.12, 1.59**
BD CAT1	0.01	0.03	0.26	-0.04, 0.06	1.01	0.02	0.96, 1.06
Oth. ALL	**0.76**	**0.21**	**3.55**	**0.34, 1.18**	**2.14**	**0.45**	**1.42, 3.21**
Oth. CAT5	0.43	0.27	1.63	-0.09, 0.10	1.54	0.41	0.91, 2.60
Oth. CAT4	0.11	0.11	1.03	-0.10, 0.32	1.12	0.12	0.90, 1.38
Oth. CAT3	**0.22**	**0.09**	**2.40**	**0.04, 0.39**	**1.24**	**0.11**	**1.04, 1.48**
Oth. CAT2	0.08	0.06	1.16	-0.05, 0.20	1.08	0.07	0.95, 1.22
Oth. CAT1	**-0.15**	**0.02**	**-6.44**	**-0.19, -0.10**	**0.87**	**0.02**	**0.83, 0.90**
2010/11	**0.79**	**0.04**	**21.13**	**0.72, 0.87**	**2.21**	**0.07**	**2.08, 2.35**

Table 23 (continued)
Full results for RQ2 Model 1 predicting total attrition.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
2012/13	**1.27**	**0.05**	**25.42**	**1.18, 1.37**	**3.57**	**0.14**	**3.31, 3.87**
Intercept	**-3.19**	**0.08**	**-42.64**	**-3.34, -3.05**	**0.04**	**0.00**	**0.04, 0.05**
Variances							
Teacher	5.37	0.33					
School	0.68	0.05					
Log likelihood	-102622.5 (47)						
AIC	205338.9						
BIC	205828.5						
Observations	246,751						
Teachers	127,581						
Schools	2,310						

Note. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. LD= learning disabilities; SLI=speech/language impairments; OHI= other health impairments; AU= autism; ID= intellectual disabilities; BD= behavior disorders; Oth.= other disabilities. SE= Standard error; CI= confidence interval; OR= odds ratio. Model includes teacher and classroom variables. Results in bold are statistically significant at, at least, $p<.05$.

Table 24
Full results for RQ2 Model 2 including teacher variables predicting total attrition.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
LD ALL	0.20	0.27	0.75	-0.33, 0.73	1.22	0.31	0.74, 2.02
LD CAT5	0.18	0.19	0.95	-0.20, 0.56	1.20	0.24	0.82, 1.76
LD CAT4	0.01	0.06	0.21	-0.11, 0.14	1.01	0.06	0.90, 1.15
LD CAT3	-0.03	0.05	-0.64	-0.13, 0.06	0.97	0.05	0.88, 1.06
LD CAT2	0.00	0.03	0.14	-0.06, 0.06	1.00	0.03	0.95, 1.06
LD CAT1	**-0.08**	**0.02**	**-3.12**	**-0.13, -0.03**	**0.93**	**0.02**	**0.89, 0.97**
SLI ALL	0.09	0.27	0.34	-0.44, 0.62	1.09	0.29	0.65, 1.85
SLI CAT5	0.60	0.38	1.55	-0.16, 1.35	1.82	0.68	0.87, 3.78
SLI CAT4	-0.14	0.15	-0.93	-0.42, 0.15	0.87	0.13	0.65, 1.18
SLI CAT3	**-0.26**	**0.08**	**-3.06**	**-0.42, -0.09**	**0.77**	**0.06**	**0.66, 0.91**
SLI CAT2	**-0.17**	**0.04**	**-4.35**	**-0.25, -0.10**	**0.84**	**0.03**	**0.78, 0.91**
SLI CAT1	**-0.09**	**0.02**	**-4.36**	**-0.12, -0.05**	**0.92**	**0.02**	**0.88, 0.95**
OHI ALL	**0.81**	**0.41**	**1.99**	**0.01, 1.61**	**2.25**	**0.78**	**1.14, 4.43**
OHI CAT5	1.06	0.64	1.65	-0.20, 2.32	2.88	1.71	0.90, 9.24
OHI CAT4	0.08	0.09	0.89	-0.10, 0.27	1.09	0.10	0.91, 1.30
OHI CAT3	-0.05	0.06	-0.75	-0.16, 0.07	0.96	0.06	0.85, 1.07
OHI CAT2	-0.03	0.04	-0.71	-0.11, 0.05	0.97	0.04	0.90, 1.05
OHI .CAT1	-0.04	0.02	-1.71	-0.08, 0.01	0.96	0.02	0.93, 1.00
AU ALL	0.17	0.16	1.03	-0.15, 0.49	1.18	0.18	0.88, 1.60
AU CAT5	-0.04	0.20	-0.19	-0.44, 0.36	0.96	0.18	0.66, 1.40
AU CAT4	-0.10	0.12	-0.87	-0.34, 0.13	0.90	0.11	0.71, 1.14
AU CAT3	0.07	0.09	0.72	-0.11, 0.25	1.07	0.10	0.90, 1.28
AU CAT2	-0.06	0.07	-0.87	-0.18, 0.07	0.95	0.06	0.83, 1.07
AU CAT1	**-0.13**	**0.02**	**-5.90**	**-0.17, 0.09**	**0.88**	**0.02**	**0.84, 0.92**
ID ALL	**0.80**	**0.20**	**4.06**	**0.41, 1.18**	**2.22**	**0.46**	**1.48, 3.33**
ID CAT5	0.06	0.16	0.38	-0.26, 0.38	1.06	0.17	0.78, 1.44
ID CAT4	-0.01	0.07	-0.19	-0.16, 0.13	0.99	0.07	0.86, 1.13
ID CAT3	0.05	0.06	0.81	-0.07, 0.17	1.05	0.06	0.93, 1.18
ID CAT2	-0.05	0.05	-0.96	-0.15, 0.05	0.95	0.05	0.86, 1.05
ID CAT1	0.02	0.02	0.76	-0.03, 0.06	1.02	0.02	0.97, 1.06
BD ALL	**1.64**	**0.37**	**4.38**	**0.91, 2.37**	**5.16**	**1.85**	**2.56, 10.40**
BD CAT5	**0.89**	**0.44**	**2.04**	**0.03, 1.75**	**2.44**	**0.98**	**1.11, 5.36**
BD CAT4	**0.39**	**0.15**	**2.56**	**0.09, 0.69**	**1.48**	**0.23**	**1.10, 2.00**
BD CAT3	**0.46**	**0.13**	**3.62**	**0.21, 0.70**	**1.58**	**0.19**	**1.25, 2.00**
BD CAT2	**0.21**	**0.08**	**2.69**	**0.06, 0.36**	**1.23**	**0.10**	**1.05, 1.44**
BD CAT1	0.01	0.02	0.33	-0.03, 0.06	1.01	0.02	0.97, 1.05
Oth. ALL	0.53	0.18	2.84	0.16, 0.89	1.69	0.30	1.19, 2.41
Oth. CAT5	0.25	0.24	1.04	-0.22, 0.72	1.28	0.31	0.80, 2.05
Oth. CAT4	0.00	0.10	-0.03	-0.19, 0.19	1.00	0.10	0.82, 1.21
Oth. CAT3	0.13	0.08	1.64	-0.03, 0.29	1.14	0.09	0.98, 1.34
Oth. CAT2	0.06	0.06	0.99	-0.06, 0.17	1.06	0.06	0.95, 1.18
Oth. CAT1	**-0.12**	**0.02**	**-5.83**	**-0.16, -0.08**	**0.89**	**0.02**	**0.86, 0.92**
SPED	**0.34**	**0.06**	**5.67**	**0.22, 0.45**	**1.40**	**0.08**	**1.26, 1.56**
Dual true	**0.22**	**0.05**	**4.35**	**0.12, 0.31**	**1.24**	**0.06**	**1.13, 1.37**
Dual test	0.13	0.09	1.44	-0.05, 0.31	1.14	0.11	0.95, 1.37
Test scores	**0.08**	**0.01**	**5.87**	**0.05, 0.11**	**1.08**	**0.01**	**1.06, 1.11**
First yr.	**0.71**	**0.04**	**19.61**	**0.64, 0.78**	**2.03**	**0.06**	**1.91, 2.16**
Second yr.	**0.55**	**0.04**	**15.42**	**0.48, 0.62**	**1.74**	**0.06**	**1.63, 1.85**
Third yr.	**0.63**	**0.03**	**18.27**	**0.56, 0.70**	**1.88**	**0.06**	**1.77, 2.00**
Thirty+ yr.	**1.43**	**0.04**	**32.52**	**1.35, 1.52**	**4.18**	**0.16**	**3.89, 4.51**

Table 24 (continued)
Full results for RQ2 Model 2 including teacher variables predicting total attrition.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
Out of state	1.03	0.12	8.51	**0.33, 0.43**	**1.46**	**0.03**	**1.40, 1.53**
TFA	0.31	0.03	10.83	**0.79, 1.26**	**2.80**	**0.28**	**2.30, 3.40**
Alt. entry	0.08	0.04	1.97	**0.25, 0.37**	**1.36**	**0.04**	**1.29, 1.44**
Unclass. entry	0.71	0.10	7.11	**0.00, 0.16**	**1.09**	**0.04**	**1.00, 1.18**
Visiting	-0.01	0.02	-0.45	**0.52, 0.91**	**2.04**	**0.19**	**1.69, 2.46**
Male	1.03	0.12	8.51	-0.06, 0.04	0.99	0.02	0.95, 1.04
Black	**0.11**	**0.03**	**3.28**	**0.04, 0.17**	**1.11**	**0.03**	**1.05, 1.18**
Asian	**0.22**	**0.10**	**2.17**	**0.02, 0.42**	**1.24**	**0.13**	**1.02, 1.52**
Hispanic	**0.29**	**0.07**	**4.10**	**0.15, 0.43**	**1.34**	**0.10**	**1.16, 1.54**
Native Am.	0.09	0.10	0.88	-0.11, 0.30	1.10	0.11	0.90, 1.33
Other race	**0.30**	**0.07**	**4.10**	**0.16, 0.44**	**1.35**	**0.10**	**1.16, 1.57**
English	**0.23**	**0.03**	**8.73**	**0.18, 0.28**	**1.25**	**0.03**	**1.19, 1.32**
Science	**0.13**	**0.03**	**4.45**	**0.08, 0.19**	**1.14**	**0.03**	**1.08, 1.21**
Math	**0.17**	**0.03**	**6.01**	**0.12, 0.23**	**1.19**	**0.03**	**1.13, 1.26**
Social studies	**0.07**	**0.03**	**2.68**	**0.02, 0.13**	**1.08**	**0.03**	**1.02, 1.14**
Other cert.	**0.05**	**0.02**	**2.26**	**0.01, 0.09**	**1.05**	**0.02**	**1.01, 1.09**
2010/11	**0.57**	**0.03**	**18.07**	**0.51, 0.63**	**1.77**	**0.05**	**1.68, 1.86**
2012/13	**0.96**	**0.04**	**22.47**	**0.88, 1.05**	**2.62**	**0.09**	**2.45, 2.79**
Intercept	**-3.23**	**0.07**	**-47.16**	**-3.36, -3.09**	**0.04**	**0.00**	**0.04, 0.04**
Variances							
Teacher	2.99	0.23					
School	0.44	0.04					
Log likelihood	-101039.6 (71)						
AIC	202221.2						
BIC	202960.7						
Observations	246,751						
Teachers	126,680						
Schools	2,310						

Note. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. LD= learning disabilities; SLI=speech/language impairments; OHI= other health impairments; AU= autism; ID= intellectual disabilities; BD= behavior disorders; Oth.= other disabilities. SE= Standard error; CI= confidence interval; OR= odds ratio. SPED= special education certification; TFA= Teach for America. SE= Standard error; CI= confidence interval; OR= odds ratio. Results in bold are statistically significant at, at least, $p<.05$.

Table 25
Full results for RQ2 Model 3 including teacher, classroom, and school variables predicting total attrition.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
LD ALL	0.06	0.27	0.22	-0.46, 0.58	1.06	0.27	0.64, 1.75
LD CAT5	0.07	0.19	0.38	-0.30, 0.45	1.08	0.21	0.73, 1.58
LD CAT4	-0.07	0.06	-1.02	-0.19, 0.06	0.94	0.06	0.83, 1.06
LD CAT3	-0.08	0.05	-1.69	-0.18, 0.01	0.92	0.04	0.84, 1.01
LD CAT2	-0.02	0.03	-0.78	-0.08, 0.04	0.98	0.03	0.92, 1.04
LD CAT1	**-0.08**	**0.02**	**-3.38**	**-0.13, -0.03**	**0.92**	**0.02**	**0.88, 0.96**
SLI ALL	0.29	0.27	1.07	-0.24, 0.82	1.34	0.35	0.79, 2.25
SLI CAT5	0.72	0.38	1.88	-0.03, 1.47	2.06	0.76	0.99, 4.26
SLI CAT4	-0.07	0.15	-0.47	-0.36. 0.22	0.93	0.14	0.69, 1.26
SLI CAT3	**-0.20**	**0.08**	**-2.44**	**-0.37, -0.04**	**0.81**	**0.07**	**0.69, 0.96**
SLI CAT2	**-0.12**	**0.04**	**-3.12**	**-0.20, -0.05**	**0.88**	**0.03**	**0.82, 0.95**
SLI CAT1	**-0.06**	**0.02**	**-2.84**	**-0.09, -0.02**	**0.95**	**0.02**	**0.91, 0.98**
OHI ALL	**0.79**	**0.41**	**1.93**	**-0.01, 1.58**	**2.19**	**0.75**	**1.12, 4.30**
OHI CAT5	0.97	0.64	1.52	-0.28, 2.21	2.63	1.55	0.83, 8.35
OHI CAT4	0.07	0.09	0.75	-0.11, 0.25	1.07	0.10	0.90, 1.28
OHI CAT3	-0.05	0.06	-0.92	-0.17, 0.06	0.95	0.06	0.84, 1.06
OHI CAT2	-0.03	0.04	-0.68	-0.11, 0.05	0.97	0.04	0.90, 1.06
OHI .CAT1	-0.02	0.02	-1.16	-0.07, 0.02	0.98	0.02	0.94, 1.02
AU ALL	0.15	0.17	0.88	-0.18, 0.47	1.16	0.18	0.85, 1.56
AU CAT5	-0.05	0.20	-0.24	-0.44, 0.35	0.95	0.18	0.66, 1.39
AU CAT4	-0.08	0.12	-0.65	-0.31, 0.16	0.92	0.11	0.73, 1.17
AU CAT3	0.10	0.09	1.07	-0.08, 0.28	1.10	0.10	0.93, 1.32
AU CAT2	-0.03	0.06	-0.48	-0.16, 0.10	0.97	0.06	0.85, 1.10
AU CAT1	**-0.10**	**0.02**	**-4.65**	**-0.14, -0.06**	**0.90**	**0.02**	**0.87, 0.94**
ID ALL	**0.60**	**0.20**	**3.09**	**0.22, 0.99**	**1.83**	**0.38**	**1.22, 2.74**
ID CAT5	-0.13	0.16	-0.78	-0.44, 0.19	0.88	0.14	0.65, 1.20
ID CAT4	**-0.17**	**0.08**	**-2.21**	**-0.31, -0.02**	**0.85**	**0.06**	**0.74, 0.97**
ID CAT3	-0.05	0.06	-0.91	-0.17, 0.06	0.95	0.06	0.84, 1.06
ID CAT2	**-0.12**	**0.05**	**-2.35**	**-0.22, -0.02**	**0.89**	**0.04**	**0.80, 0.98**
ID CAT1	-0.02	0.02	-0.96	-0.06, 0.02	0.98	0.02	0.94, 1.02
BD ALL	**1.39**	**0.37**	**3.74**	**0.66, 2.12**	**4.03**	**1.44**	**2.00, 8.10**
BD CAT5	0.67	0.43	1.53	-0.19, 1.52	1.95	0.77	0.89, 4.25
BD CAT4	0.26	0.15	1.70	-0.04, 0.56	1.30	0.20	0.96, 1.75
BD CAT3	**0.39**	**0.13**	**3.09**	**0.14, 0.63**	**1.47**	**0.18**	**1.17, 1.86**
BD CAT2	**0.15**	**0.08**	**1.98**	**0.00, 0.30**	**1.16**	**0.09**	**1.00, 1.36**
BD CAT1	-0.01	0.02	-0.58	-0.06, 0.03	0.99	0.02	0.95, 1.03
Oth. ALL	**0.45**	**0.18**	**2.46**	**0.09, 0.81**	**1.57**	**0.28**	**1.11, 2.24**
Oth. CAT5	0.21	0.23	0.91	-0.25, 0.67	1.24	0.30	0.78, 1.98
Oth. CAT4	-0.03	0.10	-0.35	-0.22, 0.16	0.97	0.10	0.80, 1.17
Oth. CAT3	0.13	0.08	1.67	-0.02, 0.29	1.14	0.09	0.98, 1.34
Oth. CAT2	0.06	0.06	1.04	-0.05, 0.17	1.06	0.06	0.95, 1.18
Oth. CAT1	**-0.11**	**0.02**	**-5.41**	**-0.15, -0.07**	**0.90**	**0.02**	**0.86, 0.93**
SPED	**0.32**	**0.06**	**5.49**	**0.21, 0.44**	**1.38**	**0.08**	**1.24, 1.54**
Dual true	**0.21**	**0.05**	**4.29**	**0.11, 0.31**	**1.24**	**0.06**	**1.13, 1.36**
Dual test	0.14	0.09	1.52	-0.04, 0.32	1.15	0.11	0.96, 1.38
Test scores	**0.08**	**0.01**	**6.13**	**0.06, 0.11**	**1.09**	**0.01**	**1.06, 1.12**
First yr.	**0.68**	**0.04**	**19.10**	**0.61, 0.75**	**1.98**	**0.06**	**1.86, 2.10**
Second yr.	**0.53**	**0.04**	**14.94**	**0.46, 0.60**	**1.69**	**0.06**	**1.59, 1.80**
Third yr.	**0.61**	**0.03**	**17.86**	**0.54, 0.68**	**1.84**	**0.06**	**1.73, 1.96**
Thirty+ yr.	**1.40**	**0.04**	**32.42**	**1.32, 1.49**	**4.07**	**0.15**	**3.79, 4.38**

Table 25 (continued)
Full results for RQ2 Model 3 including teacher, classroom, and school variables predicting total attrition.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
Out of state	**0.36**	**0.02**	**15.43**	**0.32, 0.41**	**1.44**	**0.03**	**1.38, 1.50**
TFA	**0.82**	**0.12**	**7.03**	**0.59, 1.04**	**2.26**	**0.22**	**1.86, 2.75**
Alt. entry	**0.26**	**0.03**	**9.40**	**0.21, 0.32**	**1.30**	**0.04**	**1.23, 1.37**
Unclass. entry	0.06	0.04	1.56	-0.02, 0.15	1.07	0.04	0.99, 1.15
Visiting	**0.60**	**0.10**	**6.11**	**0.41, 0.79**	**1.83**	**0.17**	**1.52, 2.20**
Male	-0.02	0.02	-0.82	-0.07, 0.03	0.98	0.02	0.94, 1.03
Black	-0.01	0.03	-0.44	-0.08, 0.05	0.99	0.03	0.93, 1.04
Asian	0.16	0.10	1.59	-0.04, 0.35	1.17	0.12	0.96, 1.43
Hispanic	**0.22**	**0.07**	**3.18**	**0.09, 0.36**	**1.25**	**0.09**	**1.09, 1.44**
Native Am.	0.01	0.11	0.14	-0.19, 0.22	1.02	0.10	0.83, 1.24
Other race	**0.24**	**0.07**	**3.34**	**0.10, 0.39**	**1.28**	**0.10**	**1.10, 1.48**
English	**0.20**	**0.03**	**7.79**	**0.15, 0.25**	1.22	0.03	1.16, 1.29
Science	**0.12**	**0.03**	**4.09**	**0.06, 0.18**	**1.13**	**0.03**	**1.07, 1.20**
Math	**0.15**	**0.03**	**5.17**	**0.09, 0.21**	**1.16**	**0.03**	**1.10, 1.23**
Social studies	**0.06**	**0.03**	**2.20**	**0.01, 0.11**	**1.06**	**0.03**	**1.01, 1.12**
Other cert.	0.01	0.02	0.55	-0.03, 006	1.01	0.02	0.97, 1.05
Avg. class % Asian	0.00	0.00	0.72	0.00, 0.01	1.00	0.00	1.00, 1.01
Avg. class % Black	**0.00**	**0.00**	**4.55**	**0.00, 0.01**	**1.00**	**0.00**	**1.00, 1.01**
Avg. class % Hisp.	**0.00**	**0.00**	**2.01**	**0.00, 0.00**	**1.00**	**0.00**	**1.00, 1.00**
Avg. class % Other	0.00	0.00	1.41	0.00, 0.01	1.00	0.00	1.00, 1.01
Avg. class size	**-0.01**	**0.00**	**-3.71**	**-0.01, 0.00**	**0.99**	**0.00**	**0.99, 1.00**
Avg. class % male	0.00	0.00	-0.94	0.00, 0.00	1.00	0.00	1.00, 1.00
Avg. class % gifted	**0.00**	**0.00**	**4.31**	**0.00, 0.00**	**1.00**	**0.00**	**1.00, 1.00**
Avg. class % FRL	**0.00**	**0.00**	**5.10**	**0.00, 0.01**	**1.00**	**0.00**	**1.00, 1.00**
Avg. class % EL	**0.00**	**0.00**	**2.25**	**0.00, 0.00**	**1.00**	**0.00**	**1.00, 1.01**
Avg. days absent	0.00	0.00	1.35	0.00, 0.01	1.00	0.00	1.00, 1.01
Middle school	0.07	0.06	1.22	-0.04, 0.18	1.07	0.06	0.97, 1.19
Elem./Mid. school	0.11	0.09	1.18	-0.07, 0.30	1.12	0.08	0.96, 1.30
High school	0.13	0.08	1.76	-0.02, 0.28	1.14	0.07	1.02, 1.28
Other school config.	0.31	0.16	1.94	0.00, 0.63	1.37	0.29	0.90, 2.08
City	0.04	0.06	0.62	-0.08, 0.15	1.04	0.06	0.92, 1.17
Town	**0.16**	**0.07**	**2.19**	**0.02, 0.31**	**1.17**	**0.08**	**1.03, 1.34**
Rural	**0.11**	**0.05**	**2.38**	**0.02, 0.21**	**1.12**	**0.06**	**1.01, 1.24**
Title 1	0.04	0.06	0.73	-0.07, 0.15	1.04	0.05	0.95, 1.14
Violent acts	**0.01**	**0.00**	**3.35**	**0.00, 0.02**	**1.01**	**0.00**	**1.01, 1.02**
Per pupil exp.	0.00	0.00	0.80	0.00, 0.00	1.00	0.00	1.00, 1.00
Exceeds exp.	0.02	0.04	0.49	-0.06, 0.10	1.02	0.04	0.95, 1.10
Not met exp.	0.08	0.05	1.61	-0.02, 0.19	1.09	0.05	0.99, 1.20
School % Asian	**0.01**	**0.00**	**2.35**	**0.00, 0.02**	**1.01**	**0.00**	**1.00, 1.02**
School % Black	**0.01**	**0.00**	**6.61**	**0.01, 0.01**	**1.01**	**0.00**	**1.01, 1.01**
School % Hisp.	0.00	0.00	0.27	0.00, 0.00	1.00	0.00	1.00, 1.00
School % Oth.	0.00	0.00	0.58	0.00, 0.01	1.00	0.00	1.00, 1.01
School % FRL	0.00	0.00	-0.97	0.00, 0.00	1.00	0.00	1.00, 1.00
2010/11	**0.54**	**0.03**	**17.41**	**0.48, 0.61**	**1.72**	**0.04**	**1.64, 1.81**
2012/13	**0.90**	**0.04**	**21.26**	**0.81, 0.98**	**2.45**	**0.08**	**2.30, 2.62**
Intercept	**-3.89**	**0.12**	**-32.84**	**-4.13, -3.66**	**0.02**	**0.00**	**0.02, 0.03**
Variances							
Teacher	2.84	0.22					
School	0.32	0.03					

Table 25 (continued)
Full results for RQ2 Model 3 including teacher, classroom, and school variables predicting total attrition.

Log likelihood	-100713.6 (98)
AIC	201623.1
BIC	202643.9
Observations	246,751
Teachers	127,581
Schools	2,310

Note. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. LD= learning disabilities; SLI=speech/language impairments; OHI= other health impairments; AU= autism; ID= intellectual disabilities; BD= behavior disorders; Oth.= other disabilities. SE= Standard error; CI= confidence interval; OR= odds ratio. SPED= special education certification; TFA= Teach for America. SE= Standard error; CI= confidence interval; OR= odds ratio; Avg.= average; exp= expectations; FRL=Free/reduced lunch. Results in bold are statistically significant at, at least, $p<.05$.

Table 26
Results for RQ2 Model 4 adding school fixed effects to Model 3 and removing school control variables predicting total attrition.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
LD ALL	0.15	0.22	0.71	-0.27, 0.58	1.17	0.25	0.76, 1.78
LD CAT5	0.08	0.15	0.50	-0.22, 0.37	1.08	0.16	0.80, 1.45
LD CAT4	-0.05	0.06	-0.91	-0.16, 0.06	0.95	0.05	0.85, 1.06
LD CAT3	-0.06	0.03	-2.08	-0.13. 0.00	0.94	0.03	0.88, 1.00
LD CAT2	**-0.01**	**0.03**	**-0.44**	**-0.06, 0.04**	**0.99**	**0.03**	**0.94, 1.04**
LD CAT1	**-0.07**	**0.02**	**-3.23**	**-0.11, -0.03**	**0.94**	**0.02**	**0.90, 0.97**
SLI ALL	0.31	0.23	1.36	-0.14, 0.76	1.37	0.32	0.87, 2.15
SLI CAT5	**0.61**	**0.30**	**2.06**	**0.03, 1.20**	**1.85**	**0.55**	**1.03, 3.32**
SLI CAT4	0.00	0.10	0.04	-0.19, 0.19	1.00	0.10	0.83, 1.21
SLI CAT3	**-0.18**	**0.07**	**-2.54**	**-0.31, -0.04**	**0.84**	**0.06**	**0.73, 0.96**
SLI CAT2	**-0.11**	**0.03**	**-3.53**	**-0.18, -0.05**	**0.89**	**0.03**	**0.84, 0.95**
SLI CAT1	**-0.05**	**0.02**	**-2.75**	**-0.09, -0.01**	**0.95**	**0.02**	**0.92, 0.99**
OHI ALL	**0.72**	**0.25**	**2.91**	**0.23, 1.20**	**2.05**	**0.51**	**1.26, 3.33**
OHI CAT5	0.89	0.46	1.93	-0.01, 1.79	2.43	1.11	0.99, 5.96
OHI CAT4	0.07	0.08	0.85	-0.09, 0.22	1.07	0.08	0.92, 1.25
OHI CAT3	-0.03	0.05	-0.57	-0.13, 0.07	0.97	0.05	0.88, 1.07
OHI CAT2	-0.02	0.03	-0.75	-0.08, 0.04	0.98	0.03	0.92, 1.04
OHI .CAT1	-0.01	0.01	-0.69	-0.04, 0.02	0.99	0.01	0.96, 1.02
AU ALL	0.14	0.12	1.18	-0.09, 0.37	1.15	0.13	0.91, 1.44
AU CAT5	-0.04	0.16	-0.24	-0.35, 0.28	0.96	0.15	0.70, 1.32
AU CAT4	-0.01	0.09	-0.15	-0.19, 0.17	0.99	0.09	0.82, 1.18
AU CAT3	0.08	0.07	1.15	-0.05, 0.21	1.08	0.07	0.95, 1.23
AU CAT2	-0.03	0.05	-0.63	-0.13, 0.06	0.97	0.05	0.88, 1.07
AU CAT1	**-0.08**	**0.01**	**-5.57**	**-0.11, -0.05**	**0.92**	**0.01**	**0.90, 0.95**
ID ALL	**0.49**	**0.13**	**3.82**	**0.24, 0.73**	**1.63**	**0.21**	**1.27, 2.08**
ID CAT5	-0.12	0.12	-1.02	-0.37, 0.12	0.88	0.11	0.69, 1.12
ID CAT4	-0.09	0.06	-1.49	-0.21, 0.03	0.91	0.06	0.81, 1.03
ID CAT3	-0.03	0.04	-0.65	-0.11, 0.06	0.97	0.04	0.90, 1.06
ID CAT2	**-0.09**	**0.04**	**-2.62**	**-0.16, -0.02**	**0.91**	**0.03**	**0.85, 0.98**
ID CAT1	-0.02	0.02	-1.05	-0.05, 0.01	0.98	0.02	0.95, 1.01
BD ALL	**1.07**	**0.30**	**3.55**	**0.48, 1.66**	**2.92**	**0.88**	**1.62, 5.28**
BD CAT5	0.44	0.30	1.49	-0.14, 1.03	1.56	0.46	0.87, 2.80
BD CAT4	0.19	0.12	1.59	-0.04, 0.42	1.20	0.14	0.96, 1.51
BD CAT3	**0.30**	**0.08**	**3.91**	**0.15, 0.45**	**1.35**	**0.10**	**1.16, 1.57**
BD CAT2	0.10	0.06	1.58	-0.02, 0.22	1.10	0.07	0.98, 1.25
BD CAT1	-0.01	0.02	-0.41	-0.04, 0.03	0.99	0.02	0.96, 1.03
Observations	246,399						
Teachers	127,266						
Schools	2,291						

Note. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. LD= learning disabilities; SLI=speech/language impairments; OHI= other health impairments; AU= autism; ID= intellectual disabilities; BD= behavior disorders. SE= Standard error; CI= confidence interval; OR= odds ratio. Model includes teacher and classroom controls. Results in bold are statistically significant at, at least, $p<.05$.

Table 27
Full results for RQ2 Model 1 predicting leaving.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
LD ALL	-0.02	0.37	-0.05	-0.75, 0.71	0.98	0.35	0.49, 1.97
LD CAT5	-0.10	0.27	-0.36	-0.63, 0.43	0.91	0.24	0.54, 1.54
LD CAT4	0.00	0.05	0.05	-0.15, 0.16	1.00	0.08	0.86, 1.17
LD CAT3	0.01	0.06	0.17	-0.11, 0.13	1.01	0.06	0.90, 1.14
LD CAT2	0.05	0.04	1.36	-0.03, 0.13	1.05	0.04	0.98, 1.14
LD CAT1	0.00	0.03	0.11	-0.05, 0.06	1.00	0.03	0.95, 1.06
SLI ALL	-0.55	0.40	-1.36	-1.33, 0.24	0.58	0.23	0.27, 1.25
SLI CAT5	0.15	0.53	0.28	-0.89, 1.18	1.16	0.59	0.43, 3.13
SLI CAT4	-0.35	0.21	-1.67	-0.76, 0.06	0.71	0.14	0.47, 1.05
SLI CAT3	**-0.29**	**0.11**	**-2.68**	**-0.49, -0.08**	**0.75**	**0.08**	**0.61, 0.93**
SLI CAT2	**-0.20**	**0.05**	**-3.98**	**-0.30, -0.10**	**0.82**	**0.04**	**0.75, 0.90**
SLI CAT1	**-0.12**	**0.02**	**-4.77**	**-0.16, -0.07**	**0.89**	**0.02**	**0.85, 0.93**
OHI ALL	-0.33	0.05	-0.63	-1.35, 0.70	0.72	0.38	0.26, 2.03
OHI CAT5	-0.47	0.98	-0.48	-2.39, 1.45	0.63	0.60	0.10, 4.13
OHI CAT4	0.07	0.12	0.58	-0.16, 0.30	1.07	0.13	0.85, 1.35
OHI CAT3	-0.07	0.08	-0.83	-0.22, 0.09	0.94	0.07	0.80, 1.09
OHI CAT2	-0.04	0.05	-0.79	-0.15, 0.06	0.96	0.05	0.86, 1.06
OHI .CAT1	0.01	0.03	0.46	-0.04, 0.06	1.01	0.03	0.96, 1.06
AU ALL	0.12	0.22	0.56	-0.30, 0.55	1.13	0.22	0.77, 1.66
AU CAT5	0.12	0.25	0.48	-0.37, 0.61	1.13	0.28	0.70, 1.82
AU CAT4	-0.26	0.16	-1.59	-0.57, 0.06	0.77	0.13	0.56, 1.07
AU CAT3	-0.07	0.13	-0.57	-0.32, 0.18	0.93	0.12	0.73, 1.19
AU CAT2	-0.07	0.08	-0.81	-0.23, 0.10	0.94	0.08	0.79, 1.11
AU CAT1	**-0.13**	**0.03**	**-4.78**	**-0.19, 0.08**	**0.88**	**0.02**	**0.83, 0.92**
ID ALL	0.51	0.27	1.87	-0.03, 1.05	1.67	0.45	0.98, 2.83
ID CAT5	-0.04	0.21	-0.21	-0.45, 0.36	0.96	0.20	0.64, 1.43
ID CAT4	-0.12	0.09	-1.27	-0.30, 0.06	0.89	0.08	0.75, 1.06
ID CAT3	0.00	0.08	0.04	-0.15, 0.15	1.00	0.08	0.86, 1.17
ID CAT2	-0.03	0.07	-0.50	-0.17, 0.10	0.97	0.06	0.85, 1.10
ID CAT1	-0.02	0.03	-0.71	-0.08, 0.04	0.98	0.03	0.93, 1.03
BD ALL	**0.97**	**0.48**	**2.04**	**0.04, 1.91**	**2.64**	**1.24**	**1.06, 6.62**
BD CAT5	0.03	0.61	0.05	-1.17, 1.23	1.03	0.62	0.32, 3.33
BD CAT4	0.16	0.20	0.79	-0.24, 0.55	1.17	0.24	0.78, 1.76
BD CAT3	0.21	0.17	1.23	-0.12, 0.53	1.23	0.20	0.89, 1.69
BD CAT2	**0.26**	**0.10**	**2.57**	**0.06, 0.46**	**1.30**	**0.13**	**1.06, 1.59**
BD CAT1	0.05	0.03	1.72	-0.01, 0.10	1.05	0.03	1.00, 1.11
Oth. ALL	-0.22	0.27	-0.83	-0.74, 0.30	0.80	0.21	0.48, 1.34
Oth. CAT5	0.10	0.30	0.32	-0.50, 0.69	1.10	0.35	0.59, 2.05
Oth. CAT4	**-0.38**	**0.14**	**-2.67**	**-0.66, -0.10**	**0.69**	**0.10**	**0.52, 0.90**
Oth. CAT3	0.03	0.11	0.28	-0.18, 0.24	1.03	0.11	0.83, 1.27
Oth. CAT2	-0.01	0.08	-0.19	-0.16, 0.13	0.99	0.08	0.85, 1.14
Oth. CAT1	**-0.12**	**0.03**	**-4.74**	**-0.17, -0.07**	**0.89**	**0.02**	**0.85, 0.93**
2010/11	**0.44**	**0.03**	**14.68**	**0.38, 0.50**	**1.55**	**0.05**	**1.47, 1.65**
2012/13	**0.74**	**0.04**	**19.02**	**0.67, 0.82**	**2.10**	**0.08**	**1.95, 2.26**
Intercept	**-3.89**	**0.08**	**-50.44**	**-4.04, -3.74**	**0.02**	**0.00**	**0.02, 0.02**
Variances							
Teacher	3.97	0.24					
School	0.25	0.02					

Table 27 (continued)
Full results for RQ2 Model 1 predicting leaving.

Log likelihood	-67912 (47)
AIC	135919.5
BIC	136400.00
Observations	246,751
Teachers	127,581
Schools	2,310

Note. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. LD= learning disabilities; SLI=speech/language impairments; OHI= other health impairments; AU= autism; ID= intellectual disabilities; BD= behavior disorders; Oth.= other disabilities. SE= Standard error; CI= confidence interval; OR= odds ratio. Results in bold are statistically significant at, at least, $p<.05$.

Table 28
Full results for RQ2 Model 2 including teacher variables predicting leaving.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
LD ALL	0.03	0.32	0.08	-0.60, 0.66	1.03	0.31	0.57, 1.86
LD CAT5	-0.01	0.24	-0.06	-0.48, 0.45	0.99	0.23	0.62, 1.57
LD CAT4	0.02	0.07	0.27	-0.13, 0.17	1.02	0.07	0.89, 1.18
LD CAT3	-0.03	0.05	-0.52	-0.13, 0.08	0.97	0.05	0.88, 1.08
LD CAT2	0.00	0.03	-0.09	-0.07, 0.06	1.00	0.03	0.93, 1.06
LD CAT1	-0.04	0.03	-1.46	-0.09, 0.01	0.96	0.02	0.92, 1.01
SLI ALL	-0.37	0.35	-1.06	-1.07, 0.32	0.69	0.23	0.35, 1.34
SLI CAT5	0.18	0.45	0.40	-0.70, 1.06	1.20	0.53	0.51, 2.83
SLI CAT4	-0.26	0.18	-1.47	-0.61, 0.09	0.77	0.14	0.54, 1.09
SLI CAT3	-0.17	0.09	-1.81	-0.35, 0.01	0.84	0.08	0.70, 1.01
SLI CAT2	**-0.10**	**0.04**	**-2.23**	**-0.18, -0.01**	**0.91**	**0.04**	**0.83, 0.99**
SLI CAT1	**-0.06**	**0.02**	**-3.06**	**-0.11, -0.02**	**0.94**	**0.02**	**0.90, 0.98**
OHI ALL	-0.11	0.46	-0.23	-1.00, 0.79	0.90	0.41	0.37, 2.20
OHI CAT5	-0.41	0.84	-0.49	-2.05, 1.23	0.66	0.57	0.12, 3.58
OHI CAT4	0.11	0.11	1.00	-0.10, 0.32	1.11	0.12	0.91, 1.37
OHI CAT3	-0.07	0.07	-0.94	-0.21, 0.07	0.94	0.06	0.82, 1.07
OHI CAT2	-0.04	0.05	-0.94	-0.14, 0.05	0.96	0.05	0.87, 1.05
OHI .CAT1	0.00	0.02	0.08	-0.04, 0.05	1.00	0.02	0.96, 1.05
AU ALL	0.16	0.19	0.85	-0.21, 0.53	1.17	0.20	0.84, 1.64
AU CAT5	0.17	0.22	0.79	-0.26, 0.60	1.19	0.25	0.78, 1.80
AU CAT4	-0.20	0.14	-1.38	-0.48, 0.08	0.82	0.12	0.62, 1.09
AU CAT3	-0.07	0.11	-0.61	-0.29, 0.15	0.93	0.10	0.76, 1.15
AU CAT2	-0.05	0.07	-0.74	-0.20, 0.09	0.95	0.07	0.82, 1.10
AU CAT1	-0.10	0.02	-4.14	-0.15, 0.05	0.91	0.02	0.86, 0.95
ID ALL	**0.51**	**0.23**	**2.23**	**0.06, 0.96**	**1.67**	**0.39**	**1.06, 2.64**
ID CAT5	0.00	0.19	0.00	-0.37, 0.37	1.00	0.19	0.70, 1.44
ID CAT4	0.01	0.09	0.10	-0.16, 0.18	1.01	0.08	0.86, 1.18
ID CAT3	0.06	0.07	0.81	-0.08, 0.19	1.06	0.07	0.92, 1.21
ID CAT2	-0.01	0.06	-0.25	-0.13, 0.10	0.99	0.06	0.88, 1.10
ID CAT1	0.01	0.02	0.23	-0.04, 0.05	1.01	0.02	0.96, 1.05
BD ALL	**0.98**	**0.40**	**2.45**	**0.20, 1.77**	**2.67**	**1.05**	**1.23, 5.77**
BD CAT5	0.31	0.52	0.59	-0.72, 1.34	1.37	0.69	0.51, 3.68
BD CAT4	0.19	0.17	1.10	-0.15, 0.53	1.21	0.21	0.85, 1.71
BD CAT3	0.22	0.14	1.52	-0.06, 0.50	1.25	0.18	0.94, 1.65
BD CAT2	**0.20**	**0.09**	**2.19**	**0.02, 0.38**	**1.22**	**0.11**	**1.02, 1.45**
BD CAT1	**0.05**	**0.02**	**2.07**	**0.00, 0.10**	**1.05**	**0.02**	**1.00, 1.10**
Oth. ALL	-0.12	0.23	-0.51	-0.57, 0.34	0.89	0.20	0.57, 1.39
Oth. CAT5	-0.41	0.84	-0.49	-2.05, 1.23	1.25	0.34	0.73, 2.13
Oth. CAT4	0.11	0.11	1.00	-0.10, 0.32	0.77	0.09	0.60, 0.98
Oth. CAT3	-0.07	0.07	-0.94	-0.21, 0.07	1.06	0.10	0.88, 1.27
Oth. CAT2	-0.04	0.05	-0.94	-0.14, 0.05	1.02	0.07	0.90, 1.16
Oth. CAT1	0.00	0.02	0.08	-0.04, 0.05	0.93	0.02	0.89, 0.97
SPED	0.01	0.06	0.15	-0.12, 0.14	1.01	0.06	0.89, 1.14
Dual true	-0.03	0.05	-0.61	-0.14, 0.07	0.97	0.05	0.87, 1.07
Dual test	**-0.26**	**0.11**	**-2.48**	**-0.47, -0.05**	**0.77**	**0.08**	**0.62, 0.95**
Test scores	**0.07**	**0.01**	**4.54**	**0.04, 0.09**	**1.07**	**0.02**	**1.04, 1.10**
First yr.	**0.66**	**0.04**	**17.88**	**0.59, 0.73**	**1.94**	**0.07**	**1.81, 2.07**
Second yr.	**0.69**	**0.04**	**18.89**	**0.62, 0.76**	**1.99**	**0.07**	**1.85, 2.13**
Third yr.	**0.78**	**0.04**	**21.13**	**0.71, 0.85**	**2.18**	**0.07**	**2.03, 2.33**
Thirty+ yr.	**1.88**	**0.05**	**39.63**	**1.79, 1.97**	**6.55**	**0.29**	**6.01, 7.13**

Table 28 (continued)
Full results for RQ2 Model 2 including teacher variables predicting leaving.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
Out of state	**0.60**	**0.03**	**23.61**	**0.55, 0.65**	**1.82**	**0.04**	**1.74, 1.91**
TFA	**1.85**	**0.10**	**17.68**	**1.64, 2.05**	**6.34**	**0.59**	**5.28, 7.62**
Alt. entry	**0.33**	**0.03**	**10.31**	**0.27, 0.39**	**1.39**	**0.04**	**1.31, 1.48**
Unclass. entry	**0.35**	**0.04**	**8.23**	**0.27, 0.44**	**1.42**	**0.06**	**1.31, 1.55**
Visiting	**1.10**	**0.10**	**11.46**	**0.91, 1.29**	**3.01**	**0.28**	**2.51, 3.60**
Male	-0.05	0.03	-1.83	-0.10, 0.00	0.95	0.02	0.91, 1.00
Black	0.03	0.03	1.04	-0.03, 0.09	1.03	0.03	0.97, 1.10
Asian	**0.29**	**0.10**	**2.86**	**0.09, 0.49**	**1.34**	**0.14**	**1.10, 1.63**
Hispanic	**0.17**	**0.08**	**2.26**	**0.02, 0.32**	**1.19**	**0.09**	**1.03, 1.38**
Native Am.	-0.01	0.10	-0.14	-0.21, 0.19	0.99	0.10	0.80, 1.21
Other race	**0.39**	**0.08**	**5.10**	**0.24, 0.54**	**1.48**	**0.12**	**1.27, 1.72**
English	**0.26**	**0.03**	**9.86**	**0.21, 0.31**	**1.29**	**0.03**	**1.23, 1.36**
Science	**0.18**	**0.03**	**5.84**	**0.12, 0.25**	**1.20**	**0.04**	**1.13, 1.28**
Math	**0.08**	**0.03**	**2.68**	**0.02, 0.14**	**1.08**	**0.03**	**1.02, 1.15**
Social studies	0.04	0.03	1.44	-0.01, 0.09	1.04	0.03	0.98, 1.10
Other cert.	-0.03	0.02	-1.39	-0.08, 0.01	0.97	0.02	0.93, 1.01
2010/11	**0.28**	**0.03**	**10.37**	**0.23, 0.33**	**1.32**	**0.03**	**1.26, 1.39**
2012/13	**0.49**	**0.03**	**15.16**	**0.43, 0.56**	**1.64**	**0.05**	**1.54, 1.74**
Intercept	**-3.84**	**0.08**	**-49.14**	**-3.99, -3.68**	**0.02**	**0.00**	**0.02, 0.02**
Variances							
Teacher	1.54	0.18					
School	0.10	0.01					
Log likelihood	-65148.06 (71)						
AIC	130438.1						
BIC	131177.7						
Observations	246,751						
Teachers	127,581						
Schools	2,310						

Note. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. LD= learning disabilities; SLI=speech/language impairments; OHI= other health impairments; AU= autism; ID= intellectual disabilities; BD= behavior disorders; Oth.= other disabilities. SE= Standard error; CI= confidence interval; OR= odds ratio. SPED= special education certification; TFA= Teach for America. Results in bold are statistically significant at, at least, $p<.05$.

Table 29
Full results for RQ2 Model 3 including teacher, classroom, and school variables predicting leaving.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
LD ALL	-0.04	0.33	-0.13	-0.68, 0.60	0.96	0.29	0.53, 1.75
LD CAT5	-0.04	0.24	-0.16	-0.51, 0.43	0.96	0.23	0.60, 1.53
LD CAT4	-0.02	0.08	-0.27	-0.17, 0.13	0.98	0.07	0.85, 1.13
LD CAT3	-0.07	0.05	-1.27	-0.18, 0.04	0.93	0.05	0.84, 1.04
LD CAT2	-0.05	0.03	-1.37	-0.11, 0.02	0.95	0.03	0.89, 1.02
LD CAT1	**-0.07**	**0.03**	**-2.63**	**-0.12, -0.02**	**0.93**	**0.02**	**0.89, 0.98**
SLI ALL	-0.03	0.35	-0.09	-0.72, 0.66	0.97	0.33	0.50, 1.89
SLI CAT5	0.35	0.45	0.78	-0.53, 1.23	1.42	0.62	0.60, 3.36
SLI CAT4	-0.12	0.18	-0.69	-0.47, 0.22	0.88	0.16	0.62, 1.26
SLI CAT3	-0.10	0.09	-1.07	-0.29, 0.08	0.90	0.08	0.75, 1.09
SLI CAT2	-0.05	0.04	-1.07	-0.13, 0.04	0.95	0.04	0.88, 1.04
SLI CAT1	-0.03	0.02	-1.40	-0.07, 0.01	0.97	0.02	0.93, 1.01
OHI ALL	-0.04	0.46	-0.08	-0.94, 0.87	0.96	0.44	0.39, 2.37
OHI CAT5	-0.43	0.84	-0.51	-2.07, 1.22	0.65	0.56	0.12, 3.53
OHI CAT4	0.14	0.11	1.27	-0.07, 0.35	1.15	0.12	0.93, 1.41
OHI CAT3	-0.06	0.07	-0.82	-0.20, 0.08	0.94	0.07	0.82, 1.08
OHI CAT2	-0.04	0.05	-0.86	-0.13, 0.05	0.96	0.05	0.87, 1.06
OHI .CAT1	0.00	0.02	-0.09	-0.05, 0.04	1.00	0.02	0.95, 1.04
AU ALL	0.21	0.19	1.07	-0.17, 0.58	1.23	0.21	0.87, 1.73
AU CAT5	0.22	0.22	0.99	-0.21, 0.65	1.24	0.26	0.82, 1.89
AU CAT4	-0.12	0.14	-0.84	-0.40, 0.16	0.89	0.13	0.67, 1.18
AU CAT3	-0.01	0.11	-0.05	-0.23, 0.22	0.99	0.11	0.80, 1.23
AU CAT2	-0.01	0.07	-0.13	-0.15, 0.13	0.99	0.08	0.85, 1.15
AU CAT1	**-0.07**	**0.02**	**-2.96**	**-0.12, -0.02**	**0.93**	**0.02**	**0.89, 0.97**
ID ALL	0.39	0.23	1.67	-0.07, 0.85	1.48	0.35	0.93, 2.34
ID CAT5	-0.16	0.19	-0.83	-0.52, 0.21	0.85	0.16	0.59, 1.23
ID CAT4	-0.12	0.09	-1.37	-0.29, 0.05	0.89	0.07	0.75, 1.04
ID CAT3	-0.04	0.07	-0.63	-0.18, 0.09	0.96	0.07	0.84, 1.10
ID CAT2	-0.09	0.06	-1.54	-0.21, 0.02	0.91	0.05	0.82, 1.02
ID CAT1	-0.04	0.02	-1.80	-0.09, 0.00	0.96	0.02	0.91, 1.00
BD ALL	**0.83**	**0.40**	**2.06**	**0.04, 1.63**	**2.30**	**0.91**	**1.06, 4.99**
BD CAT5	0.18	0.52	0.35	-0.84, 1.21	1.20	0.61	0.45, 3.23
BD CAT4	0.13	0.18	0.71	-0.22, 0.47	1.13	0.20	0.80, 1.61
BD CAT3	0.17	0.15	1.20	-0.11, 0.46	1.19	0.17	0.90, 1.57
BD CAT2	0.14	0.09	1.61	-0.03, 0.32	1.16	0.10	0.97, 1.38
BD CAT1	0.01	0.02	0.58	-0.03, 0.06	1.01	0.02	0.97, 1.06
Oth. ALL	-0.08	0.23	-0.35	-0.54, 0.37	0.92	0.21	0.59, 1.44
Oth. CAT5	0.26	0.26	1.00	-0.25, 0.77	1.30	0.36	0.76, 2.22
Oth. CAT4	-0.23	0.13	-1.86	-0.48, 0.01	0.79	0.10	0.62, 1.01
Oth. CAT3	0.10	0.09	1.03	-0.09, 0.28	1.10	0.10	0.91, 1.33
Oth. CAT2	0.02	0.07	0.37	-0.10, 0.15	1.02	0.07	0.90, 1.17
Oth. CAT1	**-0.07**	**0.02**	**-3.15**	**-0.11, -0.03**	**0.93**	**0.02**	**0.89, 0.97**
SPED	0.04	0.06	0.62	-0.09, 0.17	1.04	0.07	0.92, 1.18
Dual true	-0.01	0.05	-0.23	-0.12, 0.09	0.99	0.05	0.89, 1.09
Dual test	**-0.23**	**0.11**	**-2.20**	**-0.44, -0.03**	**0.79**	**0.09**	**0.64, 0.98**
Test scores	**0.07**	**0.01**	**5.04**	**0.04, 0.10**	**1.08**	**0.02**	**1.05, 1.11**
First yr.	**0.61**	**0.04**	**16.53**	**0.54, 0.68**	**1.84**	**0.06**	**1.73, 1.97**
Second yr.	**0.65**	**0.04**	**17.87**	**0.58, 0.72**	**1.91**	**0.07**	**1.78, 2.05**
Third yr.	**0.74**	**0.04**	**20.30**	**0.67, 0.82**	**2.11**	**0.07**	**1.97, 2.25**
Thirty+ yr.	**1.87**	**0.05**	**39.84**	**1.78, 1.96**	**6.48**	**0.28**	**5.96, 7.06**

Table 29 (continued)
Full results for RQ2 Model 3 including teacher, classroom, and school variables predicting leaving.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
Out of state	**0.58**	**0.03**	**23.04**	**0.53, 0.63**	**1.79**	**0.04**	**1.71, 1.87**
TFA	**1.60**	**0.10**	**15.83**	**1.40, 1.80**	**4.97**	**0.46**	**4.15, 5.95**
Alt. entry	**0.28**	**0.03**	**8.85**	**0.22, 0.35**	**1.33**	**0.04**	**1.25, 1.41**
Unclass. entry	**0.34**	**0.04**	**7.94**	**0.26, 0.42**	**1.40**	**0.06**	**1.29, 1.53**
Visiting	**1.02**	**0.10**	**10.56**	**0.83, 1.21**	**2.77**	**0.25**	**2.31, 3.31**
Male	**-0.06**	**0.03**	**-2.39**	**-0.11, -0.01**	**0.94**	**0.02**	**0.89, 0.99**
Black	**-0.11**	**0.03**	**-3.39**	**-0.18, -0.05**	**0.89**	**0.03**	**0.84, 0.95**
Asian	**0.21**	**0.10**	**2.12**	**0.02, 0.41**	**1.24**	**0.13**	**1.02, 1.51**
Hispanic	0.11	0.08	1.47	-0.04, 0.26	1.12	0.08	0.97, 1.30
Native Am.	-0.13	0.11	-1.19	-0.35, 0.09	0.88	0.10	0.71, 1.09
Other race	**0.33**	**0.08**	**4.28**	**0.18, 0.48**	**1.39**	**0.11**	**1.19, 1.62**
English	**0.24**	**0.03**	**9.17**	**0.19, 0.29**	**1.27**	**0.03**	**1.21, 1.34**
Science	**0.17**	**0.03**	**5.52**	**0.11, 0.24**	**1.19**	**0.04**	**1.12, 1.27**
Math	0.06	0.03	1.95	0.00, 0.12	1.06	0.03	1.00, 1.13
Social studies	0.03	0.03	1.14	-0.02, 0.09	1.03	0.03	0.98, 1.09
Other cert.	-0.03	0.02	-1.26	-0.08, 0.02	0.97	0.02	0.93, 1.01
Avg. class % Asian	0.00	0.00	1.29	0.00, 0.01	1.00	0.00	1.00, 1.01
Avg. class % Black	**0.00**	**0.00**	**3.94**	**0.00, 0.01**	**1.00**	**0.00**	**1.00, 1.01**
Avg. class % Hisp.	0.00	0.00	1.09	0.00, 0.00	1.00	0.00	1.00, 1.00
Avg. class % Other	0.00	0.00	0.95	0.00, 0.00	1.00	0.00	1.00, 1.00
Avg. class size	**0.01**	**0.00**	**3.39**	**0.00, 0.01**	**1.01**	**0.00**	**1.00, 1.01**
Avg. class % male	0.00	0.00	-0.50	0.00, 0.00	1.00	0.00	1.00, 1.00
Avg. class % gifted	0.00	0.00	-0.42	0.00, 0.00	1.00	0.00	1.00, 1.00
Avg. class % FRL	**0.00**	**0.00**	**5.83**	**0.00, 0.01**	**1.00**	**0.00**	**1.00, 1.01**
Avg. class % EL	0.00	0.00	1.12	0.00, 0.00	1.00	0.00	1.00, 1.00
Avg. days absent	0.00	0.00	0.77	0.00, 0.01	1.00	0.00	1.00, 1.01
Middle school	0.02	0.04	0.61	-0.05, 0.10	1.02	0.04	0.95, 1.11
Elem./Mid. school	0.05	0.06	0.89	-0.06, 0.17	1.05	0.06	0.94, 1.18
High school	**0.14**	**0.05**	**3.07**	**0.05, 0.23**	**1.15**	**0.05**	**1.05, 1.26**
Other school config.	**0.48**	**0.17**	**2.84**	**0.15, 0.81**	**1.61**	**0.31**	**1.11, 2.36**
City	-0.01	0.04	-0.25	-0.09, 0.07	0.99	0.04	0.91, 1.08
Town	0.04	0.05	0.78	-0.06, 0.13	1.04	0.05	0.95, 1.14
Rural	0.04	0.04	1.21	-0.03, 0.12	1.05	0.04	0.97, 1.12
Title 1	0.05	0.04	1.48	-0.02, 0.13	1.06	0.04	0.98, 1.13
Violent acts	**0.01**	**0.00**	**2.90**	**0.00, 0.00**	**1.01**	**0.00**	**1.00, 1.01**
Per pupil exp.	0.00	0.00	0.05	0.00, 0.00	1.00	0.00	1.00, 1.00
Exceeds exp.	-0.04	0.03	-1.46	-0.09, 0.01	0.96	0.03	0.91, 1.01
Not met exp.	0.00	0.04	-0.05	-0.07, 0.07	1.00	0.04	0.93, 1.07
School % Asian	0.00	0.00	-0.32	-0.01, 0.01	1.00	0.00	0.99, 1.01
School % Black	**0.01**	**0.00**	**5.51**	**0.00, 0.01**	**1.01**	**0.00**	**1.00, 1.01**
School % Hisp.	0.00	0.00	1.14	0.00, 0.00	1.00	0.00	1.00, 1.01
School % Oth.	0.00	0.00	1.46	0.00, 0.01	1.00	0.00	1.00, 1.01
School % FRL	**0.00**	**0.00**	**-5.00**	**-0.01, 0.00**	**1.00**	**0.00**	**0.99, 1.00**
2010/11	**0.27**	**0.03**	**10.04**	**0.21, 0.32**	**1.31**	**0.03**	**1.24, 1.37**
2012/13	**0.50**	**0.03**	**14.78**	**0.43, 0.56**	**1.64**	**0.05**	**1.55, 1.74**
Intercept	**-4.27**	**0.12**	**-36.92**	**-4.49, -4.04**	**0.01**	**0.00**	**0.01, 0.02**
Variances							
Teacher	1.51	0.17					
School	0.06	0.01					

Table 29 (continued)
Full results for RQ2 Model 3 including teacher, classroom, and school variables predicting leaving.

Log likelihood	-64916.15 (98)
AIC	130028.3
BIC	131049.1
Observations	246,751
Teachers	127,581
Schools	2,310

Note. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. LD= learning disabilities; SLI=speech/language impairments; OHI= other health impairments; AU= autism; ID= intellectual disabilities; BD= behavior disorders; Oth.= other disabilities. SE= Standard error; CI= confidence interval; OR= odds ratio. SPED= special education certification; TFA= Teach for America. Avg.= average; exp= expectations; FRL=Free/reduced lunch. Results in bold are statistically significant at, at least, $p<.05$.

Table 30
Results for RQ2 Model 4 adding school fixed effects to Model 3 and removing school control variables predicting leaving.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
LD ALL	0.05	0.37	0.13	-0.67, 0.77	1.05	0.39	0.51, 2.16
LD CAT5	-0.05	0.21	-0.21	-0.47, 0.37	0.96	0.20	0.63, 1.45
LD CAT4	-0.03	0.07	-0.35	-0.17, 0.12	0.97	0.07	0.84, 1.13
LD CAT3	-0.07	0.05	-1.44	-0.16, 0.02	0.93	0.04	0.85, 1.03
LD CAT2	-0.04	0.03	-1.26	-0.10, 0.02	0.96	0.03	0.90, 1.02
LD CAT1	**-0.06**	**0.03**	**-2.36**	**-0.12, -0.01**	**0.94**	**0.03**	**0.89, 0.99**
SLI ALL	0.06	0.37	0.15	-0.67, 0.78	1.06	0.39	0.51, 2.18
SLI CAT5	0.42	0.40	1.05	-0.36, 1.20	1.52	0.61	0.70, 3.33
SLI CAT4	-0.08	0.13	-0.60	-0.33, 0.18	0.92	0.12	0.72, 1.20
SLI CAT3	-0.10	0.09	-1.09	-0.27, 0.08	0.91	0.08	0.76, 1.08
SLI CAT2	-0.05	0.04	-1.19	-0.14, 0.03	0.95	0.04	0.87, 1.03
SLI CAT1	**-0.04**	**0.02**	**-2.01**	**-0.08, 0.00**	**0.96**	**0.02**	**0.92, 1.00**
OHI ALL	0.04	0.47	0.08	-0.88, 0.95	1.04	0.48	0.42, 2.59
OHI CAT5	-0.24	4.85	-0.05	-9.76, 9.27	0.78	3.80	0.00, .
OHI CAT4	0.17	0.09	1.88	-0.01, 0.34	1.18	0.10	0.99, 1.40
OHI CAT3	-0.03	0.07	-0.39	-0.16, 0.10	0.97	0.06	0.85, 1.11
OHI CAT2	-0.03	0.05	-0.53	-0.12, 0.07	0.97	0.05	0.89, 1.07
OHI .CAT1	0.00	0.02	0.18	-0.04, 0.04	1.00	0.02	0.97, 1.04
AU ALL	0.26	0.17	1.55	-0.07, 0.59	1.30	0.22	0.93, 1.80
AU CAT5	0.21	0.18	1.11	-0.16, 0.57	1.23	0.23	0.85, 1.76
AU CAT4	-0.07	0.14	-0.51	-0.34, 0.20	0.93	0.13	0.71, 1.22
AU CAT3	0.03	0.11	0.24	-0.19, 0.24	1.03	0.11	0.83, 1.28
AU CAT2	-0.01	0.06	-0.11	-0.120.11	0.99	0.06	0.89, 1.12
AU CAT1	**-0.06**	**0.02**	**-3.38**	**-0.10, -0.03**	**0.94**	**0.02**	**0.90, 0.97**
ID ALL	0.36	0.20	1.75	-0.04, 0.76	1.43	0.29	0.96, 2.13
ID CAT5	-0.17	0.19	-0.90	-0.53, 0.20	0.85	0.16	0.59, 1.22
ID CAT4	-0.08	0.09	-0.97	-0.25, 0.09	0.92	0.08	0.77, 1.09
ID CAT3	-0.03	0.05	-0.56	-0.13, 0.07	0.97	0.05	0.87, 1.08
ID CAT2	-0.09	0.05	-1.89	-0.17, 0.00	0.92	0.04	0.84, 1.00
ID CAT1	**-0.05**	**0.02**	**-2.11**	**-0.09, 0.00**	**0.96**	**0.02**	**0.92, 1.00**
BD ALL	0.75	0.46	1.62	-0.16, 1.65	2.11	0.97	0.86, 5.22
BD CAT5	0.19	0.40	0.46	-0.61, 0.98	1.21	0.49	0.55, 2.66
BD CAT4	0.10	0.17	0.63	-0.22, 0.43	1.11	0.18	0.80, 1.54
BD CAT3	0.17	0.12	1.34	-0.08, 0.41	1.18	0.15	0.93, 1.51
BD CAT2	0.13	0.07	1.80	-0.01, 0.27	1.14	0.08	0.99, 1.31
BD CAT1	0.01	0.02	0.63	-0.03, 0.06	1.01	0.02	0.97, 1.06
Observations	246,399						
Teachers	127,266						
Schools	2,291						

Note. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. LD= learning disabilities; SLI=speech/language impairments; OHI= other health impairments; AU= autism; ID= intellectual disabilities; BD= behavior disorders; Oth.= other disabilities. SE= Standard error; CI= confidence interval; OR= odds ratio. Model includes teacher and classroom variables. Results in bold are statistically significant at, at least, $p<.05$.

Table 31
Interaction results for RQ3 predicting total attrition with SWDs grouped together.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
SPEDxAll	**-2.63**	**0.24**	**-11.05**	**-3.10, -2.16**	**0.07**	**0.02**	**0.05, 0.11**
SPEDxCAT5	**-2.26**	**0.26**	**-8.60**	**-2.78, -1.75**	**0.10**	**0.03**	**0.06, 0.17**
SPEDxCAT4	**-1.93**	**0.23**	**-8.22**	**-2.39, -1.47**	**0.15**	**0.03**	**0.09, 0.23**
SPEDxCAT3	**-1.81**	**0.30**	**-6.01**	**-2.40, -1.22**	**0.16**	**0.05**	**0.09, 0.29**
SPEDxCAT2	**-1.54**	**0.27**	**-5.63**	**-2.08, -1.01**	**0.21**	**0.06**	**0.13, 0.36**
SPEDxCAT1	**-0.97**	**0.27**	**-3.60**	**-1.50, -0.44**	**0.38**	**0.10**	**0.22, 0.65**
DUALxAll	**-1.02**	**0.20**	**-5.09**	**-1.41, -0.63**	**0.36**	**0.07**	**0.25, 0.53**
DUALxCAT5	**-0.67**	**0.23**	**-2.96**	**-1.12, -0.23**	**0.51**	**0.12**	**0.33, 0.80**
DUALxCAT4	-0.25	0.21	-1.22	-0.65, 0.15	0.78	0.16	0.53, 1.15
DUALxCAT3	-0.14	0.19	-0.73	-0.51, 0.23	0.87	0.16	0.60, 1.26
DUALxCAT2	-0.23	0.17	-1.39	-0.55, 0.09	0.80	0.13	0.58, 1.10
DUALxCAT1	**-0.31**	**0.16**	**-1.96**	**-0.62, 0.00**	**0.73**	**0.11**	**0.54, 1.00**
TESTxAll	**-1.37**	**0.38**	**-3.63**	**-2.11, -0.63**	**0.25**	**0.10**	**0.12, 0.54**
TESTxCAT5	**-1.10**	**0.40**	**-2.76**	**-1.88, -0.32**	**0.33**	**0.14**	**0.15, 0.75**
TESTxCAT4	-0.04	0.42	-0.08	-0.87, 0.80	0.97	0.42	0.41, 2.29
TESTxCAT3	-0.37	0.44	-0.83	-1.24, 0.50	0.69	0.31	0.29, 1.67
TESTxCAT2	-0.05	0.39	-0.12	-0.82, 0.72	0.96	0.40	0.42, 2.16
TESTxCAT1	-0.18	0.40	-0.45	-0.95, 0.60	0.84	0.34	0.38, 1.87
ALL	0.76	0.13	5.76	0.50, 1.01	2.13	0.28	1.65, 2.74
CAT5	0.19	0.16	1.15	-0.13, 0.51	1.21	0.20	0.87, 1.67
CAT4	-0.09	0.07	-1.36	-0.22, 0.04	0.91	0.06	0.80, 1.04
CAT3	**-0.29**	**0.04**	**-7.53**	**-0.36, -0.21**	**0.75**	**0.03**	**0.70, 0.80**
CAT2	**-0.25**	**0.03**	**-7.75**	**-0.31, -0.19**	**0.78**	**0.02**	**0.74, 0.83**
CAT1	**-0.24**	**0.03**	**-7.89**	**-0.30, -0.18**	**0.79**	**0.02**	**0.75, 0.83**
SPED	**2.02**	**0.19**	**10.39**	**1.64, 2.41**	**7.57**	**1.41**	**5.26, 10.90**
Dual cert.	**0.40**	**0.14**	**2.95**	**0.13, 0.67**	**1.49**	**0.20**	**1.15, 1.94**
Test dual cert.	0.49	0.32	1.52	-0.14, 1.13	1.64	0.56	0.84, 3.20
Intercept	**-3.82**	**0.12**	**-32.75**	**-4.05, -3.59**	**0.02**	**0.00**	**0.02, 0.03**
Variances							
Teacher	2.72	-.21					
School	0.32	0.03					
Log likelihood	-100682.5 (80)						
AIC	201525.0						
BIC	202358.3						
Observations	246,751						
Teachers	127,581						
Schools	2,310						

Note. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. SPED= special education certification; DUAL= dual certification; TEST= test dual certification. SE= Standard error; CI= confidence interval; OR= odds ratio. Teacher, classroom, and school controls were included in the model but are not reported here for parsimony. Results in bold are statistically significant at, at least, $p<.05$.

Table 32
Interaction results for RQ3 predicting leaving with SWDs grouped together.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
SPEDxAll	-0.40	0.28	-1.45	-0.95, 0.14	0.67	0.19	0.38, 1.16
SPEDxCAT5	-0.24	0.31	-0.75	-0.85, 0.38	0.79	0.25	0.43, 1.47
SPEDxCAT4	**-0.60**	**0.28**	**-2.16**	**-1.15, -0.06**	**0.55**	**0.15**	**0.32, 0.94**
SPEDxCAT3	-0.56	0.38	-1.46	-1.31, 0.19	0.57	0.22	0.27, 1.20
SPEDxCAT2	-0.55	0.35	-1.60	-1.23, 0.12	0.58	0.20	0.29, 1.14
SPEDxCAT1	0.07	0.34	0.21	-0.60, 0.74	1.07	0.35	0.56, 2.04
DUALxAll	-0.14	0.23	-0.61	-0.60, 0.31	0.87	0.20	0.55, 1.36
DUALxCAT5	-0.16	0.28	-0.58	-0.70, 0.38	0.85	0.24	0.50, 1.47
DUALxCAT4	-0.32	0.24	-1.32	-0.79, 0.15	0.73	0.17	0.46, 1.15
DUALxCAT3	-0.03	0.23	-0.12	-0.47, 0.41	0.97	0.21	0.64, 1.49
DUALxCAT2	-0.01	0.19	-0.04	-0.38, 0.36	0.99	0.18	0.69, 1.43
DUALxCAT1	-0.31	0.19	-1.65	-0.68, 0.06	0.73	0.13	0.52, 1.05
TESTxAll	-0.21	0.48	-0.43	-1.16, 0.74	0.81	0.39	0.32, 2.08
TESTxCAT5	-0.24	0.52	-0.47	-1.26, 0.77	0.78	0.41	0.28, 2.17
TESTxCAT4	-0.09	0.56	-0.17	-1.19, 1.01	0.91	0.50	0.31, 2.70
TESTxCAT3	0.09	0.55	0.16	-1.00, 1.17	1.09	0.60	0.37, 3.19
TESTxCAT2	-0.19	0.53	-0.37	-1.23, 0.84	0.82	0.44	0.29, 2.32
TESTxCAT1	0.15	0.50	0.31	-0.82, 1.13	1.17	0.58	0.44, 3.10
ALL	0.01	0.16	0.04	-0.31, 0.32	1.01	0.16	0.73, 1.39
CAT5	-0.25	0.21	-1.21	-0.66, 0.15	0.78	0.16	0.52, 1.18
CAT4	-0.01	0.07	-0.10	-0.15, 0.14	0.99	0.07	0.86, 1.14
CAT3	**-0.20**	**0.04**	**-4.90**	**-0.28, -0.12**	**0.82**	**0.03**	**0.76, 0.89**
CAT2	**-0.15**	**0.03**	**-4.40**	**-0.22, -0.08**	**0.86**	**0.03**	**0.81, 0.92**
CAT1	**-0.10**	**0.03**	**-3.11**	**-0.16, -0.04**	**0.91**	**0.03**	**0.85, 0.96**
SPED	0.36	0.22	1.60	-0.08, 0.79	1.43	0.32	0.92, 2.23
Dual cert.	0.11	0.16	0.72	-0.19, 0.42	1.12	0.17	0.83, 1.50
Test dual cert.	-0.13	0.42	-0.31	-0.96, 0.70	0.88	0.37	0.38, 2.00
Intercept	**-4.25**	**0.12**	**-36.24**	**-4.48, -4.02**	**0.01**	**0.00**	**0.01, 0.02**
Variances							
Teacher	1.51	0.17					
School	0.06	0.01					
Log likelihood	-100682.5 (80)						
AIC	201525.0						
BIC	202358.3						
Observations	246,751						
Teachers	127,581						
Schools	2,310						

Note. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. SPED= special education certification; DUAL= dual certification; TEST= test dual certification. SE= Standard error; CI= confidence interval; OR= odds ratio. Teacher, classroom, and school controls were included in the model but are not reported here for parsimony. Results in bold are statistically significant at, at least, $p<.05$.

Table 33
Results from separate models for each teacher category RQ3 predicting total attrition for categories of the average percentage of students with learning disabilities in teacher's classes.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
SPED Int.	**-2.90**	**0.45**	**-6.48**	**-3.78, -2.02**	**0.06**	**0.02**	**0.02, 0.13**
ALL LD	-0.80	0.45	-1.77	-1.69, 0.09	0.45	0.20	0.18, 1.09
CAT5 LD	**-1.00**	**0.30**	**-3.31**	**-1.60. -0.41**	**0.37**	**0.11**	**0.20, 0.66**
CAT4 LD	**-0.56**	**0.14**	**-4.11**	**-0.82, -0.29**	**0.57**	**0.08**	**0.44, 0.75**
CAT3 LD	**-0.42**	**0.13**	**-3.33**	**-0.67, -0.17**	**0.65**	**0.08**	**0.51, 0.84**
CAT2 LD	**-0.39**	**0.14**	**-2.72**	**-0.67. -0.11**	**0.68**	**0.10**	**0.51, 0.90**
CAT1 LD	-0.19	0.15	-1.34	-0.48, 0.09	0.82	0.12	0.62, 1.09
Teacher var.	3.72	1.15					
School var.	0.20	0.09					
Teachers	7,818						
Dual Int.	**-3.24**	**0.66**	**-4.93**	**-4.53, -1.95**	**0.04**	**0.03**	**0.01, 0.14**
ALL LD	-0.91	0.67	-1.35	-2.22, 0.41	0.40	0.27	0.11, 1.50
CAT5 LD	0.31	0.37	0.85	-0.41, 1.03	1.36	0.50	0.67, 2.80
CAT4 LD	-0.18	0.17	-1.08	-0.51, 0.15	0.84	0.14	0.60, 1.16
CAT3 LD	-0.20	0.16	-1.24	-0.50, 0.11	0.82	0.13	0.60, 1.12
CAT2 LD	-0.06	0.14	-0.43	-0.34, 0.22	0.94	0.14	0.71, 1.25
CAT1 LD	-0.13	0.13	-1.01	-0.37, 0.12	0.88	0.11	0.69, 1.13
Teacher var.	4.45	2.08					
School var.	0.10	0.23					
Teachers	6,238						
Test Int.	**-3.31**	**1.01**	**-3.28**	**-5.28, -1.33**	**0.04**	**0.04**	**0.01, 0.26**
ALL LD	-1.10	1.33	-0.82	-3.71, 1.52	0.33	0.45	0.02, 4.56
CAT5 LD	-0.07	0.69	-0.10	-1.42, 1.29	0.93	0.65	0.24, 3.62
CAT4 LD	-0.61	0.35	-1.76	-1.28, 0.07	0.54	0.19	0.28, 1.07
CAT3 LD	**-0.66**	**0.34**	**-1.96**	**-1.32, 0.00**	**0.52**	**0.17**	**0.27, 1.00**
CAT2 LD	-0.59	0.33	-1.77	-1.24, 0.06	0.56	0.18	0.29, 1.07
CAT1 LD	-0.07	0.27	-0.24	-0.60, 0.47	0.94	0.26	0.55, 1.60
Teacher var.	1.38	1.65					
School var.	0.31	0.29					
Teachers	1,238						
Gen. Ed. Int.	**-4.07**	**0.17**	**-23.77**	**-4.40, -3.73**	**0.02**	**0.00**	**0.01, 0.02**
ALL LD	0.84	0.44	1.94	-0.01, 1.70	2.33	1.01	0.99, 5.46
CAT5 LD							
CAT4 LD	0.31	0.16	1.94	0.00, 0.62	1.36	0.22	1.00, 1.86
CAT3 LD	-0.01	0.06	-0.11	-0.13, 0.11	0.99	0.06	0.88, 1.12
CAT2 LD	0.00	0.03	0.08	-0.06, 0.07	1.00	0.03	0.94, 1.07
CAT1 LD	**-0.08**	**0.03**	**-2.88**	**-0.13, -0.02**	**0.93**	**0.02**	**0.88, 0.98**
Teacher var.	3.11	0.44					
School var.	0.34	0.04					
Teachers	112,900						

Note. Each model includes teacher, classroom (including the average percentage of students with other disabilities), and school control variables. These results are from models run on separate samples of teachers. Statistical significance is indicated by bold; here the comparison is to a teacher without any SWDs. A blank row indicates that the coefficient was not estimable. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. LD= learning disability; var.=variance; SPED= special education certification; DUAL= dual certification; TEST= test dual certification. SE= Standard error; CI= confidence interval; OR= odds ratio. Results in bold are statistically significant at, at least, $p<.05$.

Table 34
Interaction results for RQ3 predicting leaving with interactions between certification and the category of the average percentage of students with learning disabilities in teachers classes.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
SPEDxAll LD	-0.07	0.68	-0.10	-1.41, 1.27	0.93	0.64	0.24, 3.56
SPEDxCAT5 LD	-3.00	1.62	-1.85	-6.17, 0.17	0.05	0.08	0.00, 1.19
SPEDxCAT4 LD	-0.31	0.20	-1.55	-0.71, 0.08	0.73	0.15	0.49, 1.09
SPEDxCAT3 LD	0.16	0.14	1.12	-0.12, 0.43	1.17	0.16	0.89, 1.54
SPEDxCAT2 LD	-0.02	0.15	-0.13	-0.32, 0.28	0.98	0.15	0.73, 1.32
SPEDxCAT1 LD	0.20	0.16	1.30	-0.10, 0.51	1.23	0.19	0.90, 1.67
DUALxAll LD	-1.08	0.94	-1.14	-2.92, 0.77	0.34	0.32	0.05, 2.17
DUALxCAT5 LD	-2.54	1.63	-1.56	-5.73, 0.64	0.08	0.13	0.00, 1.90
DUALxCAT4 LD	**-0.65**	**0.22**	**-2.96**	**-1.09, -0.22**	**0.52**	**0.11**	**0.34, 0.80**
DUALxCAT3 LD	-0.14	0.16	-0.91	-0.45, 0.16	0.87	0.14	0.64, 1.18
DUALxCAT2 LD	0.01	0.14	0.07	-0.27, 0.29	1.01	0.15	0.76, 1.34
DUALxCAT1 LD	-0.09	0.12	-0.79	-0.33, 0.14	0.91	0.11	0.72, 1.15
TESTxAll LD	-0.25	1.32	-0.19	-2.84, 2.33	0.78	1.02	0.06, 10.25
TESTxCAT5 LD	-2.50	1.80	-1.39	-6.02, 1.02	0.08	0.15	0.00, 2.70
TESTxCAT4 LD	**-0.67**	**0.34**	**-1.96**	**-1.33, 0.00**	**0.51**	**0.17**	**0.26, 1.00**
TESTxCAT3 LD	-0.42	0.33	-1.29	-1.07, 0.22	0.66	0.22	0.34, 1.25
TESTxCAT2 LD	-0.09	0.32	-0.28	-0.71, 0.53	0.92	0.29	0.49, 1.70
TESTxCAT1 LD	-0.04	0.28	-0.14	-0.59, 0.52	0.96	0.27	0.55, 1.67
ALL LD	0.19	0.49	0.38	-0.78, 1.15	1.21	0.60	0.46, 3.17
CAT5 LD	2.70	1.58	1.71	-0.40, 5.80	14.84	23.47	0.67, 329.40
CAT4 LD	**0.39**	**0.17**	**2.30**	**0.06, 0.72**	**1.48**	**0.25**	**1.06, 2.06**
CAT3 LD	-0.08	0.07	-1.12	-0.21, 0.06	0.93	0.06	0.64, 1.18
CAT2 LD	-0.05	0.04	-1.37	-0.12, 0.02	0.95	0.03	0.76, 1.34
CAT1 LD	**-0.07**	**0.03**	**-2.62**	**-0.12, -0.02**	**0.93**	**0.02**	**0.72, 1.15**
SPED	-0.03	0.09	-0.26	-0.22, 0.15	0.97	0.09	0.81, 1.16
Dual cert.	0.06	0.08	0.75	-0.10, 0.22	1.06	0.09	0.91, 1.25
Test dual cert.	-0.10	0.20	-0.49	-0.50, 0.30	0.91	0.18	0.61, 1.35
Intercept	**-4.29**	**0.13**	**-32.38**	**-4.55, -4.03**	**0.01**	**0.00**	**0.01, 0.02**
Variances							
Teacher	1.56	0.22					
School	0.06	0.01					
Log likelihood	-64905.52 (116)						
AIC	130043.0						
BIC	131251.3						
Observations	246,751						
Teachers	127,581						
Schools	2,310						

Note. Model includes teacher, classroom (including the average percentage of students with other disabilities), and school control variables. Statistical significance is indicated by bold; here the comparison is to a teacher without any SWDs. A blank row indicates that the coefficient was not estimable. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. LD= learning disability; var.=variance; SPED= special education certification; DUAL= dual certification; TEST= test dual certification. SE= Standard error; CI= confidence interval; OR= odds ratio. Results in bold are statistically significant at, at least, $p<.05$.

Table 35

Results from separate models for each teacher category RQ3 predicting total attrition for categories of the average percentage of students with speech/language disorders in teacher's classes.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
SPED Int.	**-2.90**	**0.45**	**-6.48**	**-3.78, -2.02**	**0.06**	**0.02**	**0.02, 0.13**
ALL SLI	-1.48	0.82	-1.80	-3.09, 0.13	0.23	0.19	0.05, 1.14
CAT5 SLI	-0.89	1.40	-0.63	-3.63, 1.86	0.41	0.58	0.03, 6.42
CAT4 SLI	0.05	0.53	0.09	-0.98, 1.08	1.05	0.55	0.37, 2.95
CAT3 SLI	-0.30	0.42	-0.72	-1.12, 0.52	0.74	0.31	0.33, 1.68
CAT2 SLI	-0.36	0.29	-1.23	-0.93, 0.21	0.70	0.20	0.39, 1.24
CAT1 SLI	-0.20	0.15	-1.34	-0.49, 0.09	0.82	0.12	0.61, 1.10
Teacher var.	3.72	1.15					
School var.	0.20	0.09					
Teachers	7,818						
Dual Int.	**-3.24**	**0.66**	**-4.93**	**-4.53, -1.95**	**0.04**	**0.03**	**0.01, 0.14**
ALL SLI							
CAT5 SLI	-0.84	2.17	-0.39	-5.09, 3.42	0.43	0.94	0.01, 30.53
CAT4 SLI	-0.84	0.89	-0.95	-2.58, 0.90	0.43	0.38	0.08, 2.45
CAT3 SLI	-0.88	0.46	-1.92	-1.79, 0.02	0.41	0.19	0.17, 1.02
CAT2 SLI	-0.18	0.19	-0.93	-0.56, 0.20	0.84	0.16	0.57, 1.22
CAT1 SLI	-0.12	0.11	-1.08	-0.34, 0.10	0.89	0.10	0.71, 1.10
Teacher var.	4.45	2.08					
School var.	0.10	0.23					
Teachers	6,238						
Test Int.	**-3.31**	**1.01**	**-3.28**	**-5.28**	**0.04**	**0.04**	**0.01, 0.26**
ALL SLI							
CAT5 SLI							
CAT4 SLI							
CAT3 SLI	0.62	0.86	0.73	-1.06, 2.30	1.86	1.60	0.35, 9.99
CAT2 SLI	0.79	0.48	1.64	-0.15, 1.72	2.19	1.05	0.86, 5.60
CAT1 SLI	-0.33	0.22	-1.48	-0.76, 0.11	0.72	0.16	0.47, 1.11
Teacher var.	1.38	1.65					
School var.	0.31	0.29					
Teachers	1,238						
Gen. Ed. Int.	**-4.07**	**0.17**	**-23.77**	**-4.40, -3.73**	**0.02**	**0.00**	**0.01, 0.02**
ALL SLI	0.45	0.29	1.56	-0.11, 1.01	1.56	0.45	0.89, 2.73
CAT5 SLI	**0.90**	**0.42**	**2.16**	**0.08, 1.71**	**2.46**	**1.02**	**1.09, 5.54**
CAT4 SLI	-0.07	0.16	-0.45	-0.38, 0.24	0.93	0.15	0.69, 1.27
CAT3 SLI	**-0.19**	**0.09**	**-2.17**	**-0.37, -0.02**	**0.82**	**0.07**	**0.69, 0.98**
CAT2 SLI	**-0.12**	**0.04**	**-2.92**	**-0.20, -0.04**	**0.89**	**0.04**	**0.82, 0.96**
CAT1 SLI	**-0.05**	**0.02**	**-2.64**	**-0.10, -0.01**	**0.95**	**0.02**	**0.91, 0.99**
Teacher var.	3.11	0.44					
School var.	0.34	0.04					
Teachers	112,900						

Note. Each model includes teacher, classroom (including the average percentage of students with other disabilities), and school control variables. These results are from models run on separate samples of teachers. Statistical significance is indicated by bold; here the comparison is to a teacher without any SWDs. A blank row indicates that the coefficient was not estimable. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. SLI= speech/language impairment; var.=variance; SPED= special education certification; DUAL= dual certification; TEST= test dual certification. SE= Standard error; CI= confidence interval; OR= odds ratio. Results in bold are statistically significant at, at least, $p<.05$.

Table 36
Interaction results for RQ3 predicting leaving with interactions between certification and the category of the average percentage of students with speech/language impairments in teachers classes.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
SPEDxAll SLI							
SPEDxCAT5 SLI	0.32	1.52	0.21	-2.65, 3.29	1.38	2.09	0.07, 26.96
SPEDxCAT4 SLI	0.74	0.57	1.30	-0.38, 1.86	2.10	1.20	0.68, 6.41
SPEDxCAT3 SLI	0.07	0.48	0.15	-0.87, 1.02	1.08	0.52	0.42, 2.78
SPEDxCAT2 SLI	-0.05	0.35	-0.15	-0.74, 0.63	0.95	0.33	0.48, 1.88
SPEDxCAT1 SLI	-0.24	0.17	-1.40	-0.57, 0.09	0.79	0.13	0.57, 1.10
DUALxAll SLI							
DUALxCAT5 SLI	0.55	1.92	0.28	-3.22, 4.31	1.73	3.31	0.04, 74.22
DUALxCAT4 SLI	0.71	0.84	0.84	-0.94, 2.36	2.03	1.71	0.39, 10.57
DUALxCAT3 SLI	-0.74	0.58	-1.29	-1.87, 0.39	0.48	0.27	0.15, 1.47
DUALxCAT2 SLI	0.37	0.19	1.91	-0.01, 0.75	1.45	0.28	0.99, 2.12
DUALxCAT1 SLI	-0.01	0.11	-0.14	-0.22, 0.19	0.99	0.11	0.80, 1.21
TESTxAll SLI							
TESTxCAT5 SLI							
TESTxCAT4 SLI							
TESTxCAT3 SLI	0.76	1.24	0.61	-1.67, 3.19	2.14	2.65	0.19, 24.34
TESTxCAT2 SLI	0.52	0.55	0.94	-0.56, 1.59	1.68	0.92	0.57, 4.92
TESTxCAT1 SLI	-0.12	0.27	-0.43	-0.65, 0.42	0.89	0.24	0.52, 1.52
ALL SLI	0.13	0.36	0.35	-0.58, 0.83	1.13	0.41	0.56, 2.29
CAT5 SLI	0.32	1.52	0.21	-2.65, 3.29	1.31	0.65	0.50, 3.47
CAT4 SLI	0.74	0.57	1.30	-0.38, 1.86	0.80	0.15	0.55, 1.17
CAT3 SLI	0.07	0.48	0.15	-0.87, 1.02	0.92	0.09	0.76, 1.12
CAT2 SLI	-0.05	0.35	-0.15	-0.74, 0.63	0.94	0.04	0.85, 1.03
CAT1 SLI	-0.24	0.17	-1.40	-0.57, 0.09	0.97	0.02	0.93, 1.02
SPED	0.05	0.07	0.77	-0.08, 0.19	1.06	0.07	0.92, 1.21
Dual cert.	-0.03	0.07	-0.37	-0.16, 0.11	0.98	0.07	0.86, 1.11
Test dual cert.	-0.23	0.12	-1.92	-0.47, 0.01	0.79	0.10	0.63, 1.01
Intercept	**-4.29**	**-0.13**	**-32.33**	**-4.55, -4.03**	**0.01**	**0.00**	**0.01, 0.02**
Variances							
Teacher	1.56	0.22					
School	0.06	0.01					
Log likelihood	-64908.62 (111)						
AIC	130039.2						
BIC	131195.4						
Observations	246,729						
Teachers	127,573						
Schools	2,310						

Note. Model includes teacher, classroom (including the average percentage of students with other disabilities), and school control variables. Statistical significance is indicated by bold; here the comparison is to a teacher without any SWDs. A blank row indicates that the coefficient was not estimable. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. SLI= speech/language impairment; var.=variance; SPED= special education certification; DUAL= dual certification; TEST= test dual certification. SE= Standard error; CI= confidence interval; OR= odds ratio. Results in bold are statistically significant at, at least, $p<.05$.

Table 37
Results from separate models for each teacher category RQ3 predicting total attrition for categories of the average percentage of students with other health impairments in teacher's classes.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
SPED Int.	**-2.90**	**0.45**	**-6.48**	**-3.78, -2.02**	**0.06**	**0.02**	**0.02, 0.13**
ALL OH	0.40	0.59	0.68	-0.76, 1.56	1.50	0.89	0.47, 4.78
CAT5 OH	0.16	0.82	0.20	-1.45, 1.77	1.18	0.97	0.24, 5.89
CAT4 OH	-0.17	0.17	-0.97	-0.50, 0.17	0.85	0.14	0.61, 1.18
CAT3 OH	-0.07	0.12	-0.59	-0.30, 0.16	0.93	0.11	0.74, 1.17
CAT2 OH	0.01	0.11	0.10	-0.21, 0.23	1.01	0.12	0.81, 1.26
CAT1 OH	-0.01	0.11	-0.06	-0.23, 0.22	0.99	0.11	0.79, 1.24
Teacher var.	3.72	1.15					
School var.	0.20	0.09					
Teachers	7,818						
Dual Int.	**-3.24**	**0.66**	**-4.93**	**-4.53, -1.95**	**0.04**	**0.03**	**0.01, 0.14**
ALL OH	-2.35	1.51	-1.55	-5.32, 0.62	0.10	0.14	0.00, 1.85
CAT5 OH	0.44	1.41	0.31	-2.31, 3.20	1.56	2.19	0.10, 24.50
CAT4 OH	0.04	0.20	0.20	-0.36, 0.44	1.04	0.21	0.70, 1.55
CAT3 OH	-0.08	0.15	-0.55	-0.38, 0.21	0.92	0.14	0.68, 1.24
CAT2 OH	0.03	0.15	0.21	-0.25, 0.32	1.03	0.15	0.78, 1.37
CAT1 OH	0.15	0.11	1.37	-0.07, 0.37	1.17	0.13	0.94, 1.45
Teacher var.	4.45	2.08					
School var.	0.10	0.23					
Teachers	6,238						
Test Int.	**-3.31**	**1.01**	**-3.28**	**-5.28, -1.33**	**0.04**	**0.04**	**0.01, 0.26**
ALL OH	1.40	1.55	0.90	-1.64, 4.44	4.06	6.29	0.19, 84.60
CAT5 OH							
CAT4 OH	0.12	0.39	0.30	-0.65, 0.88	1.13	0.44	0.52, 2.41
CAT3 OH	0.19	0.30	0.63	-0.41, 0.79	1.21	0.37	0.67, 2.20
CAT2 OH	-0.12	0.29	-0.41	-0.70, 0.45	0.89	0.26	0.50, 1.58
CAT1 OH	0.10	0.25	0.39	-0.39, 0.59	1.10	0.27	0.68, 1.80
Teacher var.	1.38	1.65					
School var.	0.31	0.29					
Teachers	1,238						
Gen. Ed. Int.	**-4.07**	**0.17**	**-23.77**	**-4.40, -3.73**	**0.02**	**0.00**	**0.01, 0.02**
ALL OH	**1.48**	**0.67**	**2.20**	**0.16, 2.80**	**4.39**	**2.95**	**1.17, 16.40**
CAT5 OH							
CAT4 OH	**0.65**	**0.28**	**2.29**	**0.09, 1.20**	**1.91**	**0.54**	**1.10, 3.33**
CAT3 OH	-0.04	0.13	-0.35	-0.29, 0.20	0.96	0.12	0.75, 1.23
CAT2 OH	-0.03	0.05	-0.60	-0.13, 0.07	0.97	0.05	0.87, 1.07
CAT1 OH	-0.04	0.02	-1.92	-0.09, 0.00	0.96	0.02	0.92, 1.00
Teacher var.	3.11	0.44					
School var.	0.34	0.04					
Teachers	112,900						

Note. Each model includes teacher, classroom (including the average percentage of students with other disabilities), and school control variables. These results are from models run on separate samples of teachers. Statistical significance is indicated by bold; here the comparison is to a teacher without any SWDs. A blank row indicates that the coefficient was not estimable. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. OH= other health impairment; var.=variance; SPED= special education certification; DUAL= dual certification; TEST= test dual certification. SE= Standard error; CI= confidence interval; OR= odds ratio. Results in bold are statistically significant at, at least, $p<.05$.

Table 38
Interaction results for RQ3 predicting leaving with interactions between certification and the category of the average percentage of students with other health impairments in teachers classes.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
SPEDxAll OH	1.85	1.25	1.48	-0.59, 4.30	6.37	7.96	0.55. 73.65
SPEDxCAT5 OH	**16.40**	**0.97**	**16.83**	**14.49, 18.31**			
SPEDxCAT4 OH	0.26	0.37	0.71	-0.46, 0.97	1.29	0.47	0.63, 2.65
SPEDxCAT3 OH	0.30	0.18	1.68	-0.05, 0.65	1.35	0.24	0.95, 1.92
SPEDxCAT2 OH	0.16	0.13	1.18	-0.10, 0.41	1.17	0.15	0.90, 1.51
SPEDxCAT1 OH	0.16	0.12	1.30	-0.08, 0.40	1.17	0.14	0.92, 1.49
DUALxAll OH	0.72	1.69	0.43	-2.59, 4.03	2.06	3.47	0.08, 56.20
DUALxCAT5 OH							
DUALxCAT4 OH	-0.09	0.38	-0.23	-0.83, 0.66	0.92	0.35	0.43, 1.94
DUALxCAT3 OH	-0.09	0.20	-0.46	-0.47, 0.29	0.91	0.18	0.62, 1.34
DUALxCAT2 OH	-0.08	0.15	-0.55	-0.36, 0.21	0.92	0.13	0.69, 1.23
DUALxCAT1 OH	0.04	0.10	0.42	-0.16, 0.25	1.05	0.11	0.85, 1.28
TESTxAll OH							
TESTxCAT5 OH							
TESTxCAT4 OH	-0.20	0.52	-0.38	-1.21, 0.82	0.82	0.43	0.30, 2.27
TESTxCAT3 OH	-0.31	0.32	-0.96	-0.94, 0.32	0.73	0.24	0.39, 1.38
TESTxCAT2 OH	-0.65	0.34	-1.94	-1.31, 0.01	0.52	0.18	0.27, 1.01
TESTxCAT1 OH	-0.02	0.25	-0.09	-0.52, 0.47	0.98	0.25	0.60, 1.60
ALL OH	-1.05	1.08	-0.97	-3.17, 1.08	0.35	0.38	0.04, 2.94
CAT5 OH	**-17.14**	**0.21**	**-79.75**	**-17.57, -16.72**			
CAT4 OH	0.11	0.33	0.32	-0.55, 0.76	1.11	0.37	0.58, 2.14
CAT3 OH	-0.11	0.14	-0.79	-0.38, 0.16	0.90	0.12	0.69, 1.17
CAT2 OH	-0.03	0.06	-0.51	-0.14, 0.08	0.97	0.06	0.87, 1.09
CAT1 OH	-0.01	0.02	-0.35	-0.06, 0.04	0.99	0.02	0.95, 1.04
SPED	-0.13	0.09	-1.38	-0.31, 0.05	0.88	0.08	0.74, 1.06
Dual cert.	-0.01	0.07	-0.08	-0.15, 0.13	0.99	0.07	0.86, 1.14
Test dual cert.	-0.07	0.19	-0.38	0.44, 0.30	0.93	0.18	0.64, 1.35
Intercept	**-4.30**	**0.13**	**-32.23**	**-4.56, -4.04**	**0.01**	**0.00**	**0.01, 0.02**
Variances							
Teacher	1.58	0.22					
School	0.06	0.01					
Log likelihood	-64902 .75 (112)						
AIC	130029.5						
BIC	131196.1						
Observations	246,738						
Teachers	127,576						
Schools	2,310						

Note. Model includes teacher, classroom (including the average percentage of students with other disabilities), and school control variables. Statistical significance is indicated by bold; here the comparison is to a teacher without any SWDs. A blank row indicates that the coefficient was not estimable. I have excluded very large odds ratios from the table. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. OH= other health impairment; var.=variance; SPED= special education certification; DUAL= dual certification; TEST= test dual certification. SE= Standard error; CI= confidence interval; OR= odds ratio. Results in bold are statistically significant at, at least, $p<.05$.

Table 39

Interaction results for RQ3 predicting total attrition with interactions between certification and the category of the average percentage of students with autism in teachers' classes.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
SPEDxAll AU	**-1.57**	**0.60**	**-2.63**	**-2.74, 0.40**	**0.21**	**0.12**	**0.06, 0.67**
SPEDxCAT5 AU	**-2.44**	**0.75**	**-3.27**	**-3.90, -0.97**	**0.09**	**0.07**	**0.02, 0.38**
SPEDxCAT4 AU	-0.63	0.38	-1.65	-1.38, 0.12	0.53	0.20	0.25, 1.13
SPEDxCAT3 AU	-0.28	0.25	-1.14	-0.76, 0.20	0.76	0.19	0.47, 1.22
SPEDxCAT2 AU	-0.25	0.15	-1.62	-0.55, 0.05	0.78	0.12	0.58, 1.05
SPEDxCAT1 AU	0.02	0.09	0.18	-0.16, 0.19	1.02	0.09	0.85, 1.21
DUALxAll AU	-0.92	0.64	-1.43	-2.17, 0.34	0.40	0.26	0.11, 1.40
DUALxCAT5 AU	**-2.33**	**0.81**	**-2.89**	**-3.92, -0.75**	**0.10**	**0.08**	**0.02, 0.47**
DUALxCAT4 AU	-0.30	0.43	-0.70	-1.14, 0.54	0.74	0.32	0.32, 1.72
DUALxCAT3 AU	-0.22	0.27	-0.82	-0.76, 0.31	0.80	0.22	0.47, 1.37
DUALxCAT2 AU	-0.06	0.18	-0.35	-0.41, 0.28	0.94	0.17	0.67, 1.33
DUALxCAT1 AU	-0.06	0.10	-0.62	-0.26, 0.13	0.94	0.09	0.77, 1.14
TESTxAll AU	**-2.63**	**1.14**	**-2.31**	**-4.86, -0.40**	**0.07**	**0.08**	**0.01, 0.67**
TESTxCAT5 AU	**-2.71**	**1.07**	**-2.52**	**-4.81, 0.61**	**0.07**	**0.07**	**0.01, 0.55**
TESTxCAT4 AU	-0.69	0.71	-0.96	-2.08, 0.71	0.50	0.36	0.12, 2.03
TESTxCAT3 AU	-0.44	0.49	-0.89	-1.40, 0.53	0.65	0.32	0.25, 1.69
TESTxCAT2 AU	0.29	0.30	0.98	-0.29, 0.88	1.34	0.40	0.75, 2.40
TESTxCAT1 AU	0.04	0.20	0.19	-0.35, 0.43	1.04	0.21	0.70, 1.53
ALL AU	**1.43**	**0.56**	**2.57**	**0.34, 2.52**	**4.17**	**2.31**	**1.40, 12.37**
CAT5 AU	**2.19**	**0.69**	**3.19**	**0.85, 3.54**	**8.98**	**6.17**	**2.33, 34.52**
CAT4 AU	0.35	0.35	1.01	-0.33, 1.03	1.42	0.49	0.72, 2.80
CAT3 AU	0.31	0.21	1.47	-0.10, 0.71	1.36	0.28	0.90, 2.04
CAT2 AU	0.06	0.11	0.55	-0.15, 0.27	1.06	0.11	0.86, 1.31
CAT1 AU	**-0.10**	**0.02**	**-4.36**	**-0.15, 2.52**	**0.90**	**0.02**	**0.86, 0.94**
SPED	**0.41**	**0.07**	**5.49**	**0.26, 0.56**	**1.51**	**0.11**	**1.30, 1.75**
Dual cert.	**0.24**	**0.06**	**4.14**	**0.13, 0.36**	**1.28**	**0.08**	**1.14, 1.43**
Test dual cert.	0.14	0.12	1.21	-0.09, 0.38	1.15	0.14	0.92, 1.46
Intercept	**-4.16**	**0.20**	**-20.68**	**-4.55, -3.76**	**0.02**	**0.00**	**0.01, 0.02**
Variances							
Teacher	3.63	0.59					
School	0.36	0.04					
Log likelihood	-100683.5 (116)						
AIC	201599.0						
BIC	202807.2						
Observations	246,751						
Teachers	127,581						
Schools	2,310						

Note. Model includes teacher, classroom (including the average percentage of students with other disabilities), and school control variables. Statistical significance is indicated by bold; here the comparison is to a teacher without any SWDs. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. AU= autism; var.=variance; SPED= special education certification; DUAL= dual certification; TEST= test dual certification. SE= Standard error; CI= confidence interval; OR= odds ratio. Results in bold are statistically significant at, at least, $p<.05$.

Table 40
Interaction results for RQ3 predicting leaving with interactions between certification and the category of the average percentage of students with autism in teachers' classes.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
SPEDxAll AU	-0.45	0.71	-0.64	-1.84, 0.93	0.63	0.45	0.16, 2.53
SPEDxCAT5 AU	-0.83	0.83	-1.00	-2.46, 0.79	0.44	0.36	0.09, 2.21
SPEDxCAT4 AU	-0.25	0.47	-0.52	-1.17, 0.68	0.78	0.37	0.31, 1.98
SPEDxCAT3 AU	-0.09	0.31	-0.30	-0.69, 0.51	0.91	0.28	0.50, 1.66
SPEDxCAT2 AU	0.03	0.18	0.14	-0.32, 0.37	1.03	0.18	0.72, 1.45
SPEDxCAT1 AU	0.12	0.10	1.18	-0.08, 0.32	1.13	0.11	0.92, 1.37
DUALxAll AU	0.60	0.72	0.83	-0.81, 2.01	1.82	1.31	0.44, 7.47
DUALxCAT5 AU	-0.56	0.83	-0.68	-2.20, 1.07	0.57	0.47	0.11, 2.91
DUALxCAT4 AU	0.05	0.51	0.10	-0.96, 1.05	1.05	0.54	0.38, 2.87
DUALxCAT3 AU	0.09	0.32	0.28	-0.54, 0.73	1.10	0.36	0.58, 2.07
DUALxCAT2 AU	0.16	0.19	0.84	-0.21, 0.54	1.17	0.23	0.81, 1.71
DUALxCAT1 AU	-0.14	0.11	-1.28	-0.36, 0.08	0.87	0.10	0.70, 1.08
TESTxAll AU	-0.89	1.27	-0.70	-3.37, 1.59	0.41	0.52	0.03, 4.90
TESTxCAT5 AU	0.39	1.05	0.37	-1.66, 2.44	1.47	1.54	0.19, 11.46
TESTxCAT4 AU	-0.10	0.78	-0.13	-1.63, 1.43	0.90	0.70	0.19, 4.16
TESTxCAT3 AU	-0.34	0.67	-0.50	-1.66, 0.98	0.71	0.48	0.19, 2.66
TESTxCAT2 AU	0.51	0.34	1.49	-0.16, 1.17	1.66	0.56	0.85, 3.23
TESTxCAT1 AU	-0.11	0.23	-0.46	-0.56, 0.35	0.90	0.21	0.57, 1.41
ALL AU	0.32	0.67	0.49	-0.98, 1.63	1.38	0.92	0.37, 5.11
CAT5 AU	0.84	0.77	1.10	-0.67, 2.35	2.33	1.79	0.51, 10.53
CAT4 AU	0.01	0.43	0.01	-0.83, 0.84	1.01	0.43	0.44, 2.32
CAT3 AU	0.02	0.26	0.09	-0.49, 0.54	1.02	0.27	0.61, 1.71
CAT2 AU	-0.08	0.12	-0.68	-0.33, 0.16	0.92	0.11	0.72, 1.17
CAT1 AU	**-0.07**	**0.03**	**-2.81**	**-0.12, -0.02**	**0.93**	**0.02**	**0.89, 0.98**
SPED	0.06	0.08	0.77	-0.09, 0.21	1.06	0.08	0.91, 1.23
Dual cert.	-0.01	0.06	-0.09	-0.12, 0.11	0.99	0.06	0.88, 1.12
Test dual cert.	-0.24	0.14	-1.75	-0.50, 0.03	0.79	0.11	0.61, 1.03
Intercept	**-4.29**	**0.13**	**-32.52**	**-4.55, -4.03**	**0.01**	**0.00**	**0.01, 0.02**
Variances							
Teacher	1.55	0.22					
School	0.06	0.01					
Log likelihood	-64905.59 (116)						
AIC	130043.2						
BIC	131251.4						
Observations	246,751						
Teachers	127,381						
Schools	2,310						

Note. Model includes teacher, classroom (including the average percentage of students with other disabilities), and school control variables. Statistical significance is indicated by bold; here the comparison is to a teacher without any SWDs. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. AU= autism; var.=variance; SPED= special education certification; DUAL= dual certification; TEST= test dual certification. SE= Standard error; CI= confidence interval; OR= odds ratio. Results in bold are statistically significant at, at least, $p<.05$.

Table 41

Interaction results for RQ3 predicting total attrition with interactions between certification and the category of the average percentage of students with intellectual disabilities in teachers' classes.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
SPEDxAll ID	-0.96	0.76	-1.27	-2.45. 0.53	0.38	0.29	0.09, 1.69
SPEDxCAT5 ID	-0.71	2.04	-0.35	-4.71, 3.29	0.49	1.00	0.01. 26.85
SPEDxCAT4 ID	**-0.74**	**0.29**	**-2.53**	**-1.31, -0.17**	**0.48**	**0.14**	**0.27, 0.85**
SPEDxCAT3 ID	-0.02	0.15	-0.14	-0.32, 0.28	0.98	0.15	0.72, 1.32
SPEDxCAT2 ID	-0.11	0.14	-0.81	-0.38, 0.16	0.90	0.12	0.69, 1.17
SPEDxCAT1 ID	-0.08	0.11	-0.70	-0.30, 0.14	0.93	0.10	0.74, 1.15
DUALxAll ID	-0.74	0.86	-0.87	-2.42, 0.93	0.48	0.41	0.09, 2.54
DUALxCAT5 ID	-0.02	2.10	-0.01	-4.13, 4.09	0.98	2.05	0.02, 59.88
DUALxCAT4 ID	-0.50	0.30	-1.66	-1.10, 0.09	0.61	0.18	0.33, 1.10
DUALxCAT3 ID	0.03	0.17	0.17	-0.30, 0.36	1.03	0.17	0.74, 1.44
DUALxCAT2 ID	0.21	0.16	1.33	-0.10, 0.51	1.23	0.19	0.91, 1.67
DUALxCAT1 ID	0.07	0.11	0.61	-0.15, 0.29	1.07	0.12	0.86, 1.33
TESTxAll ID	0.15	1.18	0.13	-2.17, 2.46	1.16	1.37	0.11, 11.74
TESTxCAT5 ID	0.35	2.14	0.16	-3.84, 4.54	1.42	3.04	0.02, 94.10
TESTxCAT4 ID	-0.62	0.37	-1.68	-1.34, 0.10	0.54	0.20	0.26, 1.11
TESTxCAT3 ID	-0.20	0.31	-0.64	-0.82, 0.42	0.82	0.26	0.44, 1.52
TESTxCAT2 ID	0.29	0.31	0.93	-0.32, 0.89	1.33	0.41	0.73, 2.43
TESTxCAT1 ID	**0.70**	**0.22**	**3.15**	**0.26, 1.13**	**2.01**	**0.45**	**1.30, 3.10**
ALL ID	**1.37**	**0.70**	**1.96**	**0.00, 2.74**	**3.93**	**2.75**	**1.00, 15.48**
CAT5 ID	0.31	2.04	0.15	-3.68, 4.29	1.36	2.76	0.03, 73.25
CAT4 ID	0.43	0.27	1.60	-0.10, 0.95	1.54	0.41	0.91, 2.60
CAT3 ID	-0.05	0.10	-0.49	-0.26, 0.15	0.95	0.10	0.77, 1.17
CAT2 ID	**-0.14**	**0.07**	**-2.09**	**-0.26, -0.01**	**0.87**	**0.06**	**0.77, 0.99**
CAT1 ID	-0.03	0.02	-1.15	-0.07, 0.02	0.97	0.02	0.93, 1.02
SPED	**0.43**	**0.08**	**5.39**	**0.27, 0.58**	**1.53**	**0.12**	**1.31, 1.79**
Dual cert.	**0.20**	**0.06**	**3.19**	**0.08, 0.32**	**1.22**	**0.07**	**1.08, 1.37**
Test dual cert.	-0.02	0.14	-0.11	-0.28, 0.25	0.98	0.14	0.75, 1.29
Intercept	**0.02**	**0.00**	**-20.58**	**0.01, 0.02**	**0.02**	**0.00**	**-20.58**
Variances							
Teacher	3.64	0.59					
School	0.36	0.04					
Log likelihood	-100682.3 (116)						
AIC	201596.6						
BIC	202804.8						
Observations	246,751						
Teachers	127,581						
Schools	2,310						

Note. Model includes teacher, classroom (including the average percentage of students with other disabilities), and school control variables. Statistical significance is indicated by bold; here the comparison is to a teacher without any SWDs. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. ID= intellectual disability; var.=variance; SPED= special education certification; DUAL= dual certification; TEST= test dual certification. SE= Standard error; CI= confidence interval; OR= odds ratio. Results in bold are statistically significant at, at least, $p<.05$.

Table 42
Interaction results for RQ3 predicting leaving with interactions between certification and the category of the average percentage of students with intellectual disabilities in teachers' classes.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
SPEDxAll ID	-0.27	0.74	-0.37	-1.71, 1.17	0.76	0.56	0.18, 3.23
SPEDxCAT5 ID	17.36	6.05	2.87	5.50, 29.21			
SPEDxCAT4 ID	0.17	0.32	0.51	-0.47, 0.80	1.18	0.38	0.63, 2.22
SPEDxCAT3 ID	0.13	0.16	0.81	-0.19, 0.45	1.14	0.18	0.83, 1.56
SPEDxCAT2 ID	0.07	0.16	0.46	-0.23, 0.38	1.07	0.17	0.79, 1.46
SPEDxCAT1 ID	-0.01	0.13	-0.05	-0.26, 0.25	0.99	0.13	0.77, 1.28
DUALxAll ID	-0.73	0.87	-0.84	-2.45, 0.98	0.48	0.42	0.09, 2.66
DUALxCAT5 ID	17.87	9.45	1.89	-0.65, 36.39			
DUALxCAT4 ID	0.37	0.34	1.10	-0.29, 1.03	1.45	0.49	0.75, 2.81
DUALxCAT3 ID	0.03	0.18	0.18	-0.32, 0.39	1.03	0.19	0.72, 1.47
DUALxCAT2 ID	0.26	0.17	1.54	-0.07, 0.60	1.30	0.22	0.93, 1.82
DUALxCAT1 ID	-0.03	0.13	-0.22	-0.28, 0.22	0.97	0.12	0.76, 1.25
TESTxAll ID	0.81	1.08	0.75	-1.31, 2.93	2.25	2.43	0.27, 18.75
TESTxCAT5 ID							
TESTxCAT4 ID	0.41	0.40	1.02	-0.38, 1.21	1.51	0.61	0.68, 3.34
TESTxCAT3 ID	-0.47	0.38	-1.25	-1.22, 0.27	0.62	0.24	0.30, 1.31
TESTxCAT2 ID	0.18	0.36	0.51	-0.53, 0.89	1.20	0.43	0.59, 2.44
TESTxCAT1 ID	0.21	0.24	0.87	-0.26, 0.68	1.23	0.30	0.77, 1.98
ALL ID	0.67	0.67	1.00	-0.65, 1.98	1.95	1.31	0.52, 7.27
CAT5 ID	**-17.60**	**2.55**	**-6.91**	**-22.59, -12.61**			
CAT4 ID	-0.34	0.30	-1.12	-0.94, 0.26	0.71	0.22	0.39, 1.29
CAT3 ID	-0.07	0.10	-0.68	-0.27, 0.13	0.93	0.10	0.76, 1.14
CAT2 ID	-0.14	0.07	-1.93	-0.28, 0.00	0.87	0.06	0.75, 1.00
CAT1 ID	-0.05	0.03	-1.80	-0.10, 0.00	0.96	0.02	0.91, 1.00
SPED	0.04	0.08	0.51	-0.12, 0.21	1.04	0.09	0.89, 1.23
Dual cert.	-0.04	0.06	-0.64	-0.16, 0.08	0.96	0.06	0.85, 1.09
Test dual cert.	-0.26	0.16	-1.67	-0.57, 0.05	0.77	0.12	0.57, 1.05
Intercept	**-4.27**	**0.12**	**-36.69**	**-4.50, -4.04**	**0.01**	**0.00**	**0.01, 0.02**
Variances							
Teacher	1.51	0.17					
School	0.06	0.01					
Log likelihood	-64907.07 (114)						
AIC	130042.1						
BIC	131229.6						
Observations	246,722						
Teachers	127,574						
Schools	2,310						

Note. Model includes teacher, classroom (including the average percentage of students with other disabilities), and school control variables. Statistical significance is indicated by bold; here the comparison is to a teacher without any SWDs. A blank row indicates that the coefficient was not estimable. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. ID= intellectual disability; var.=variance; SPED= special education certification; DUAL= dual certification; TEST= test dual certification. SE= Standard error; CI= confidence interval; OR= odds ratio. Results in bold are statistically significant at, at least, $p<.05$.

Table 43

Results from separate models for each teacher category RQ3 predicting total attrition for categories of the average percentage of students with behavior disorders in teacher's classes.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
SPED Int.	**-2.90**	**0.45**	**-6.48**	**-3.78, -2.02**	**0.06**	**0.02**	**0.02, 0.13**
ALL BD	0.62	0.57	1.09	-0.50, 1.74	1.86	1.06	0.61, 5.70
CAT5 BD	0.21	0.54	0.40	-0.84, 1.27	1.24	0.67	0.43, 3.55
CAT4 BD	-0.35	0.24	-1.43	-0.83, 0.13	0.70	0.17	0.44, 1.14
CAT3 BD	0.08	0.19	0.44	-0.29, 0.46	1.09	0.21	0.75, 1.58
CAT2 BD	0.18	0.14	1.23	-0.11, 0.46	1.19	0.17	0.90, 1.58
CAT1 BD	-0.05	0.10	-0.44	-0.25, 0.16	0.96	0.10	0.78, 1.17
Teacher var.	3.72	1.15					
School var.	0.20	0.09					
Teachers	7,818						
Dual Int.	**-3.24**	**0.66**	**-4.93**	**-4.53, -1.95**	**0.04**	**0.03**	**0.01, 0.14**
ALL BD	**1.88**	**0.90**	**2.09**	**0.11, 3.64**	**6.53**	**5.88**	**1.12, 38.09**
CAT5 BD	1.46	1.20	1.22	-0.89, 3.82	4.32	5.20	0.41, 45.61
CAT4 BD	**0.78**	**0.36**	**2.16**	**0.07, 1.49**	**2.19**	**0.79**	**1.08, 4.46**
CAT3 BD	0.52	0.27	1.90	-0.02, 1.05	1.68	0.46	0.98, 2.87
CAT2 BD	0.27	0.19	1.38	-0.11, 0.65	1.31	0.25	0.89, 1.92
CAT1 BD	0.17	0.11	1.52	-0.05, 0.38	1.18	0.13	0.95, 1.46
Teacher var.	4.45	2.08					
School var.	0.10	0.23					
Teachers	6,238						
Test Int.	**-3.31**	**1.01**	**-3.28**	**-5.28, -1.33**	**0.04**	**0.04**	**0.01, 0.26**
ALL BD	0.61	1.46	0.42	-2.25, 3.47	1.84	2.69	0.11, 32.15
CAT5 BD							
CAT4 BD	0.51	0.66	0.76	-0.80, 1.81	1.66	1.10	0.45, 6.10
CAT3 BD	0.45	0.51	0.88	-0.55, 1.46	1.57	0.81	0.58, 4.30
CAT2 BD	0.18	0.32	0.57	-0.45, 0.81	1.20	0.39	0.64, 2.26
CAT1 BD	0.32	0.20	1.61	-0.07, 0.70	1.37	0.27	0.93, 2.01
Teacher var.	1.38	1.65					
School var.	0.31	0.29					
Teachers	1,238						
Gen. Ed. Int.	**-4.07**	**0.17**	**-23.77**	**-4.40, -3.73**	**0.02**	**0.00**	**0.01, 0.02**
ALL BD	1.46	1.11	1.32	-0.72, 3.64	4.32	4.80	0.49, 38.10
CAT5 BD							
CAT4 BD	0.80	0.47	1.70	-0.12, 1.73	2.23	1.05	0.88, 5.61
CAT3 BD	0.55	0.31	1.79	-0.05, 1.15	1.73	0.53	0.95, 3.15
CAT2 BD	0.13	0.12	1.09	-0.11, 0.38	1.14	0.14	0.90, 1.46
CAT1 BD	-0.03	0.02	-1.34	-0.08, 0.02	0.97	0.02	0.92, 1.02
Teacher var.	3.11	0.44					
School var.	0.34	0.04					
Teachers	112,900						

Note. Each model includes teacher, classroom (including the average percentage of students with other disabilities), and school control variables. These results are from models run on separate samples of teachers. Statistical significance is indicated by bold; here the comparison is to a teacher without any SWDs. A blank row indicates that the coefficient was not estimable. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. BD= behavior disorder; var.=variance; SPED= special education certification; DUAL= dual certification; TEST= test dual certification. SE= Standard error; CI= confidence interval; OR= odds ratio. Results in bold are statistically significant at, at least, $p<.05$.

Table 44
Interaction results for RQ3 predicting leaving with interactions between certification and the category of the average percentage of students with behavior disorders in teachers' classes.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
SPEDxAll BD	1.78	1.54	1.16	-1.23, 4.80	5.95	9.16	0.29, 121.56
SPEDxCAT5 BD	**17.90**	**7.02**	**2.55**	**4.14, 31.66**			
SPEDxCAT4 BD	1.27	0.83	1.52	-0.36, 2.90	3.56	2.97	0.69, 18.25
SPEDxCAT3 BD	-0.26	0.40	-0.64	-1.05, 0.53	0.77	0.31	0.35, 1.70
SPEDxCAT2 BD	-0.01	0.20	-0.03	-0.40, 0.39	0.99	0.20	0.67, 1.48
SPEDxCAT1 BD	0.15	0.11	1.41	-0.06, 0.36	1.16	0.13	0.94, 1.44
DUALxAll BD	0.35	1.72	0.21	-3.01, 3.72	1.42	2.44	0.05, 41.12
DUALxCAT5 BD							
DUALxCAT4 BD	1.17	0.86	1.36	-0.51, 2.85	3.21	2.75	0.60, 17.23
DUALxCAT3 BD	-0.18	0.44	-0.41	-1.03, 0.68	0.84	0.37	0.36, 1.97
DUALxCAT2 BD	-0.30	0.24	-1.25	-0.78, 0.17	0.74	0.18	0.46, 1.19
DUALxCAT1 BD	-0.09	0.11	-0.80	-0.29, 0.12	0.92	0.10	0.75, 1.13
TESTxAll BD							
TESTxCAT5 BD							
TESTxCAT4 BD	0.44	1.24	0.35	-1.99, 2.87	1.55	1.92	0.14, 17.62
TESTxCAT3 BD	0.12	0.63	0.19	-1.12, 1.36	1.13	0.72	0.33, 3.91
TESTxCAT2 BD	-0.32	0.43	-0.75	-1.17, 0.52	0.72	0.31	0.31, 1.68
TESTxCAT1 BD	0.16	0.23	0.70	-0.29, 0.60	1.17	0.26	0.75, 1.82
ALL BD	-0.31	1.46	-0.21	-3.17, 2.55	0.73	1.07	0.04, 12.86
CAT5 BD	-17.50	17.04	-1.03	-50.89, 15.89			
CAT4 BD	-0.96	0.80	-1.21	-2.52, 0.60	0.38	0.30	0.08, 1.82
CAT3 BD	0.35	0.34	1.03	-0.32, 1.02	1.42	0.48	0.73, 2.77
CAT2 BD	0.24	0.13	1.76	-0.03, 0.50	1.27	0.17	0.97, 1.65
CAT1 BD	0.01	0.03	0.37	-0.04, 0.06	1.01	0.03	0.96, 1.06
SPED	-0.01	0.07	-0.16	-0.16, 0.13	0.99	0.07	0.86, 1.14
Dual cert.	0.01	0.06	0.09	-0.11, 0.12	1.01	0.06	0.90, 1.13
Test dual cert.	**-0.27**	**0.13**	**-1.98**	**-0.53, 0.00**	**0.77**	**0.10**	**0.59, 1.00**
Intercept	**-4.30**	**0.13**	**-32.32**	**-4.56, -4.04**	**0.01**	**0.00**	**0.01, 0.02**
Variances							
Teacher	1.57	0.22					
School	0.06	0.01					
Log likelihood	-64908.7 (112)						
AIC	130041.4						
BIC	131208.0						
Observations	246,747						
Teachers	127,579						
Schools	2,310						

Note. Model includes teacher, classroom (including the average percentage of students with other disabilities), and school control variables. Statistical significance is indicated by bold; here the comparison is to a teacher without any SWDs. A blank row indicates that the coefficient was not estimable. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. BD= behavior disorder; var.=variance; SPED= special education certification; DUAL= dual certification; TEST= test dual certification. SE= Standard error; CI= confidence interval; OR= odds ratio. Results in bold are statistically significant at, at least, $p<.05$.

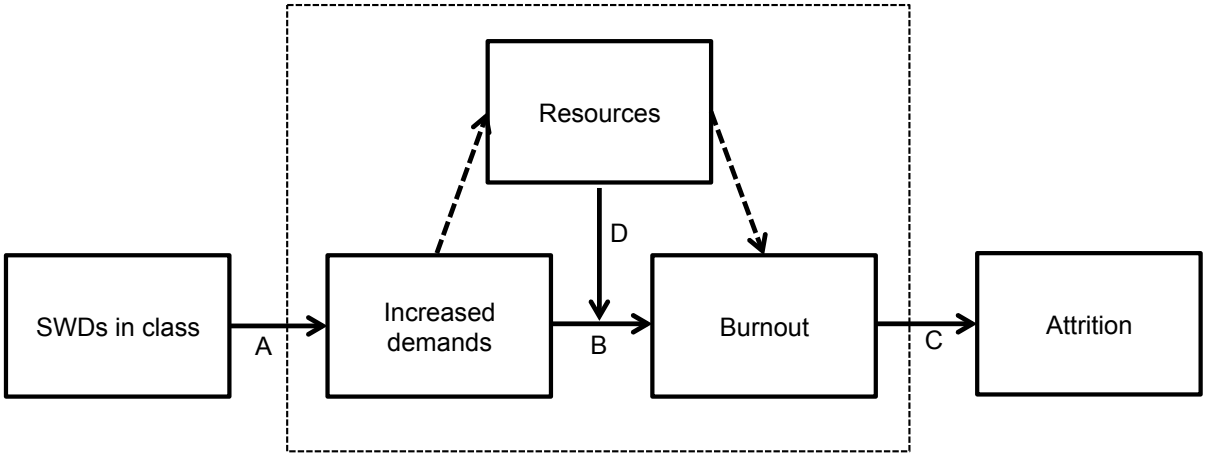


Figure 1. Theory of change underlying the associations between SWDs and teacher attrition.

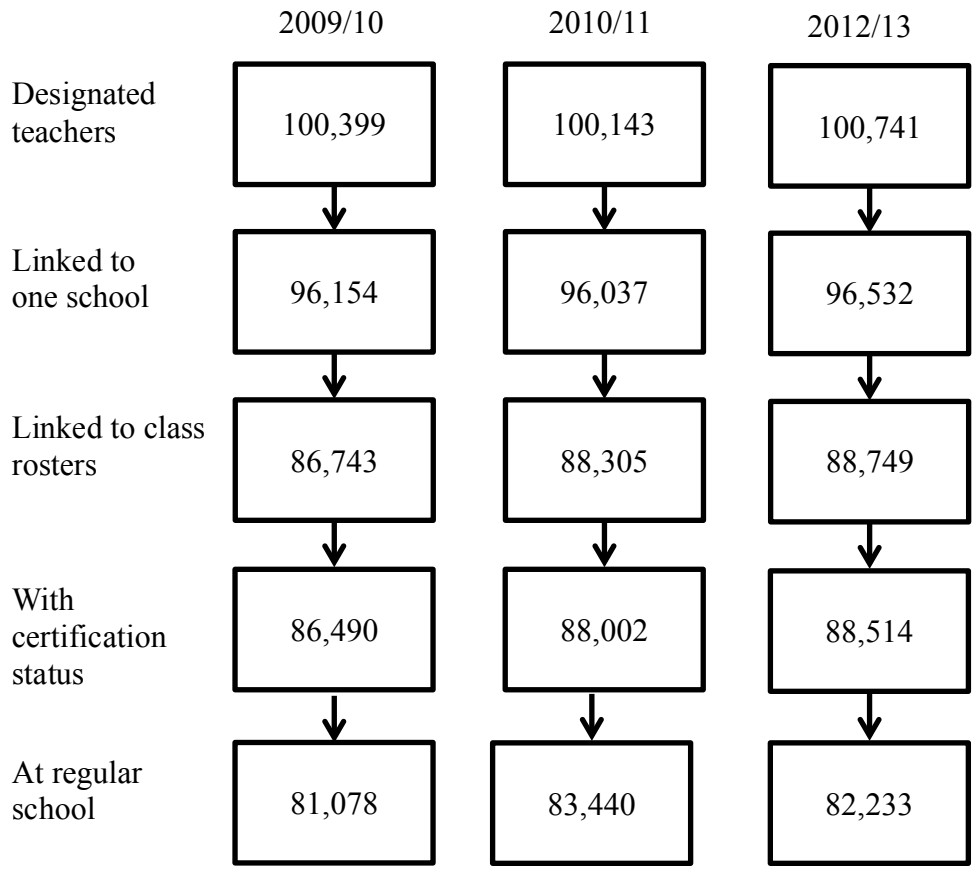


Figure 2. Number of teachers included at each stage of the sample development.

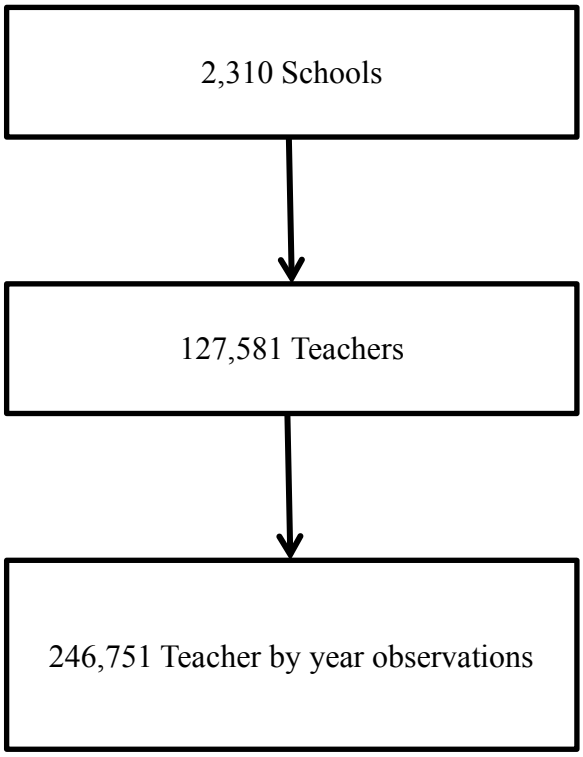


Figure 3. The number of teacher by year observations, nested in teachers, who are nested in schools.

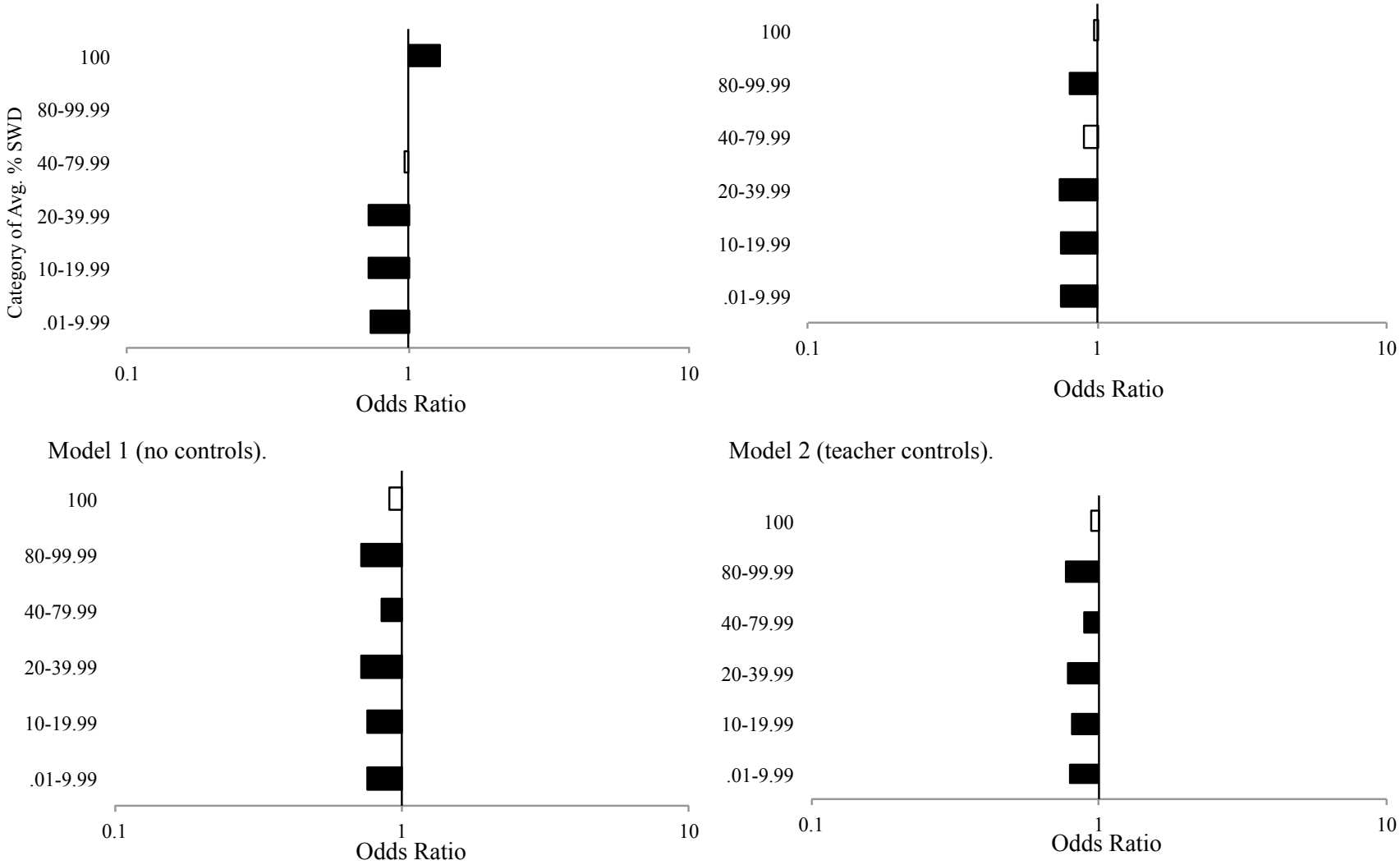


Figure 4. Change in the conditional average odds of total attrition associated with the categories of the average percentage of SWDs in teachers' classes. A solid bar represents a statistically significant difference.

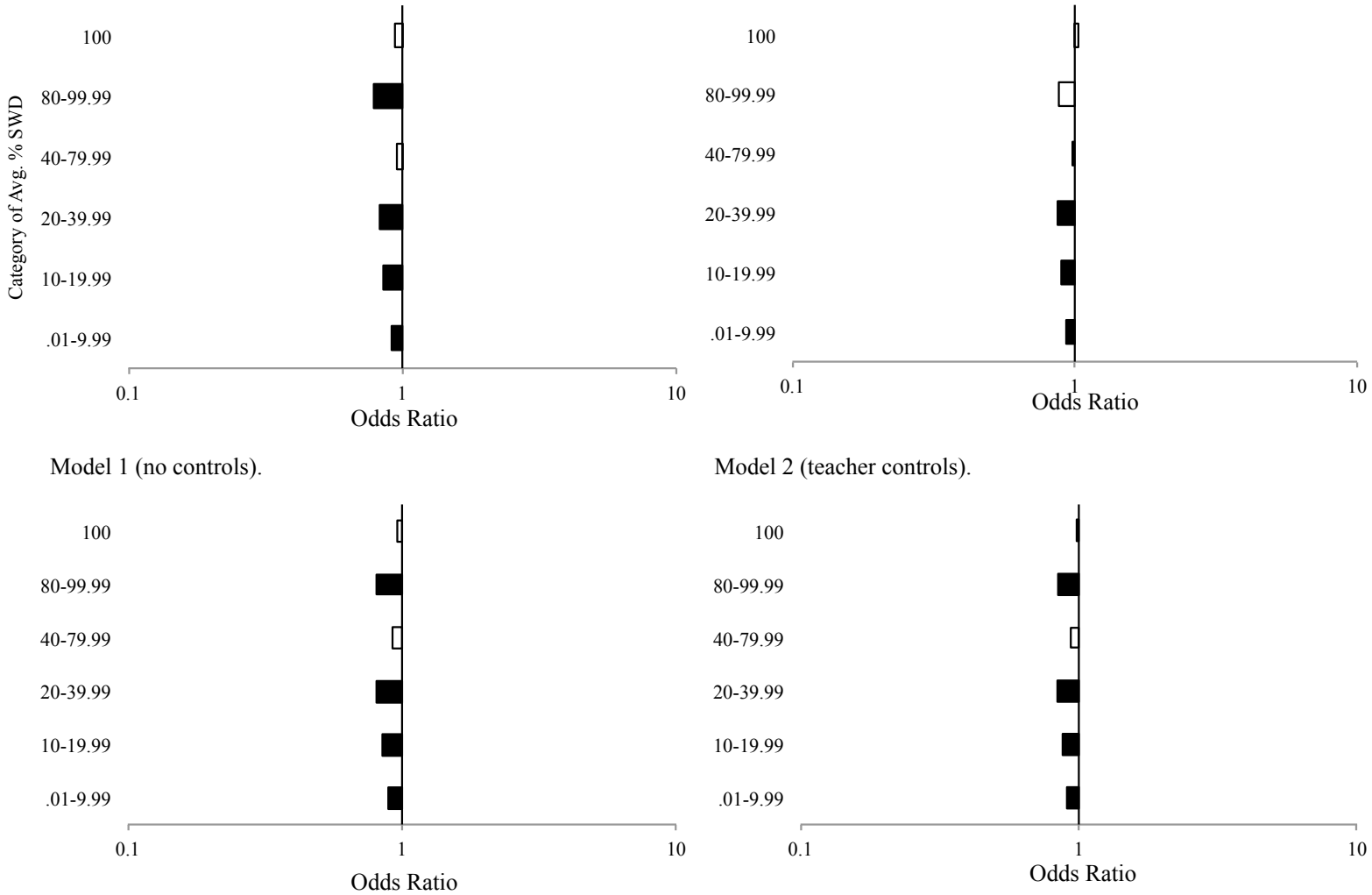


Figure 5. Change in the conditional average odds of leaving associated with the categories of the average percentage of SWDs in teachers' classes. A solid bar represents a statistically significant difference.

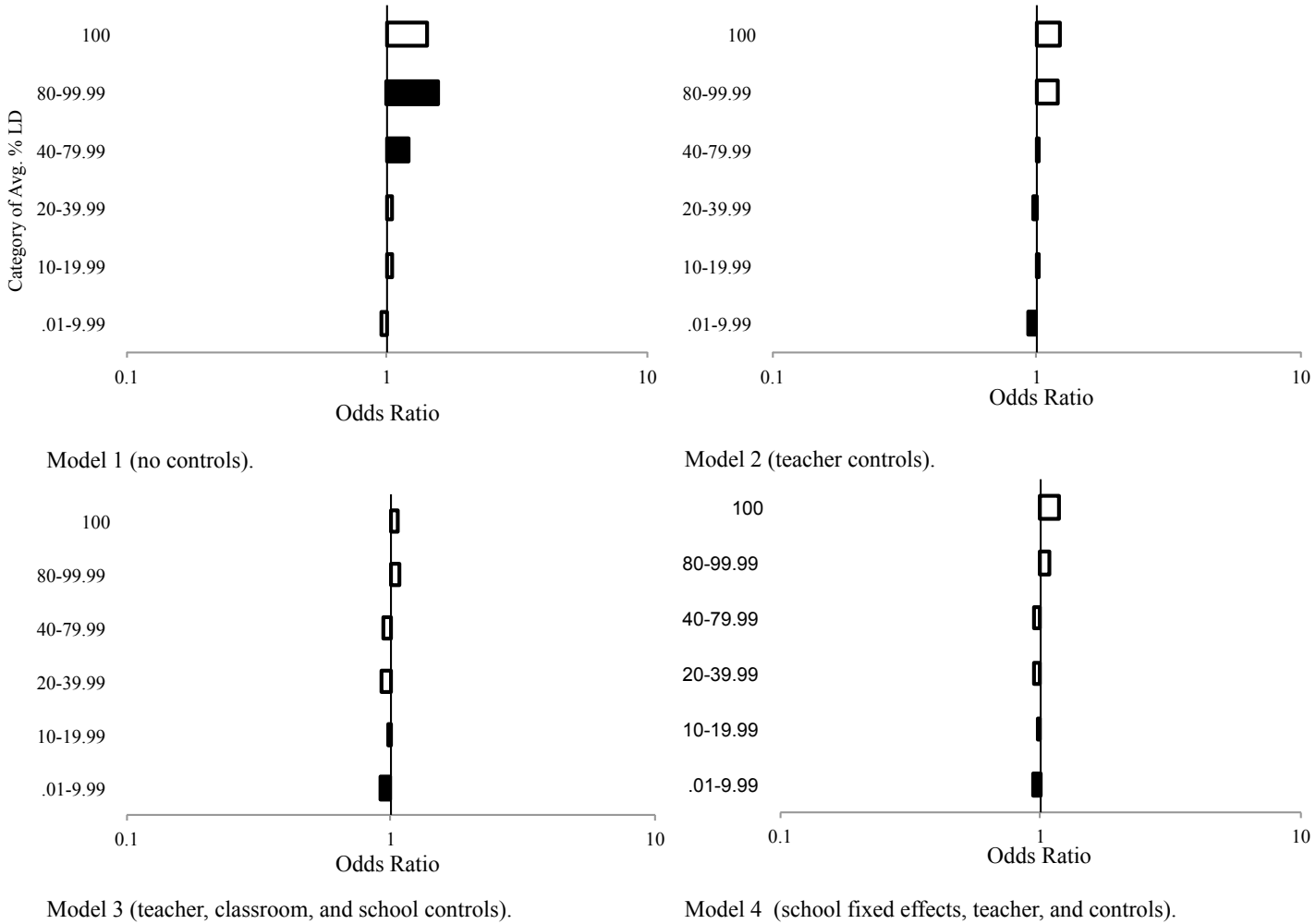


Figure 6. Change in the conditional average odds of total attrition associated with the categories of the average percentage of students with learning disabilities in teachers' classes. A solid bar represents a statistically significant difference.

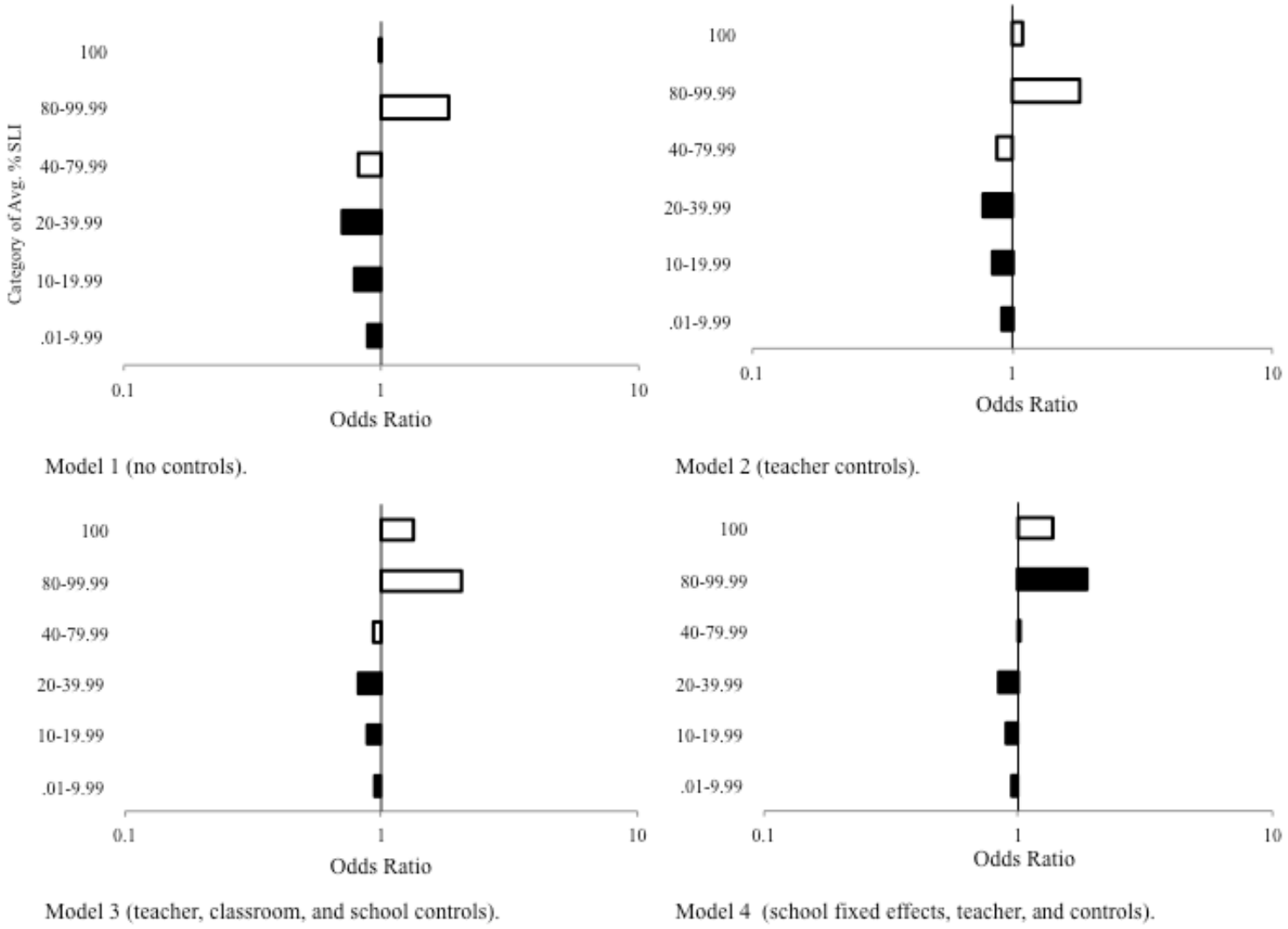


Figure 7. Change in the conditional average odds of total attrition associated with the categories of the average percentage of students with speech/language impairments in teachers' classes. A solid bar represents a statistically significant difference.

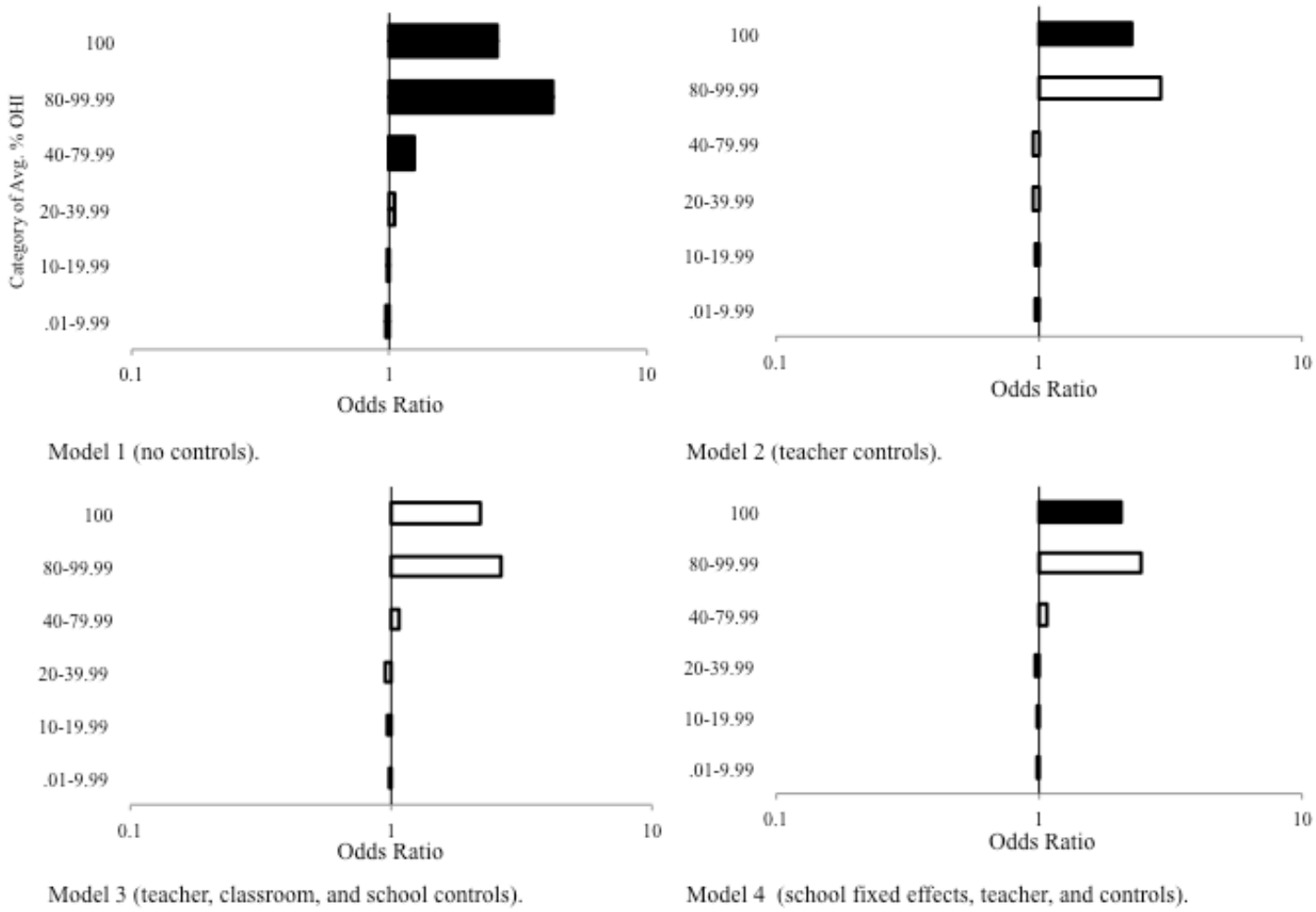


Figure 8. Change in the conditional average odds of total attrition associated with the categories of the average percentage of students with other health impairments in teachers' classes. A solid bar represents a statistically significant difference.

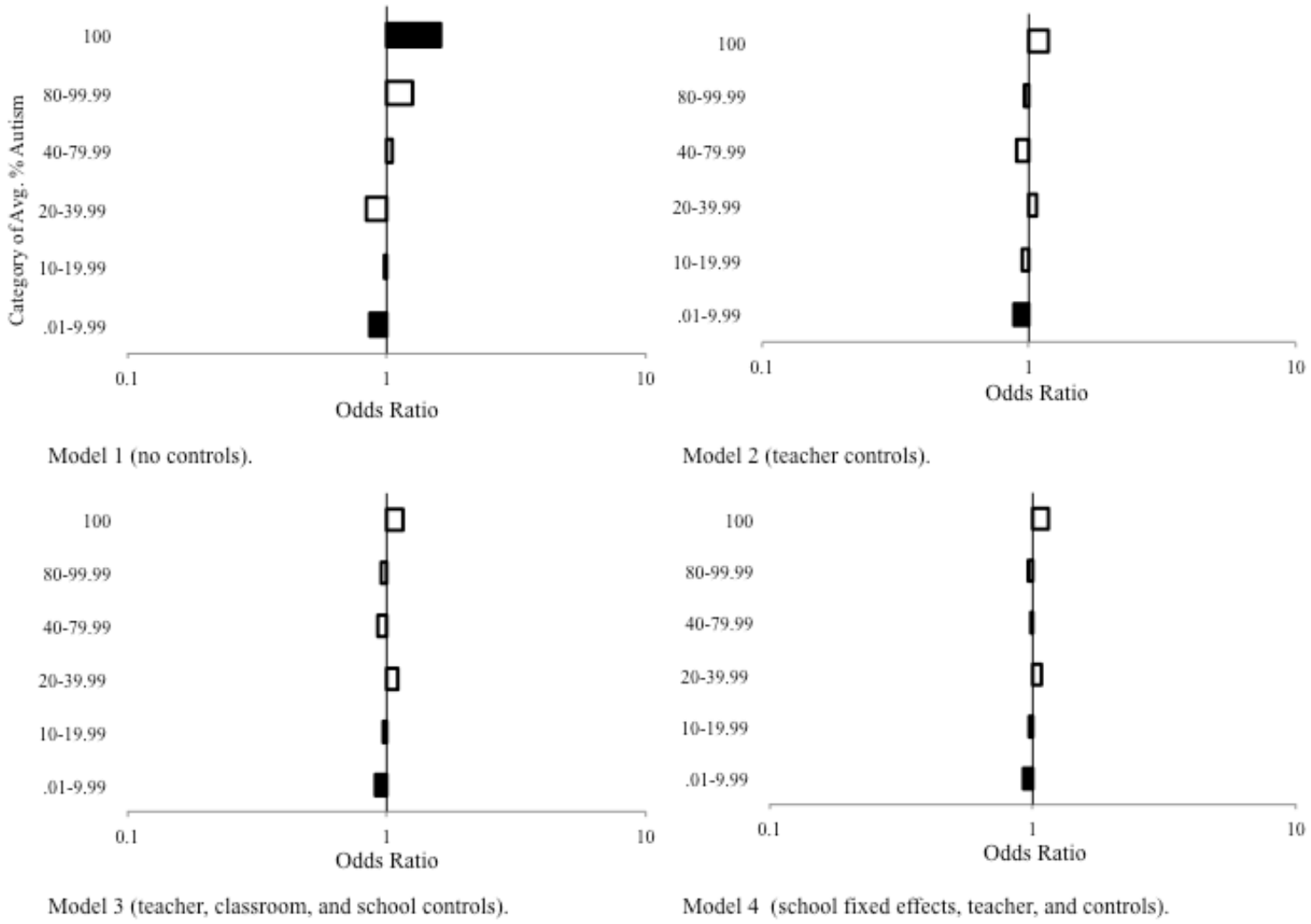


Figure 9. Change in the conditional average odds of total attrition associated with the categories of the average percentage of students with autism in teachers' classes. A solid bar represents a statistically significant difference.

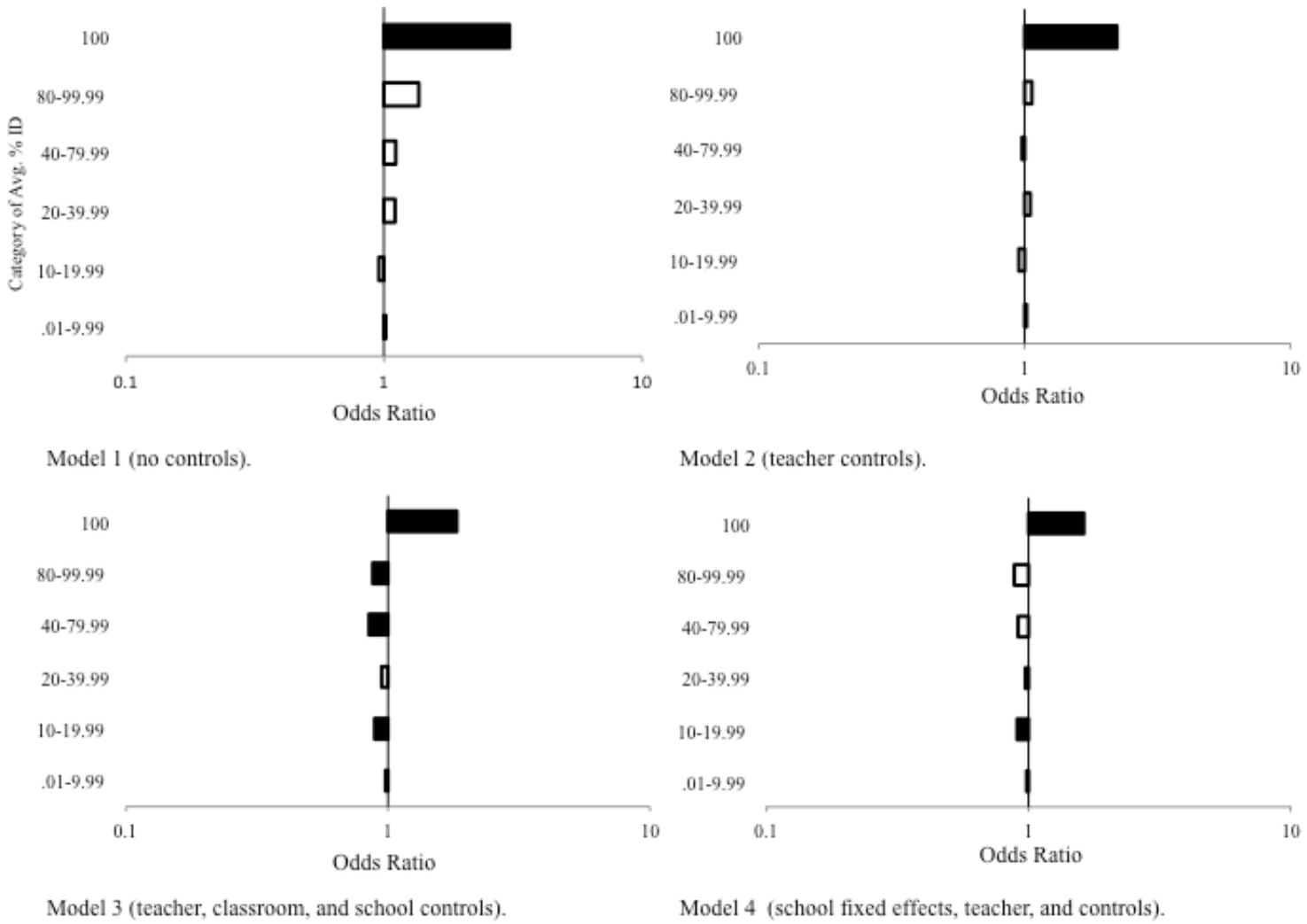


Figure 10. Change in the conditional average odds of total attrition associated with the categories of the average percentage of students with intellectual disabilities in teachers' classes. A solid bar represents a statistically significant difference.

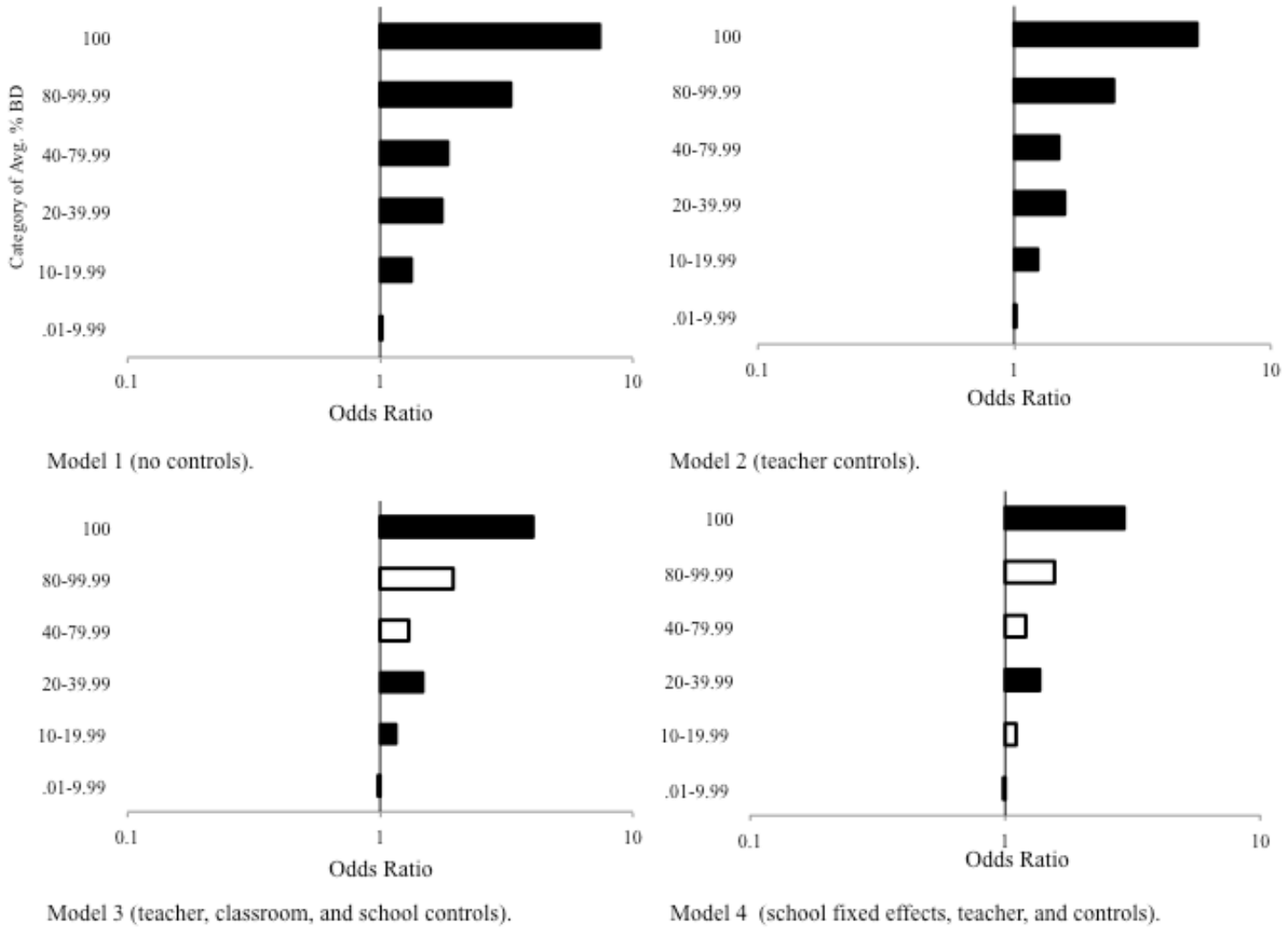


Figure 11. Change in the conditional average odds of total attrition associated with the categories of the average percentage of students with behavior disorders in teachers' classes. A solid bar represents a statistically significant difference.

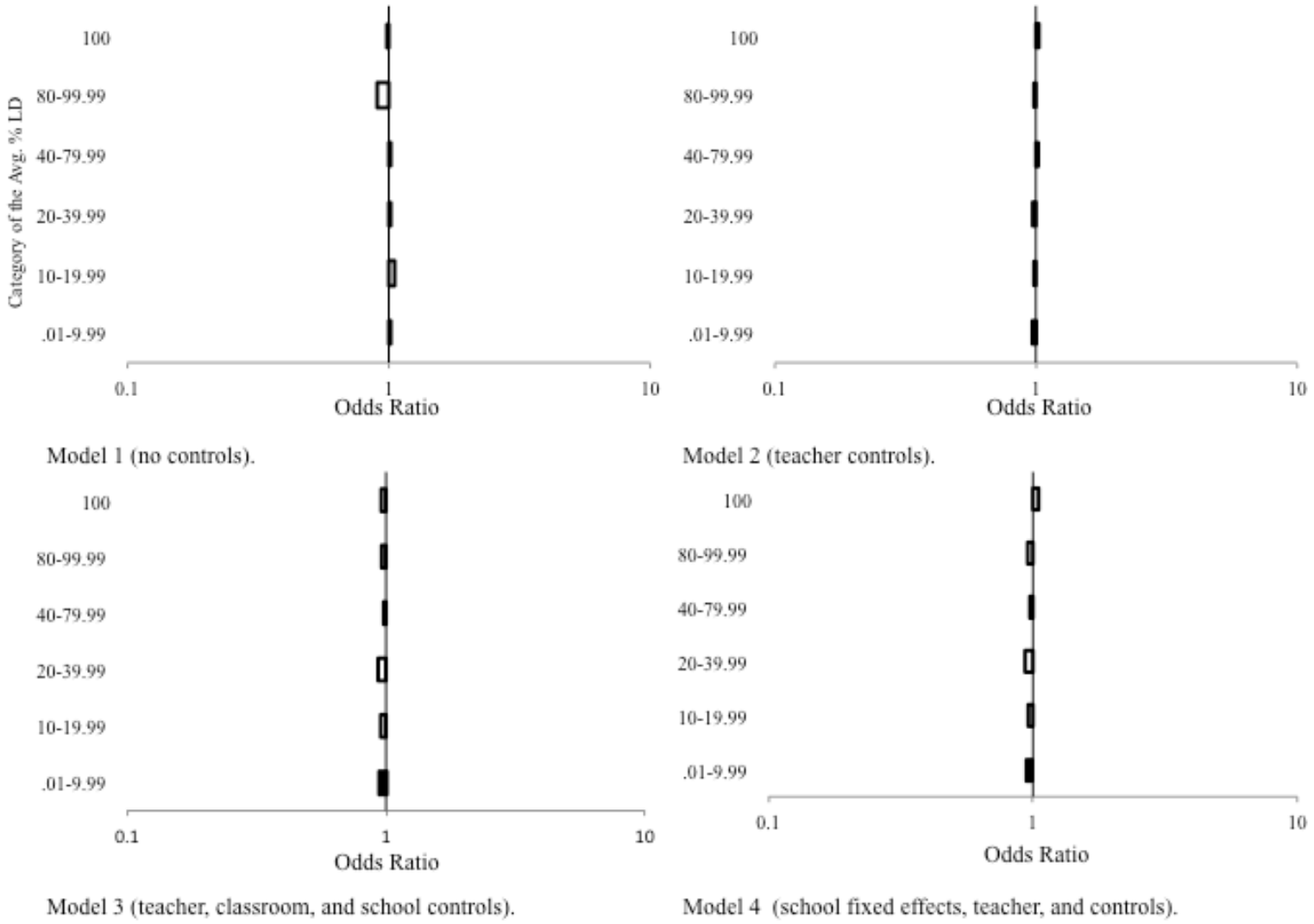


Figure 12. Change in the conditional average odds of leaving associated with the categories of the average percentage of students with learning disabilities in teachers' classes. A solid bar represents a statistically significant difference.

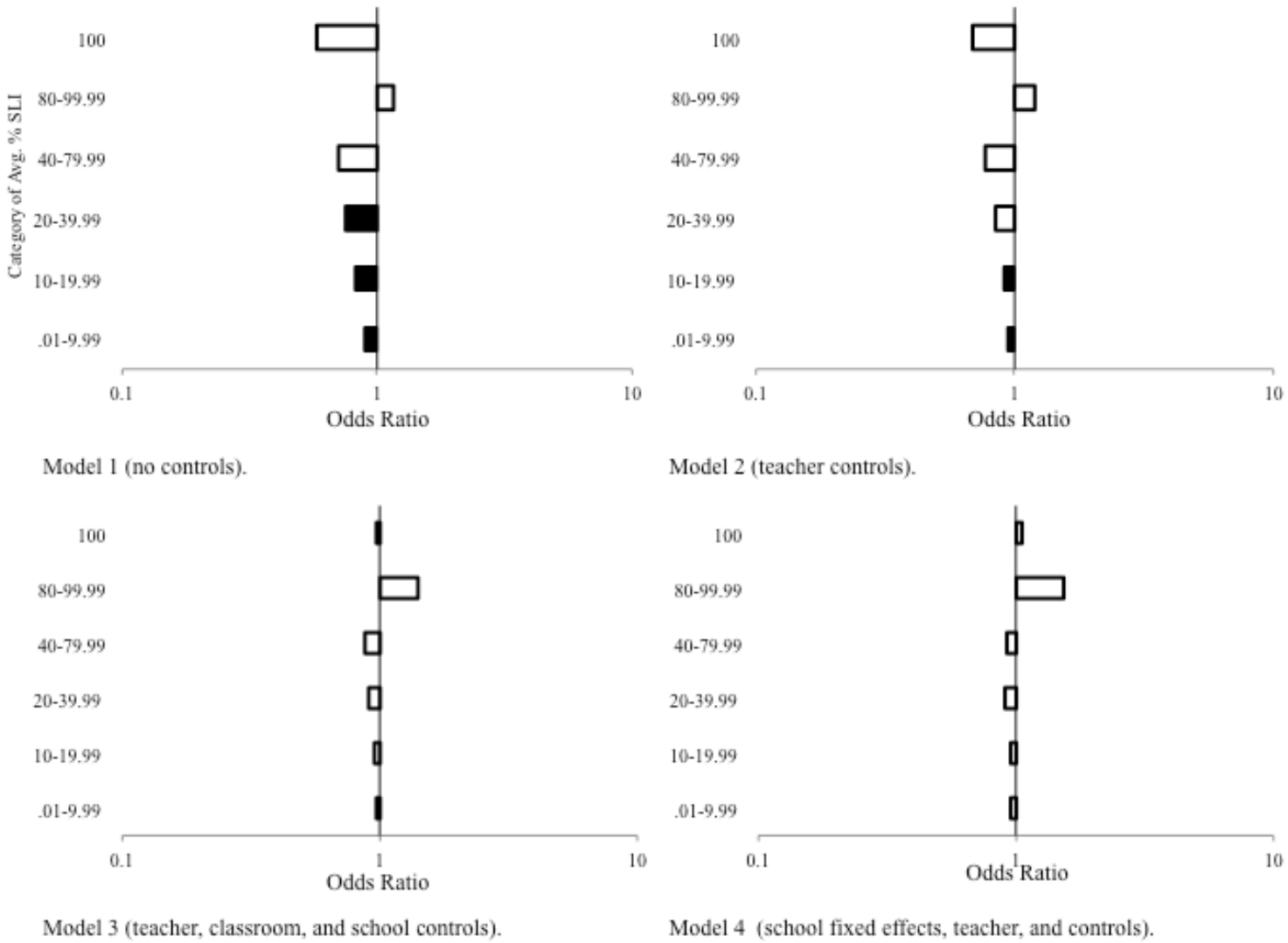


Figure 13. Change in the conditional average odds of leaving associated with the categories of the average percentage of students with speech/language impairments in teachers' classes. A solid bar represents a statistically significant difference.

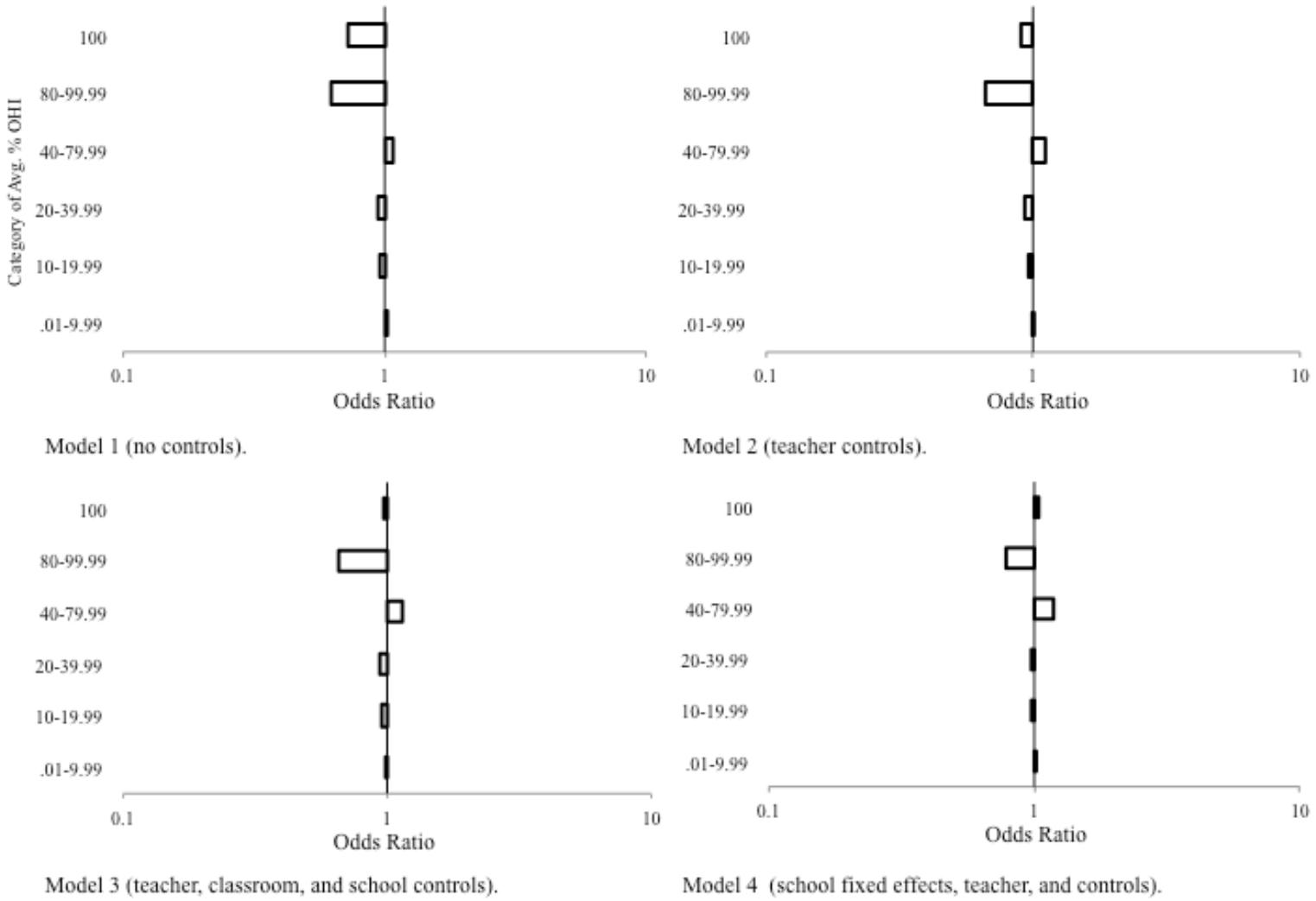


Figure 14. Change in the conditional average odds of leaving associated with the categories of the average percentage of students with other health impairments in teachers' classes. A solid bar represents a statistically significant difference.

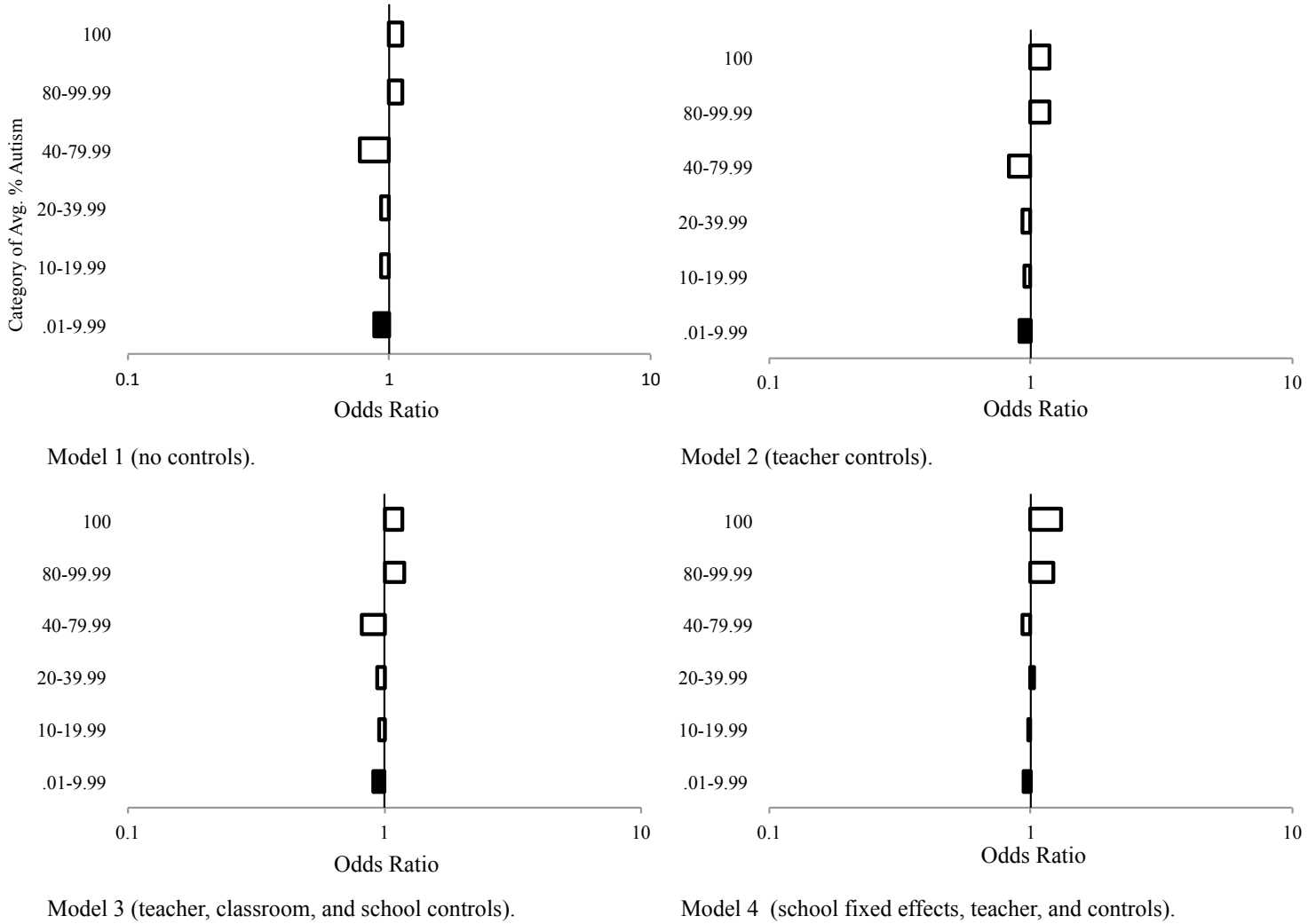


Figure 15. Change in the conditional average odds of leaving associated with the categories of the average percentage of students with autism in teachers' classes. A solid bar represents a statistically significant difference.

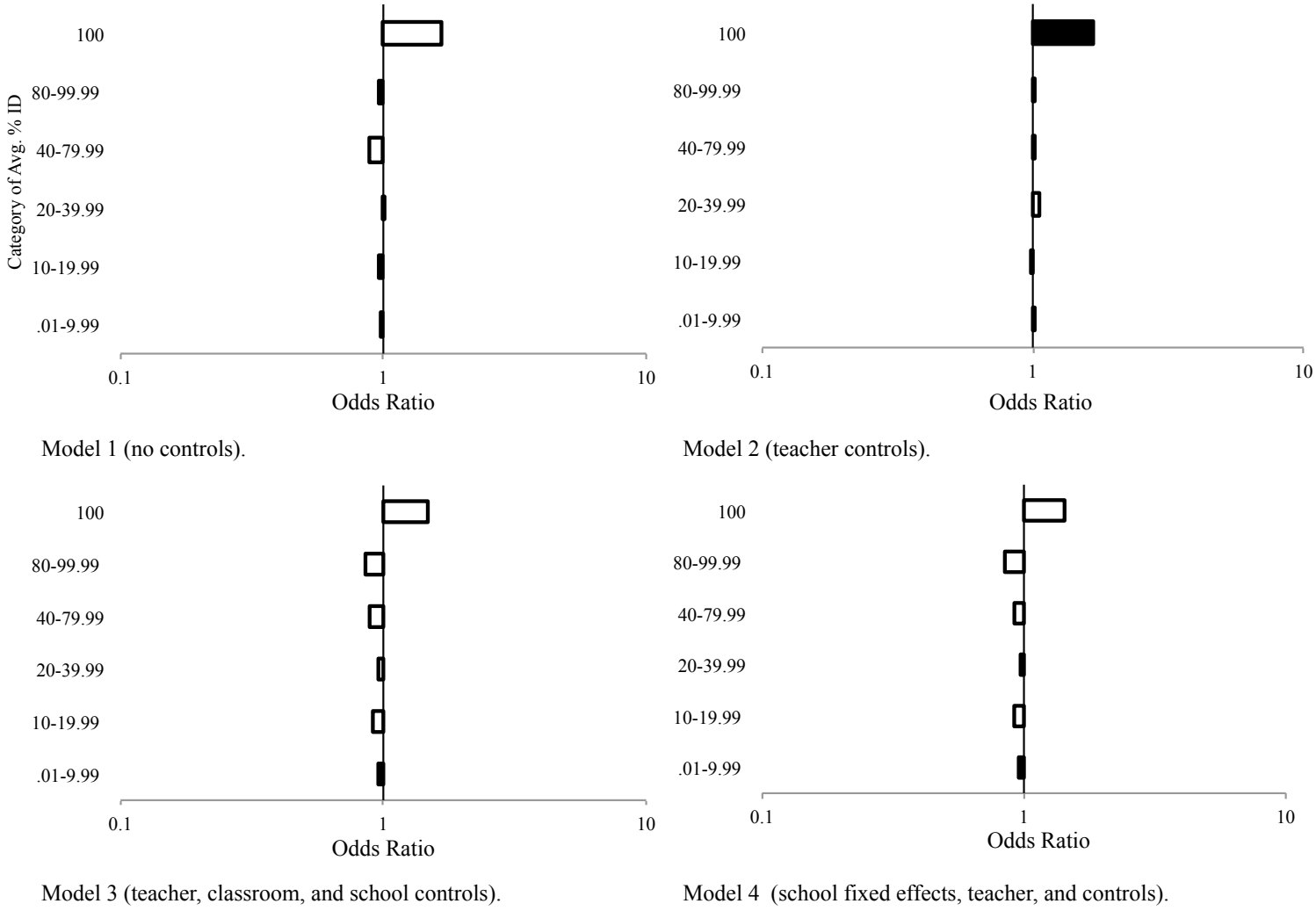
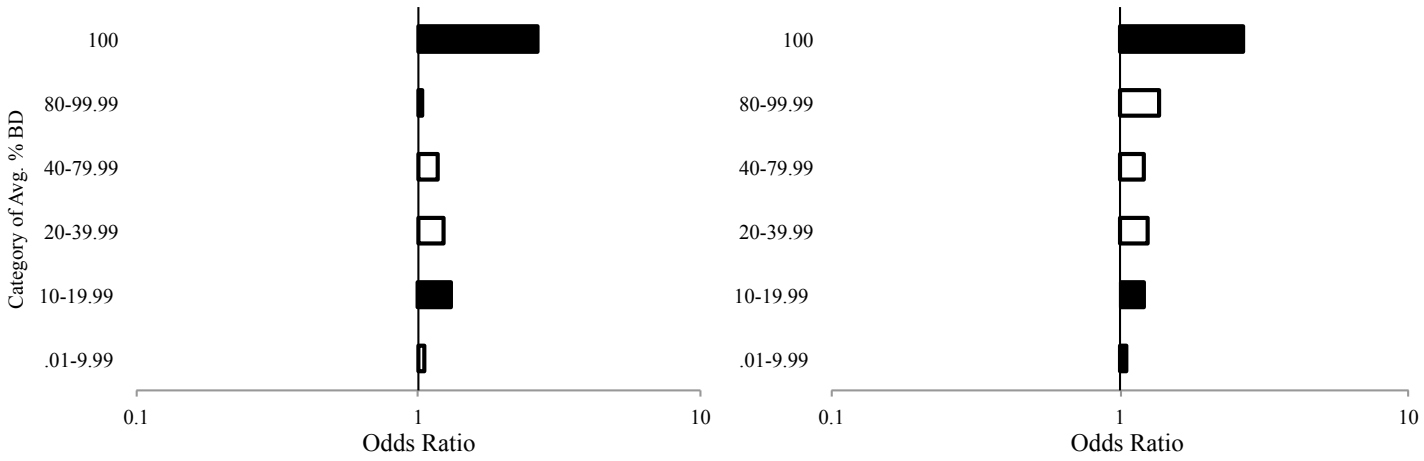
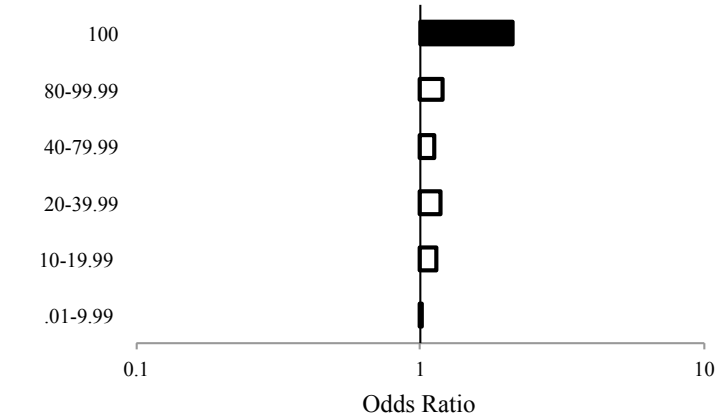


Figure 16. Change in the conditional average odds of leaving associated with the categories of the average percentage of students with intellectual disabilities in teachers' classes. A solid bar represents a statistically significant difference.

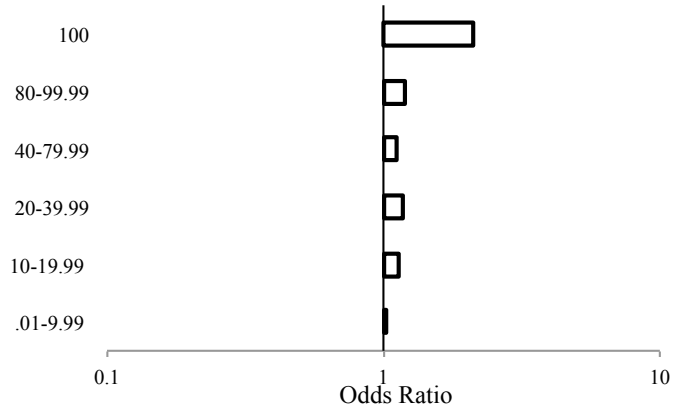


Model 1 (no controls).

Model 2 (teacher controls).



Model 3 (teacher, classroom, and school controls).



Model 4 (school fixed effects, teacher, and controls).

Figure 17. Change in the conditional average odds of leaving associated with the categories of the average percentage of students with behavior disorders in teachers' classes. A solid bar represents a statistically significant difference.

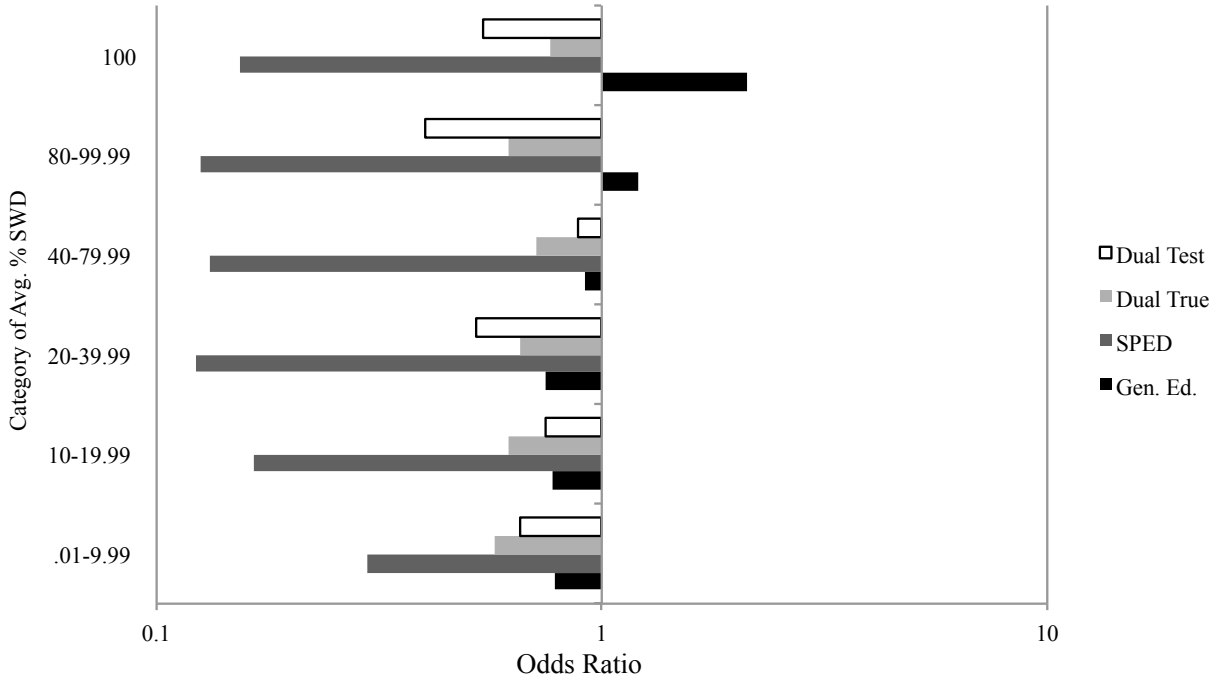


Figure 18. Conditional average odds of attrition from interaction model. Model includes controls for teacher, classroom, and school characteristics.

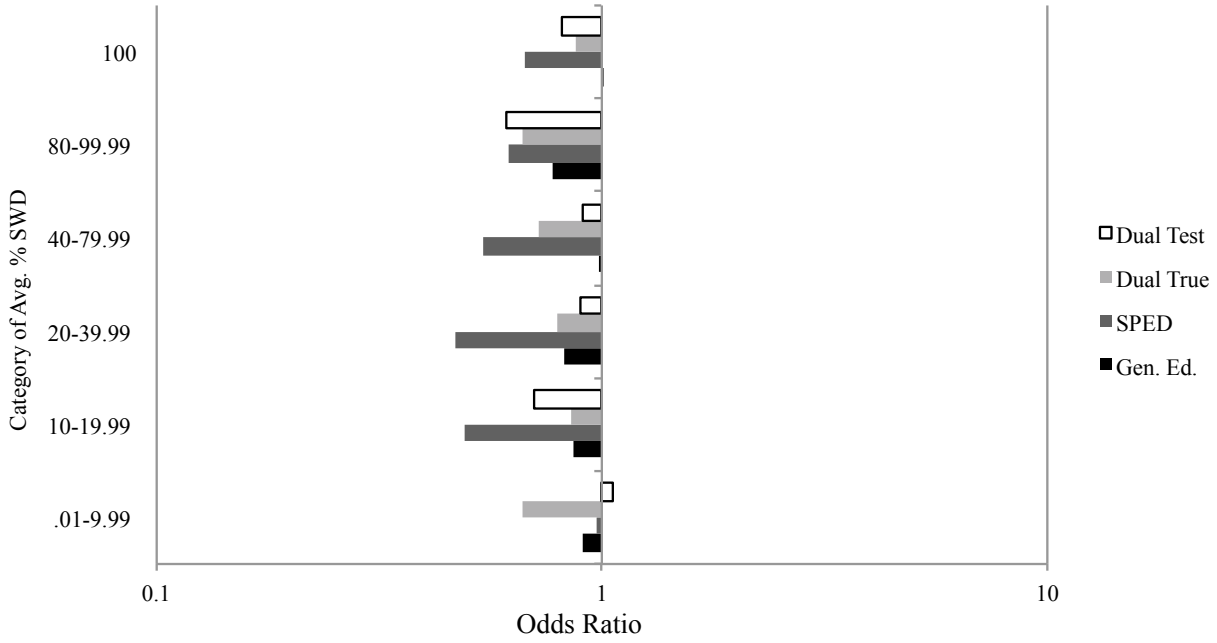


Figure 19. Conditional average odds leaving by certification type from the interaction models. Model includes controls for teacher, classroom, and school characteristics.

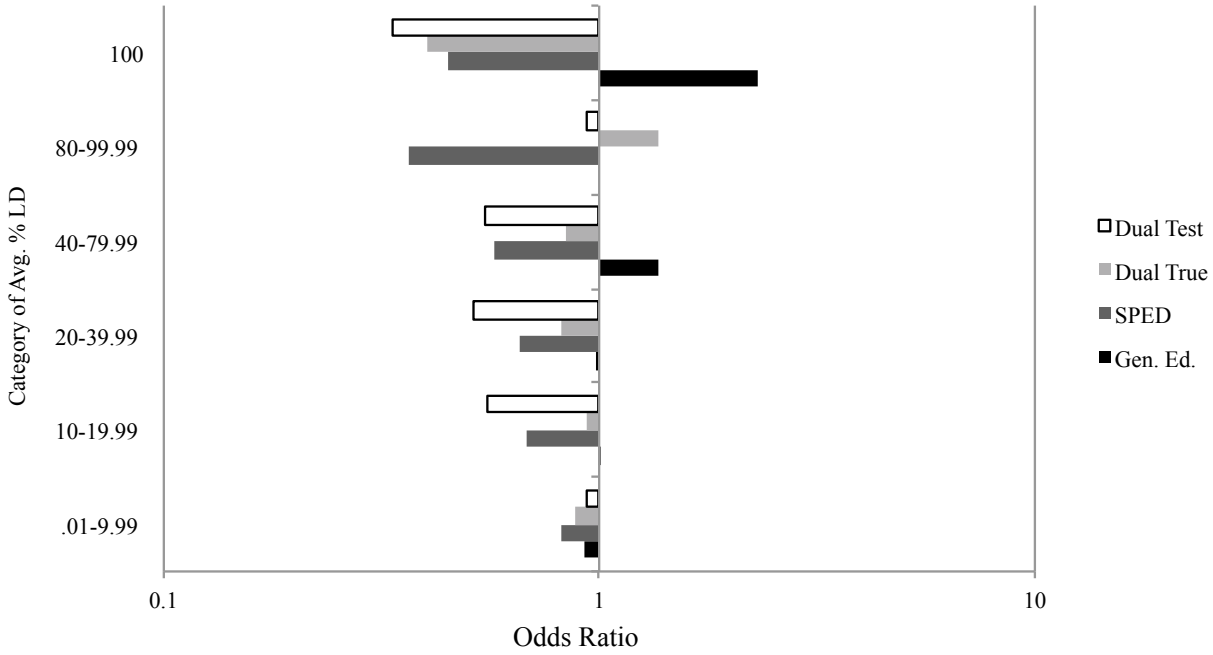


Figure 20. Conditional average odds of attrition for categories of the average percentage of students with learning disabilities by teacher certification. Results are from models run on subsamples by certification type. Models included controls for teacher, classroom, and school characteristics.

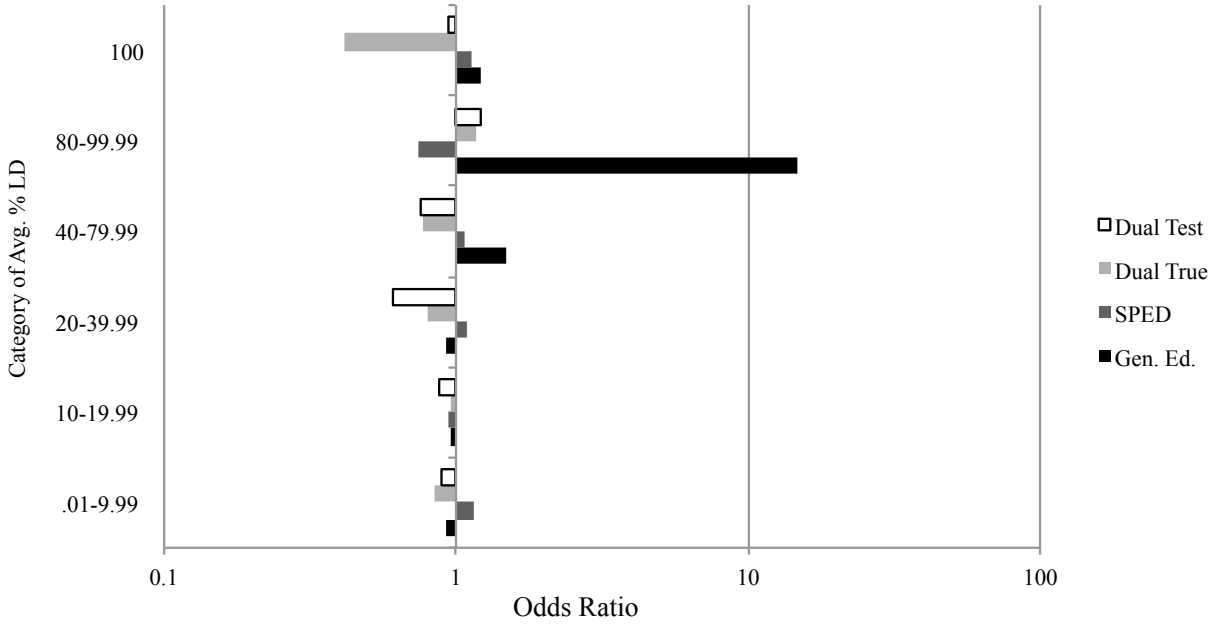


Figure 21. Conditional average odds of leaving associated with the category of the average percentage of students with learning disabilities by certification type from the interaction models. Model includes controls for teacher, classroom, and school characteristics.

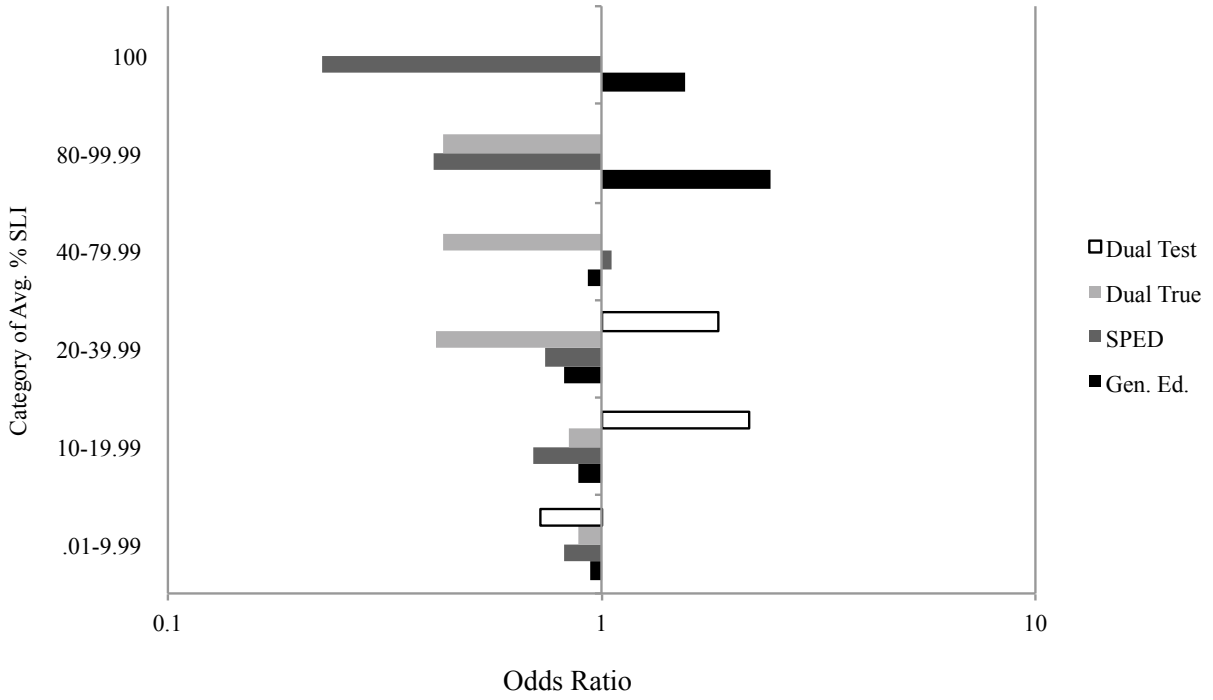


Figure 22. Conditional average odds of attrition for categories of the average percentage of students with speech/language impairments by teacher certification. Results are from models run on subsamples by certification type. Models included controls for teacher, classroom, and school characteristics.

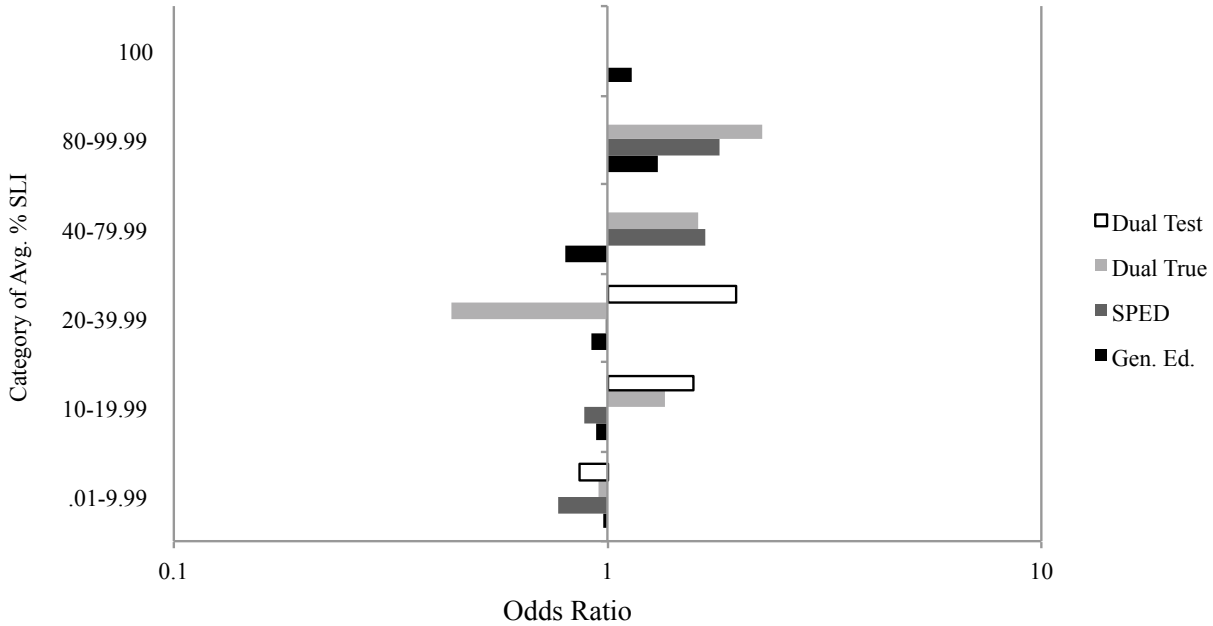


Figure 23. Conditional average odds of leaving associated with the category of the average percentage of students with speech/language disabilities by certification type from the interaction models. Model includes controls for teacher, classroom, and school characteristics.

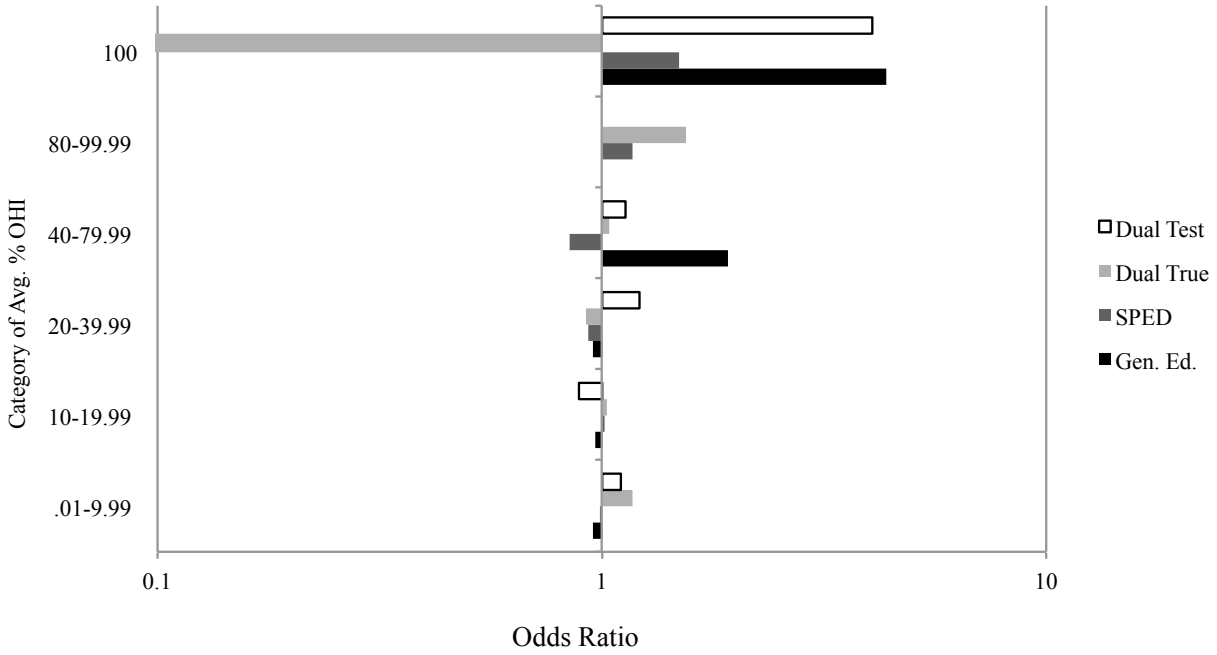


Figure 22. Conditional average odds of attrition for categories of the average percentage of students with other health impairments by teacher certification. Results are from models run on subsamples by certification type. Models included controls for teacher, classroom, and school characteristics.

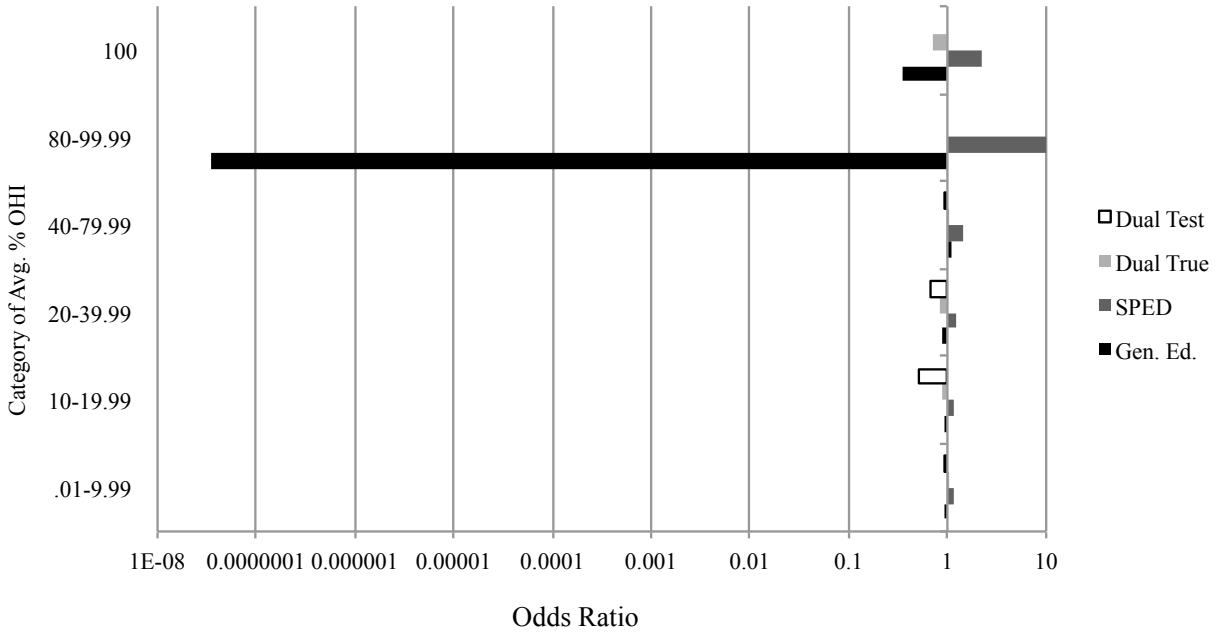


Figure 25. Conditional average odds of leaving associated with the category of the average percentage of students with other health impairmentsby certification type from the interaction models. Model includes controls for teacher, classroom, and school characteristics.

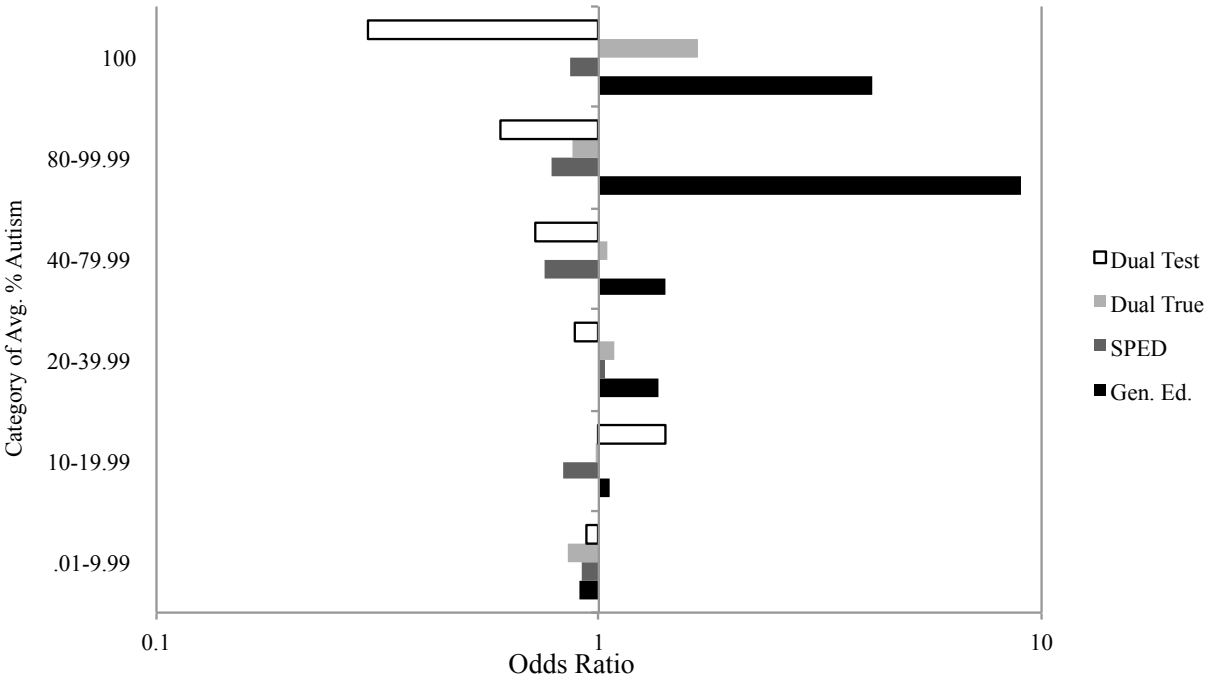


Figure 26. Change in the conditional average odds of attrition associated with the category of the average percentage of students with autism by certification type from the interaction models. Model includes controls for teacher, classroom, and school characteristics.

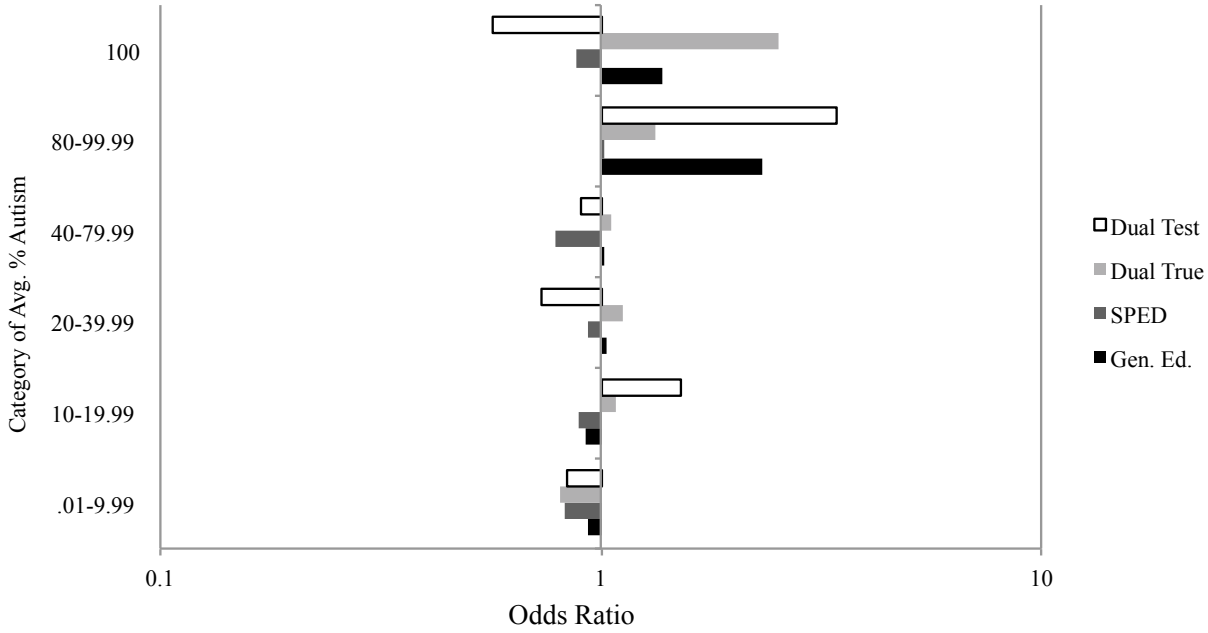


Figure 27. Change in the conditional average odds of leaving associated with the category of the average percentage of students with autism by certification type from the interaction models. Model includes controls for teacher, classroom, and school characteristics.

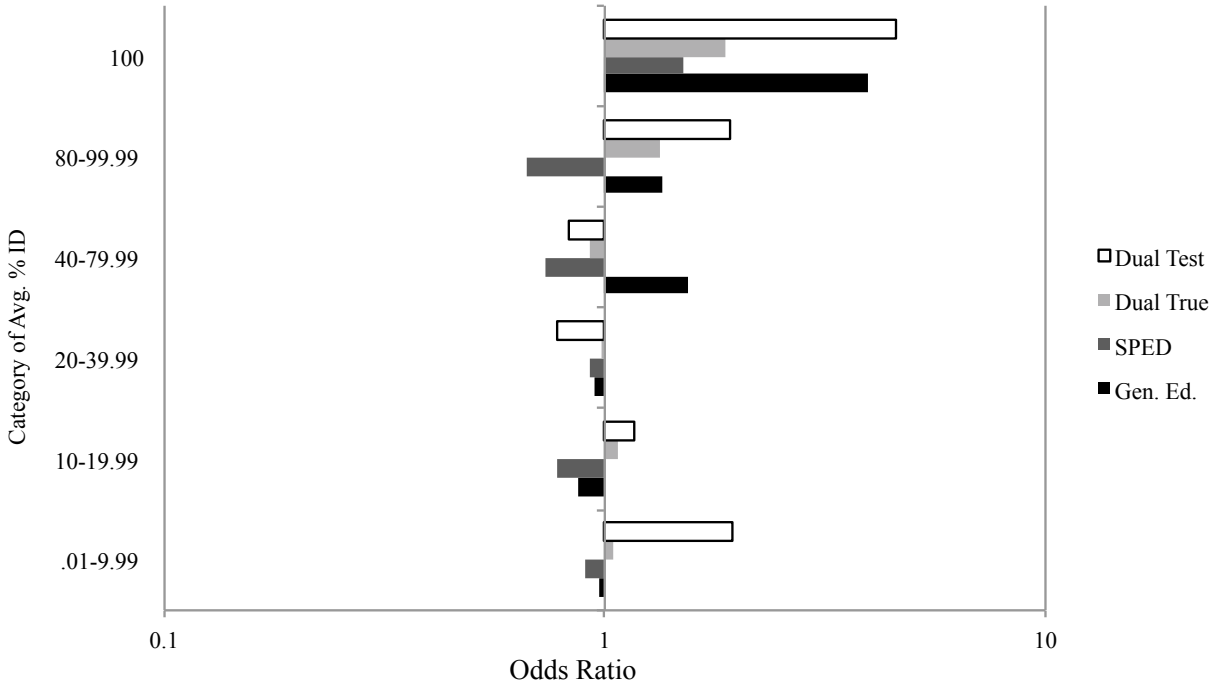


Figure 28. Change in the conditional average odds of attrition associated with the category of the average percentage of students with intellectual disabilities by certification type from the interaction models. Model includes controls for teacher, classroom, and school characteristics.

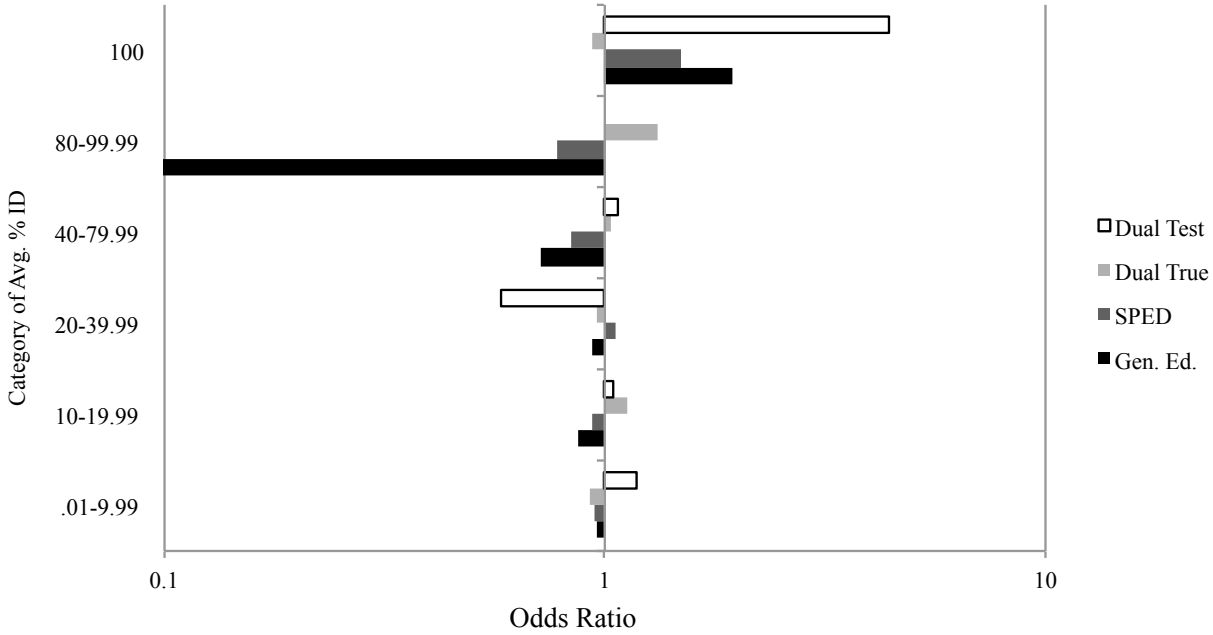


Figure 29. Change in the conditional average odds of leaving associated with the category of the average percentage of students with intellectual disabilities by certification type from the interaction models. Model includes controls for teacher, classroom, and school characteristics.

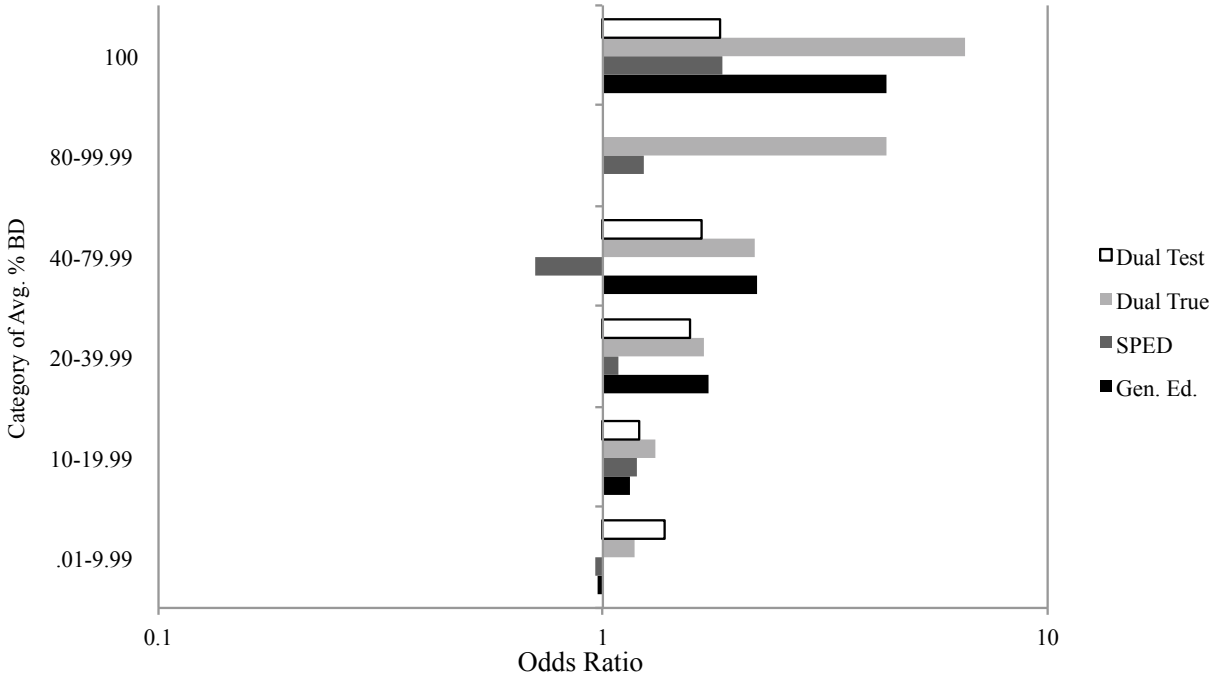


Figure 30. Change in the conditional average odds of attrition for categories of the average percentage of students with behavior disorders by teacher certification. Results are from models run on subsamples by certification type. Models included controls for teacher, classroom, and school characteristics.

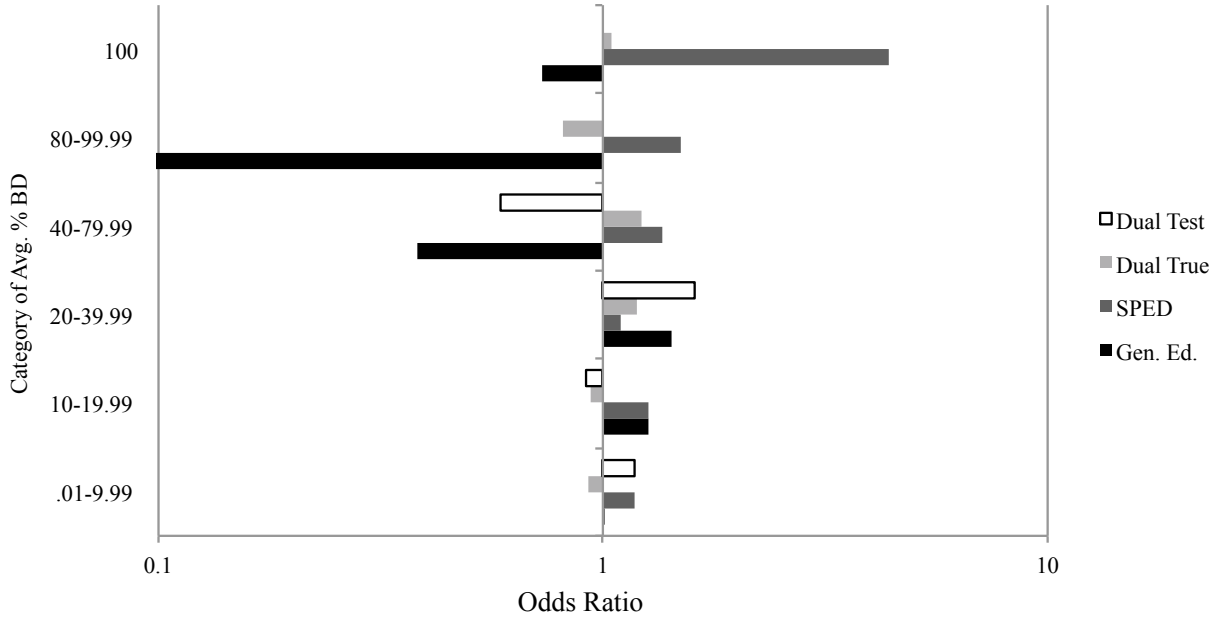


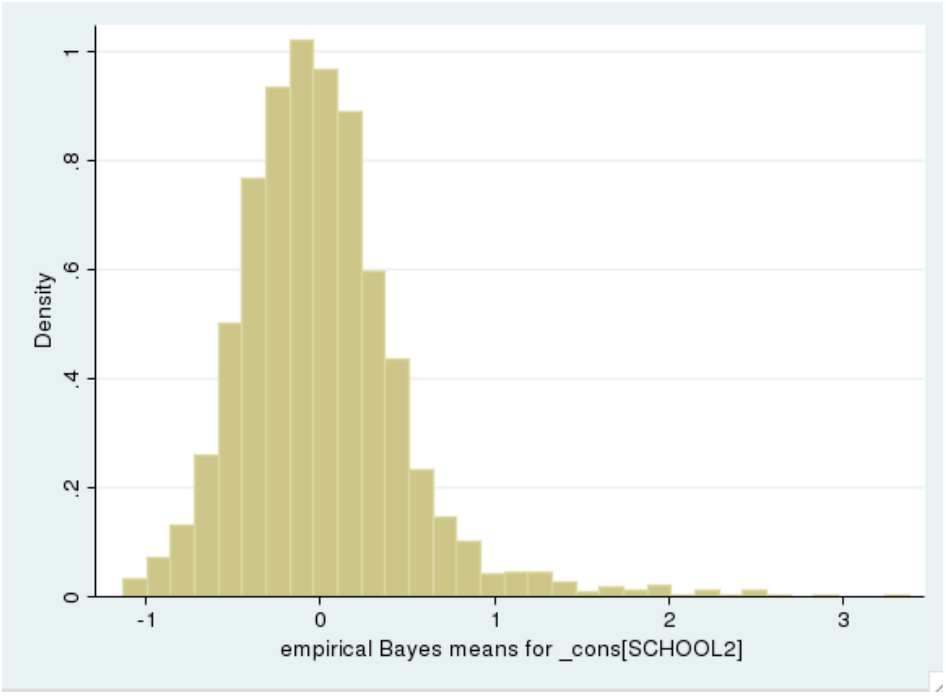
Figure 31. Change in the conditional average odds of leaving associated with the category of the average percentage of students with behavior disorders by certification type from the interaction models. Model includes controls for teacher, classroom, and school characteristics.

APPENDIX A

Table A1
Results for RQ2 Model 3 including teacher, classroom, and school variables predicting total attrition using a sample excluding potential outliers.

	Logits	SE	*z*	95% CI	OR	SE	95% CI
LD ALL	0.04	0.28	0.14	-0.51, 0.59	1.04	0.29	0.60, 1.81
LD CAT5	0.08	0.20	0.41	-0.32, 0.48	1.09	0.22	0.73, 1.62
LD CAT4	-0.06	0.07	-0.93	-0.20, 0.07	0.94	0.06	0.82, 1.07
LD CAT3	-0.08	0.05	-1.60	-0.18, 0.02	0.92	0.05	0.83, 1.02
LD CAT2	-0.03	0.03	-0.83	-0.09, 0.04	0.97	0.03	0.91, 1.04
LD CAT1	**-0.09**	**0.03**	**-3.34**	**-0.14, -0.04**	**0.92**	**0.02**	**0.87, 0.96**
SLI ALL	0.29	0.28	1.00	-0.27, 0.84	1.33	0.38	0.76, 2.32
SLI CAT5	0.74	0.40	1.85	-0.04, 1.53	2.10	0.84	0.96, 4.62
SLI CAT4	-0.07	0.15	-0.49	-0.37, 0.23	0.93	0.14	0.69, 1.25
SLI CAT3	**-0.23**	**0.09**	**-2.65**	**-0.41, -0.06**	**0.79**	**0.07**	**0.67, 0.94**
SLI CAT2	**-0.14**	**0.04**	**-3.32**	**-0.22, -0.06**	**0.87**	**0.04**	**0.80, 0.95**
SLI CAT1	**-0.06**	**0.02**	**-2.72**	**-0.10, -0.02**	**0.95**	**0.02**	**0.91, 0.98**
OHI ALL	0.81	0.44	1.85	-0.05, 1.67	2.24	0.98	0.95, 5.29
OHI CAT5	1.00	0.68	1.47	-0.33, 2.33	2.72	1.85	0.72, 10.32
OHI CAT4	0.08	0.10	0.82	-0.11, 0.27	1.08	0.11	0.89, 1.32
OHI CAT3	-0.06	0.06	-0.95	-0.18, 0.06	0.94	0.06	0.83, 1.07
OHI CAT2	-0.03	0.04	-0.77	-0.12, 0.05	0.97	0.04	0.89, 1.05
OHI .CAT1	-0.03	0.02	-1.29	-0.07, 0.01	0.97	0.02	0.93, 1.02
AU ALL	0.15	0.18	0.87	-0.19, 0.50	1.16	0.20	0.83, 1.64
AU CAT5	-0.04	0.21	-0.21	-0.46, 0.37	0.96	0.20	0.63, 1.45
AU CAT4	-0.09	0.13	-0.71	-0.34, 0.16	0.91	0.12	0.71, 1.17
AU CAT3	0.10	0.10	1.07	-0.09, 0.30	1.11	0.11	0.92, 1.35
AU CAT2	-0.03	0.07	-0.43	-0.16, 0.10	0.97	0.07	0.85, 1.11
AU CAT1	**-0.11**	**0.02**	**-4.70**	**-0.15, -0.06**	**0.90**	**0.02**	**0.86, 0.94**
ID ALL	**0.65**	**0.21**	**3.08**	**0.24, 1.06**	**1.91**	**0.40**	**1.27, 2.88**
ID CAT5	-0.13	0.17	-0.73	-0.46, 0.21	0.88	0.15	0.63, 1.23
ID CAT4	**-0.17**	**0.08**	**-2.13**	**-0.33, -0.01**	**0.84**	**0.07**	**0.72, 0.99**
ID CAT3	-0.06	0.06	-0.87	-0.18, 0.07	0.95	0.06	0.84, 1.07
ID CAT2	**-0.13**	**0.05**	**-2.38**	**-0.24, -0.02**	**0.88**	**0.05**	**0.79, 0.98**
ID CAT1	-0.02	0.02	-0.93	-0.07, 0.02	0.98	0.02	0.94, 1.02
BD ALL	**1.47**	**0.40**	**3.64**	**0.68, 2.27**	**4.36**	**1.77**	**1.97, 9.64**
BD CAT5	0.73	0.47	1.56	-0.19, 1.64	2.07	0.96	0.83, 5.15
BD CAT4	0.29	0.16	1.75	-0.03, 0.61	1.33	0.22	0.97, 1.84
BD CAT3	**0.41**	**0.13**	**3.08**	**0.15, 0.67**	**1.51**	**0.20**	**1.16, 1.95**
BD CAT2	**0.16**	**0.08**	**1.96**	**0.00, 0.32**	**1.17**	**0.09**	**1.00, 1.37**
BD CAT1	-0.01	0.02	-0.58	-0.06, 0.03	0.99	0.02	0.94, 1.03
Variances							
Teacher	3.80	0.72					
School	0.29	0.03					
Log likelihood	-100405(98)						
AIC	201006.1						
BIC	202026.8						
Observations	246,542						
Teachers	127,372						
Schools	2,297						

Notes. Model includes controls for classroom, teacher, and school variables. CAT= category. ALL=100%; CAT1= >0-9.99; CAT2= 10-19.99%; CAT3= 20-39.99%; CAT4= 40-79.99%; CAT5= 80-99.99%. LD= learning disabilities; SLI=speech/language impairments; OHI= other health impairments; AU= autism; ID= intellectual disabilities; BD= behavior disorders; Oth.= other disabilities. SE= Standard error; CI= confidence interval; OR= odds ratio. Model includes teacher and classroom variables. Results in bold are statistically significant at, at least, $p<.05$.



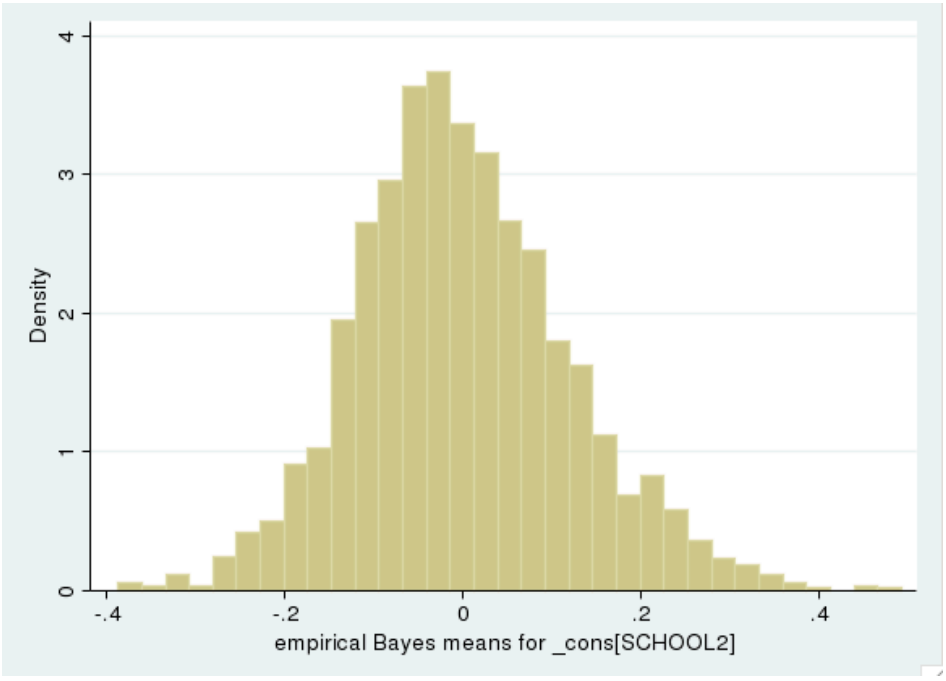


Figure A1. Plots of the conditional random effects at the school level for total attrition (top) and leaving (bottom).

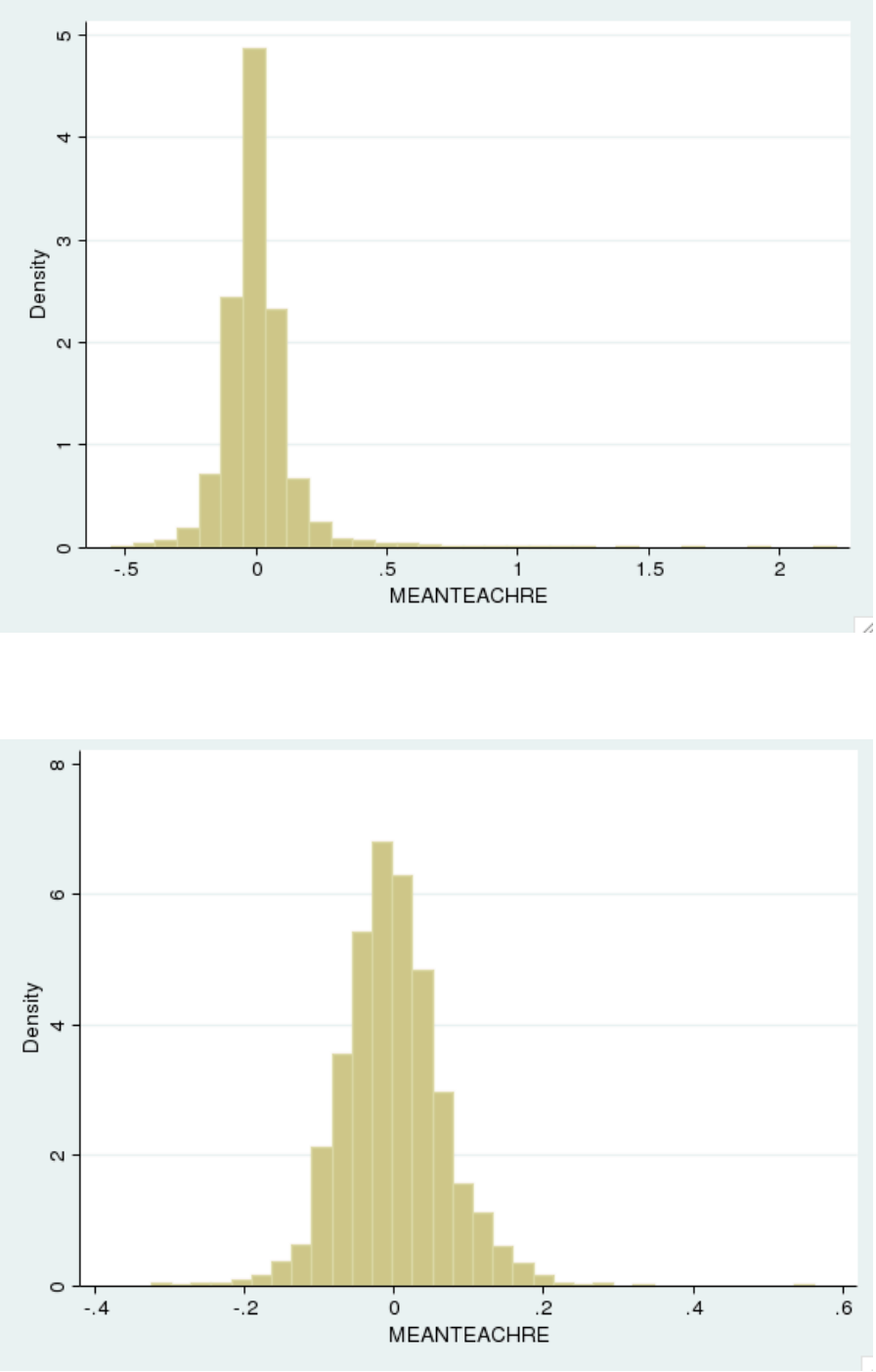


Figure A2. Plots of the conditional teacher random effects aggregated at the school level for total attrition (top) and leaving (bottom).

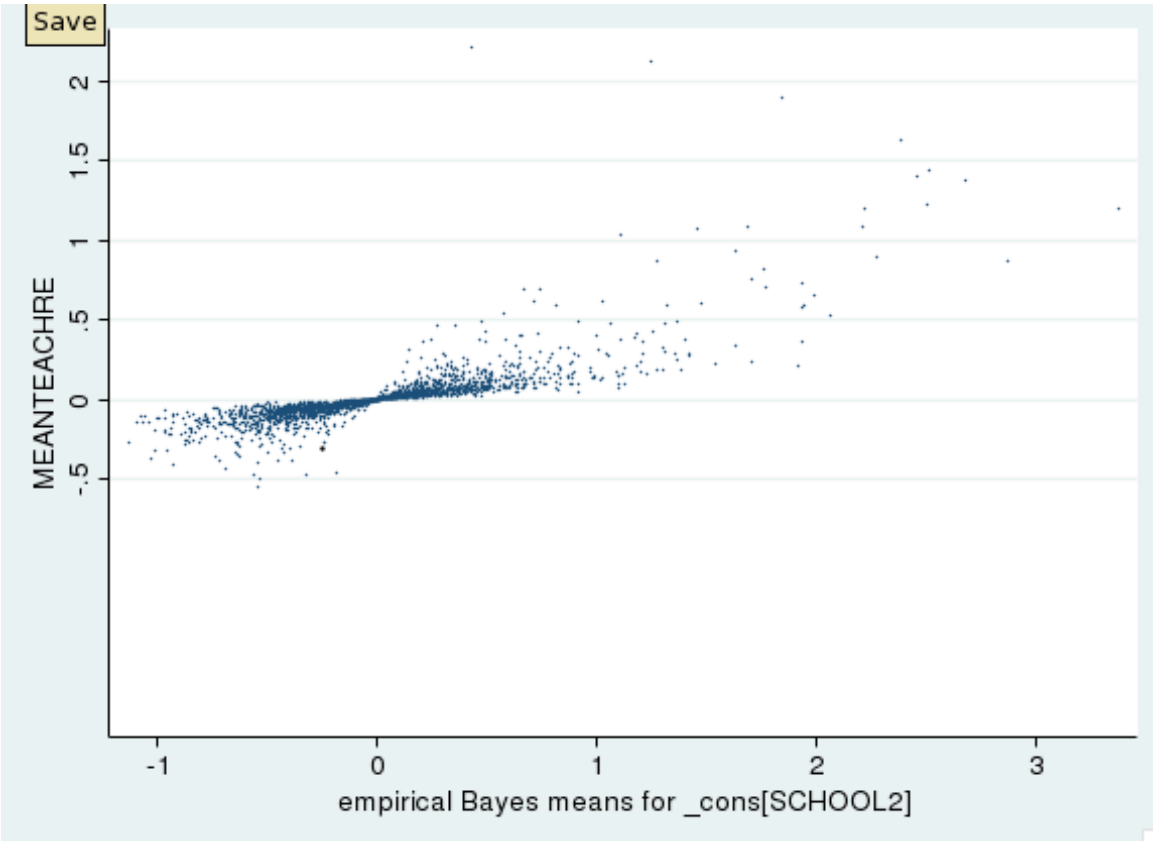


Figure A3. Plots of the conditional teacher random effects aggregated at the school against the conditional school random effects.