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Education Policy Factors Contributing to Special Education Identification

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Abstract

Vital to the discussion around special education is the topic of identification and de-identification as having a disability that impacts one's education. Variation in special education enrollment across geographic locations, racial groups, and schooling sectors causes researchers to question the process and incentives involved in identification and de-identification. The studies that comprise this dissertation aim to analyze the effects that educational policies have on special education identification and subsequent enrollment. Specifically, the studies cover the special education finance, school accountability, and school choice policies.

The special education finance reform effort of switching from a prospective to a capitation funding system over the last 20 years provides the opportunity to employ an event study framework to determine the average effect of these policy changes on special education enrollment. Building on prior research on this topic, this study analyzes data from all 50 states and D.C. on special education enrollment and school resources from 1991-2013. In implementing the No Child Left Behind Act of 2001 (NCLB), states had flexibility to determine the minimum size of subgroups to provide statistical reliability along with accountability for as many schools as possible. If a school's enrollment of a subgroup did not meet the state's minimum subgroup size, the proficiency of the students in the group was not calculated as part of AYP. For this reason, we anticipate seeing a cliff in which rates of students with disabilities drop significantly at the cutoff, demonstrating a school's response to accountability incentives. We use data from over 1,000 Arkansas schools for the years 2004-05 to 2013-14 in a school-level fixed effects analyses to show how falling below the minimum subgroup cutoff of 40 is associated with a decrease in students with disabilities at a school. Lastly, we conduct the first experimental analysis of the impact of enrollment in a private school choice program on special education identification and de-identification. Using data for almost 2,000 students who were

randomly assigned to private schools in the Louisiana Scholarship Program (LSP), we analyze the local average treatment effects of the program on the probability of a student being identified or de-identified in special education.

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Dedication

This edition of *Education Policy Factors Contributing to Special Education Identification* is dedicated to all my teachers, who dedicated their lives to helping me love learning.

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Introduction

Special education has been an important topic in educational policy since its inception in the 1970's. This importance has continued to grow as special education enrollment and thus funding have increased in the last 40 years. Vital to the discussion around special education is the topic of identification and de-identification as having a disability that impacts one's education. Variation in special education enrollment across geographic locations, racial groups, and schooling sectors causes researchers to question the process and incentives involved in identification and de-identification.

The decision to identify a student as having a disability begins primarily with a student's school or parent. Either party can request that a student be assessed for special education services with proper reasoning. The assessment process is completed, typically, by the school psychologist and a special educator, though this varies based on the type of disability and expertise needed. Medical professionals are also involved, particularly for physical disabilities. Assessment results alone do not determine a student's eligibility. An Individual Education Program (IEP) team composed of the student's parent, a general educator, special educator, and administrator meet to review the results of the assessment and make a final determination.

Controversy over the process of identifying a student as having a disability and qualifying for special education services primarily surrounds "fuzzy" disabilities. These are disabilities such as specific learning disabilities, speech or language impairments, other health impairments, emotional disturbance, and sometimes even mental retardation. In these cases, the IEP team exercises its discretion over students who may be on the margin of qualifying for special education. For example, the qualification used for a specific learning disability is based on a 1.5 standard deviation discrepancy between a student's cognitive ability and academic

achievement assessments. Despite this explicit line, members of the IEP team have discretion over eligibility, particularly when scores are on the margin for qualification. In his book *Distinguishing Disability*, Colin Dean documents the way in which levels of wealth and education of parents creates a divide in the amount of power parents hold on an IEP team, particularly in these eligibility decisions. Chambers, Parrish, & Hikido (1996) interviewed special education directors in Pennsylvania, finding that they felt that the lack of rigidity in the regulations for determining eligibility for special education services resulted in an increased number of parental requests for services. The discretion available in this identification process provides the opportunity for manipulation if incentives exist for one of the parties to do so.

Several outcomes may result due to these incentives. One result is that public schools may receive additional funds for those students above their true cost (Green and Forster, 2002). Wealthier families can ensure that their child gets extra time to complete college entrance exams such as the SAT or ACT (Ong-Dean, 2009). Special day classes can function as de facto segregation of males of color (Artiles & Trent, 1994). Whether researchers find overrepresentation of racial minorities (GAO, 2013) or underrepresentation (Morgan et al, 2015), the reality is that we do not know the true incidence of disability, particularly "fuzzy disabilities, in order to determine if policies are "good" or "bad." Instead, the goal is to anticipate unintended as well as intended consequences when constructing policies, and evaluate relative changes over time with the intention of best serving students. The three studies contained in this dissertation aim to determine how the policies of special education finance formulas, minimum subgroup size in an accountability system, and private school choice interplay with the identification of students in special education.

Relevant Literature

A variety of studies has looked at policy levers that may relate to the rates of students in special education over time. Figlio and Getzler (2002) analyzed student level data in Florida and found that students who were lower performing and lower income prior to the implementation of an accountability system were identified as having a disability at statistically significant higher rates when the new system was put in place. Hanushek and Raymond (2005) analyzed the relationship between high-stakes accountability systems and special education enrollment without statistically significant findings. Research by Kubik (1999) looking at Social Security Income benefits found that compared to high-income families, families with low-incomes saw a statistically significant increase in the percent of children identified as having disabilities after the expansion of benefits in 1990.

Finance Formulas

Several researchers have studied the variation in how schools receive funding for special education. Julie Cullen (2003) used the differential funding between districts in Texas due to the state funding equalization policy to analyze how fiscal incentives may affect disability rates from 1991-92 to 1996-97. She found that a 10 percent increase in revenue gain led to a 2.1 percent increase in the disability rate (Cullen, 2003). Greene and Forster (2002) found that over a ten year period, a state with a prospective system saw a 1.24 percentage point increase in special education enrollment compared to a census based system.[1] Mahitivanichcha and Parrish (2005) re-analyzed Greene and Forster's study finding similar results when replicating their model. They also used a second model with a poverty measure and found that the effect of a census system on special education enrollment was somewhat weaker than the prior analyses

[1] Greene and Forster use the term "bounty" to refer to funding systems that provide additional funding for each student placed in special education. "Lump sum" systems fund base on a state average rate of special education enrollment rather than a school or districts actual enrollment.

(Mahitivanichcha & Parrish, 2005). Dhuey & Lipscomb (2011) employed a state level fixed effects model utilizing states that changed from one system to another during the period of 1991-2000. This research found about a 1.24 percentage point decrease in special education enrollment when states switched from a prospective to a capitation system. Dhuey and Lipscomb's slightly more sophisticated methods yield findings that mirror Greene and Forster's earlier work.

Minimum Subgroup Size

No Child Left Behind (NCLB) only required schools to include at-risk subgroups in the calculation of annual yearly progress (AYP) if they had a minimum enrollment size of that group.[2] This created a potential incentive for under-identification of students for special education services in order to avoid including the group in AYP calculations. Little empirical research exists on the actual effect that a state's minimum subgroup size may have on students with disabilities. When using a regression discontinuity design to analyze the effect of the introduction of school accountability for the subgroup of students with disabilities in California, Wei (2012b) did not find any evidence of improved achievement for these students. Wei (2012a) did find that the use of more stringent accountability pressures, including a lower minimum subgroup size, resulted in increased achievement for only Hispanic students. In Florida, however, schools were more likely to identify low income and low achieving students as having a disability with the introduction of the state's accountability system. In particular, schools that were closer to being considered a failing school participated more heavily in these practices (Figlio & Getzler, 2002). Similarly, Cullen and Reback (2006) found that schools that had higher incentives to improve test scores on a state achievement tests were significantly more

[2] This enrollment size was determined by each state.

likely to identify students as in an exempt group, such as students with disabilities, for test taking purposes.

School Choice

Much of the choice literature regarding students with disabilities is concentrated on concerns that choice schools discriminate against these students in the enrollment process, resulting in a low proportion of students with disabilities taking part in school choice. The USCCB's 2002 survey found that 7 percent of students enrolled in Catholic schools were identified as having a disability. Wolf, Witte, and Fleming (2012) had similar findings that at least 7.5 percent and possibly as many as 14.6 percent of students participating in the Milwaukee Parental Choice Program had a disability. This research team also found no statistical disadvantage during school admittance to students based on disability (Wolf, 2013).

Most of the literature on school choice and special education revolves around concerns over enrollment discrimination in the charter sector (Heubert, 1997; Horn & Miron, 2000; Rhim, 2008; Garda, 2012). In recent years, however, several studies have systematically analyzed the movement of students with disabilities in and out of the charter sector as well as in and out of special education eligibility status (Setren, 2015; Winters, 2013; 2014; 2015; Winters, Carpenter II, & Clayton, 2017). These studies, as with Wolf, Witte, and Fleming's (2012) analysis of vouchers in Milwaukee, suggest that discrepancies in the enrollment rate of students with disabilities across school sectors are an issue of parental choice, student mobility, and differential declassification practices rather than one of discrimination.

Hypotheses

Paper 1

a) States decrease their enrollments of students with disabilities when financial incentives to do so are introduced.

b) When states are induced to decrease their special education enrollments, these decreases primarily come from students with the least severe disabilities.

c) Once incentives to decrease special education enrollments are introduced, the distribution of students in special education will become more severe, resulting in a lower proportion of students being placed in the least inclusive environments.

d) Financial constraints caused by a change to a capitation based special education finance formula will reduce school resources (e.g. pupil-teacher ratios, teacher salaries, and revenues)

Paper 2

Given the opportunity to avoid accountability under No Child Left Behind for the subgroup of students with disabilities, schools in Arkansas will reduce their special education enrollment when they fall close to the minimum subgroup cutoff of 40 students with disabilities.

a) The reduction in special education enrollment to avoid accountability for the subgroup under NCLB should be greatest when schools fall closer to the cutoff point of 40.

Paper 3

a) Students who participate in the Louisiana Scholarship Program are less likely to be identified for special education than those who do not participate?

b) Students in special education who participate in the Louisiana Scholarship Program ae more likely to have their special education label removed than those who do not participate?

Methodology

Paper 1

Event study analysis is used to observe changes in state special education identification rates over time as states alter their special education finance formulas from prospective to census based systems and vice-versa. Other possible policy influences are also included in estimation models such as accountability systems, voucher programs, and school finance court cases. Panel data used is publicly accessible for all 50 states and the District of Columbia across 22 years, from 1991-2013.

Paper 2

School-level data are analyzed to determine how rates of special education vary as schools fall above and below the minimum subgroup size of 40 for students with disabilities in Arkansas. Fixed effects analysis is used to simply observe the impact of falling above or below the line while secondary analyses look at how the distance the enrollment level is above and below this subgroup cutoff has a differential relationship with the rate of students placed in special education. Panel data used is publicly accessible for over 1,000 Arkansas schools for the years 2004-05 to 2013-14.

Paper 3

Over 10,000 eligible students applied to attend a private school as part of the Louisiana Scholarship Program (LSP). Over 5,000 students were awarded a scholarship. We leverage the deferred lottery system to assign students to school to estimate a local average treatment effect

(LATE) of being awarded one's first choice school on the probability of being identified and de-identified for special education while in the program. We estimate our two stage models using a Cox proportional hazard model for an overall effect and bivariate probits for individual year effects.

Results

Paper 1

- Changing from a prospective to capitation based finance system appears to be related to a decline in special education enrollment, though our findings are not statistically significant.
- Disaggregated results show declines in non-severe disabilities as a result of switching from capitation to census funding, in particular for specific learning disabilities.
- Decreases occur in the proportion of students with non-severe disabilities enrolled in the most inclusive educational placements and a marginally significant increase in the placement of students with severe disabilities in public residential schools
- School resources do not appear to be affected positively or negatively by changes in special education finance formulas.

Paper 2

- Falling below the minimum subgroup cutoff of 40 is associated with a 1.5 percentage point decrease in students with disabilities at the school.
- Schools just below the minimum subgroup size cutoff react most strongly to the incentive to reduce their rates of special education.

Paper 3

- Participating in the Louisiana Scholarship Program (LSP) does not have an effect on the likelihood of being identified or de-identified for special education when analyzing across all three years of the program.
- Students in the LSP were less likely to be identified for special education in the third year of the program. They were more likely to have their special education label removed in the second year and then less likely to have it removed in the third year of the program.

Implications

This research makes it clear that considering the unintentional consequences of policies on students with disabilities is essential. As funding for special education continues to be an important policy issue in education, it is necessary to determine whether funding system changes that became popular in the 1990's continue to have the same desired effects long term. While a census based system may help contain short term costs, the lack of local differentiation in these formulas force schools to utilize general education funds to compensate (Harr, Parrish, & Chambers, 2008). It is also necessary to consider the possible undesirable effects of such a shift, particularly on student achievement and postsecondary outcomes, which can also have long term costs to society as a whole.

Unlike funding formula changes, minimum subgroup sizes were developed for statistical purposes, not, in themselves, to change behaviors. Nevertheless, schools falling below the cutoff may want to maintain their status and avoid potential consequences associated with the high probability of failing to meet AYP due to the low performance of their students with disabilities. Conversely, schools above the minimum subgroup cutoff may have little hope of lowering their overall number of students with disabilities and continue with a trend of growth in special

education. State accountability systems will shift in the coming years with the Every Student Succeeds Act (ESSA) transferring control to the states, but the statistical purpose of the minimum subgroup size will continue to exist as long as we disaggregate the data for at-risk groups. Arkansas, itself, has already shifted to a minimum subgroup size of only 25 in the last year. For this reason, understanding the incentive to under-identify students to avoid accountability sanctions in this policy is essential for properly constructing minimum subgroup sizes that reduce negative consequences for students.

Finally, differential incentives that exist for schools of choice and traditional public schools to identify and de-identify students for special education are important to understand. Financial incentives, as have been discussed, play one important role. While the Louisiana Scholarship Program (LSP) does offer an opportunity for additional special education funds, there were requirements attached in the form of teacher credentialing and school experience serving students with disabilities. Environmental changes, such as moving to a smaller school or class sizes, can sometimes substitute for aspects of special education services. Private schools are likely to see the school itself as an intervention for students. Moreover, different schools have differing beliefs regarding disability, inclusion, and serving students. Wolf, Witte, and Fleming (2012) found that private schools did not feel the need to give students a label in order to serve their needs. All of these potential differences between private and public schools alter the likelihood of identification and de-identification. In the LSP, the high rate of de-identification in the first years is likely why the de-identification rates were substantially below the public schools' by the third year of the program. This shows evidence of differing equilibriums for special education identification between the two sectors. For researchers and

policy makers, these differences must be considered when attempting to compare enrollment rates across schooling sectors.

Only the policy of census based finance formulas had the stated purpose of altering the percent of students with disabilities enrolled in schools. Regardless of intention, these policies have impacts on decisions made at schools regarding the referral and identification of students for special education. Policy makers and school personnel do their best to construct and implement procedures that will improve the efficiency, accountability, and quality of education students receive. More attention needs to be made with regards to how policies may inadvertently interact with one another in potentially negative ways. While we can never know a student's true disability status, it is our job to at least limit the incentives for schools to misidentify students.

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Chapter 1

Special Education Funding Incentivizes in a Capitation Based System

Introduction

With the passage of the All Handicapped Children Act of 1975, Americans with Disabilities Act of 1990, and finally the Individuals with Disabilities in Education Act (IDEA) in 1997 and 2004, guaranteeing a free and appropriate education (FAPE) for students with disabilities in public schools, special education enrollment and, subsequently, expenditures have continued to grow at all levels of government. For 2014-15, over $12.5 billion dollars were allocated for special education by the federal government (Department of Education, 2015). Federal spending, however, is only a small portion of the overall revenue attributed to supporting students with disabilities. The method for distributing local, state, and federal funds to each school district is determined at the state level. This study aims to build upon prior research on how these various systems for distributing special education funds may create incentives to increase enrollment through new identification or decrease it through removal of special education status.

Identification of Students

Parents or school staff initiate the process of referring a student for a special education assessment. This assessment process is typically completed by the school psychologist and a special educator and must be occur within 60 days of when the referral was made.[3] Assessment results cannot be the sole determinant of a student's eligibility for special education. An Individual Education Program (IEP) team composed of the student's parent(s), a general

[3] Additional professionals can be included in the assessment process based on the needs of the student and hypothesized disability. These might include speech and language therapists, medical doctors, or occupational therapists.

educator, special educator, and school or district administrator meet to review the results of the assessment and make a final determination.

Controversy over the process of identifying a student as having a disability and qualifying for special education services primarily surrounds "fuzzy" disabilities. These are disabilities that are less clearly detectible such as specific learning disabilities, speech or language impairments, other health impairments, and emotional disturbance. Assessment results may not provide definite guidance for the IEP team, which then exercises its discretion over students who may be on the margin of qualifying for special education. For example, the standard practice used for qualifying a student as having a specific learning disability is that there is a 1.5 standard deviation discrepancy between a student's cognitive ability and academic achievement assessments. While this standard seems to draw a very clear line between being and not being eligible, the members of the IEP team can still make a determination that a student receive services, particularly if the student's scores sit on the margin of this qualification. In his book *Distinguishing Disability*, Colin Dean documented the way in which levels of wealth and education of parents creates a divide in the amount of power parents hold on an IEP team, particularly in these eligibility decisions. Chambers, Parrish, & Hikido (1996) interviewed special education directors as part of their evaluation of Pennsylvania's funding system change. The directors felt that the lack of rigidity in the regulations for determining eligibility for special education services resulted in an increased number of parental requests for services.

The flexibility of an IEP team in determining whether a student qualifies for special education services may be consciously or unconsciously influenced by financial incentives. The cost of services provided by the school is not at the forefront of parents minds. Parents are focused on their students receiving the help and support they need from their school for their

success (Dhuey & Lipscomb, 2011). If a student only marginally needs services, school personnel may be unmotivated to qualify a student for special education services when the funding system does not provide compensation for a shift in total special education enrollment. Systems that fund schools for each additional student placed in special education may create an incentive to qualify a student on the margin even if he or she would be at least as well served without the new identification.

States started to consider reforming funding mechanisms to decrease incentives to over-identify students for special education and to slow the increase in special education enrollment and overall expenditures.

Special Education Funding Formulas

Several studies have attempted to categorize and analyze the types of special education funding systems in each state. A 2003 report by the Center for Special Education Finance (CSEF) analyzed survey results from state special education directors in 1999-00. From these surveys, they categorized and summarized each type of funding system (Parrish et al., 2003). Nine years later, as part of Project Forum, the National Association of State Directors of Special Education updated Parrish et al. (2003) through similar surveys to state special education directors (Ahearn, 2010). These studies provide the foundation in which we create two groupings of special education finance formulas based on the incentives they create for identification.

The first type of system is a capitation system. Capitation systems, as termed by the medical insurance field, provides a lump-sum that is not based on variation between individuals, but expects that the school districts will provide services within a finite amount of money provided (Newhouse, 1996). Like in the medical field, the purpose of capitation is to incentivize

efficiency rather than increasing services for a marginal benefit. The most common funding system that falls into the category of a capitation system is a census based formula. A census funding formula applies a state average rate of special education enrollment to district total enrollment or Average Daily Membership/Average Daily Attendance (ADM/ADA) to determine special education funding (Ahearn, 2010). Some flat grant formulas also function in this same manner, allocating funds for special education based on district total enrollment. Capitation funding systems allocate resources using an assumed rate of disability across the state rather than a true rate within each district. The supposition under a capitation system is that there is not, or should not be, any variation in disability incidence across school districts.

The remaining funding formulas are prospective systems. These funding formulas allocate or reimburse expenditures on the basis of the actual number of students with disabilities, many by the type of disability. The most common type of prospective system uses weights for students with disabilities. Weights, or multipliers, are applied to the special education enrollment overall or separately for each disability. In her 2008-09 surveys, Ahearn (2010) found that 19 out of 50 states were utilizing either a single weight or multiple different weights based either on the type of disability or special educational environment for individual students. Some states allocate funding based on the number of teachers or classrooms needed to service the actual special education population in a district (Ahearn, 2010). Additionally, a few states have a formula based on a percent of expenditures that can be reimbursed by the state for special education. Finally, states may also use a block grant funding formula that provides revenues based on a base year or the prior year's special education revenues or enrollment (Ahearn, 2010). Each of these funding formulas under a prospective system provide an incentive for districts to

spend freely on services and even increase special education enrollment because they will receive additional funding for each new student placed in special education.

Some states use a combination of capitation and prospective funding systems. Many of these systems, however, only differentiate between the most expensive to fund students (catastrophic funding) and all other students with disabilities, which has become common practice in most capitation systems as well. Other states do not have a specific allocation for special education funding and incorporate it into their overall funding for districts (Ahearn, 2010). We will discuss below how we categorize states that do not clearly fall into the prospective or capitation system.

Other Factors

Accountability systems

Several studies have evaluated the impact of an accountability system on special education enrollment rates. Figlio and Getzler (2002) analyzed student level data in Florida, finding lower performing and lower income students were more likely to be identified as having a disability when the new accountability system was put in place, likely in order to exclude them from accountability testing. These exclusionary practices were particularly common at lower income and lower performing schools that were potentially at risk of being labeled as a failing school under the new system (Figlio & Getzler, 2002). These findings indicate that schools react to incentives created by broader policies, which can unintentionally result in changes in special education identification practices. Subsequent studies by other researchers failed to find any statistically significant effects of a high-stakes accountability system on disability identification rates (Hanushek & Raymond, 2005; Greene & Forster, 2002; Dhuey & Lipscomb, 2011). Unlike Figlio and Getzler's analyses, these other studies use aggregated state-level data and look across

states rather than examining student-level data in one state, potentially masking some of the individual changes that occurred within schools and/or within states.

All relevant studies, however, use data that only extend slightly into the early 2000's, with 2003 the most recent data used by Dhuey and Lipscomb (2011). It is possible that incentives from NCLB were delayed, and did not show up in these earlier studies. Using a longer span of data to 2013, the present study is better positioned to observe whether a long term effect of accountability exists.

Special education voucher programs

In 1997, Arizona introduced the first publicly funded voucher program specifically for students with disabilities to attend private schools in the state. Since then, a total of 18 different voucher, tax credit scholarships, and education savings account programs for students with disabilities now exist in 13 states. While enrollment in these programs is generally pretty small, enrolling fewer than 500 students, programs like Florida's John M. McKay Scholarship for Students with Disabilities currently enrolls over 30,000 students (EdChoice, 2017). These programs provide parents with the opportunity to choose the educational settings and/or services that their child receives without the hurdles of the IEP team and administrative authorization (Greene & Buck, 2010).

There are two competing theories at work with regards to special education vouchers and identification in special education. One theory is that parents of students with disabilities are inclined to have their students assessed for special education with the hope that their student will qualify to receive a scholarship and attend a private school of choice. Conversely, local schools and districts are deterred from qualifying a student for special education because this will also enable that student to take his or her entire state funding to a private school. This hypothesis would be particularly true for students on the margin of qualifying for special education who do

not require as many services as other students but receive the same funding. Winters and Greene (2009) specifically analyzed the enrollment trends in Florida from 2002-03, three years after the initial special education voucher pilot year, to 2005-06. Using the total number of participating private schools within a five mile radius of each public school to measure the competitive effects from exposure to the voucher program by traditional public schools, they found that special education enrollment decreased for students with specific learning disabilities and, to a greater extent, those with higher achievement test scores (Winters & Greene, 2009). Chakrabarti (2013) used a regression discontinuity design to more closely assess causal impacts of the McKay voucher program on special education identification in like of accountability pressures. She found no effect on the identification of students to special education.

Still, we will attempt to use this framework to guide the inclusion of a variable identifying the year a state enacted a special education voucher program to determine whether these policies may have a more widespread effect on special education enrollment.

Social Security Income benefits

A final mechanism that may drive special education enrollment rates is Social Security benefits. Kubik (1999) studied the influence of increased Social Security Income benefits after 1990 on the number of households claiming benefits for children identified as having a disability. This research found that compared to high-income families, families with low-incomes saw a statistically significant increase in the percent of children identified as having disabilities after the expansion of benefits in 1990. This change also seemed to broaden the types of disabilities receiving benefits, particularly intellectual disabilities. Kubik (1999) also found that the receipt of Social Security Income benefits for children with disabilities resulted in more doctor visits and referrals to special education. The influence that additional funding and

resources can have for a family, in this case, rather than just a school, is another important consideration in the analysis of special education identification changes.

This paper builds from the previous literature exploring how incentives that exist for capitation and prospective systems may influence the rate of special education enrollment in a given state. Specifically, this work updates the categorization of states that fall into the two types of systems, as some have changed in the last ten years, and expand the number of years of data used in the analyses. These specification changes will inform whether the prior relationships seen in the literature maintain strength over time, and determine how robust these results are to alternative interpretations for categorizing state funding formulas.

The subsequent section of this paper will review the literature on this topic. We will then describe the methodology used, including a description of the general trends in the data. Next, the analytic strategy will be explained followed by results from all analyses conducted. We conclude with a discussion of the findings, policy implications, and potential for future research.

Prior Literature

Starting in the 1980's, researchers began to descriptively analyze how special education funding influences enrollment of students with disabilities in special education (McLaughlin & Owings, 1992). By the mid to late 1990's, the CSEF, directed by Tom Parrish, and their Special Education Expenditure Project, led by Jay G. Chambers, were conducting studies on how special education funds were being dispersed in states. Parrish and Montgomery (1995) published case studies of Oregon, Pennsylvania, and Vermont to evaluate how or whether each state chose to reform their special education financing system. At the time, states were encountering the rising cost of special education and considering the option of developing capitation systems.

An early piece quantitatively analyzing special education by Dempsey and Fuchs (1993) analyzed the different types of funding systems available in Tennessee to determine whether they altered the distribution of students with disabilities into various educational environments. Evidence from this work demonstrated that when a funding formula changed from a single weight formula to multiple weights, which compensated for more expensive placements, students with disabilities were placed less frequently in the least restrictive environments in regular education programs (Dempsey & Fuchs, 1993). Ten years later, Julie B. Cullen (2003) used the differential funding between districts in Texas as part of the state funding equalization policy to analyze how fiscal incentives may affect disability rates from 1991-92 to 1996-97. She found that a 10 percent increase in special education revenue led to a 2.1 percent increase in the disability rate, and the financial incentives alone were able to explain nearly 40 percent of the variation in disability rates (Cullen, 2003). In another state specific analysis, Kwak (2010) looked at how the change in California's special education finance formula from a weighted (prospective) to census-based (capitation) system impacted special education enrollment, finding that for every $1000 decrease in funding received by a district, special education enrollment decreased 1.5 percentage points (Kwak, 2010).

The by Greene and Forster (2002) analyzed funding system differences across states categorized system as either a "bounty" (prospective) or "lump-sum" (capitation) funding system. The label of "bounty" demonstrates the fact that each "head" or child is associated with money obtained by a school under the prospective system. The authors utilized the *Annual Report to Congress on the Implementation of the Individuals with Disabilities Education Act* for the years 1991-92 to 2000-01 to determine the relationship between the type of funding system employed and enrollment rates in special education. They found that over a ten year period, a

state with a "bounty" system saw a 1.24 percentage point increase in special education enrollment (Greene & Forster, 2002). Mahitivanichcha and Parrish (2005) re-analyzed Greene and Forster's study finding similar results when replicating their model. They also used a second model with a poverty measure and found that the effect of changing from a capitation to prospective system on special education enrollment was somewhat weaker than Greene and Forster (Mahitivanichcha & Parrish, 2005).

The most recent study to quantitatively analyze the relationship between a state's special education funding system and the enrollment of students in special education was published in 2011 by Dhuey and Lipscomb. They employed a state level fixed effects model utilizing states that changed from one system to another during the period of 1991-2000. This research found about a 1.24 percentage point decrease in special education enrollment when states switched from a prospective to a capitation system. The effect size found with Dhuey and Lipscomb's more analytically rigorous method is identical to Greene and Forster's findings, just stated in the opposite manner.

The current research will build off of Dhuey and Lipscomb's (2011) research and improve upon their state-level fixed effects with an event study framework to better control for time-trends (Lafortune, Rothstein, Schanzenbach, 2016). By including more years of data both prior and following funding system changes, this paper can demonstrate whether the trends seen in the early 2000's were merely proximal or are long term effects. Unlike prior research, this paper will also attempt to determine whether the advent of special education voucher programs have an effect on the enrollment of students in special education. Finally, utilizing newer surveys of state special education directors regarding the type of funding formulas for special

education, this study considers a different sample of states that switched from a prospective to capitation system.

Research Methodology

Data Description

Data for this study come from a wide variety of sources. State level data concerning special education enrollment counts by disability and educational environment for the years 1990-91 to 2005-06 were obtained from the *Annual Report to Congress on the Implementation of the Individuals with Disabilities Education Act*.[4] Data for the years 1990-91, 1991-92, and 1993-94 were obtained through microfiche of original documents, scanned, and input by hand by the researcher. The final years in the dataset, 2006-07 to 2012-13, special education enrollment counts, educational environments, and personnel counts were all retrieved digitally through ideadata.org. All special education data were gathered for students ages 6-21 only.

An important data issue arose in regards to how the types of educational environments were coded in different years. Prior to 1997-98, students educated in public schools were either counted as placed in a "Regular Class," "Resource Room," or "Separate Class." From 1997-98 on, these three categories were changed into the percent of the school day a student was in or out of the general education classroom.[5] For coding purposes, each type of class was equated to a given percent in the general education classroom. "Regular class" was considered the most inclusive and coded as 80 percent or more time in the regular education classroom. "Resource Room" is typically a service that requires students to leave the general education classroom for a period of the day, so it was coded as 40 percent to 79 percent in the regular education classroom.

[4] Both Greene and Forster (2002) and Dhuey and Lipscomb (2011) utilize this same data source.
[5] From 1997-98 to 2005-06, these percents are given based on the amount of time a student was place out of the general education classroom. 2007-08 and all years after, the terminology was changed to reflect inclusivity and reported as the percent of time a student was inside the general education classroom. The percentage values were equivalent across these time periods.

Finally, "Separate Class" was coded as inside the general education classroom less than 40 percent. Additionally, there are five different types of out of school placements, public day school, private day school, public residential, private residential, and home/hospital care. Analyses are conducted looking at each individually out of school placement option as well as the total percent of students placed out of school.

Table 1: Variables used in analyses

Variable	Years of Data	Source
Educational environment by disability	1990-91 to 2005-06	*Annual Report to Congress on the Implementation of the Individuals with Disabilities Education Act*
Educational environment by disability	2006-07 to 2012-13	ideadata.org
Total enrollment Full-time employed staff Student race Free or reduced price lunch status Limited English proficiency Local revenues State revenues Federal revenues Total revenues Teacher salaries	1990-91 to 2012-13	National Center on Educational Statistics (NCES) Common Core of Data (CCD)
Social Security Insurance (SSI) benefits	1990-91 to 2012-13	Annual Social Security Supplement
Unemployment rates	1990-91 to 2012-13	Bureau of Labor Statistics

Notes: All variables were acquired at for all 50 states and Washington, D.C.

Primary analyses focus on changes in overall disability rates. To determine whether there are heterogeneous effects in our study, disabilities are grouped as severe or non-severe along with disaggregating by individual disability. In their study, Dhuey and Lipscomb (2011) choose to create their distinction between severe and non-severe based on cost of educating the different students with disabilities. In this analysis, however, the interest is not so much in the net cost of educating a student, but also the marginal revenue gained from assigning a student to one category versus another. While analyses in the current study will use Dhuey and Lipscomb's

definition of disabilities as severe and non-severe, we also redefine non-severe by including intellectual disabilities. Specific learning disabilities (SLD), speech or language impairments (SLI), emotional disturbance (ED), and other health impairments[6] (OHI), and intellectual disabilities (ID)[7] are all considered high-incidence disabilities, are often in the less severe range, and thus lower cost. More importantly, each of these disabilities can be somewhat subjectively determined by the IEP team, making them more likely to shift under a change in funding system. Under a prospective system, students with intellectual disabilities may be more likely to be educated in a separate classroom because the school district will be reimbursed for this higher cost educational setting. In a capitation system, however, the school is incentivized to place this same student in a more inclusive setting that is lower cost. As previously mentioned, analyses are conducted using both definitions as well as disaggregated by disability in order to observe the impact on this variation in definition.

All data on total enrollment, full-time employed staff, student race, free or reduced price lunch status, limited English proficiency, local, state, federal, and total revenues, and teacher salaries[8] were obtained through the National Center on Educational Statistics (NCES) Common Core of Data (CCD). Unemployment rates for all years of data were acquired from the Bureau of Labor Statistics. Finally, Social Security Income benefits for children were found in the Annual Social Security Supplement.

Finally, information on the type of funding system for each state was collected and categorized. Table 2 displays how we used Ahearn's (2010) funding formula types to create

[6] Other health impairments has come to primarily be composed of students with diagnoses of AD/HD, which has caused a greater increase in student eligibility in this disability category.
[7] Intellectual disabilities is the chosen terminology for this paper, however, it should be noted that mental retardation remains what is used in IDEA. Cognitive impairments is also used by some for the same categorization.
[8] All revenues (local, state, federal, and total), salaries, and Social Security Income benefits were all adjusted to account for inflation and converted to 2014 dollars.

initial categorizations. To compare prior categorizations, Table 3 presents the definitions used and associated years of policy change in prior literature as well as the current study. Two states, Missouri and New Jersey, changed their funding formulas in 2005 and 2008 respectively. As Dhuey and Lipscomb used Parrish et al. (2003) as their reference, which is based on surveys in 1999-00, these two states are also categorized differently, as are Arkansas and Rhode Island, which do not have a specific funding formula. In these two states, however, funding is allocated for special education based on the whole school enrollment. This is essentially a capitation based funding formula, which does not allocate funds for each additional student placed in special education. We present all findings utilizing Dhuey and Lispcomb's definitions in the appendix.

Table 2: Capitation and prospective special education formulas

Capitation	**Prospective**
Multiple student weights Single weight Resource-based Percentage reimbursement	Census-based Block grant
No separate funding formula Combination	

Notes: Types of formulas were derived from Ahearn (2010). Categorizations based on author's interpretation of incentives. No separate funding formula and combination formulas can be categorized as either incentive type based on the actual construction of the formula.

Table 3: State special education funding system changes, 1991-2013

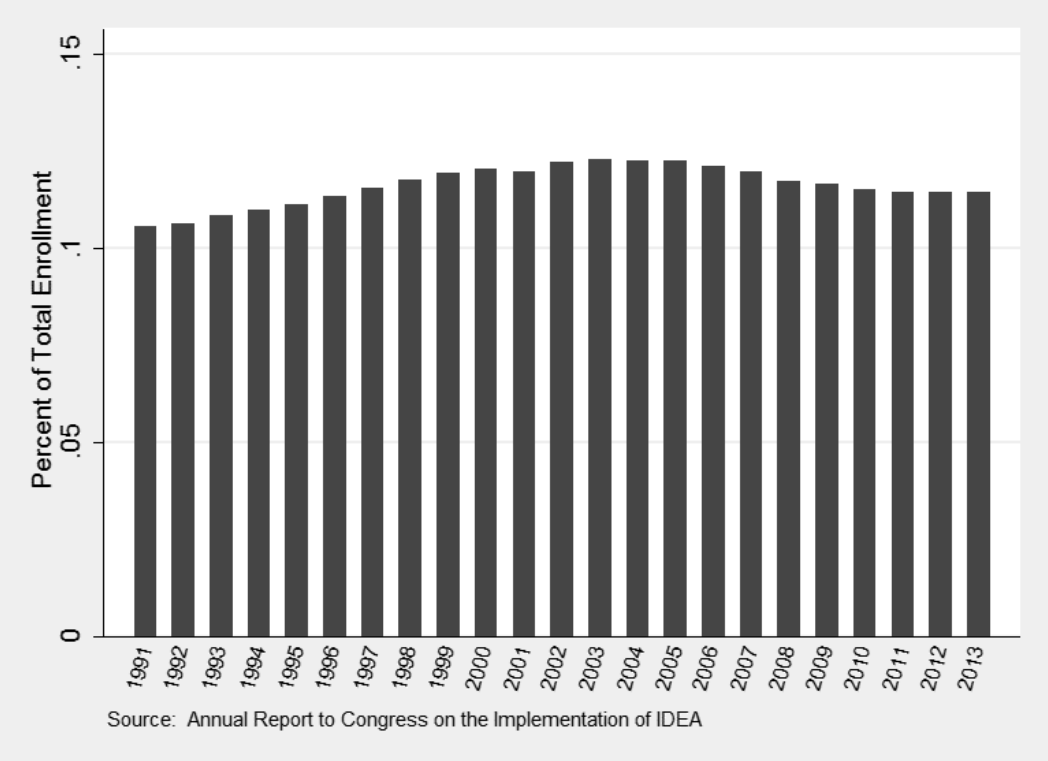
State	Greene & Forster (2002)	Dhuey & Lipscomb (2011)	Tuchman (2017)	Year of Change
Alabama	Capitation	Capitation	Capitation	1995
Alaska	Capitation	Capitation	Capitation	1998
Arizona	Prospective	Prospective	Prospective	1981
Arkansas	**Capitation**	**Prospective**	**Capitation**	**1996**
California	Capitation	Capitation	Capitation	1998
Colorado	Prospective	Prospective	Prospective	1994
Connecticut	Capitation	Capitation	Capitation	1995
Hawaii	Prospective	Prospective	Prospective	2006
Idaho	Capitation	Capitation	Capitation	1994
Massachusetts	Capitation	Capitation	Capitation	1993
Missouri	**Capitation**	**Combination**	**Capitation**	**2005**
Montana	Capitation	Capitation	Capitation	1994
New Hampshire	Prospective	Prospective	Prospective	1999
New Jersey	**Prospective**	**Prospective**	**Capitation**	**2008**
North Dakota	Capitation	Capitation	Capitation/ Prospective	1995/ 2013
Pennsylvania	Capitation	Capitation	Capitation	1992
Rhode Island	**Capitation**	**Prospective**	**Capitation**	**1995**
Utah	**Capitation**	**Combination**	**Capitation**	**1991**

Notes: Bolded lines indicate funding formulas that are categorized differently from prior analyses.

Descriptive Statistics

Over the 22 year time span of the database created, special education enrollment ranges from just over 10 percent in the early 1990's to just over 12 percent of total student enrollment in the mid-2000's (Figure 1). Special education enrollment began to drop slowly in about 2006, and seems to have plateaued in the most recent years from 2010 to 2013. The data in Figure 1 tells a very different story than what one often believes about special education. The downward trend in 2006 also highlights the importance of the current study in determining whether changes in special education finance formulas actually have long term impacts on special education enrollment.

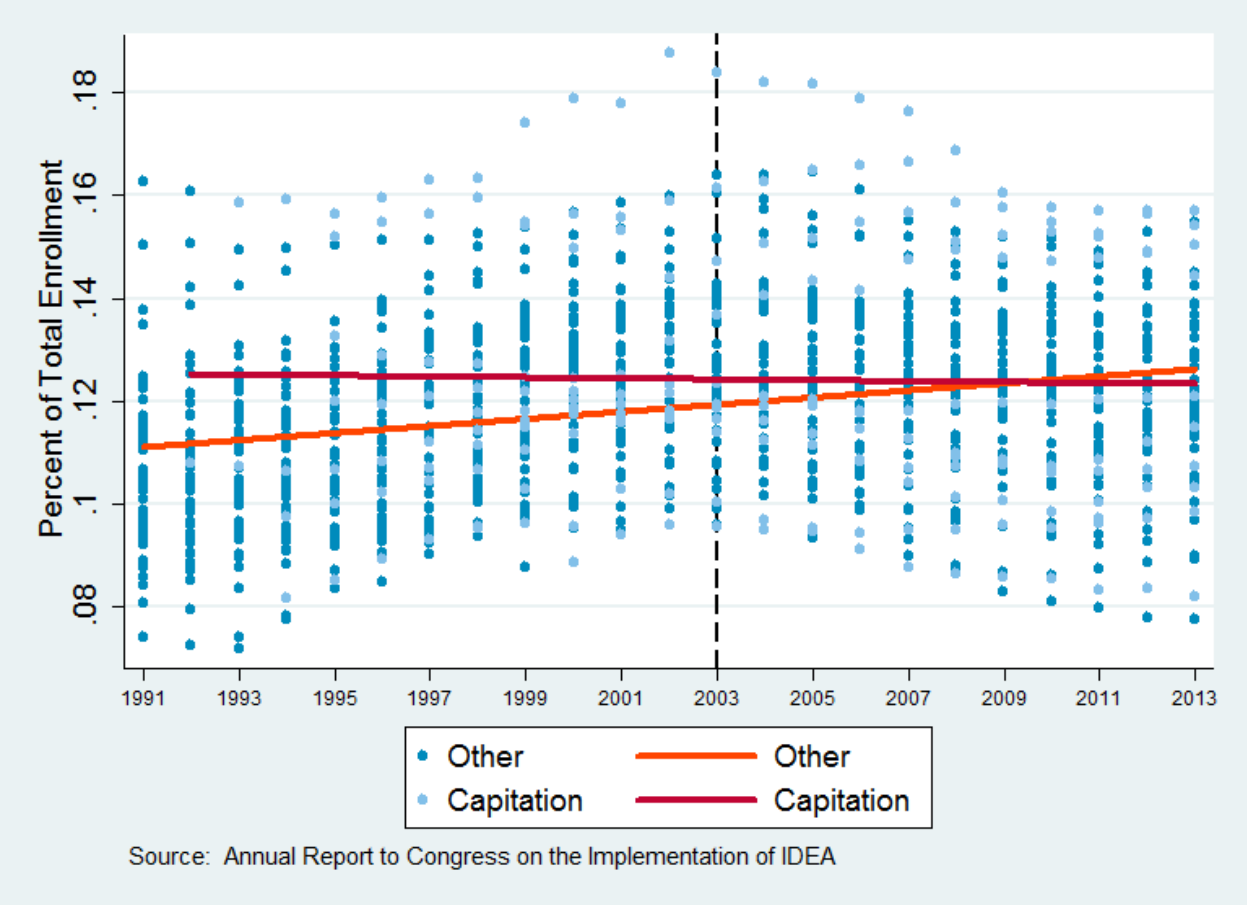
Figure 1: Trends in special education enrollment, 1991-2013



Descriptive differences in special education enrollment trends between states with prospective versus capitation based special education finance formulas suggest what more rigorous analytic methods might confirm. One interesting observation in the data is the increased variation in enrollment over time from a seemingly tighter distribution in the 1990's to a more dispersed distribution by the 2010's. States that adopted capitation based formulas started with higher rates of special education enrollment. Despite lower enrollments, states with other formulas steadily increased their rates over time while capitation states stayed relatively consistent. The dotted line in the year 2003 indicates the last year of data used by other researchers to analyze the issue of funding incentives in special education when the slope of non-capitation funding formula states was rising, and the gap between capitation and non-capitation formulas was quite clear. In about 2008, the trend lines intersect, and the most recent data only show a small separation in trends. Moreover, there is a slight indication that capitation states

show a downward slope in enrollment. We also can see evidence of an extreme outlier at the top of the distribution. This state is Rhode Island, which is also one of the states that we categorize differently than Dhuey and Lipscomb (2011).[9]

Figure 2: Capitation versus other funding systems and special education enrollment, 1991-2013



Analytic Strategy

All analyses estimate effects using an event study methodology that leverages changes in state's funding systems over time in order to determine the effect while limiting endogeneity caused by the unobservable differences between states (Wolfers, 2006). The following linear model is based on Lafortune, Rothstein, and Schanzenbach (2016):

[9] Using the prior definitions of the funding systems results in similar trend lines, though the non-capitation based systems have a slightly steeper slope that results in the two trends intersecting about 10 years earlier (Appendix Figure 1).

$$Y_{st} = \propto_t + 1(t > t_s^*)\beta^{Cap} + 1(t > t_s^*)(t - t_s^*)\beta_{Prior}^{Cap} + 1(t > t_s^*)(t + t_s^*)\beta_{After}^{Cap} +$$

$$(t - t_s^*)\beta_{Prior} + (t + t_s^*)\beta_{After} + \varphi_s + u_{st} \quad (1)$$

Where *s* indicates each state in time *t*, which is a capitation state if *t* is after the policy change year t_s^* between the years either 1991 – 2003, replicating Dhuey and Lipscomb (2011), or with updated data from 1991 - 2013. Included are controls for the anticipatory build up, β_{Prior}^{Cap}, and β_{After}^{Cap}, the delayed reaction to the policy change in years after implementation. β_{Prior} and β_{After} are time trend variables that should be equal to zero as a check that results are not driven by a national trend in the dependent variable.

Our dependent variable, Y_{st}, varies for each estimation. The first analysis will model Y_{st} as the fraction of special education enrollment as measured by the number of students all special education environments over the total enrollment of all students in the state in a given year. Subsequent analyses will examine this fraction as it relates to severe and non-severe disabilities. To disaggregate further, special education enrollment will also be analyzed in regards to each disability individually.[10]

Our primary variable of interest is β^{Cap}, which takes the value of zero for each year a state is considered a prospective system and a one for years it is a capitation system. As mentioned in the prior section, the type of funding system was determined through the use of several sources, including Dhuey and Lipscomb (2011), Ahearn (2010), Parrish et al. (2003) and Greene and Forster (2002). When sources conflicted in regards to which system was present for a given state, the state's funding formula was reviewed to determine what type of incentive a state might have to qualify or not qualify a given student on the margin of eligibility for special

[10] Data was not available consistently for the disability category of developmental disability, so it is not included in any analyses.

education services. An indicator is also utilized to analyze the potential influence of other funding changes that occur in states on the identification of students with disabilities.

We also estimate non-parametric models that capture any non-linear increase or decrease in special education enrollment following a funding policy change.

$$Y_{st} = \propto_t + \sum_{r=-5}^{5} 1(t = t_s^* + r)\beta_r + \varphi_s + u_{st} \quad (2)$$

In our non-parametric models, β_r is an estimate of the effect of the policy change r years after the change occurred. We allow the r to take on values, $-5 \leq r \leq 5$, five years prior and five years following the policy change. Effects in the year of the policy change when r = 0 are excluded. This construction enables us to observe each policy change for the same amount of time given the final change occurred in 2008.

This study additionally includes three education policy specific variables that may alter special education enrollment. Indicators for the presence of a special education voucher program, an accountability system (Hanushek and Raymond, 2005), and school finance court cases (Lafortune, Rothstein, and Schanzenbach, 2016) in time *t* are included in most models. A vector of state level covariates for the unemployment rate; the percent of students who were black, Hispanic, or other race; the percent of students receiving free or reduced lunch; and the average monthly Social Security Income benefit are also included. Finally, φ_s contains the state level fixed effect that eliminates any time-invariant unobservable characteristics for an individual state. Due to the heterogeneous nature of each state's policy environment, standard errors are clustered at the state level in all analyses (Arellano, 1987).

Results

Special Education Enrollment

The most basic question we aim to answer is regarding the ability of funding formula changes to incentivize changes in special education enrollment. We present estimates from our linear model for the limited time frame (Columns 1 and 2) used by other studies as well as with our updated data (Columns 3 and 4) that includes newer policy changes (Table 4).[11] Coefficients on capitation are with respect to prospective funding formulas. Our preferred specification in Columns 2 and 4 show similar negative effects of a change from a prospective to capitation based system, but are only marginally significant in our shorter time span (Column 2). It should also be noted that these coefficients are about half the size of what Dhuey and Lipscomb (2011) find for their overall models.

Even though we do not see any effects in our linear models, we may find different results if we allow for the growth in special education enrollment to be non-linear with respect to time. Table 5 shows the estimates for the total year to year change in special education enrollment for states for the five years following a change to a capitation based formula. We find no evidence to suggest that the differences in enrollment in these states were different from those in states that did not change their finance formulas to a capitation system. All models indicate a null relationship between a capitation formula and special education enrollment. The standard errors on all model coefficients in the non-parametric model are quite large, lacking precision in the estimates. Based on these results and our graphical representations, treating our data linearly is most appropriate. All further results will be for our linear model (1).

[11] Replication analyses using prior categorizations of funding formulas are available in the appendix. Our replication findings are nearly identical to Dhuey and Lipscomb's

Table 4: Linear model estimating a change to a capitation system

	1991-2003		1991-2013	
	(1)	(2)	(3)	(4)
Capitation formula	-0.0047	-0.0059*	-0.0045	-0.0045
	(0.0031)	(0.0035)	(0.0032)	(0.0037)
Voucher program		-0.0007		-0.0005
		(0.0023)		(0.0028)
Accountability		0.0027		0.0040
		(0.0019)		(0.0033)
Court win		-0.0037		-0.0012
		(0.0023)		(0.0025)
Free/reduced lunch		0.0282		0.0278**
		(0.0191)		(0.0132)
Black		-0.3527*		-0.0742
		(0.2002)		(0.1339)
Hispanic		-0.0631		-0.0807**
		(0.0490)		(0.0345)
Other race		-0.0378		0.0232**
		(0.0891)		(0.0100)
Constant	0.1060***	0.1395***	0.1059***	0.1069***
	(0.0010)	(0.0383)	(0.0013)	(0.0266)
Observations	663	616	1,173	1,126
Number of states	51	51	51	51
Adj. R-squared	0.4849	0.6102	0.2682	0.3075

*** p<0.01, ** p<0.05, * p<0.1

Notes: Robust standard errors in parentheses. All models include year fixed effects. Fully specified models (Columns 2 and 4) also include controls for state average Social Security Income benefits and unemployment rates.

Table 5: Non-parametric model estimating a change to a capitation system

	1991-2003		1991-2013	
	(1)	(2)	(3)	(4)
Capitation formula	0.0000	0.0004	0.0000	0.0017
	(0.0115)	(0.0107)	(0.0093)	(0.0087)
Voucher program		0.0001		-0.0002
		(0.0023)		(0.0027)
Accountability		0.0029		0.0040
		(0.0019)		(0.0033)
Court win		-0.0045*		-0.0017
		(0.0024)		(0.0024)
Free/reduced lunch		0.0267		0.0271*
		(0.0194)		(0.0135)
Black		-0.3254		-0.0646
		(0.2004)		(0.1345)
Hispanic		-0.0669		-0.0822**
		(0.0485)		(0.0342)
Other race		-0.0616		0.0196*
		(0.0932)		(0.0113)
Constant	0.1058***	0.1316***	0.1057***	0.1008***
	(0.0010)	(0.0385)	(0.0014)	(0.0258)
Observations	663	616	1,173	1,126
Number of states	51	51	51	51
Adj. R-squared	0.4755	0.5994	0.2613	0.3002

*** p<0.01, ** p<0.05, * p<0.1

Notes: Robust standard errors in parentheses. All models include year fixed effects. Fully specified models (Columns 2 and 4) also include controls for state average Social Security Income benefits and unemployment rates.

We also test for whether any one state drives our results. We run our basic estimates of the relationship between a state change to a capitation based funding system and special education enrollment omitting one state from our analyses at a time. Rhode Island appears, both visually in the data, as well as in this specification test, to be an outlier that is driving our results toward zero. While still not as large as Dhuey and Lipscomb's estimates, omitting Rhode Island results in a statistically significant decrease of 0.68 percentage points in special education

enrollments when states switch to a capitation form a prospective funding system (See Appendix for complete results).

Severe and Non-Severe

We should not expect any effect of special education funding formulas on special education enrollments to be homogenous across the severity of disabilities. Capitation funding is "blind" to the disability of an individual student. Weighted or resource based systems, however, allocate funding based either on the type or educational placement of a student. The underlying incentive in the capitation system is likely to result in finding a student on the margin of eligibility ineligible for special education and thus increasing the proportion of students with more severe disabilities.

We present the results for our analyses of how enrollment of students with severe and non-severe disabilities are influenced by funding changes from the year 1991-2013 in Table 6.[12] Intellectual disabilities are classified as severe in Columns 1-2 and not severe in Columns 5-6. We see a decrease of under 0.7 percentage points in non-severe disability enrollment and no change in enrollment of students with severe disabilities, but this result is only marginally significant. Altering the definition of non-severe to include students with intellectual disabilities does not change our estimates substantially. The increase in magnitude of the coefficient on non-severe disabilities, which becomes only marginally significant, indicates a likely negative relationship for the disability category of intellectual disabilities. This issue will be explored in the next section when we analyze trends for each disability individually.

[12] Results for previously used time span of 1991-2003 can be found in the appendix.

Table 6: Non-severe and severe enrollment under a capitation funding system

	Non-severe w/out ID		Non-severe w/ID		Severe w/ID		Severe w/out ID	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Capitation formula	-0.006*	-0.007*	-0.0072**	-0.0074*	0.0012	0.0011	0.0023	0.0025
	(0.0034)	(0.0035)	(0.0035)	(0.0038)	(0.0013)	(0.0013)	(0.0015)	(0.0016)
Voucher program		0.0013		-0.0003		-0.0025***		-0.0011
		(0.0026)		(0.0025)		(0.0008)		(0.0008)
Accountability		0.0017		0.0036		0.0015		-0.0003
		(0.0029)		(0.0033)		(0.0016)		(0.0006)
Court Win		-0.0009		0.0001		0.0004		-0.0004
		(0.0023)		(0.0024)		(0.0010)		(0.0006)
Free/reduced lunch		0.0204		0.0151		-0.0186**		-0.0101**
		(0.0163)		(0.0174)		(0.0077)		(0.0043)
Black		-0.0809		-0.0480		0.0288		-0.0105
		(0.0782)		(0.1005)		(0.0698)		(0.0425)
Hispanic		-0.0885**		-0.0670**		0.0084		-0.0140
		(0.0339)		(0.0326)		(0.0144)		(0.0109)
Other race		0.0101		0.0100		0.0045		0.0042*
		(0.0097)		(0.0110)		(0.0040)		(0.0023)
Constant	0.0880***	0.0861**	0.1007***	0.1107***	0.0182***	0.0203	0.0058***	-0.0030
	(0.0013)	(0.0347)	(0.0015)	(0.0377)	(0.0007)	(0.0176)	(0.0006)	(0.0194)
Observations	1,138	1,094	1,137	1,093	1,040	1,001	1,041	1,002
Number of states	51	51	51	51	51	51	51	51
Adj. R-squared	0.3281	0.3629	0.3567	0.3723	0.1613	0.2040	0.6177	0.6500

*** p<0.01, ** p<0.05, * p<0.1

Notes: Robust standard errors in parentheses. All models include year fixed effects. Fully specified models (Columns 2, 4, 6, and 8) also include controls for state average Social Security Income benefits and unemployment rates.

Individual Disabilities

Our results from disaggregating disability severity indicate that there may also be some differential effects of funding formula changes between individual disabilities categories. It is unlikely that we can see any significant differences within the severe disability categories due to their normally small enrollments, which are unlikely to show much variation. Furthermore, there is often little ambiguity on the part of the IEP team over whether a student has a visual impairment or not. While a visual impairment may or may not be diagnosed because of a lack of access to quality medical care, this is unlikely to be associated with a state's decision to alter their special education finance formula. Some more severe disabilities, or those that have a large spectrum of severity, like intellectual disabilities and even autism, may see changes in their rates as funding systems change. Moreover, these two categories may also be easily labeled as a specific learning disability or speech or language impairment depending upon the incentives present in a funding formula. Non-severe disabilities (specific learning disabilities, speech or language impairments, emotional disturbance, and other health impairments), however, are the disability categories that enroll students on the margin of having a disability or not. For this reason, they are most likely to have shifting rates of enrollment when funding systems change.

We analyze changes in enrollment for each disability in Table 7 for the previously used years of 1991-2003 (Columns 1 and 2) and the extended time frame of 1991-2013 (Columns 3 and 4). In all models, we find a negative and statistically significant relationship between changing to a capitation based funding system and enrollment of students categorized as having a specific learning disability. In the expanded time frame, we see that this relationship is nearly 0.9 percentage points lower than when those same states have a prospective funding formula. This result aligns with the hypothesis that specific learning disabilities are the most likely to be

influenced by incentives because the nature of eligibility under this disability category involves the most IEP team discretion. The enrollment size of specific learning disabilities compared to other disabilities lends itself to more variation between states and over time.

A graphical look at the enrollment trends in Figure 3 demonstrates the differences between capitation and non-capitation funding states. There are some considerable differences between funding types in the categories of emotional disturbance, intellectual disabilities, and autism, but the percent of all students with disabilities from these groups is quite small, making any differences difficult to detect statistically. Given the size of the group of students labeled as having a specific learning disability (SLD) the initial gap between states that became capitation based systems and those that did not is quite large. It seems plausible that the higher rates of SLD in these states precipitated the need for a funding system change, and seems to have had the desired effect of lowering the proportion of students with SLD labels.

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Table 7: Enrollment by disability category for capitation based funding systems

		1991-2003		1991-2013	
		(1)	(2)	(3)	(4)
Non-Severe Disabilities	Specific learning disabilities	-0.0061***	-0.0064***	-0.0096***	-0.0085***
		(0.0016)	(0.0018)	(0.0021)	(0.0022)
	Speech/ language impairments	-0.0002	-0.0002	0.0003	0.0003
		(0.0017)	(0.0014)	(0.0019)	(0.002)
	Emotional disturbance	-0.0004	-0.0007	0.0006	-0.0002
		(0.0005)	(0.0007)	(0.0009)	(0.0008)
	Other health impairments	-0.0003	-0.0007	0.0002	-0.0001
		(0.0011)	(0.0011)	(0.0013)	(0.0013)
	Intellectual disabilities	0.0007	0.0007	0.0015	0.0013
		(0.0011)	(0.001)	(0.0016)	(0.0017)
Severe Disabilities	Multiple disabilities	0.0014	0.0013	0.0018	0.0019
		(0.001)	(0.0009)	(0.0013)	(0.0013)
	Hearing impairments	0.0000	0.0000	0.0000	0.0000
		(0.0001)	(0.0001)	(0.0001)	(0.0001)
	Orthopedic impairments	-0.0003	-0.0001	0.0000	-0.0001
		(0.0002)	(0.0002)	(0.0002)	(0.0002)
	Visual impairments	0.0000	0.0000	0.0000	0.0000
		(0.0000)	(0.0000)	(0.0000)	(0.0000)
	Autism	0.0001	0.0002	0.0003	0.0004
		(0.0001)	(0.0002)	(0.0004)	(0.0004)
	Deaf/blindness	0.0000	0.0000	0.0000	0.0000
		(0.0000)	(0.0000)	(0.0000)	(0.0000)
	Traumatic brain injury	0.0001	0.0001	0.0002	0.0002
		(0.0001)	(0.0001)	(0.0002)	(0.0001)
	Time variant controls		X		X

*** p<0.01, ** p<0.05, * p<0.1

Notes: Robust standard errors in parentheses. All models include year fixed effects. Fully specified models (Columns 2 and 4) also include controls for other finance formulas, implementation of a state accountability system and/or voucher program, and state average student demographics (free or reduced lunch and race), Social Security Income benefits, and unemployment rates.

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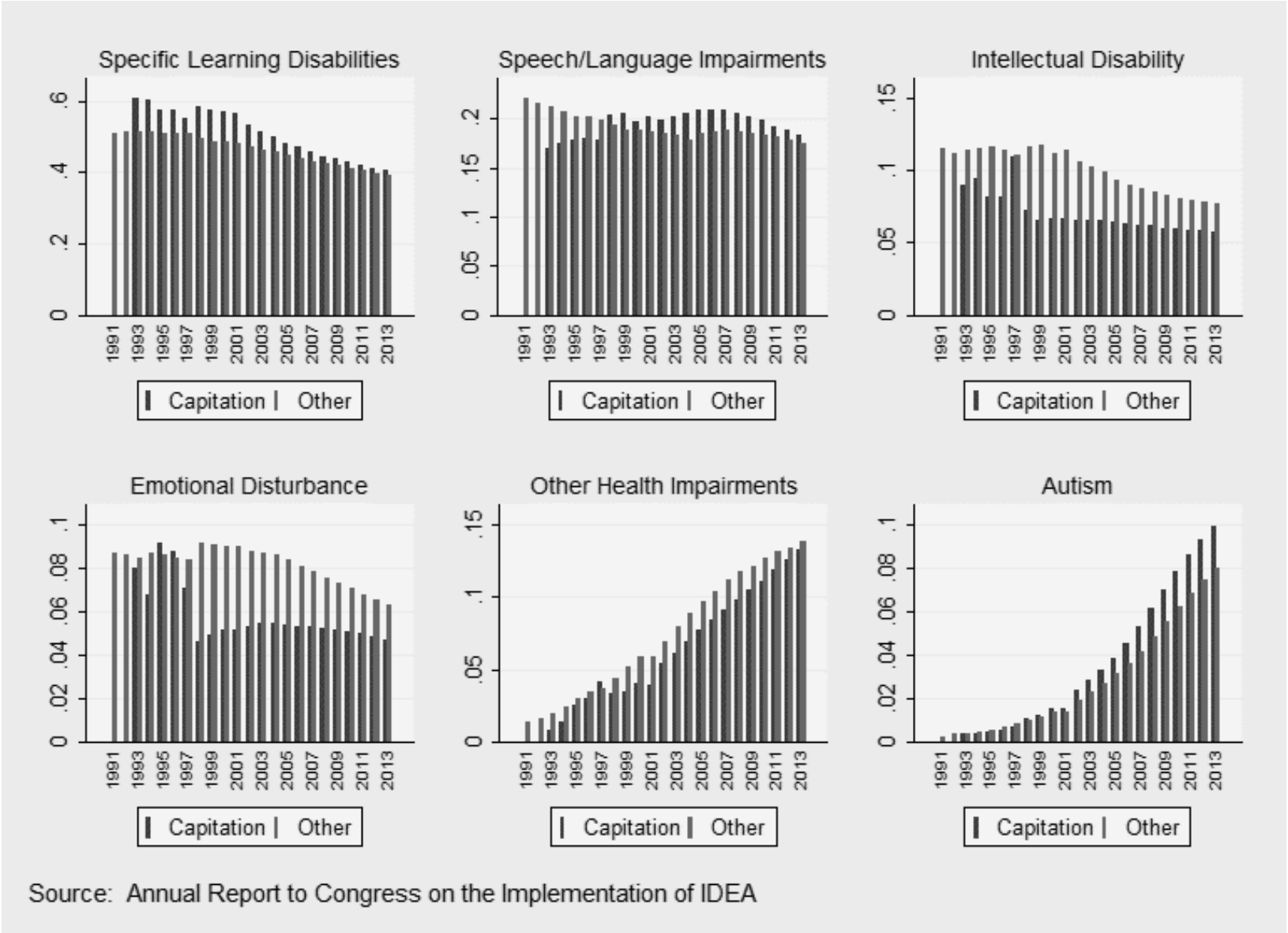
Figure 3: Differences in enrollment trends by disability in capitation and non-capitation systems



Educational Environment

Capitation funding systems are blind to both disability and educational placement determined by the IEP team. Just as enrollment for individual disabilities may be altered when finance formulas change, educational placements for students may also shift. Fewer non-severe students or those who are easily placed in the general education classroom most of the day will result in a higher proportion of students with disabilities being educated in less inclusive settings since the entire distribution of disability has shifted to be more severe than previously. We separate each of our analyses by educational placement type and by non-severe and severe disabilities in Table 8.

As expected, we see that when states switch to a capitation based special education finance formula they have a lower enrollment for students with non-severe disabilities in the most inclusive educational placement then when they had a prospective funding formula. The magnitude of the decline is over 0.87 percentage points in the expanded time frame model, nearly equivalent to the lower rate of students identified as having specific learning disabilities. In a complimentary fashion, there is a significant increase of about 0.46 percentage points for non-severe students placed in a less inclusive setting.[13]

Students with severe disabilities did not see a significant change in enrollment in our overall severity and disability specific analyses. Disaggregating enrollment by educational placement, however, demonstrates that a shift in placement does occur when states change to a capitation based funding formula. Specifically, there is a an increase of 0.69 percentage points in the proportion of students with severe disabilities (intellectual disabilities not included) educated

[13] Inclusion 40%-79% is most likely two or more subjects taught by a special educator out of the general education classroom.

in the two less inclusive regular school settings. There is also a marginally significant increase in the percent of students with severe disabilities placed out of school.

The increases in students with non-severe disabilities being placed in less inclusive settings and students with severe disabilities being placed in the least inclusive in-school setting align with our hypothesis that the distribution of students with disabilities shifts to become more severe and have few students on the margin of eligibility, thus requiring a higher proportion educated in less inclusive placements. Higher rates of students with severe disabilities in less inclusive environments also indicates this shift. This trend also requires on understanding of the importance of catastrophic aide in special education. The capitation based funding formula may move the distribution of severity to make the per capita cost of each student in special education more expensive, but the per student allocation is unlikely to actually change. The additional cost of educating each student in special education thus forces schools to utilize catastrophic funding from the state to educate their most expensive students, of which there are now proportionally more. There is a nominal cost to utilizing catastrophic aid for a district,[14] and the state incurs the remainder. This mechanism has the potential to increase the incentive to advocate that the most expensive students be placed elsewhere, paid for by the state, instead of in the district.

[14] In some states, the district is required to pay up to $15,000, and the state pays the remaining cost (Ahearn, 2010).

Table 8: Enrollment in educational placements when states change to a capitation funding system

	Non Severe w/Intellectual Disabilities				Severe w/out Intellectual Disabilities			
	1991-2003		1991-2013		1991-2003		1991-2013	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Inclusion >80%	-0.0670**	-0.0658**	-0.0884***	-0.0867***	-0.0014	-0.0012	0.0007	0.0027
	(0.0276)	(0.0309)	(0.0225)	(0.0253)	(0.0029)	(0.003)	(0.0031)	(0.0032)
Inclusion 40%-79%	0.0494**	0.0541**	0.0513**	0.0458**	0.0043*	0.0051*	0.0055*	0.0069**
	(0.021)	(0.0222)	(0.0217)	(0.0209)	(0.0026)	(0.0028)	(0.0032)	(0.0033)
Inclusion <40%	0.0080	0.0080	0.016	0.0186	0.0037*	0.0045**	0.0053**	0.0060**
	(0.0165)	(0.0154)	(0.0167)	(0.0175)	(0.0019)	(0.0022)	(0.0021)	(0.0026)
Out of school	0.0015	-0.0018	0.0021	0.0026	0.0058***	0.0041*	0.006**	0.0047*
	(0.0032)	(0.0046)	(0.0031)	(0.0035)	(0.0021)	(0.0021)	(0.0023)	(0.0023)
Public special day	0.0031	0.0000	0.0070***	0.0043	0.0029**	0.0022	0.0042*	0.0030
	(0.0021)	(0.0032)	(0.0026)	(0.0033)	(0.0014)	(0.0015)	(0.0022)	(0.0024)
Private special day	-0.0013	-0.0018	-0.0016	-0.0001	0.0014	0.0006	0.0010	0.0009
	(0.0012)	(0.0012)	(0.0012)	(0.0015)	(0.0013)	(0.0011)	(0.001)	(0.0009)
Public residential	0.0003	0.0007	0.0005	0.0009	0.0011*	0.0012	0.0012*	0.0012*
	(0.0009)	(0.001)	(0.0008)	(0.0008)	(0.0007)	(0.0008)	(0.0006)	(0.0007)
Private residential	0.0006	0.0004	0.0006	0.0011	0.0003	0.0002	0.0002	0.0003
	(0.0006)	(0.0007)	(0.0006)	(0.0007)	(0.0003)	(0.0002)	(0.0003)	(0.0002)
Home/hospital	-0.0005	-0.0002	-0.0007**	-0.0003	0.0001	0.0001	0.0002	0.0002
	(0.0005)	(0.0004)	(0.0003)	(0.0004)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Time variant controls		X		X		X		X

*** p<0.01, ** p<0.05, * p<0.1

Notes: Robust standard errors in parentheses. All models include year fixed effects. Fully specified models (Columns 2, 4, 6, and 8) also include controls for other finance formulas, implementation of a state accountability system and/or voucher program, and state average student demographics (free or reduced lunch and race), Social Security Income benefits, and unemployment rates.

School Resources

Changes to a state's special education funding formula can have impacts on the broader school. In particular, the shifting in the distribution of disability severity seen in the previous section suggests that districts may have much higher costs for each additional student with a disability but no funding to support that increase. Parrish et al (2004) raises the issue of special education costs encroaching on general education funds to pay for the federally mandated entitlement possessed by students with disabilities. This begs the question whether certain school resources must be cut back to reduce overall spending or other sources of funding need to be increased to compensate. It is essential to see whether, in the long run, there is a true difference in the resource allocation under different funding systems.

We analyze the relationship between changing from a weighted to a capitation based funding formula and pupil-teacher ratios, student enrollment, teacher salaries, and school revenue in Table 8. We find no relationship between funding formula changes and any of the school resources we attempt to analyze. Dhuey and Lipscomb (2011) only found a significant relationship between local revenues and changes to a capitation funding system. Our replication results using their categorizations, however, do find decreases in overall per pupil revenues that are driven by state revenue decreases (See Appendix).

Table 9: Resource allocation changes under capitation funding systems

	1991-2003		1991-2013	
	(1)	(2)	(3)	(4)
Pupil-teacher ratio	-0.105	-0.236	-0.161	0.035
	(0.255)	(0.262)	(0.328)	(0.329)
Ln(enrollment)	0.017	0.015	0.0009	0.012
	(0.030)	(0.023)	(0.044)	(0.033)
Ln(teacher salaries)	-0.008	-0.010	0.000	-0.006
	(0.023)	(0.020)	(0.032)	(0.031)
Total Revenues ($1000's/pupil)	-0.163	-0.303	0.238	-0.630
	(0.333)	(0.246)	(0.338)	(0.495)
Federal	-0.015	-0.061	0.006	-0.018
	(0.0496)	(0.05)	(0.080)	(0.072)
State	-0.532	-0.575	-0.142	-0.784*
	(0.454)	(0.369)	(0.33)	(0.42)
Local	0.379	0.321	0.356	0.149
	(0.294)	(0.306)	(0.279)	(0.451)
Time variant controls		X		X

*** p<0.01, ** p<0.05, * p<0.1

Notes: Robust standard errors in parentheses. All models include year fixed effects. Fully specified models (Columns 2 and 4) also include controls for other finance formulas, implementation of a state accountability system and/or voucher program, and state average student demographics (free or reduced lunch and race), Social Security Income benefits, and unemployment rates.

Private School Vouchers

In order to further add to the literature regarding incentives for identification in special education, we look specifically at what happens to enrollment in special education when a special education voucher bill is enacted within a state. Winters and Greene (2009) found that the McKay Scholarship in Florida reduced the identification of students for special education in public schools. Chakrabarti (2013) found null effects of the voucher due to the contradictory incentives involved in identifying students to exclude them from Florida's high stakes accountability system and then making the voucher program available to those students. No Child Left Behind does not allow for the exclusion of students in special education, eliminating this incentive to identify students after 2001. We present our results of the simple correlations

for the year a special education voucher program was enacted and special education enrollment in Table 10.

While there is no relationship between the enactment of a special education private school voucher and overall enrollment in special education, there is an increase in students identified as having a specific learning disability after such enactments, though this result is only marginally significant. The magnitude of this relationship is about 0.5 percentage points, which, given the size of most special education voucher programs, is quite large. There is a marginally significant decrease in students identified with intellectual disabilities when special education voucher programs are enacted.

Of importance is how students enrolled in a private school choice program are reported to the state and federal government. Our counts of students in special education are based on IDEA Part B counts, and students enrolled in special education private school choice programs no longer have an active IEP in order to receive Part B funds. We, thus, work under the assumption that all reported students counts do not include students enrolled in a special education voucher program. These results may indicate that parents may be using special education identification as having a specific learning disability as a mechanism for future enrollment in the private school choice program, and those with intellectual disabilities are using the voucher to attend private schools that the district is normally unwilling to pay for through the IEP process.

Table 10: Difference in special education enrollments in states that enact a special education voucher program compared to those that do not, 1991-2013

Enrollment in special education	-0.0005
	(0.0028)
Non-severe enrollment	-0.0003
	(0.0025)
Specific learning disabilities	0.0051**
	(0.0025)
Speech or language impairments	-0.0020
	(0.0017)
Other health impairments	-0.0013
	(0.0010)
Emotional disturbances	-0.0007
	(0.0012)
Intellectual disabilities	-0.0017*
	(0.0009)
Severe enrollment	-0.0011
	(0.0008)
Multiple disabilities	-0.0005
	(0.0004)
Hearing impairments	0.0001
	(0.0001)
Orthopedic impairments	-0.0001
	(0.0002)
Visual impairments	0.0001
	(0.0000)
Autism	-0.0006
	(0.0004)
Deaf/blindness	0.0000
	(0.0000)
Traumatic brain injury	-0.0000
	(0.0001)

*** p<0.01, ** p<0.05, * p<0.1

Notes: Robust standard errors in parentheses. All models are fully specified models to also include year fixed effects and controls for other finance formulas, implementation of a state accountability system and/or voucher program, and state average student demographics (free or reduced lunch and race), Social Security Income benefits, and unemployment rates. The omitted funding formula is weighted funding.

We further investigate the legitimacy of this hypothesis in Table 11, which displays results of enrollment in each educational placement for students in states that enact a voucher program. Unsurprisingly, we see a decrease in public special day placements for students with

severe and non-severe disabilities (including intellectual disabilities) and out of school placements in general for students with severe disabilities. One can see this as shifts away from public options for out of school placements to private options. Students who choose to stay in the public school system are likely advocating for more private options and those who use the special education voucher are doing so in order to opt into a private program rather than the previously provided public option though their IEPs. These results demonstrate the way in which special education private school choice programs may be able to function, as partially intended, to empower parents to circumvent the IEP process in order to obtain the type of educational services they desire for their students. The advent of a special education voucher and opening the door to diverse private schools to parents of students with disabilities may diminish the myth that private schools discriminate against students with disabilities.[15] It is less clear why we would see a very small (0.05 percentage point) increase in students with non-severe disabilities in home/hospital placements.

[15] There is variation across programs in the proportion of participating private schools that are specifically for students with disabilities.

Table 11: Differences in rates of various educational placements in states that enact a special education voucher program compared to those that do not, 1991-2013

	Non-severe w/ID	Severe w/out ID
Inclusion >80%	0.0232	-0.0023
	-0.032	(0.0030)
Inclusion 40%-79%	-0.0108	-0.0038*
	(0.0241)	(0.0022)
Inclusion <40%	-0.0145	0.0011
	(0.0146)	(0.0022)
Out of school	-0.0015	-0.0033**
	(0.0019)	(0.0013)
Public special day school	-0.0051***	-0.0051***
	(0.0017)	(0.0010)
Private special day school	0.0004	0.0005
	(0.0031)	(0.0006)
Public residential school	0.0001	-0.0003
	(0.0008)	(0.0007)
Private residential school	0.0011	0.0002
	(0.0009)	(0.0003)
Home/hospital	0.0005**	0.0001
	(0.0002)	(0.0001)

*** p<0.01, ** p<0.05, * p<0.1

Notes: Robust standard errors in parentheses. All models are fully specified models to also include year fixed effects and controls for other finance formulas, implementation of a state accountability system and/or voucher program, and state average student demographics (free or reduced lunch and race), Social Security Income benefits, and unemployment rates. The omitted funding formula is weighted funding.

Discussion

In this study, we find null effects of changing to a capitation based from a prospective funding system on overall special education enrollment. Disaggregated results show declines in non-severe disabilities, in particular specific learning disabilities. Further analyses also show decreases in students with non-severe disabilities enrolled in the most inclusive educational placements and a marginally significant increase in the placement of students with severe disabilities in public residential schools. We also analyze the correlations between the enactment of voucher programs for special education on public school special education enrollments,

finding increases in specific learning disabilities, decreases in intellectual disabilities, and rises in private placement options.

Finance policies can be challenging because they have to balance true financial constraints with what may be ideal in the world. Special education is often viewed as an area of education that lives without financial constraint as a result of the individual entitlement in IDEA to a free and appropriate education. Federal funds accompany IDEA, but 90 percent of special education funding is born by state and local revenues. States have thus attempted to manage the cost of special education through finance policies, balancing the various incentives that may occur as a result of any one decision. Over the last two decades, some states chose to switch to capitation based funding systems as a result. The formulas developed assume a homogenous distribution of disability in general and disability types and severities specifically. There are many reasons to believe this is not true whether due to environmental factors, such as pollution or access to prenatal health care, or Tiebout Choice (Tiebout, 1956), drawing individuals with children with disabilities to cities with more resources to support them. Creating heavy financial burdens to schools to provide adequate educational services to students with disabilities may result in higher long term costs for states that will be forced to support those individuals for years to come through welfare programs.

Unconstrained financially, schools and parents alike may have reasons to identify students as having a disability. Students can receive extra time on tests, be provided services to help their progress, or be excluded from a classroom when disruptive. Conversely, students without parents to advocate for them or those seen simply as behavior problems may not be identified and provided these necessary services to enable their academic progress. The goal is creating a balance through these policies.

Implementation of capitation based systems is an old innovation now. States attempt to create systems for allocating money that are simple to administer even if they are not best for students. Some districts are now using their state allocations to better redistribute funds using student based allocation schemes. Student based allocation is a set number of dollars assigned to a student or student type that follows a student to any school they attend and offers school staff, those closest to the student, the opportunity to cater services to the precise needs of the student using their knowledge of all the strengths of the staff and understanding of the student's family and community.

Because evidence on the best ways to serve students in special education is mixed, it is nearly impossible to determine what is the "right" way to serve a student. Not only is this dependent on the individual needs of that student, but also on the various services available within his or her educational setting. Student based allocation gives administrators the confidence that funds can be used in diverse ways based on the actual student, which can in turn empower them as an IEP team member and potentially eliminate the financial incentive to underserve. Additionally, putting the funds under the control of the school creates an incentive for them to serve the student at the lowest costs necessary since any reduction in spending would allow the school to spend those funds in another way at the school level. With a strong accountability system in place, this could result in a decrease in spending and an improvement in student outcomes.

Student based allocation is increasingly being used by states and districts to allocate public education funds across the country. Districts using student based allocation to allocate funds to schools include Baltimore, Boston, Chicago, Cleveland, Denver, Hartford, Houston, Lawrence, Los Angeles, Milwaukee, Minneapolis, Nashville, New York City, Newark, the

Recovery School District, and San Francisco. It is essential that researchers focus their energy on how these locally run special education finance systems are implemented along with various outcomes. Policies like these must constantly be evaluated and reevaluated in order to ensure that they are having their intended impact, not unintended ones.

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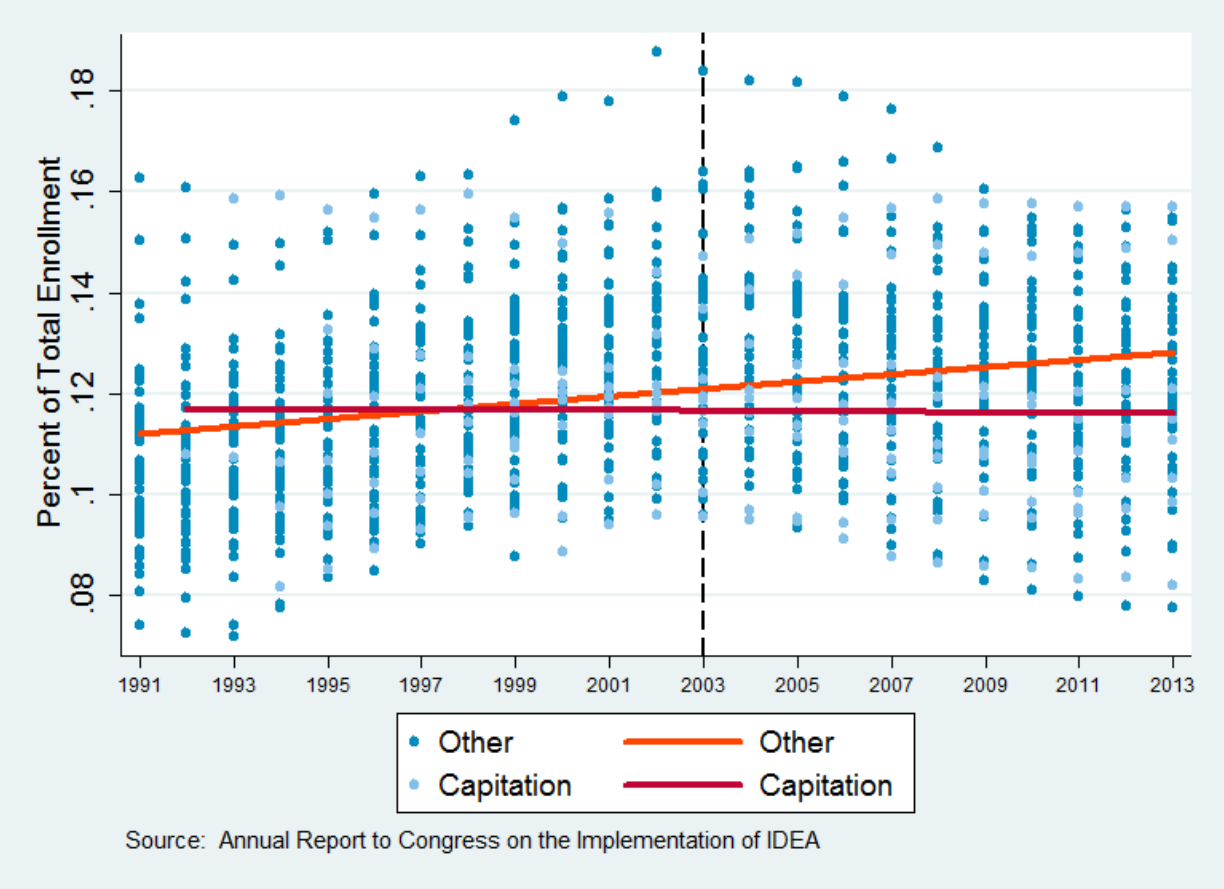
Appendix

Appendix Figure 1: Capitation versus other funding systems and special education enrollment, 1991-2013 (Dhuey and Lispcomb definitions)



Appendix Table 1: Relationship between capitation funding formula and special education enrollment, single state omission checks

	1991-2003		1991-2013	
State omitted	No controls	Time variant controls	No controls	Time variant controls
Alabama	-0.0051	-0.0062*	-0.0051	-0.005
Alaska	-0.0041	-0.0056	-0.004	-0.0036
Arizona	-0.0048	-0.0059*	-0.0045	-0.0045
Arkansas	-0.0054	-0.0062*	-0.0051	-0.0048
California	-0.0042	-0.0053	-0.0042	-0.0048
Colorado	-0.005	-0.0062*	-0.0049	-0.0048
Connecticut	-0.0036	-0.005	-0.003	-0.003
Delaware	-0.0048	-0.0059*	-0.0046	-0.0046
Florida	-0.0046	-0.0057	-0.0044	-0.0044
Georgia	-0.0047	-0.0059*	-0.0045	-0.0045
Hawaii	-0.005*	-0.0054	-0.0048	-0.0044
Idaho	-0.0048	-0.0061	-0.0044	-0.0042
Indiana	-0.0045	-0.0059*	-0.0042	-0.0045
Iowa	-0.0046	-0.0059*	-0.0045	-0.0044
Kansas	-0.0047	-0.0059*	-0.0044	-0.0042
Kentucky	-0.0047	-0.0059*	-0.0044	-0.0046
Louisiana	-0.0045	-0.006*	-0.0044	-0.0045
Maine	-0.0044	-0.0057	-0.0041	-0.0043
Maryland	-0.0049	-0.006*	-0.0051	-0.0056
Massachusetts	-0.0037	-0.0051	-0.0039	-0.004
Michigan	-0.0047	-0.0059*	-0.0044	-0.0046
Minnesota	-0.0047	-0.0059*	-0.0043	-0.0048
Mississippi	-0.005	-0.0061*	-0.0047	-0.0047
Missouri	-0.005	-0.006*	-0.0048	-0.0047
Montana	-0.005	-0.0063	-0.0046	-0.0046
Nebraska	-0.0046	-0.006*	-0.0044	-0.0045
Nevada	-0.0049	-0.006	-0.0046	-0.0045
New Hampshire	-0.0044	-0.0056	-0.0039	-0.0038
New Jersey	-0.0037	-0.0054	-0.004	-0.0047
New Mexico	-0.0046	-0.0052	-0.0046	-0.0048
New York	-0.0047	-0.006	-0.0043	-0.0039
North Carolina	-0.0047	-0.0057	-0.0046	-0.0047
North Dakota	-0.0057	-0.0067*	-0.0061*	-0.0062
Ohio	-0.0049	-0.006	-0.0045	-0.0048
Oklahoma	-0.0047	-0.0059	-0.0043	-0.0044
Oregon	-0.0046	-0.0059	-0.0044	-0.0045
Pennsylvania	-0.0047	-0.0059	-0.0042	-0.0042
Rhode Island	-0.0069***	-0.0089***	-0.0061**	-0.0068**
South Carolina	-0.0045	-0.0058	-0.0044	-0.0046
South Dakota	-0.0045	-0.0059	-0.0038	-0.004
Tennessee	-0.005	-0.006*	-0.005	-0.005

Appendix Table 2: Relationship between capitation funding formula and special education enrollment, single state omission checks (cont.)

	1991-2003		1991-2003	
State omitted	No controls	Time variant controls	No controls	Time variant controls
Texas	-0.0049	-0.0061*	-0.0049	-0.005
Utah	-0.0048	-0.006*	-0.0047	-0.0046
Vermont	-0.005	-0.0061*	-0.0046	-0.0048
Virginia	-0.0047	-0.0059*	-0.0046	-0.0047
Washington	-0.0048	-0.0059*	-0.0045	-0.0042
Washington D.C.	-0.0041	-0.0036	-0.0037	-0.0022
West Virginia	-0.0044	-0.005	-0.0043	-0.0042
Wisconsin	-0.0046	-0.0053	-0.0043	-0.0041
Wyoming	-0.0049	-0.0063*	-0.0046	-0.0047

*** p<0.01, ** p<0.05, * p<0.1

Notes: Robust standard errors in parentheses. All models include year fixed effects. Fully specified models (Columns 2 and 4) also include controls for state average Social Security Income benefits and unemployment rates. The omitted funding formula is weighted funding.

Appendix Table 3: Replication of Dhuey and Lipscomb linear model estimating a change to a capitation system

	1991-2003		1991-2013	
	(1)	(2)	(3)	(4)
Capitation formula	-0.0113***	-0.011***	-0.0109***	-0.0098**
	(0.0038)	(0.0037)	(0.004)	(0.0042)
Voucher program		0.0016		0.0031
		(0.0018)		(0.0031)
Accountability		-0.0031		-0.0001
		(0.0022)		(0.0024)
Court win		0.0329		0.0282*
		(0.0198)		(0.0167)
Free/reduced lunch		-0.0708		0.1317**
		(0.1090)		(0.0652)
Black		-0.0714*		-0.0723**
		(0.0423)		(0.0307)
Hispanic		0.0043		0.0247***
		(0.0919)		(0.0089)
Other race	0.1069***	0.1075***	0.1059***	0.0978***
	(0.0009)	(0.0219)	(0.0013)	(0.0232)
Constant				
	650	604	1,173	1,104
	50	50	51	50
Observations	0.6177	0.6333	0.2682	0.3665
Number of states	-0.0113***	-0.011***	-0.0109***	-0.0098**
Adj. R-squared	(0.0038)	(0.0037)	(0.004)	(0.0042)

*** p<0.01, ** p<0.05, * p<0.1

Notes: Robust standard errors in parentheses. All models include year fixed effects. Fully specified models (Columns 2 and 4) also include controls for state average Social Security Income benefits and unemployment rates. The omitted funding formula is weighted funding.

Appendix Table 4: Replication of Dhuey and Lipscomb non-severe and severe enrollment under a capitation funding system

	Non-severe w/out ID		Non-severe w/ID		Severe w/ID		Severe w/out ID	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Capitation formula	-0.0102**	-0.0104**	-0.0113***	-0.0109**	0.0002	0.0005	0.0023	0.0025
	(0.0041)	(0.0039)	(0.0042)	(0.0045)	(0.0017)	(0.0017)	(0.0015)	(0.0016)
Accountability		0.0013		0.0029		0.0009		-0.0006
		(0.0028)		(0.0031)		(0.0015)		(0.0005)
Court Win		0.0001		0.0012		0.0012		0.0001
		(0.0021)		(0.0022)		(0.0009)		(0.0006)
Free/reduced lunch		0.0315**		0.0269*		-0.0119		-0.0058
		(0.0146)		(0.0159)		(0.0076)		(0.0041)
Black		0.0400		0.1143*		0.1255***		0.0419
		(0.0562)		(0.0596)		(0.0374)		(0.0261)
Hispanic		-0.0868***		-0.0629**		0.0138		-0.0102
		(0.0308)		(0.0292)		(0.0144)		(0.0098)
Other race		0.0115		0.0114		0.0069*		0.0063**
		(0.0089)		(0.0096)		(0.0036)		(0.0027)
Constant	0.0888***	0.0841**	0.1015***	0.1081***	0.0188***	0.0194	0.0063***	-0.0038
	(0.0012)	(0.0314)	(0.0014)	(0.0335)	(0.0007)	(0.0195)	(0.0006)	(0.0211)
Observations	1,117	1,073	1,116	1,072	1,020	981	1,021	982
Number of states	50	50	50	50	50	50	50	50
Adj. R-squared	0.3430	0.3832	0.3781	0.4149	0.1463	0.2550	0.6184	0.6481

*** p<0.01, ** p<0.05, * p<0.1

Notes: Robust standard errors in parentheses. All models include year fixed effects. Fully specified models (Columns 2, 4, 6, and 8) also include controls for state average Social Security Income benefits and unemployment rates. The omitted funding formula is weighted funding.

Appendix Table 5: Replication of Dhuey and Lipscomb enrollment by disability category for capitation based funding systems

		1991-2003		1991-2013	
		(1)	(2)	(3)	(4)
Non-Severe Disabilities	Specific learning disabilities	-0.0058**	-0.0054**	-0.0072**	-0.0057
		(0.0027)	(0.0027)	(0.003)	(0.0035)
	Speech/ language impairments	-0.0002	-0.0002	0.0001	0.0001
		(0.0017)	(0.0014)	(0.0019)	(0.002)
	Emotional disturbance	-0.001	-0.001	-0.0005	-0.0003
		(0.0015)	(0.0014)	(0.0018)	(0.0016)
	Other health impairments	-0.0032**	-0.0037***	-0.0045***	-0.0054***
		(0.0013)	(0.001)	(0.0016)	(0.0012)
	Intellectual disabilities	-0.001	-0.0008	0.0007	0.0006
		(0.0007)	(0.0008)	(0.0011)	(0.001)
Severe Disabilities	Multiple disabilities	-0.0004	-0.0003	-0.0004	-0.0001
		(0.0007)	(0.0011)	(0.0009)	(0.0013)
	Hearing impairments	0.0000	0.0000	0.0000	-0.0001
		(0.0001)	(0.0001)	(0.0001)	(0.0001)
	Orthopedic impairments	-0.0002	0.0000	0.0000	0.0000
		(0.0002)	(0.0002)	(0.0002)	(0.0002)
	Visual impairments	0.0000	0.0000	0.0000	-0.0001
		(0.0001)	(0.0000)	(0.0001)	(0.0001)
	Autism	-0.0002	-0.0001	-0.0004	-0.0003
		(0.0001)	(0.0001)	(0.0005)	(0.0005)
	Deaf/blindness	0.0000	0.0000	0.0000	0.0000
		(0.0000)	(0.0000)	(0.0000)	(0.0000)
	Traumatic brain injury	0.0000	0.0000	0.0001	0.0001
		(0.0001)	(0.0001)	(0.0002)	(0.0002)
	Time variant controls		X		X

*** p<0.01, ** p<0.05, * p<0.1

Notes: Robust standard errors in parentheses. All models include year fixed effects. Fully specified models (Columns 2 and 4) also include controls for other finance formulas, implementation of a state accountability system and/or voucher program, and state average student demographics (free or reduced lunch and race), Social Security Income benefits, and unemployment rates. The omitted funding formula is weighted funding.

Appendix Table 6: Replication of Dhuey and Lipscomb enrollment in educational placements when states change to a capitation funding system

	Non Severe w/Intellectual Disabilities				Severe w/out Intellectual Disabilities			
	1991-2003		1991-2013		1991-2003		1991-2013	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Inclusion >80%	-0.0575	-0.0504	-0.0808**	-0.0721**	-0.0028	-0.0015	0.0000	0.002
	(0.0433)	(0.0449)	(0.0329)	(0.0347)	(0.0029)	(0.0031)	(0.0033)	(0.003)
Inclusion 40%-79%	0.0432	0.0376	0.0487*	0.0402	0.001	0.0017	0.0021	0.0036
	(0.0329)	(0.0345)	(0.0257)	(0.0289)	(0.0027)	(0.0036)	(0.0033)	(0.0043)
Inclusion <40%	0.0171	0.021	0.0328**	0.0414***	-0.0002	0.0004	0.0012	0.0022
	(0.0144)	(0.0158)	(0.0135)	(0.0146)	(0.0025)	(0.0031)	(0.0024)	(0.0031)
Out of school	0.0059*	0.0048	0.0065**	0.0063*	0.0038	0.0034	0.0044	0.0039
	(0.0031)	(0.0035)	(0.0029)	(0.0034)	(0.0027)	(0.0028)	(0.0029)	(0.0031)
Public special day	0.0054*	0.0000	0.0062**	0.0045	0.0024	0.0025	0.0023	0.002
	(0.0028)	(0.0026)	(0.0028)	(0.0031)	(0.0021)	(0.0022)	(0.0028)	(0.003)
Private special day	0.0000	-0.0004	-0.0015	-0.0013	-0.0009	-0.0013	-0.0001	-0.0003
	(0.0014)	(0.0014)	(0.0018)	(0.0019)	(0.0009)	(0.001)	(0.0004)	(0.0006)
Public residential	0.0003	0.0007	0.0005	0.0009	0.0019**	0.0019*	0.0017**	0.0016*
	(0.0009)	(0.001)	(0.0008)	(0.0008)	(0.0008)	(0.0009)	(0.0008)	(0.0008)
Private residential	0.0006	0.0004	0.0012	0.0011	0.0005***	0.0005***	0.0005***	0.0005**
	(0.001)	(0.0009)	(0.0009)	(0.0008)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Home/hospital	-0.0002	-0.0001	-0.0002	0.0000	0.0001	0.0001	0.0002	0.0002
	(0.0005)	(0.0006)	(0.0004)	(0.0005)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Time variant controls		X		X		X		X

*** p<0.01, ** p<0.05, * p<0.1

Notes: Robust standard errors in parentheses. All models include year fixed effects. Fully specified models (Columns 2, 4, 6, and 8) also include controls for other finance formulas, implementation of a state accountability system and/or voucher program, and state average student demographics (free or reduced lunch and race), Social Security Income benefits, and unemployment rates. The omitted funding formula is weighted funding.

Appendix Table 7: Replication of Dhuey and Lipscomb resource allocation changes under capitation funding systems

	1991-2003		1991-2013	
	(1)	(2)	(3)	(4)
Pupil-teacher ratio	0.023	-0.0144	0.367	0.585
	(0.45)	(0.486)	(0.4)	(0.531)
Ln(enrollment)	-0.0032	0.0067	-0.0145	0.0116
	(0.0334)	(0.0248)	(0.0443)	(0.038)
Ln(teacher salaries)	-0.0148	-0.0116	-0.0013	-0.0028
	(0.0395)	(0.0341)	(0.0504)	(0.0529)
Total Revenues ($1000's/pupil)	-0.684	-0.65	-0.633*	-1.271**
	(0.599)	(0.501)	(0.375)	(0.536)
Federal	0.0725*	0.0428	0.0807	0.0502
	(0.0429)	(0.0446)	(0.0667)	(0.0578)
State	-1.418**	-1.461**	-1.04**	-1.596**
	(0.689)	(0.638)	(0.487)	(0.637)
Local	0.662	0.769*	0.325	0.275
	(0.422)	(0.422)	(0.416)	(0.491)
Time variant controls		X		X

*** p<0.01, ** p<0.05, * p<0.1

Notes: Robust standard errors in parentheses. All models include year fixed effects. Fully specified models (Columns 2 and 4) also include controls for other finance formulas, implementation of a state accountability system and/or voucher program, and state average student demographics (free or reduced lunch and race), Social Security Income benefits, and unemployment rates. The omitted funding formula is weighted funding.

Appendix Table 8: Relationship between capitation funding formula and special education enrollment, single state omission checks

	1991-2003		1991-2013	
State omitted	No controls	Time variant controls	No controls	Time variant controls
Alabama	-0.0113**	-0.0109**	-0.0113**	-0.0091*
Alaska	-0.0116***	-0.0114***	-0.0113***	-0.0102**
Arizona	-0.0119***	-0.0119***	-0.0118***	-0.0105**
Arkansas	-0.0114***	-0.011***	-0.0109***	-0.0098**
California	-0.0114**	-0.0117**	-0.0115**	-0.0127***
Colorado	-0.0115***	-0.0113***	-0.0111***	-0.0099**
Connecticut	-0.0097**	-0.0093***	-0.0084**	-0.0075**
Delaware	-0.0114***	-0.011***	-0.0109***	-0.0098**
Florida	-0.0111***	-0.0108***	-0.0108**	-0.0096**
Georgia	-0.0113***	-0.0113***	-0.0111***	-0.0109**
Hawaii	-0.0111***	-0.0102***	-0.0107**	-0.0097**

Appendix Table 7: Relationship between capitation funding formula and special education enrollment, single state omission checks (Cont.)

	1991-2003		1991-2013	
State omitted	No controls	Time variant controls	No controls	Time variant controls
Idaho	-0.012***	-0.012***	-0.0109**	-0.0095**
Illinois	-0.0114***	-0.0111***	-0.0109***	-0.0097**
Indiana	-0.0112***	-0.011***	-0.0107**	-0.0098**
Iowa	-0.0113***	-0.011***	-0.0109***	-0.0096**
Kansas	-0.0113***	-0.011***	-0.0108**	-0.0096**
Kentucky	-0.0114***	-0.0111***	-0.0109***	-0.0099**
Louisiana	-0.0112***	-0.0111***	-0.0108**	-0.0098**
Maine	-0.0111***	-0.0107***	-0.0106**	-0.0095**
Maryland	-0.0115***	-0.0111***	-0.0111***	-0.0103**
Massachusetts	-0.0097**	-0.0096**	-0.01**	-0.0088**
Michigan	-0.0113***	-0.011***	-0.0108**	-0.0098**
Minnesota	-0.0113***	-0.011***	-0.0107**	-0.01**
Mississippi	-0.0114***	-0.0112***	-0.011***	-0.0099**
Missouri	-0.0116***	-0.0113***	-0.0112***	-0.0101**
Montana	-0.0125***	-0.0121***	-0.0116**	-0.0101**
Nebraska	-0.0112***	-0.0109***	-0.0108**	-0.0097**
Nevada	-0.0114***	-0.011***	-0.011***	-0.0099**
New Hampshire	-0.0113***	-0.011***	-0.0101**	-0.0092**
New Jersey	-0.0123***	-0.0122***	-0.0117***	-0.0104**
New Mexico	-0.0112***	-0.0105***	-0.0109***	-0.0097**
New York	-0.0113***	-0.011***	-0.0107**	-0.0092**
North Carolina	-0.0113***	-0.011***	-0.011***	-0.0098**
North Dakota	-0.0133***	-0.0126***	-0.0134***	-0.0122***
Ohio	-0.0114***	-0.0111***	-0.0109***	-0.0099**
Oklahoma	-0.0113***	-0.011***	-0.0108**	-0.0097**
Oregon	-0.0113***	-0.0111***	-0.0109***	-0.0099**
Pennsylvania	-0.0114***	-0.011***	-0.0107**	-0.0094**
Rhode Island	-0.0089***	-0.0084***	-0.0091**	-0.0081**
South Carolina	-0.0112***	-0.0109***	-0.0108***	-0.0098**
South Dakota	-0.0114***	-0.0115***	-0.0108***	-0.0098**
Tennessee	-0.0115***	-0.011***	-0.0111***	-0.01**
Texas	-0.0114***	-0.0111***	-0.0111***	-0.0099**
Utah	-0.0115***	-0.0113***	-0.0111***	-0.0099**
Vermont	-0.0113***	-0.011***	-0.011***	-0.0103**
Virginia	-0.0113***	-0.011***	-0.0109***	-0.0098**
Washington	-0.0114***	-0.011***	-0.0109***	-0.0096**
West Virginia	-0.0111***	-0.0106***	-0.0108**	-0.0096**
Wisconsin	-0.0112***	-0.0105***	-0.0108**	-0.0096**
Wyoming	-0.0115***	-0.0114***	-0.011***	-0.01**

*** p<0.01, ** p<0.05, * p<0.1

Notes: Robust standard errors in parentheses. All models include year fixed effects. Fully specified models (Columns 2 and 4) also include controls for state average Social Security Income benefits and unemployment rates. The omitted funding formula is weighted funding.

Appendix Table 9: Replication of Dhuey and Lipscomb linear model estimating a change to a capitation system

	1991-2003		1991-2013	
	(1)	(2)	(3)	(4)
Capitation formula	-0.0113***	-0.011***	-0.0109***	-0.0098**
	(0.0038)	(0.0037)	(0.004)	(0.0042)
Voucher program		0.0016		0.0031
		(0.0018)		(0.0031)
Accountability		-0.0031		-0.0001
		(0.0022)		(0.0024)
Court win		0.0329		0.0282*
		(0.0198)		(0.0167)
Free/reduced lunch		-0.0708		0.1317**
		(0.1090)		(0.0652)
Black		-0.0714*		-0.0723**
		(0.0423)		(0.0307)
Hispanic		0.0043		0.0247***
		(0.0919)		(0.0089)
Other race	0.1069***	0.1075***	0.1059***	0.0978***
	(0.0009)	(0.0219)	(0.0013)	(0.0232)
Constant				
	650	604	1,173	1,104
	50	50	51	50
Observations	0.6177	0.6333	0.2682	0.3665
Number of states	-0.0113***	-0.011***	-0.0109***	-0.0098**
Adj. R-squared	(0.0038)	(0.0037)	(0.004)	(0.0042)

*** p<0.01, ** p<0.05, * p<0.1

Notes: Robust standard errors in parentheses. All models include year fixed effects. Fully specified models (Columns 2 and 4) also include controls for state average Social Security Income benefits and unemployment rates. The omitted funding formula is weighted funding.

Appendix Table 10: Replication of Dhuey and Lipscomb non-severe and severe enrollment under a capitation funding system

	Non-severe w/out ID		Non-severe w/ID		Severe w/ID		Severe w/out ID	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Capitation formula	-0.0102**	-0.0104**	-0.0113***	-0.0109**	0.0002	0.0005	0.0023	0.0025
	(0.0041)	(0.0039)	(0.0042)	(0.0045)	(0.0017)	(0.0017)	(0.0015)	(0.0016)
Accountability		0.0013		0.0029		0.0009		-0.0006
		(0.0028)		(0.0031)		(0.0015)		(0.0005)
Court Win		0.0001		0.0012		0.0012		0.0001
		(0.0021)		(0.0022)		(0.0009)		(0.0006)
Free/reduced lunch		0.0315**		0.0269*		-0.0119		-0.0058
		(0.0146)		(0.0159)		(0.0076)		(0.0041)
Black		0.0400		0.1143*		0.1255***		0.0419
		(0.0562)		(0.0596)		(0.0374)		(0.0261)
Hispanic		-0.0868***		-0.0629**		0.0138		-0.0102
		(0.0308)		(0.0292)		(0.0144)		(0.0098)
Other race		0.0115		0.0114		0.0069*		0.0063**
		(0.0089)		(0.0096)		(0.0036)		(0.0027)
Constant	0.0888***	0.0841**	0.1015***	0.1081***	0.0188***	0.0194	0.0063***	-0.0038
	(0.0012)	(0.0314)	(0.0014)	(0.0335)	(0.0007)	(0.0195)	(0.0006)	(0.0211)
Observations	1,117	1,073	1,116	1,072	1,020	981	1,021	982
Number of states	50	50	50	50	50	50	50	50
Adj. R-squared	0.3430	0.3832	0.3781	0.4149	0.1463	0.2550	0.6184	0.6481

*** p<0.01, ** p<0.05, * p<0.1

Notes: Robust standard errors in parentheses. All models include year fixed effects. Fully specified models (Columns 2, 4, 6, and 8) also include controls for state average Social Security Income benefits and unemployment rates. The omitted funding formula is weighted funding.

Appendix Table 11: Replication of Dhuey and Lipscomb enrollment by disability category for capitation based funding systems

		1991-2003		1991-2013	
		(1)	(2)	(3)	(4)
Non-Severe Disabilities	Specific learning disabilities	-0.0058**	-0.0054**	-0.0072**	-0.0057
		(0.0027)	(0.0027)	(0.003)	(0.0035)
	Speech/ language impairments	-0.0002	-0.0002	0.0001	0.0001
		(0.0017)	(0.0014)	(0.0019)	(0.002)
	Emotional disturbance	-0.001	-0.001	-0.0005	-0.0003
		(0.0015)	(0.0014)	(0.0018)	(0.0016)
	Other health impairments	-0.0032**	-0.0037***	-0.0045***	-0.0054***
		(0.0013)	(0.001)	(0.0016)	(0.0012)
	Intellectual disabilities	-0.001	-0.0008	0.0007	0.0006
		(0.0007)	(0.0008)	(0.0011)	(0.001)
Severe Disabilities	Multiple disabilities	-0.0004	-0.0003	-0.0004	-0.0001
		(0.0007)	(0.0011)	(0.0009)	(0.0013)
	Hearing impairments	0.0000	0.0000	0.0000	-0.0001
		(0.0001)	(0.0001)	(0.0001)	(0.0001)
	Orthopedic impairments	-0.0002	0.0000	0.0000	0.0000
		(0.0002)	(0.0002)	(0.0002)	(0.0002)
	Visual impairments	0.0000	0.0000	0.0000	-0.0001
		(0.0001)	(0.0000)	(0.0001)	(0.0001)
	Autism	-0.0002	-0.0001	-0.0004	-0.0003
		(0.0001)	(0.0001)	(0.0005)	(0.0005)
	Deaf/blindness	0.0000	0.0000	0.0000	0.0000
		(0.0000)	(0.0000)	(0.0000)	(0.0000)
	Traumatic brain injury	0.0000	0.0000	0.0001	0.0001
		(0.0001)	(0.0001)	(0.0002)	(0.0002)
	Time variant controls		X		X

*** p<0.01, ** p<0.05, * p<0.1

Notes: Robust standard errors in parentheses. All models include year fixed effects. Fully specified models (Columns 2 and 4) also include controls for other finance formulas, implementation of a state accountability system and/or voucher program, and state average student demographics (free or reduced lunch and race), Social Security Income benefits, and unemployment rates. The omitted funding formula is weighted funding.

Appendix Table 12: Replication of Dhuey and Lipscomb enrollment in educational placements when states change to a capitation funding system

	Non Severe w/Intellectual Disabilities				Severe w/out Intellectual Disabilities			
	1991-2003		1991-2013		1991-2003		1991-2013	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Inclusion >80%	-0.0575	-0.0504	-0.0808**	-0.0721**	-0.0028	-0.0015	0.0000	0.002
	(0.0433)	(0.0449)	(0.0329)	(0.0347)	(0.0029)	(0.0031)	(0.0033)	(0.003)
Inclusion 40%-79%	0.0432	0.0376	0.0487*	0.0402	0.001	0.0017	0.0021	0.0036
	(0.0329)	(0.0345)	(0.0257)	(0.0289)	(0.0027)	(0.0036)	(0.0033)	(0.0043)
Inclusion <40%	0.0171	0.021	0.0328**	0.0414***	-0.0002	0.0004	0.0012	0.0022
	(0.0144)	(0.0158)	(0.0135)	(0.0146)	(0.0025)	(0.0031)	(0.0024)	(0.0031)
Out of school	0.0059*	0.0048	0.0065**	0.0063*	0.0038	0.0034	0.0044	0.0039
	(0.0031)	(0.0035)	(0.0029)	(0.0034)	(0.0027)	(0.0028)	(0.0029)	(0.0031)
Public special day	0.0054*	0.0000	0.0062**	0.0045	0.0024	0.0025	0.0023	0.002
	(0.0028)	(0.0026)	(0.0028)	(0.0031)	(0.0021)	(0.0022)	(0.0028)	(0.003)
Private special day	0.0000	-0.0004	-0.0015	-0.0013	-0.0009	-0.0013	-0.0001	-0.0003
	(0.0014)	(0.0014)	(0.0018)	(0.0019)	(0.0009)	(0.001)	(0.0004)	(0.0006)
Public residential	0.0003	0.0007	0.0005	0.0009	0.0019**	0.0019*	0.0017**	0.0016*
	(0.0009)	(0.001)	(0.0008)	(0.0008)	(0.0008)	(0.0009)	(0.0008)	(0.0008)
Private residential	0.0006	0.0004	0.0012	0.0011	0.0005***	0.0005***	0.0005***	0.0005**
	(0.001)	(0.0009)	(0.0009)	(0.0008)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Home/hospital	-0.0002	-0.0001	-0.0002	0.0000	0.0001	0.0001	0.0002	0.0002
	(0.0005)	(0.0006)	(0.0004)	(0.0005)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Time variant controls		X		X		X		X

*** p<0.01, ** p<0.05, * p<0.1

Notes: Robust standard errors in parentheses. All models include year fixed effects. Fully specified models (Columns 2, 4, 6, and 8) also include controls for other finance formulas, implementation of a state accountability system and/or voucher program, and state average student demographics (free or reduced lunch and race), Social Security Income benefits, and unemployment rates. The omitted funding formula is weighted funding.

Appendix Table 13: Replication of Dhuey and Lipscomb resource allocation changes under capitation funding systems

	1991-2003		1991-2013	
	(1)	(2)	(3)	(4)
Pupil-teacher ratio	0.023	-0.0144	0.367	0.585
	(0.45)	(0.486)	(0.4)	(0.531)
Ln(enrollment)	-0.0032	0.0067	-0.0145	0.0116
	(0.0334)	(0.0248)	(0.0443)	(0.038)
Ln(teacher salaries)	-0.0148	-0.0116	-0.0013	-0.0028
	(0.0395)	(0.0341)	(0.0504)	(0.0529)
Total Revenues ($1000's/pupil)	-0.684	-0.65	-0.633*	-1.271**
	(0.599)	(0.501)	(0.375)	(0.536)
Federal	0.0725*	0.0428	0.0807	0.0502
	(0.0429)	(0.0446)	(0.0667)	(0.0578)
State	-1.418**	-1.461**	-1.04**	-1.596**
	(0.689)	(0.638)	(0.487)	(0.637)
Local	0.662	0.769*	0.325	0.275
	(0.422)	(0.422)	(0.416)	(0.491)
Time variant controls		X		X

*** p<0.01, ** p<0.05, * p<0.1

Notes: Robust standard errors in parentheses. All models include year fixed effects. Fully specified models (Columns 2 and 4) also include controls for other finance formulas, implementation of a state accountability system and/or voucher program, and state average student demographics (free or reduced lunch and race), Social Security Income benefits, and unemployment rates. The omitted funding formula is weighted funding.

UNIVERSITY OF ARKANSAS

Office of Research Compliance
Institutional Review Board

September 13, 2016

MEMORANDUM

TO:	Sivan Tuchman Patrick Wolf
FROM:	Ro Windwalker IRB Coordinator
RE:	New Protocol Submission
IRB Protocol #:	16-08-055
Protocol Title:	*Dis-incentivizing Identification of Disabilities in a Capitation Based Special Education Funding System*

In reference to the request for IRB approval of your project titled *Dis-incentivizing Identification of Disabilities in a Capitation Based Special Education Funding System*, the IRB is not authorized to oversee and approve such research. This protocol does not meet the definition of research involving human subjects in the federal regulations. (See the citation below.) You are free to conduct your research without IRB approval.

45 CFR 46.102 (f)

(f) Human subject means a living individual about whom an investigator (whether professional or student) conducting research obtains

(1) Data through intervention or interaction with the individual, or
(2) Identifiable private information.

If you have any questions do not hesitate to contact this office.

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Chapter 2

Falling Below the Line: Minimum Subgroup Size and Special Education Enrollment

Introduction

With the passage of the All Handicapped Children Act of 1975, Americans with Disabilities Act of 1990, and finally the Individuals with Disabilities in Education Act (IDEA) in 1997 and renewed in 2004, guaranteeing a free and appropriate education (FAPE) for students with disabilities in public schools, special education enrollment has continued to grow across the country. The No Child Left Behind Act of 2001 (NCLB) mandated the inclusion of students with disabilities in the attainment of 100 percent proficiency and progress on annual measureable objectives (AMOs) for schools to make annual yearly progress (AYP) and avoid sanctions. For statistical reliability, each state determined a minimum subgroup size for the calculation of progress toward subgroup AMOs. Schools without a sufficiently large number of students in a subgroup were not held accountable for the progress of those students in the determination of AYP. The academic challenges encountered by students with disabilities may lead schools to have an incentive to manipulate the number of students in this subgroup in order to fall below the minimum subgroup size and avoid including these students in AYP. If schools respond to this incentive to avoid including the special education subgroup, there will be a clustering of schools just below the cutoff and then a large drop in the number of schools right at or above the cutoff.

Identification of Students

The decision to identify a student as having a disability begins the referral for assessment primarily made by students' parent(s) or school staff. This assessment process is completed, typically, by the school psychologist and a special educator,[16] and must occur within 60 days of

[16] The individuals involved in assessments varies based on the type of disability and expertise needed. Medical professionals may also be involved, particularly for physical disabilities.

when the referral was made. Assessment results alone cannot be used to determine a student's eligibility for special education. An Individual Education Program (IEP) team composed of the student's parent, a general educator, special educator, and school or district administrator meet to review the results of the assessment and make a final determination.

Controversy over the process of identifying a student as having a disability and qualifying for special education services primarily surrounds "fuzzy" disabilities. These are disabilities that are less clearly detectible, such as specific learning disabilities, speech or language impairments, other health impairments, and emotional disturbance. Assessment results may not provide definite guidance for the IEP team, which then exercises its discretion over students who lay on the margin of qualifying for special education. For example, the standard practice used for qualifying as having a specific learning disability is a 1.5 standard deviation discrepancy between a student's cognitive ability and academic achievement assessments. While this line appears clear between eligibility and not, the members of the IEP team can still make the determination that a student receive services, particularly if the student's scores sit on the margin of this qualification. In his book *Distinguishing Disability*, Colin Dean (2009) documents the way in which levels of wealth and parental education create a divide in the amount of power parents hold on an IEP team, particularly in these eligibility decisions. Chambers, Parrish, & Hikido (1996) interviewed special education directors as part of their evaluation of Pennsylvania's funding system change. The directors felt that the lack of rigidity in the regulations for determining eligibility for special education services resulted in an increased number of parental requests for services.

Competing Incentives

NCLB was the first federal law to mandate the accountability of schools through standardized testing with a goal of 100 percent of students reaching proficiency by the year 2014. Some states implemented high stakes accountability systems independently prior to the passage of NCLB (Hanushek & Raymond, 2005), and the special education community responded in the 1997 and 2004 reauthorization of the Individuals with Disabilities Act (IDEA) by requiring the inclusion of students with disabilities in state assessments to the same extent as their non-disabled peers.[17] NCLB, unlike many of the state systems, included the accountability of schools to specific subgroups, including students with disabilities, in their calculations for whether a school made annual yearly progress (AYP) on measurable objectives (No Child Left Behind Act, 2001). The special education subgroup is composed only of students identified as actually having a qualifying disability defined in IDEA through the IEP process (Harr-Robbins et al, 2013).

Accordingly, NCLB allowed for states to individually determine aspects of its implementation, such as the minimum size of subgroups included in calculating AYP. These subgroups sizes were to be determined in order for aggregate test results to be statistically reliable as well as to protect personally identifiable information.[18] States determined group sizes in a balance between achieving statistical reliability and holding as many schools accountable for their subgroups as possible (Rouse & McLaughlin, 2007). On average, most states chose a minimum subgroup size of 30 or 40 (Harr-Robbins et al, 2013).[19] Some states created higher minimum subgroup sizes (e.g. California) for students with disabilities than other subgroups in order to compensate for the statistical reliability concerns surrounding the group's heterogeneity

[17] 34 CFR § 300.157
[18] 20 USC § 6311 (b)(2)(C)
[19] Chardichon (2016) updated state minimum subgroup sizes. By this time, some states, such as Arkansas, reduced their minimum subgroup size.

(Erpenbach, Forte-Fast, & Potts, 2003). If schools did not enroll a sufficient number of students with disabilities to meet the minimum subgroup size for AYP calculation, they were not held accountable for this subgroup. In 2009-10, only 35 percent of public schools were held accountable for the subgroup of students with disabilities. These trends in holding students in special education accountable varies by elementary (32 percent), middle (62 percent), and high school (23 percent) (Harr-Robbins et al, 2013). The use of a raw number rather than percentage of enrollment to determine the minimum subgroup size results in a high correlation exists between a school's overall student enrollment and the number of subgroups for which it is accountable (Kiplinger, 2008; Porter, Linn, & Trimble, 2005).

The expectation under NCLB was that the subgroup of students with disabilities could make proportional progress to other subgroups using annual measureable objectives (AMOs). Evidence by Eckes and Wando (2009) suggests that the gains for students with disabilities are substantially smaller than those of other students. Moreover, NCLB's requirement for 100 percent proficiency for each subgroup was particularly difficult for students with disabilities who, on average, start at a lower proficiency rate, making their annual targets much larger and less attainable than their non-disabled peers (Harr-Robbins et al, 2013). These increased challenges for students with disabilities to meet their AMOs likely exacerbated the principal-agent problem that surrounds many accountability systems. The inability to meet the goals of the principal (the federal government) creates an incentive for the principals (schools) to manipulate the subgroup composition in order to avoid sanctions.[20]

[20] Cullen and Reback (2006) outline the way in which gaming through student status labeling may occur when educators perceive an accountability system as "unfair." To compensate for this unfairness, teachers may strategically "teach to the test" or explicitly cheat. Manipulation of classification statuses may also occur when certain groups receive exemptions or benefits in testing (Chakrabarti, 2013; Figlio & Getzler, 2002).

The role of the IEP team

IEP teams are given several options for test taking for students with disabilities under NCLB. Students can take the regular assessment with or without accommodations, a modified assessment, or an alternative assessment.[21] There is no limit to the number of students who can take regular assessments with or without accommodations. All testing accommodations are determined by the IEP team in consult with authorized accommodations for the assessment taken.[22] In May 2005, a temporary policy stated that schools that did not meet AYP solely due to the achievement of students with disabilities would not be penalized if they could still show evidence of progress for the students with disabilities (Elledge, Le Floch, Taylor & Anderson, 2009). The policy allowed schools to determine a "proxy" for proficiency rate for students with disabilities based on 2 percent of all assessed students. This proxy was then applied to the number of students with disabilities to determine proficiency for the purposes of meeting AYP.

While this "proxy" was utilized by many states, other states chose to create an assessment based on modified achievement standards for 2 percent of test takers in the school. Many of the states that chose this approach had a larger number of schools missing AYP due to the subgroup of students with disabilities. The cost of developing such an assessment had to be warranted by a high enough need in a state for its creation (Elledge et al, 2009). Finally, NCLB required that all states create an assessment based on alternative achievement standards for 1 percent of students with the most significant cognitive impairments.

These various means for assessing students with disabilities under NCLB were attempts to increase accessibility and inclusion of students with disabilities in accountability systems. The

[21] Parents of students with IEPs can also opt out of testing in the same manner as their non-disabled peers.
[22] The Smarter Balance Assessment Consortium provides a detailed document describing the various times of accommodations that are available. They delineate them as "universal tools," "designed supports," and "accommodations" based on individual's eligibility to receive them. http://www.smarterbalanced.org/wordpress/wp-content/uploads/2014/08/SmarterBalanced_Guidelines.pdf

use of alternative calculations of proficiency also significantly decreased the number of schools not meeting AYP due solely to students with disabilities (Elledge et al., 2009). Consequently, these options may have also eliminated some of the incentives that existed previously in accountability systems to identify low achieving or poorly behaved students as having a disability in order to exclude them from accountability (Chakrabarti, 2012; Cullen & Reback, 2006; Figlio & Getzler, 2002).

Prior Literature

Accountability Incentives

Several studies evaluated the impact of an accountability system on special education enrollment rates. Figlio and Getzler (2002) analyzed student level data in Florida, finding lower performing and lower income students were more likely to be identified as having a disability when the new accountability system was put in place, likely in order to exclude them from accountability testing. This was particularly true at lower income and lower performing schools that were potentially at risk of being labeled as a failing school under the new system (Figlio & Getzler, 2002). These findings indicate that schools react to incentives created by broader policies, which can unintentionally result in changes in special education identification practices. Chakrabarti (2013) also found that exemptions under Florida's accountability system resulted in increased labeling of students as limited English proficient (LEP).[23] Hanushek and Raymond (2005) analyzed the relationship between high-stakes accountability systems and special education enrollment without statistically significant findings. Similarly, Greene and Forster (2002) and Dhuey and Lipscomb (2011) included a variable for measuring the relationship

[23] Chakrabarti (2013) also analyzed identification in special education under the accountability system, but the timing of accountability policy occurred simultaneously with the implementation of the McKay Scholarship for Students with Disabilities Program that created an incentive for public schools not to identify students for special education, which would make the eligible for the private school voucher.

between high-stakes state accountability systems and special education enrollment in their analysis without statistically significant findings. Unlike Figlio and Getzler's analyses, these other studies used aggregated state-level data and looked across states rather than student-level data in one state, potentially masking some of the individual changes that occurred within schools and/or within states.

Minimum Subgroup Size

Little empirical research exists on the effect that a state's minimum subgroup size may have on students with disabilities. In Florida, students with certain disabilities could be completely exempted from the state accountability testing. (Figlio & Getzler, 2002) found that schools were more likely to identify low income and low achieving students as having a disability with the introduction of the state's accountability system. In particular, schools that were closer to being considered a failing school participated more heavily in these practices. Similarly, Cullen and Reback (2006) found that schools that had higher incentives to improve test scores on state achievement tests were significantly more likely to identify students as in an exempt group, such as students with disabilities, for test taking purposes. Research by Wei (2012b) used regression discontinuity design to analyze the effect of the introduction of school accountability on student achievement. This research found no evidence of improved achievement for these students with disabilities. Furthermore, use of more stringent accountability pressures, including a lower minimum subgroup size, only resulted in increased achievement for Hispanic students (Wei, 2012a).

While No Child Left Behind (NCLB) allowed for flexibility by states in the implementation around specific components of the law, differences in state failure rates were strongly related to achievement targets and other variations determined by the states (Davidson,

Reback, Rockoff, & Schwartz, 2013). Specifically, fewer schools made AYP in states with a larger percent of schools held accountable for the students with disabilities subgroup (Davidson et al, 2013, Harr-Robbins et al, 2013). Further analysis by Cronin, Dahlin, Xiang, and McCahon (2009) found that only 6 percent of elementary and 3 percent of middle schools met their Annual Measureable Objectives (AMOs) for their special education subgroups. Accordingly, elementary schools were far more likely (49 percent) not to have the special education subgroup be included in annual yearly progress (AYP) determinations than middles schools (18 percent) because of not meeting the minimum subgroup size. States also mitigated some of these effects by using confidence intervals to demonstrate a lack a statistical reliability in their AYP calculations when they had high rates of students in special education (Harr-Robbins et al, 2013). There seem to be clear incentives for states to alter minimum subgroup requirements as well as schools to change their identification practices in order to avoid the high probability that their school will fail to make AYP due to the special education subgroup.

Funding Incentives

Funding incentives can also play a role in the identification practices by schools. Greene and Forster (2002) categorized systems as either a capitation or prospective funding system. They found that over a ten year period, a state with a prospective system saw a 1.24 percentage point increase in special education enrollment (Greene & Forster, 2002). Mahitivanichcha and Parrish (2005) re-analyzed Greene and Forster's with a poverty measure, and found that the effect of a changing to a capitation system from prospective on special education enrollment was somewhat weaker than the prior analyses (Mahitivanichcha & Parrish, 2005).

The most recent study to quantitatively analyze the relationship between a state's special education funding system and the enrollment of students in special education was published in

2011 by Dhuey and Lipscomb. They employed a state level fixed effects model utilizing states that changed from one system to another during the period of 1991-2000. This research found about a 1.24 percentage point decrease in special education enrollment when states switched from a prospective to a capitation system.

Applying the methodology and theory used by prior research, the current study fills the gap in literature around the identification practices of students with disabilities based on the minimum subgroup size used for AYP. Specifically, yearly changes in special education enrollment will be analyzed to determine the relationship between a school falling below the minimum subgroup size the prior year and its rate of special education identification. The next section will detail the research methodology, followed by the analytic strategy utilized. The results section will demonstrate how schools in Arkansas responded to the minimum subgroup requirement for students in special education. Finally, we will discuss the implications from the results of this study and where future research should continue.

Research Methodology

Data Description

All data utilized were obtained for the years 2004-05 to 2013-14 through two publicly accessible sources, the Arkansas Department of Education (ADE) Data Center and the Office of Education Policy at the University of Arkansas.[24] The number of students who were limited English proficient (LEP), male, free and reduced lunch, special education, gifted and talented, and had a 504 plan were obtained from the ADE Data Center. School-level percentages were then calculated based on the school's total enrollment. School-level (elementary, middle, high school) and type (magnet, alternative, or neither) were also obtained from the ADE Data Center.

[24] Data from the Office of Education Policy is obtained from the publicly available data through the ADE Data Center. For ease of calculation and formatting, this source was utilized instead of directly from the ADE.

The percent of students in each racial category, percent of students scoring proficient or advanced on state assessment by subject, a school Poverty Index,[25] and region in the state were obtained from the Office of Education Policy. Arkansas administered Benchmark exams in math and literacy to students in grade 3-8 and End of Course (EOC) assessments in algebra, biology, geometry, and literacy (11^{the} grade only) to students in high school. Algebra and geometry proficiency and advanced rates were aggregated to create a math percent proficient and advanced rate. Biology results were not utilized in this analysis. Data from both the ADE Data Center and Office of Education Policy were matched to schools using school identification numbers.

Sample

A total of 1,340 schools in Arkansas compose our sample enrolling about 460,000 students annually from 2004-05 to 2013-14. Approximately one third of schools in the state are located in the northwest region of the state with another quarter in the northeast and central regions. The remaining 20 percent of schools were located in the southwest (13 percent) and southeast (7 percent) regions of the state. Sixty percent of the schools are elementary, a quarter are middle, and 15 percent are high schools. Across all schools in Arkansas, over two-thirds of students are white, with African American students making up the largest minority at about 20 percent. On average, 60 percent of students qualify for free or reduced lunch in our sample years, which is about 15 percentage points higher than the national average.[26] Proficiency in math and literacy in schools averaged almost 70 percent over the nine year study period.

The average rate of students in special education in the state, as shown in Figure 1, continued to be lower than the national average and showed a general decline of the nine years.

[25]The Poverty Index is a sum of 2 times the number of students at a school receiving free lunch and the number of students receiving reduced priced lunch all divided by total school enrollment.

[26] The Digest of Educational Statistics reports about 42 to 48 percent of students as free or reduced price lunch eligible during this time period. https://nces.ed.gov/programs/digest/d12/tables/dt12_046.asp

The average rate for all schools was at a high in 2004, just above 12 percent, and dropped in 2011 and 2012. By the last year in our data, the state saw a slight rise to about 11 percent. While lower than the national average of about 13 percent special education enrollment, the trend in Arkansas parallels the national one.

Figure 4: Percent of students in special education 2003-04 to 2013-14

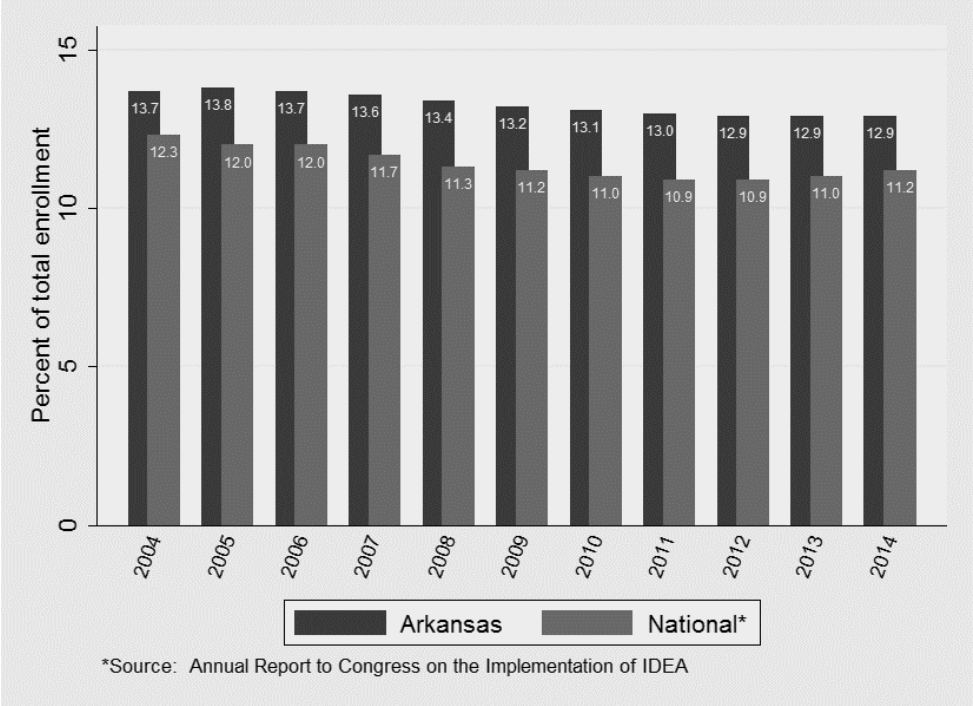


Figure 2, on the left-hand side, depicts the correlation between the number of students enrolled in Arkansas schools and their special education enrollment. As other studies have found, our sample shows a strong relationship between the total enrollment of a school and the number of students with disabilities enrolled. No doubt that this increases the probability of larger schools having a large enough special education subgroup to be included in the calculation of annual yearly progress (AYP). On average, schools in Arkansas enrolled about 48 students in special education across our years of study. The majority of schools in the state should be expected to be accountable for the achievement of the subgroup of students with disabilities, but

a substantial portion are excluded from this requirement. Moreover, with an average special education enrollment relatively close to the subgroup minimum cutoff, there should be a substantial number of schools with an incentive to only minimally reduce their population of students with disability to they are not included in the school's calculation of AYP.

Figure 2: Descriptive relationships between key variables

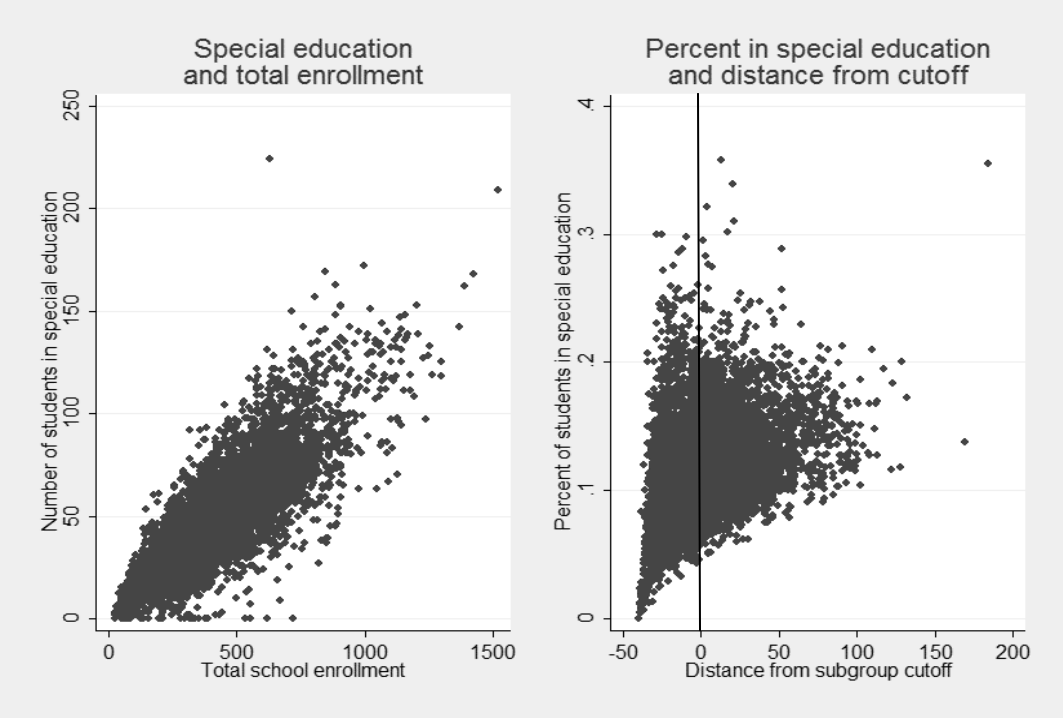


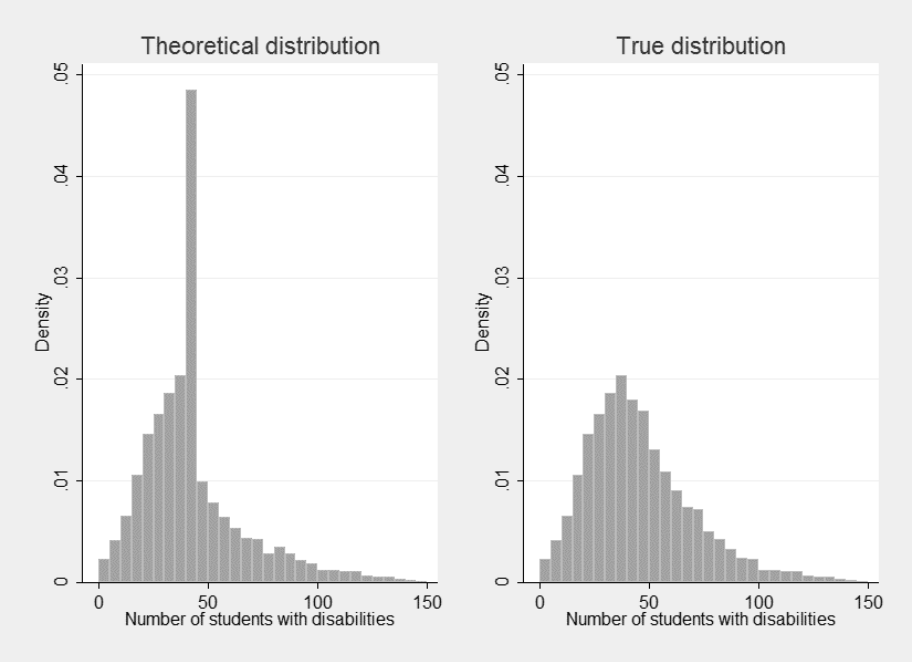
Figure 2, on the right hand side, depicts the relationship between the distance a school's special education enrollment is from the 40 student cutoff and the percent of students with disabilities enrolled in the school. There appears to be a slight positive relationship between these two variables.

Analytic Strategy

The incentive to avoid the inclusion of students with disabilities as a subgroup should theoretically cause schools to cluster directly below the 40 student cutoff and then quickly drop off with very few schools enrolling special education populations immediately above the cutoff.

Figure 3 illustrates the theoretical distribution of enrollment of students with disabilities by schools on the left, and the true special education enrollment distribution on the right. The graph of the true distribution illustrates a positively skewed distribution with a large number of schools at about the 40 student mark but no clear cliff just after the cutoff. Instead, there is a gradual decline of schools enrolling 40 students to about those enrolling about 150 students with disabilities.

Figure 3: Comparison between theoretical and true distribution



For analyses, school level fixed-effects models will utilize the variation in rates of students with disabilities from one year to another to compare the same school as its subgroup size falls above and below the cutoff.[27] Furthermore, the fixed-effects estimator allows each

[27] Given the clear cut-point used for the inclusion of a subgroup in AYP, we might consider the use of a regression discontinuity design (RD). This analysis is unsuited to use an RD because we do not know true treatment status in our data (whether the state actually included the subgroup). More importantly, a key assumption in an RD is that the school cannot manipulate the rating variable (Jacob, Zhu, Somers, & Bloom, 2012). The goal of this study is to prove that schools do manipulate the variable of subgroup size, thus violating this assumption.

school to have a different intercept, which should limit the bias from time-invariant unobservable school characteristics (Kennedy, 2008).

The use of school-level fixed effects to compare percents of special education enrollment when the same school falls above and below the minimum count for accountability reporting requires a significant portion of the schools in the sample to switch from a special education enrollment above to below the 40 student cutoff and back again over the period analyzed. Table 1 describes the frequency in which schools switched from being above to below the cutoff and vice versa.[28] We see that our models will be able to estimate off of about 40 percent of the state's schools.

Table 1: Frequency of schools switching above to below the minimum subgroup size

Total Switches	N Schools	Percent of Sample
0	809	60.4%
1	193	14.4%
2	162	12.1%
3	74	5.5%
4	67	5.0%
5	16	1.2%
6	14	1.0%
7	5	0.4%

The following basic model is what we utilize for our analysis:

$$ENROLL_{st} = \ \propto + \beta_2 BELOW_{st-1} + \beta_3 MATH_{st-1} + \beta_4 LIT_{st-1} + \beta_5 YEAR + \beta_6 X_{st} + \varphi_s + \ \varepsilon_{st}$$

with the dependent variable of special education enrollment as a percent of total enrollment. The variable of interest, BELOW, is a dummy variable taking a value of 1 if a school was below the minimum subgroup size the prior year (less than 40). Similarly, one year lagged math and literacy percentages for schools are identified by β_3 and β_4. The variable, YEAR, allows for a

[28] See Appendix Table 1 for differences between schools with one and more than one switch over the study period.

year time-trend that should account for changing rates of students with disabilities across the state as descriptive statistics indicate. The variable X_{st} is a matrix of school level time varying covariates such as percent of students eligible for free or reduced priced lunch, racial make-up, and limited English proficient. School-level fixed effects are represented by φ_s, eliminating any bias from time-invariant factors within the school. Finally, idiosyncratic error in the model is contained within ε_{st}.

A subsequent model includes an interaction term between falling below the cutoff and the distance from the cutoff. Furthermore, to accommodate for the possible non-linear nature of the distance from the cutoff for special education enrollment, a quadratic distance variable is also included in the model.

Results

The basic model analyzes the difference in percent of students with disabilities when schools fall above and below the cutoff of 40 students in special education. Table 2 displays the results of the school level-fixed effects regressions of falling below the cutoff the prior year on the percent of students with disabilities at the school. The results in Column 1, without controlling for any school level factors, illustrate that schools decreased their percent of students with disabilities by 1.60 percentage points in year following being below the cutoff. When including prior year proficient/advanced rates for math and literacy (Column 2), the magnitude of the coefficient on being below the cutoff decreases slightly to -1.53 percentage points. This relationship increases slightly when accounting for time varying school factors (Column 3), though again, not by much. The R-squared's for these models are small, accounting for, at most, seven percent of the variance. The explanatory power of this model is weak and signals the

existence of other factors that are impacting the enrollment of students with disabilities in these schools.

Table 12: Relationship between falling below the minimum subgroup and the percent of students with disabilities

	(1)	(2)	(3)
Below Cutoff	-0.0160***	-0.0153***	-0.0154***
	(0.00124)	(0.00122)	(0.00121)
% Math Proficient		-0.0351***	-0.0346***
		(0.00683)	(0.00685)
% Lit Proficient		0.0135*	0.0173**
		(0.00746)	(0.00755)
% Male			0.0830***
			(0.0164)
FRL			0.0250***
			(0.00878)
LEP			-0.0173
			(0.0200)
Hispanic			0.0131
			(0.0244)
Black			0.0231
			(0.0201)
Other race			0.0296
			(0.0211)
Constant	0.129***	0.137***	0.0828***
	(0.00114)	(0.00391)	(0.0129)
Observations	7,543	7,543	7,543
R-squared	0.052	0.058	0.072
# of schools	1,052	1,052	1,052

*** p<0.01, ** p<0.05, * p<0.1

Note: Robust standard errors in parentheses are clustered at the school level. Schools were considered below the cutoff if their special education enrollment was 39 students or less the prior year. Math and literacy proficiency are each the combined percent of students scoring advanced or proficient on the state Benchmark or End-of Course examination the prior year. For high school, the percent of students scoring at least proficient in algebra and geometry were aggregated.

The results from the basic model indicate a negative trend in the percent of students with disabilities at a school when schools fall below the minimum subgroup cutoff the previous year. This finding aligns with the hypothesis regarding how we expect schools to behave if they

internalize the minimum subgroup size and of the low probability of a high proficiency rate for the group of students with disabilities in the calculation of AYP the prior year. Schools below the line attempt to stay below the line. It is unlikely that this relationship is completely linear based on the actual size on the subgroup of students with disabilities.

In addition, there is considerable variation in the number of students from the cutoff a school falls, and this distance may result in differential incentives. Table 3 displays the results for the more complex analyses of the heterogeneity in the distance below the cutoff a school falls. For every one student a school fell below the cutoff the prior year, that same school increased their special education enrollment by 0.07 percentage points. To determine the linearity and heterogeneity within this finding, we conducted analyses of distances in increments of five students from the cutoff. Schools that fell below the cutoff the prior year by only one to five students saw a decrease in special education enrollment rate by 0.7 percentage points for every student they fell below the cutoff. The magnitude of this decline is halved to 0.3 percentage points for schools that fell below the cutoff by six to ten students. The null effect of falling below the cutoff by 11 to 20 students and the increase in percent in special education when schools fall below the line by over 20 students confirms the hypothesis originally laid out. Schools that are close to the cutoff but below attempt to stay below the cutoff by reducing their percent of student in special education.

We consider the behavior of schools when they fall above the cutoff for inclusion of the special education subgroup in AYP in Columns 4 through 6 of Table 3. We see unexpected heterogeneous effects for schools that fall above the line. Schools that fall just above the cutoff (between 1-5 students) have a 0.09 percentage point increase in special education population for each additional student over the cutoff. This increase becomes a third the size in magnitude for

schools that are farther from the cutoff with six to ten students in special education. Most surprisingly, the percent of students in special education declines markedly with each additional student above the cutoff for schools that are over 56 students in the subgroup. This increase become over a one and a half percentage point decrease for each additional student for schools with over 21 students in special education. A possible reason for this may be that schools with over 71 students with disabilities simply do not have the capacity to keep increasing their special education program at the same rate as other schools.

Both the basic and more specific models show evidence of a relationship between the minimum subgroup size and the percent of students with disabilities enrolled in the school. The results, however, are not causal in nature. For this reason, further research is necessary to make definitive claims about the potential impact that minimum subgroup requirements have on the enrollment of students to special education.

Table 13: Relationship between falling below and distance from the minimum subgroup and the percent of students with disabilities

	Below cutoff			Above cutoff		
	(1)	(2)	(3)	(4)	(5)	(6)
Distance	.0004***	.0004***	.0007***	-.0011***	-.0011***	-.0010***
	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)
1-5 students	-.0077***	-.0074***	-.0069**	.0087***	.0085***	.0092***
	(.0010)	(.0010)	(.0010)	(.0010)	(.0010)	(.0011)
6-10 students	-.0035***	-.0035***	-.0033***	.0027***	.0026**	.0030***
	(.0010)	(.0010)	(.0010)	(.0010)	(.0010)	(.0010)
11-15 students	-.0002	-.0002	.0004	.0003	.0004	.0006
	(.0012)	(.0012)	(.0011)	(.0012)	(.0012)	(.0011)
16-20 students	-.0016	-.0016	-.0013	-.0041***	-.0039***	-.0040***
	(.0013)	(.0013)	(.0012)	(.0014)	(.0014)	(.0014)
>21 students	.0122***	.0119***	.0110***	-.0146***	-.0146***	-.0160***
	(.0012)	(.0012)	(.0012)	(.0019)	(.0019)	(.0019)
Proficiency rates		X	X		X	X
Demographics			X			X
# of schools	1,052	1,052	1,052	1,052	1,052	1,052

*** p<0.01, ** p<0.05, * p<0.1

Note: Robust standard errors in parentheses are clustered at the school level. Schools were considered below the cutoff if their special education enrollment was 39 students or less the prior year. Distance is measured by the number of students greater or less than the cutoff of 40 enrolled by the school each year. Math and literacy proficiency are each the combined percent of students scoring advanced or proficient on the state Benchmark or End-of Course examination in the prior year. For high school, the percent of students scoring at least proficient in algebra and geometry were aggregated.

Discussion

The results from this study indicate some potential evidence of incentivized behavior related to the minimum subgroup size needed to include students with disabilities in calculations of annual yearly progress (AYP) in Arkansas. The overall relationship is actually quite large with a 1.5 percentage point decrease in the percent of students with disabilities for schools in the years after they fell below the minimum subgroup cutoff. The variation based on the distance from the subgroup size of 40 students indicates, as expected, that schools decrease their percent of students with disabilities when they were within 10 student below the cutoff the prior year, and increase when they are quite far below the cutoff.

For schools that fall above the cutoff, the picture is less clear. We expect those schools who were above the cutoff the prior year to decrease the number of students with disabilities to move below the cutoff the next year. Conversely to this less clear finding, schools falling below the cutoff may want to maintain their status and avoid potential consequences associated to the high probability of failure of this subgroup to make their annual measureable goals and thus the school fail to make AYP. It may be that schools above the cutoff are simply unable to respond to the incentive in place due to surges in enrollment. This analysis, however, lacks the ability to make any causal claims about the impact that the minimum subgroup size actually has on the percentage of students with disabilities enrolled in Arkansas schools.

As No Child Left Behind (NCLB) was, for many states, a large shift in the education policy enacted in schools, data prior to the enactment of the policy should provide more robust estimates of the change it caused. Furthermore, states varied in the number of students required for the special education and other subgroups to be included in the calculation of AYP. Comparing the different minimum subgroup sizes across states is likely to also increase our

understanding of what this aspect of the policy had on students with disabilities. The new accountability system under the Every Student Succeeds Act (ESSA) has shifted many portions of NCLB to states. In the wake of these changes, some states have already changed their minimum subgroup size.

Arkansas is one of these states, lowering its minimum subgroup size to 25 students. Previously, only 51 percent of Arkansas schools were held accountable for the academic proficiency of students in special education. The decrease to 25 students for the minimum subgroup added over 300 schools to those accountable, about a 50 percent increase. The lower the probability that schools can fall below the minimum subgroup cutoff, the lower chance that any incentive will exist for schools to alter their identification practices to avoid inclusion in accountability. The lowering of the subgroup size also expresses the expectation that all schools should help students with disabilities reach proficiency just like their non-disabled peers.

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Appendix

Appendix Table 1: Comparison of schools that switched only once versus multiple switches above and below the cutof

	1 Switch	>1 Switch	Difference	p-value	
Enrollment	412.68	389.49	23.189	0.93	
Elementary	44.4%	60.9%	-16.5%	0.00	***
Middle School	23.1%	17.1%	6.0%	0.01	***
High School	32.5%	22.0%	10.5%	0.00	***
Northwest	19.1%	23.2%	-4.1%	0.05	*
Northeast	18.5%	17.3%	1.1%	0.57	
Central	17.3%	19.6%	-2.2%	0.27	
Southwest	10.4%	10.4%	0.0%	0.98	
Southeast	7.2%	5.8%	1.4%	0.27	
Math Proficient/Advanced	62.3%	66.3%	-4.0%	0.00	***
Literacy Proficient/Advanced	64.6%	66.8%	-2.2%	0.02	**
Special Ed.	12.0%	11.7%	0.3%	0.14	
Section 504	2.2%	2.0%	0.2%	0.06	*
GATE	9.1%	8.7%	0.4%	0.30	
Male	51.7%	51.7%	0.1%	0.77	
FRL	59.9%	61.2%	-1.3%	0.25	
Black	24.8%	23.9%	0.9%	0.62	
Hispanic	6.8%	7.4%	-0.6%	0.35	
White	65.6%	66.0%	-0.4%	0.83	
Other	2.8%	2.7%	0.1%	0.71	
LEP	4.5%	5.0%	-0.6%	0.31	

UNIVERSITY OF ARKANSAS

Office of Research Compliance
Institutional Review Board

May 28, 2015

MEMORANDUM

TO:	Sivan Tuchman Gary Ritter
FROM:	Ro Windwalker IRB Coordinator
RE:	New Protocol Submission
IRB Protocol #:	15-05-731
Protocol Title:	*Analysis of the Minimum Subgroup Requirement for State Testing under No Child Left Behind*

In reference to the request for IRB approval of your project titled *Analysis of the Minimum Subgroup Requirement for State Testing under No Child Left Behind*, the IRB is not authorized to oversee and approve such research. This protocol does not meet the definition of research involving human subjects in the federal regulations. (See the citation below.) You are free to conduct your research without IRB approval.

45 CFR 46.102 (f)

(f) Human subject means a living individual about whom an investigator (whether professional or student) conducting research obtains

(1) Data through intervention or interaction with the individual, or
(2) Identifiable private information.

If you have any questions do not hesitate to contact this office.

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Chapter 3[29]

Special Education Identification in the Louisiana Scholarship Program

Introduction

Private school choice programs have existed in the United States since the late nineteenth century, when Vermont (1869) and Maine (1873) established town tuitioning programs to enable rural students to attend private schools of choice (Hammons, 2002). Programs take any of three forms: government issued vouchers, tax-credit scholarships, or Education Savings Accounts (ESAs), which operate like flexible medical or child-care spending accounts. By the close of 2016, by our count there were 50 private school choice programs in 26 states plus the District of Columbia (EdChoice, 2016). Private school choice programs were theorized by Milton Friedman (1955) to give parents options in where to educate their students, thereby increasing competition and improving schools as well as reducing the tie between schooling and housing markets. While research on private school choice programs has focused on questions of constitutionality, segregation, and overall student achievement effects, this study aims to examine the education of students with disabilities in the Louisiana Scholarship Program (LSP), a statewide means-tested school voucher program.[30]

While increased school choice offers students with disabilities the chance to enroll in unique private schools to meet individual needs (Lake, 2010), once enrolled families relinquish their legal rights under the Individuals with Disabilities in Education Act (IDEA). Special education advocates fear that students with disabilities will not receive necessary supports and services once enrolled in private schools (Mead, 2007). Voucher and school choice proponents, however, argue that parents and students can choose the school that will provide the supports

[29] This paper was co-authored with Patrick J. Wolf.
[30] The program was initially called the Student Scholarships for Educational Excellence Program.

they desire rather than relying on legal mandates in the public school system (Greene & Buck, 2010; Lake & Jacobs, 2008).

This research aims to better understand the implications that voucher usage has on students with disabilities in the context of a means-tested statewide voucher program. In particular, we examine a subset of students eligible for the LSP who are identified as having disabilities. Our analysis utilizes randomization from the LSP's lottery process to determine the achievement impacts of the program on 185 students with disabilities. Using student-level standardized test scores and controlling for baseline characteristics, we estimate the effect of enrollment in a private school using a voucher on test score achievement after three years of the LSP for the eligible applicants with disabilities. Moreover, we expand on the literature regarding the special education identification and de-classification practices in school choice programs.

In the following sections, we review the findings on voucher and tax-credit scholarship performance impacts from experimental designs and provide a description of some of the main issues related to students with disabilities in choice settings. Next, we describe the LSP lottery process and outline our data and analytical strategy. We then provide a presentation of our academic achievement findings. The final section provides analyses of the probability of special education identification and de-classification. We conclude with a brief discussion of the implications of this work.

Prior Literature

School Vouchers and Tax-Credit Scholarships

Over the last two decades, there has been a dramatic increase in the number of policies focused on providing funding for students to attend private schools through vouchers or other policy mechanisms. There are currently 50 voucher, tax-credit scholarship, and Education Savings

Account (ESA) programs in 26 states and the District of Columbia. Eighteen of these programs are specifically aimed at students with disabilities (EdChoice, 2016). Researchers have used randomized control trials (RCT's) to evaluate several private school choice programs over the last 20 years. Through the use of the natural experiment caused by oversubscription to these programs and subsequent random lotteries, these evaluations eliminated selection bias concerns that otherwise can bedevil school choice research.

The first RCT of a voucher program was conducted by Greene, Peterson, & Du (1998) of the Milwaukee Parental Choice Program. The study reported that student test scores were higher in math and reading after three or more years of exposure to the program. Rouse (1998) conducted a replication of the initial Milwaukee RCT, using different estimation strategies and concluding that the program only produced positive impacts in math.

Privately funded partial-tuition scholarships in Dayton, Ohio, Washington, D.C, and New York City were evaluated using an RCT design by Howell et al. (2002). In all three cities, students offered a voucher experienced positive overall achievement effects but only for African American students. The positive effects of the program disappeared in the third year of the evaluation in Washington, D.C. Subsequent replication studies of the New York wing of the three-city study reported a mix of positive achievement effects for African Americans (Barnard et al. 2003; Jin, Barnard & Rubin, 2010) and no statistically significant impacts for any subgroups of students (Krueger & Zhu 2004; Bitler et al. 2015).

Greene (2001) conducted an RCT of a privately funded scholarship program in Charlotte, reporting positive achievement effects after just one year. Cowen (2008) conducted a replication study of the Charlotte program and confirmed moderately large and statistically significant positive effects in reading after only one year of the program.

Wolf et al. (2013) conducted an experimental evaluation of the D.C. Opportunity Scholarship Program, the first federally funded voucher program. After five years of program implementation, evaluators found positive overall effects on reading and math that were only marginally statistically significant, at the level of $p<10$, but clearer positive effects for the subgroups of females, students with relatively higher baseline test scores, and students who had not attended a school in need of improvement before joining the program. Mills and Wolf (2016) recently released a test-score analysis of the Louisiana Scholarship Program, reporting large negative impacts in math after one year that decreased somewhat but remained statistically significant after two years.

None of the evaluations of voucher programs in the United States have included the academic achievement of students with disabilities as a subgroup in their analyses, although students in special education participate in the programs and the evaluations. Many of these programs have enrollment caps that make the special education subgroup so small that researchers have little ability to study them as a distinct group. For this reason, most of the literature on private school choice and students with disabilities focuses on parental satisfaction and differences in identification of students as disabled in choice settings.

The most recent non-experimental evaluation of the Milwaukee Parental Choice Program found statistically significant positive growth in reading scores for all students participating in the program but math effects that were not statistically significant (Witte et al., 2014). Further analysis of enrollment rates for students with disabilities participating in the Milwaukee Parental Choice Program showed considerable differences in the identification of students as having disabilities as they moved in and out of the private school sector but similar levels of school

satisfaction regardless of whether students with disabilities were in public or private schools (Wolf, Witte, & Fleming, 2012).

While currently there are 18 voucher, tax-credit scholarships, and ESA programs in the United States targeted specifically to students with disabilities, Florida's John M. McKay Scholarship for Students with Disabilities Program is the only one that has been evaluated empirically. Greene and Forster (2003) surveyed families of students who were current or former participants. They found that parents of McKay participants had significantly higher satisfaction with their private school than with their prior public schools. Greene and Forster also found that parents reported smaller class sizes, fewer incidents of bullying, and decreased behavioral problems for their students. Future research needs to be conducted to determine whether these same results occur when students with disabilities take part in voucher programs that are not restricted to students with special needs.

Legal Issues of Students with Disabilities in Private Schools

The focus on supporting the unique needs of students with disabilities in schools has continued to grow since the passage of Section 504 of the Rehabilitation Act of 1973 (Department of Education, 2013), which prohibits the discrimination of individuals on the basis of disability. The legal protections for students with disabilities increased with the passage of the Education of All Handicapped Children Act (EAHCA) of 1975, Americans with Disabilities Act (ADA) of 1990, and finally the Individuals with Disabilities Education Act (IDEA) in 1997 which was renewed in 2004. These federal laws entitled students with disabilities to access to a free and appropriate education (FAPE). With the newest legislation, IDEA also stipulates that students with disabilities be educated in the least restrictive environment, so that they may be educated to the extent possible with their non-disabled peers and still receive FAPE. The specifications for

each student's learning environment is detailed in their Individual Education Program (IEP), which is updated yearly by an IEP team, composed of the student's family and school staff (Wolf & Hassel, 2001). As of the 2011-12 school year, of the over 6.4 million students with an IEP, comprising 12.9% of the student population ages 3-21, 61% were educated in the general education classroom at least 80% of the time (U.S. Department of Education, 2016).

Legislation pertaining to students with disabilities has had important implications for special education in the United States, but also has created challenges for students with disabilities who participate in private school voucher programs. When a parent chooses to enroll a student with a disability in a school voucher program, they relinquish their legal rights under Section 504, which only applies to organizations accepting federal funds (Taylor, 2009). Title III of the 1990 ADA Act states that private schools must meet nondiscrimination requirements that prohibit exclusion, segregation, and unequal treatment (Department of Justice, 2009). This legislation would provide reasonable guarantees of rights to students with disabilities participating in a voucher program; however, ADA does not apply to religious organizations (Taylor, 2009) and most private schools participating in voucher programs are religious.

The reauthorization of IDEA in 2004 brought new implications for students with disabilities who attend private schools through parental choice. § 300.131 clearly states that local education agencies (LEA's) must "identify, locate, and evaluate" students with disabilities in private schools, including religious schools, as part of their child find process (IDEA, 2004). The LEA must meet with private school representatives to determine the number of students with disabilities enrolled in order to provide equitable services to those the students would receive in the public schools (IDEA, 2004). While this requirement does not guarantee an individual's right to services or an entitlement to funds, it does provide private schools with resources to

support students with disabilities. A study conducted for the United States Conference of Catholic Bishops (USCCB, 2002) looked specifically at how this legislation was being implemented in 2,800 Catholic schools in twenty-one states serving over a million students. Less than one percent of students identified as having a disability enrolled in Catholic schools were receiving services for their disabilities through IDEA funds. In this study as well as Wolf, Witte, and Fleming's (2012) study of the Milwaukee Parental Choice program, private school administrators reported great challenges in obtaining the supports needed from the LEA.

Identification and Enrollment

Much of the choice literature regarding students with disabilities is concentrated on concerns that choice schools discriminate against these students in the enrollment process, resulting in a low proportion of students with disabilities taking part in school choice. The USCCB's 2002 survey found that 7 percent of students enrolled in Catholic schools were identified as having a disability. Wolf, Witte, and Fleming (2012) had similar findings that at least 7.5 percent and possibly as many as 14.6 percent of students participating in the Milwaukee Parental Choice Program had a disability. This research team also found no statistical disadvantage during school admittance to students based on disability (Wolf, 2013).

Nearly every voucher program requires participating schools to comply with some sort of nondiscrimination requirement. For example, Virginia's Education Improvement Scholarships Tax Credit program only requires that schools comply with Title VI of the Civil Rights Act of 1964 (EdChoice, 2016). That law only prohibits discrimination on the basis of race and national origin (Department of Justice, 2013). Private schools in Louisiana are only required to comply with *Brumfield v. Dodd*, a federal nondiscrimination court order for the purpose of racial desegregation (Louisiana Department of Education, 2014).

Most of the literature on school choice and special education revolves around concerns over enrollment discrimination in the charter sector (Heubert, 1997; Horn & Miron, 2000; Rhim, 2008; Garda, 2012). In recent years, however, several studies have systematically analyzed the movement of students with disabilities in and out of the charter sector as well as in and out of special education eligibility status (Setren, 2015; Winters, 2013; 2014; 2015). These studies, as with Wolf, Witte, and Fleming's (2012) analysis of vouchers in Milwaukee, suggest that discrepancies in the enrollment rate of students with disabilities across school sectors are an issue of parental choice, student mobility, and differential declassification practices rather than necessarily one of discrimination.

Special Education and School Choice

The premise behind special education is the individualization of student learning experiences in order to enable students to meet their goals. This is very similar to the goal of school choice, which offers students and parents various options for schooling based on their specific needs. These two ideals meet when school choice programs enable students with disabilities and their families to choose the particular school that they think will meet their educational needs (Lake, 2010). In particular, many school choice models provide students with disabilities of varying severity an opportunity to be fully included in the general education population at their schools (Setren, 2015) due to a lack of economy of scale for self-contained programs. Small private and public charter schools simply cannot afford to exclude their students with special needs from the rest of their school population.

Inclusion of students with disabilities into general education classrooms potentially provides them with the least restrictive environment possible. Public schools have been legally required to place students with disabilities in the least restrictive environment since the EAHCA

of 1975. While we assume that integrating students with disabilities into general education classrooms is beneficial, the research studying the effects of inclusion on academic achievement is limited (Cosier, Causton-Theoharis, & Theoharis, 2013; Mills, Cole, Jenkins, & Dale, 1998; Rea, McLaughlin, & Walther-Thomas, 2002; Waldron & McLeskey, 1998). Systematic reviews, with higher external validity than small scale studies, indicate that inclusive practices are at least as effective as less inclusive settings in improving academic achievement, particularly for younger students with disabilities (Freeman & Alkin, 2000; Kalambouka et al., 2005; Lindsey, 2007; Salend & Duhaney, 2009).

While school choice may result in high parental satisfaction on the part of participating parents (Greene & Forster, 2003), very little is known about the effect of choice programs on academic achievement for students with disabilities. Angrist et al (2013) and Setren (2015) analyze the longer-term outcomes for students with disabilities in Boston charter schools. Both studies find large positive and statistically significant effects of winning a charter lottery on the academic achievement of students with disabilities. While they find negative effects of charters for on-time graduation of students with disabilities, the effects are null if the outcome is five-year graduation rates (Angrist et al, 2013; Setren, 2015). Voucher programs, especially, have not always required standardized testing of participating students, so an accurate relationship between achievement and participation in the program is difficult to calculate. As Ohio's Jon Peterson Special Needs Scholarship Program is the only voucher program for students with disabilities that requires this population to participate in testing, and the sample sizes of students with disabilities participating in many other voucher and tax credit scholarship programs are quite small, the comparative achievement for students with disabilities enrolled in a voucher program to those who remain in the public schools remains unknown.

This research aims to fill the gap in the literature on students with disabilities who are offered a voucher to attend a private school. We analyze the characteristics of students with disabilities who applied to the LSP as well as those who specifically won the lottery to enroll in a participating voucher school. Furthermore, we provide estimates of the effect of the LSP on math and English language arts achievement for students with disabilities who were awarded scholarships. A final analysis focuses on special education identification differences between students who received vouchers and those who did not. In the following section, we describe the data and analytical strategy used to estimate these effects.

Program Background

In 2008, the Louisiana Scholarship Program (LSP)—formerly known as the Student Scholarships for Educational Excellence Program—was piloted in New Orleans through Act 509. The program provides students with a voucher to attend private school at no cost. To be eligible, a student must live in a household with income at or below 250 percent of the federal poverty line and attend a school district that was deemed to be academically in crisis, a school that became part of the Recovery School District (RSD), and a city with a total population of at least 300,000 people (Tyler, 2011). New Orleans was the only city in Louisiana that met those criteria. In its first year, just over 1,000 students were awarded scholarships to attend private schools, and this number grew to over 2,000 in the 2011-12 school year.

Louisiana passed Act 2 in 2012 to expand the LSP to the entire state of Louisiana. The statewide scholarship program continued to use household income to determine eligibility, but it altered the criteria to include students who had attended a Louisiana public school that had received a grade of "C", "D", or "F" in the state's accountability system (Act No. 2 of 2012). For the 2012-13 school year, approximately 10,400 students submitted applications and 5,600

students were awarded scholarships based on a random "Roth" placement lottery to attend one of the 130 participating schools.[31] The voucher amount per student was equal to the lesser of the revenue the local public school would have received from the state or the total cost of private school tuition and fees. The average tuition for private schools participating in the LSP ranged from $2,966 to $8,999, with a median of $4,925. This amount can be compared to Louisiana's per pupil funding from the state's minimum foundation formula of $8,500 (LDE, 2013f).

Parents of students with disabilities who received special education services previously at their public school and enrolled in a participating private school were required to sign a document upon enrollment stating their acceptance only of the services that the private school made available to all students. If, however, the parent enrolled the student in a participating private school that had delivered services for students with disabilities for at least two years by teachers with special education certification and in accordance with the students' IEP, the state would supplement the voucher with the cost of providing special education services (Act No. 2 of 2012). Through searches of all the participating schools' websites, 48 of the 130 private schools participating in the program specified school based resources for struggling learners or students with disabilities. The services ranged from mental health counseling to the provision of special day classes for students with severe needs. Further research is needed to determine if these programs were developed in response to the LSP or if they were present beforehand.

Alongside the LSP, in 2010, Louisiana started the School Choice Pilot Program for Certain Students with Exceptionalities. Students are only eligible for this program if they have an IEP due to the disabilities of developmental delay, other health impairment, specific learning disability, autism, mental disability, emotional disturbance, or traumatic brain injury and are

[31] A "Roth" lottery is a placement lottery governed by a special algorithm, pioneered by Nobel Laureate Alvin E. Roth, which generates incentives to express one's true rank-order preferences of schools in the context of school choice (e.g. Abdulkadiroglu, Pathak, and Roth 2005).

currently enrolled in a Louisiana public school (LDE, 2013a). Students with the types of disabilities that render them eligible for this voucher program are rare, thankfully. Furthermore, private schools are only able to participate in the program if they are located in a parish with a population over 190,000.[32] For the 2013-14 school year, 17 schools participated in the program. Finally, the special education voucher only covers 50 percent of the state's minimum foundation amount or the school's tuition, whichever is less. This amounts to about $2,200 across the state on average (LDE, 2013a). Participation in the program is also determined by a separate random lottery. While not specified by the state of Louisiana, it is assumed that a student cannot participate in both the special education and means-tested voucher programs.

Research Methodology

Experimental Design

With the expansion of the LSP in 2012 to a statewide program, the Louisiana Department of Education introduced a deferred acceptance lottery, similar to the process utilized in New York City's public school choice program (see Abdulkadiroglu, Pathak, & Roth, 2005). This lottery allowed parents to choose up to five private schools, ranking their school preferences. The lottery algorithm placed students into grade level available seats within the schools in their preference list. Students were also given priorities in the lottery based on certain characteristics.

In the first year of the program, the Louisiana Department of Education (LDE) gave students with disabilities and "multiple birth siblings"[33] an automatic placement into voucher receiving schools. If all applicants who were in special education actually received a spot in a private school, our analytical approach would not have been possible. In reality, students with disabilities were not all awarded a voucher to attend a private school. The lottery mechanism

[32] Seven total parishes meet this eligibility requirement; Caddo, Calcasieu, East Baton Rouge, Jefferson, Lafayette, Orleans, and St. Tammany.
[33] "Multiple birth siblings" are twins, triplets, etc.

assigned students to available grade openings at participating schools based on preference categories. It is currently unclear where the preference for students with disabilities fell in the process (NOLA pilot program participants and their siblings also were high priority students). One of two things likely occurred: (1) students with disabilities who had the same preferences and applied to the same grade and school were not all placed if there were fewer seats available then students with disabilities vying for them; or, (2) the lottery process did not actually take into account student disability.[34] Fewer than 50 percent of our analytic sample of students with disabilities were offered placement in a private school through the voucher program (Table 1).

We treat students with disabilities as their own group within the lottery process in order to maintain what, we believe, was the intention of the lottery. After omitting students with multiple birth siblings and those who attended a school with an accountability rating of "B,"[35] we grouped students in the following priority categories:

- Priority 1 - Students who received LSP scholarships in the prior school year who are applying to the same school
- Priority 2 - Siblings of Priority 1 awardees in the current round
- Priority 3 - Students who received LSP scholarships in the prior school year who are applying to a different school
- Priority 4 – New applicants who attended public schools that received a "D" or "F" grade in Louisiana's school accountability system at baseline

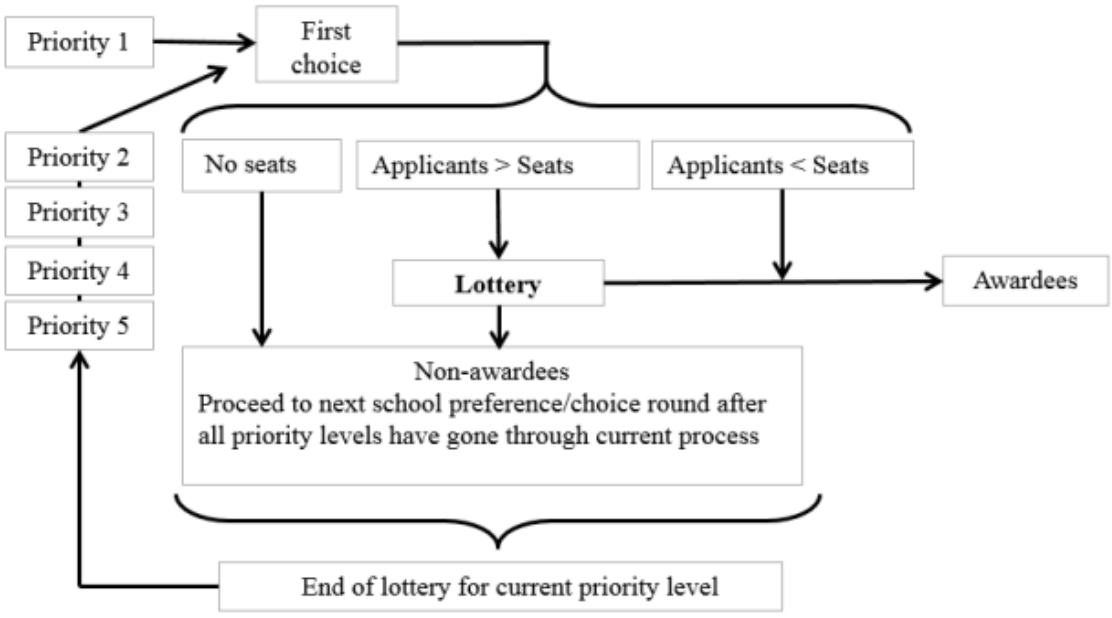
[34] At baseline, we identify students as having a disability through application (parents identified a student's disability category) and testing data (students are labeled as "special" or "regular," they took one of the two alternative assessments, and if they took an alternative assessment, they are given a disability category). We have little evidence regarding the actual usage of these data in determining the lottery preferences. When creating lottery preferences with and without student special education status included, the probability of winning is not clearly altered along any disability indicator.

[35] These students were not eligible for the program.

- Priority 5 – New applicants who attended public schools that received a "C" grade in Louisiana's school accountability system at baseline
- Priority 6 – New applicants who are applying for kindergarten placements

The lottery process first attempts to place students in the first priority category into their first choice school based on available seats in the student's grade level. If there are enough available seats in the school and grade for all applicants in Priority 1, all students are offered a scholarship. When no seats in a school and grade level are available in which students apply, no students are offered a scholarship. Once all students in Priority 1 are placed in a school and grade level, students in Priority 2 with the same school and grade level first choice school preference are offered a scholarship. After going through each priority category for first choice school preferences, the lottery algorithm continues the process by utilizing students' second choice schools. This process repeats itself until all students been awarded or not awarded a scholarship.

Figure 5: Louisiana Scholarship Program lottery process



Mills and Wolf (2016)

Not all students actually take part in a lottery, however. Only in cases where there are more students in the same priority category than seats in a school and grade available is an actual lottery conducted. Thus, we identify students as having participated in a lottery if the percentage of students awarded a scholarship in their given risk set[36] is between zero and 100. For our RCT analyses, we focus just on this sample of students since they are the only students with disabilities who we can determine were randomly awarded a scholarship to attend a private school as part of the LSP. Due to the small sample size and overall low external validity from only including students who were awarded scholarships to over-subscribed schools, we also include analyses that broaden the sample of students with disabilities to all eligible applicants including those who may not have participated in a lottery.

[36] Risk sets are constructed from students in the same priority category, school preference, grade, and special education designation.

Data Description

The data for this study come from three sources. Student-level information on LSP eligibility and scholarship usage as well as student performance outcomes were provided by the Louisiana Department of Education (LDE) in accordance with our data agreement with the state. The LDE additionally provided information on participating public and private schools, and this information was supplemented with publicly available data from the National Center for Education Statistics (NCES), Common Core of Data (CCD) and Private School Universe Survey (PSS), when necessary.

The primary data for our analysis are drawn from student applications in the year 2011-12 ("Baseline") and the state assessment results for the 2011-12 ("Baseline'), 2012-13 ("Year 1"), 2013-14 ("Year 2"), and 2014-15 ("Year 3") school years. In our analysis of identification and de-identification, we choose to only refer to a student as in special education if indicated in testing data. Application data was only available at Baseline, making this an inconsistent data source. The Louisiana state assessment system use IEP status to distinguish students with disabilities among LEAP/iLEAP test takers. We also identify students as in special education in the testing data if they took a modified or alternative assessment in any year.

In addition to individual performance outcomes, the state-provided assessment data files include information on student demographics as well as participation in school programs such as free- or reduced-price lunch (FRL), limited English proficient (LEP), and special education. Our analysis includes these baseline covariates in order to improve effect estimate precision. Fortunately, none of the LSP eligible students with disabilities who met our testing data requirements had missing data on baseline covariate values.

Sample Selection Process

The student-level data provided by the LDE indicate an initial sample of 9,829 eligible LSP applicants in the first year of the statewide expansion of the program. Of these, 5,771 students received LSP scholarship placements in a specific private school and 4,058 did not receive a voucher-supported placement. We then exclude 1,965 students with multiple birth siblings and those who attended schools with a grade of "B" at the time of application along with students who were awarded scholarships for the New Orleans Pilot Program. Of the remaining 2,401 students who have baseline test scores and are in grades 3-6, only 254 have disabilities[37] and therefore remain in our sample. Of the sample of 254 students with disabilities, 113 faced a lottery for scholarship award and placement (Table 1).

Table 14: Sample selection process for participant effects analysis

	Total Records	Received Scholarship
Eligible LSP applicants	9,809	5,771
— not participating in former New Orleans pilot	8,070	4,072
— identified as in Special Education at baseline	977	412
— in experimental analysis sample	185	96

Source. Authors' calculations.

Students with Disabilities and Non-Disabled Peers at Baseline

First, we compare our applicants in special education to the overall eligible applicants for the LSP. We also include statistics on the state of Louisiana's students in special education in order to compare our sample to the larger population. For the sample of students without disabilities, the final placement conducted by the Louisiana Department of Education (LDE) resulted in an even distribution of students into the treatment and comparison groups on the basis of gender.

[37] We only identify students at baseline using testing data in order to maintain uniformity across years in which application data cannot be updated.

The special education subgroup, like the overall Louisiana special education population, has a disproportionate rate of male students compared to females. This finding is not especially concerning as we know that males are often disproportionately placed in special education. Similarly, there is a seven percentage point difference between the overall sample and the special education subgroup in regards to free or reduced lunch participation.

Table 15: Special education eligible applicants compared to other applicants and Louisiana's special education population at baseline

		Other Eligible Applicants		Special Education Eligible Applicants		LA Non-Applicant Special Education	
		N	%	N	%	N	%
Total		8,784		1,379		43,060	
Gender							
	Female	4,325	49.2%	545	39.5%	13,879	32.2%
	Male	4,459	50.8%	834	60.5%	29,181	67.8%
Ethnicity							
	Black	7,629	86.9%	1,252	90.8%	22,472	52.1%
	Hispanic	228	2.6%	29	2.1%	1,034	2.4%
	White	680	7.7%	19	1.4%	18,613	43.2%
	Other	247	2.8%	26	1.9%	1,012	2.3%
FRL							
	Yes	5,315	63.2%	947	70.8%	33,923	78.7%
	No	3,100	36.8%	391	29.2%	8,924	20.7%

Notes. Sample represents all students with baseline testing data.
Source. Authors' calculations.

Predictably, students with disabilities in our sample are also far more likely than their non-disabled peers to score "approaching basic" and "unsatisfactory," the lowest proficiency levels, on their baseline achievement tests (See Table 3). Students with disabilities and their non-disabled peers score in the "advanced" or "mastery" range with equal infrequency. The best a

student who takes the modified assessment can score is the "basic" proficiency level; but, we do not see that this increases the likelihood that a student with a disability will reach the "basic" level compared to their non-disabled peers. The vast majority of modified test takers score in the "foundational" and "pre-foundational" levels, which are categorized under "unsatisfactory."

Table 16: Test scores levels for special education eligible applicants compared to other at baseline

	Other		Special Education	
	N	%	N	%
Proficiency - ELA				
Advanced	41	1.3%	3	0.4%
Mastery	305	9.8%	42	5.3%
Basic	1,398	44.8%	229	28.8%
Approaching Basic	931	29.8%	253	31.8%
Unsatisfactory	446	14.3%	268	33.7%
Proficiency - Math				
Advanced	41	1.3%	2	0.3%
Mastery	305	9.8%	42	5.3%
Basic	1,398	44.8%	229	28.8%
Approaching Basic	931	29.8%	253	31.9%
Unsatisfactory	446	14.3%	268	33.8%

Note: The LAA2, modified assessment level of unsatisfactory is split into two categories: Foundational and pre-Foundational (lowest).

Disaggregating Students with Disabilities

Looking further at the distribution of disabilities in our sample included in our analysis we analyze the difference in the disabilities of students offered a private school placement and those who were not (Table 4). Overall, the two groups are very similar. The largest differences are a three percentage point lower rate of awardees with intellectual disabilities and three percentage points higher rate of awardees with a speech or language impairment. Moreover, in comparison to the state of Louisiana, the disabilities of students offered placement in a private school and those who were not are nearly identical. In 2012, Louisiana enrolled a higher proportion of students with specific learning disabilities and a lower proportion with speech or language

impairments. While students with speech and language impairments often receive fewer services and considered one of the least severe disabilities, this can similarly be said for specific learning disabilities.

Table 17: Description of the special education sample in relation to Louisiana

	Awarded Scholarship†		Not Awarded Scholarship †		LA State Special Education ††	
	N	%	N	%	N	%
Total	319		367		70,029	
Autism	11	3.4%	13	3.5%	3,683	5.3%
Deaf - Blindness	0	0.0%	0	0.0%	5	0.0%
Developmental Delay (3-9)	36	11.3%	40	10.9%	5,857	8.4%
Emotional Disturbance	14	4.4%	14	3.8%	1,756	2.5%
Hearing Impairment	7	2.2%	4	1.1%	1,148	1.6%
Intellectual Disability	18	5.6%	33	9.0%	7,185	10.3%
Multiple Disabilities	5	1.6%	9	2.5%	944	1.3%
Orthopedic Impairment	4	1.3%	3	0.8%	1,066	1.5%
Other Health Impairment	25	7.8%	30	8.2%	9,553	13.6%
Specific Learning Disability	94	29.5%	107	29.2%	23,196	33.1%
Speech/Lang. Impairment	102	32.0%	106	28.9%	14,931	21.3%
Traumatic Brain Injury	0	0.0%	0	0.0%	228	0.3%
Visual Impairment	3	0.9%	8	2.2%	477	0.7%

Notes. Special education sample includes all students with disabilities with baseline test scores while enrolled in grade three through six and did not have multiple births. Louisiana does not differentiate between mild and moderate mental disabilities.
Sources. †Authors' calculations †† DATA.gov (2012)

Schools of choice often declassify students as special education (Wolf, Witte, & Fleming, 2012; Setren, 2015; Winters, 2013; 2014; 2015; Winters, Carpenter II, & Clayton, 2017). To see whether this pattern is true in the LSP, we looked at the difference between students offered private school placement and those not offered a placement who changed classification from the baseline to the third year of the program (Table 5). Simply observing the percent differences between students awarded and not awarded a scholarship does not indicate large differences between the two groups. This trend will be analyzed more rigorously later in this report. Table 6 looks at the year-by-year trends. While there still lacks a clear pattern of identification or de-

identification, it is at least interesting to observe the large numbers of students who change their disability status multiple time.

Table 18: Changes in special education identification from baseline to Year 3

	Award Scholarship		Not Awarded Scholarship	
	N	%	N	%
Classification Switchers				
Did not switch	541	80.6%	867	85.5%
Special Ed to General Ed	94	14.0%	100	9.9%
General Ed to Special Ed	36	5.4%	47	4.6%

Table 19: Changes in special education identification from baseline through Year 3

	Award Scholarship		Not Awarded Scholarship	
	N	%	N	%
Classification Switchers				
not-not-not-not	423	63.0%	653	64.4%
not-not-not-sped	15	2.2%	20	2.0%
not-not-sped-not	11	1.6%	56	5.5%
not-not-sped-sped	13	1.9%	8	0.8%
not-sped-not-not	72	10.7%	73	7.2%
not-sped-not-sped	4	0.6%	7	0.7%
not-sped-sped-not	0	0.0%	13	1.3%
not-sped-sped-sped	4	0.6%	12	1.2%
sped-not-not-not	63	9.4%	50	4.9%
sped-not-not-sped	2	0.3%	2	0.2%
sped-not-sped-not	6	0.9%	6	0.6%
sped-not-sped-sped	5	0.7%	12	1.2%
sped-sped-not-not	19	2.8%	25	2.5%
sped-sped-not-sped	5	0.7%	6	0.6%
sped-sped-sped-not	6	0.9%	19	1.9%
sped-sped-sped-sped	23	3.4%	52	5.1%

Analytical Strategy

In order to better identify differential probabilities of identification and de-identification in special education over time, we estimate annual probabilities. We begin with our two models to

estimate the probability of identification or de-identification, y_1, and probability of attending a lottery, y_2.

$$y_1 = 1[\boldsymbol{z}_1\boldsymbol{\delta}_1 + \alpha_1 y_2 + u_1 > 0] \quad (4)$$

$$y_2 = 1[\boldsymbol{z}_2\boldsymbol{\delta}_2 + v_2 > 0] \quad (5)$$

Our error terms, (u_2, v_2), are uncorrelated with **z**, but correlated with one another. If we estimated these models separately, our estimates would be inconsistent (Wooldridge, 2010). Instead, we estimate our models using a bivariate probit to model the probability of enrolling in the LSP simultaneously with the probability of identification or de-identification. Based on Wooldridge (2010) and Cameron and Trivedi (2009) we estimate our model as:

$$P(y_1 = 1|y_2 = 1,\ \boldsymbol{z}) = E[P(y_1 = 1|v_2, \boldsymbol{z})|y_2 = 1,\ \boldsymbol{z}] \quad (6)$$

We estimate our bivariate probit models disaggregated to observe annual patterns of identification and de-identification. Additionally, we analyze the probability of being identified or de-identified by the end of three years in the program for all students, those initially not identified, and those who were identified at baseline as having special education services.

Wolf, Witte, and Fleming (2012) conducted student fixed effects to estimate the probability of a student being identified or de-identified in the Milwaukee Parental Choice Program (MPCP). This estimation strategy relies on students who change schooling sectors at least once during the analysis time. Modeling non-linear panel data in this way will not produce consistent estimates if T_i is small, which will result in bias estimates of unobservable student characteristics also biases are estimates of β (Cameron & Trivedi, 2009). With only four years of data, we determined that this is not the most reliable method of estimating causal effects of the LSP on student identification and de-identification.

Results

We present our bivariate probit marginal effects of the probability of being identified for special education services or having that label removed by the third year of the program are displayed in Table 7. Our results are consistent with prior literature on identification and de-identification in special education. Estimates for the effect of de-identification for students in special education who enroll in the LSP are about 60 percentage points higher than the control group from a base rate of de-identification of about 25 percent. These results are not statistically significant in our fully specified and preferred model. Over eighteen percent of students are newly identified for special education over the three years. For students enrolled in the program, they were seven percentage points less likely to be newly identified for special education then students in the control group. In total, students who enrolled in the LSP were just over 14 percentage points less likely to be in special education by the third year in the program.

Table 7: Bivariate probit marginal effects for the likelihood of identification and de-identification for special education, lotteried sample

	Simple	*Fully Specified*
Special education de-identification	0.592*** (0.000)	0.610 (0.316)
General education identification	-0.091*** (0.000)	-0.070** (0.045)
Overall probability of special education	-0.143** (0.014)	-0.118 (0.519)

*** - p<.01, ** - p<.05, * - p<0.10

Notes. Performance measures are standardized within test type and grade based on the score distributions of members of the control group. All models control for modified assessment. Standard errors could not be calculated for marginal effects, but were calculated in initial bivariate probit models to account for nesting of observations at in lottery risk sets. Excluded comparison group is African American students

In addition to our overall analyses, we present our disaggregated annual effects of enrolling in an LSP private school on identification and de-identification in each year of the program (Table 8). We only see that there are differential probabilities between treatment and control for the identification for special education in the third year. Students who enrolled in their first choice LSP private school were 4.5 percentage points less likely to be identified for special education in the third year of the program when the average rate of identification was 4.6 percent. In the second year of the program we see nearly a 50 percentage point higher likelihood of having one's special education label removed for students enrolled in their first choice private school when the average likelihood of de-identification was 55 percent. These effects reverse direction in the third year of the program, most likely because there are so few students left who need to be de-identified in the private schools following the first and second years. These trends likely demonstrate the differential equilibrium in special education identification between the private and public schools.

Figure 6 depicts the trends in identification and de-identification over the three years of the program. This representation shows the large swing in de-identification effects for students who participated in the LSP in Year 3 of the program. Given the de-identification in the first two years of the program, it is unsurprising that there is a drop in the third year when there are few students left who may be on the margin of benefiting from their special education label.

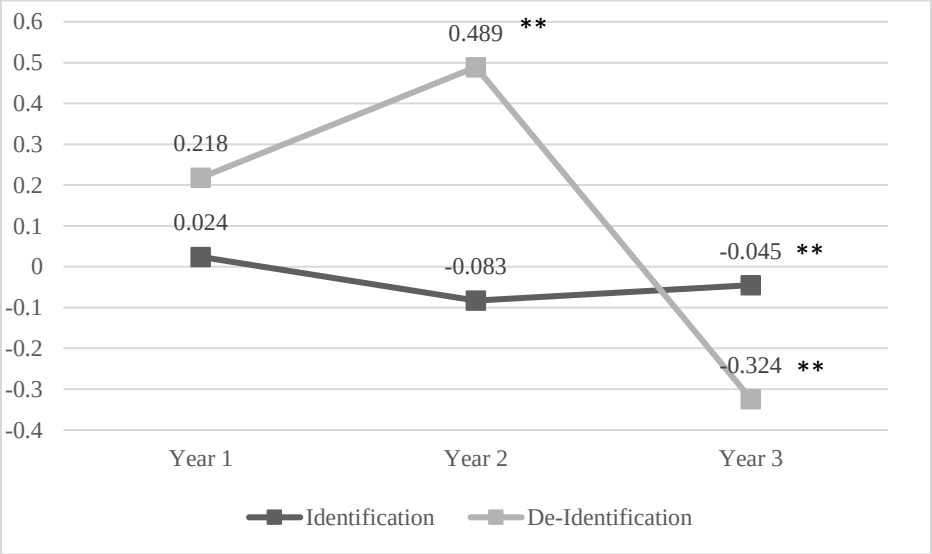
Table 8: Bivariate probit marginal effects for the likelihood of identification and de-identification for special education, lotteried sample

	Year 1		Year 2		Year 3	
	(1)	(2)	(3)	(4)	(5)	(6)
Identification	0.019	0.024	-0.098***	-0.083	-0.053***	-0.045**
Observations	1,040	1,040	989	989	1,060	1,060
De-Identification	0.283***	0.218	0.498***	0.489***	-0.343*	-0.324**
Observations	212	212	240	240	198	198
Demographics		X		X		X
Total Choices		X		X		X
NOLA		X		X		X

*** - p<.01, ** - p<.05, * - p<0.10

Notes. Performance measures are standardized within test type and grade based on the score distributions of members of the control group. All models control for modified assessment. Standard errors could not be calculated for marginal effects, but were calculated in initial bivariate probit models to account for nesting of observations at in lottery risk sets. Excluded comparison group is African American students.

Figure 2: Trends in identification and de-identification for special education in the LSP



Notes. Estimates presented are for the most specified models, which include baseline achievement, demographics, number of schools preferred on application, and whether the student attending school in New Orleans.

Discussion

This paper offers an analysis of the first three years of the Louisiana Scholarship Program (LSP) for students with disability. While our results are largely inconclusive, we believe there are a number of ways in which this work will benefit the existing literature on the experiences of students with disabilities in school choice programs. First, we establish that 13% of the eligible applicants to the LSP in its first year were students with disabilities. This rate of application is identical to the overall state of Louisiana's special education enrollment. While other school choice programs have low special education enrollment, the LSP demonstrates a desire of parents of students with disabilities to have access to private school choice.

Second, this research represents the first attempt to estimate the causal relationship between enrolling in a private school through a publicly funded voucher and special education identification. As prior literature found that schools of choice are more likely to remove the

special education label when students with disabilities enroll, we find similar results, though these are not robust to our preferred specifications. We clearly see that students who participate in the LSP are less likely than the control group to be identified for special education. While not robust to our preferred specification, it does appear that students in the program are overall less likely to be in special education by the third year. Our individual year discrete duration models, show evidence that in Year 3 of the program, students who won scholarships were less likely to be identified for special education; and in Year 2, they were more likely to have a special education label removed.

As a society, it is unclear whether identifying students for special education is positive or negative. If students who truly have disabilities and need services are identified, then we assume it is positive. The assumption is often that schools over-identify students as needing special education services in order to acquire additional funding, exempt students from accountability, or remove them from the general education classrooms. Thus, reducing identification is typically considered a positive policy change. As we do not know the true disability incidence rate in the population, we cannot determine what a desirable outcome actually is in this case.

These findings have limitations. First, the results are based on a small sample of students identified and de-identified who won a lottery to attend their first choice LSP private school. This small sample, along with our analytical requirements, restricts the statistical power of our analysis. Furthermore, we identify students with disabilities using the state testing data. Non-tested students with disabilities cannot be included in our study. For this reason, we also caution against generalizing these findings to all the students with disabilities participating in the LSP and other private school voucher programs.

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Appendix

The analysis in this appendix serves as a robustness check of our overall discrete duration model findings using Cox proportional hazard models in place of probit estimations.

Analytic strategy

In order to estimate the average effect of scholarship award to a student's first choice school on the likelihood of identification to special education and likelihood of having a disability identification removed, we use a Cox proportional hazard model. We estimate using a hazard function defined as:

$$h(t|\boldsymbol{x}_j) = h_0(t)\exp(\boldsymbol{x}_j\boldsymbol{\beta}_x) \quad (1)$$

and derive the likelihood function:

$$L(\beta) = \prod_{j=1}^{n}\left\{\frac{\exp(\boldsymbol{x}_j\boldsymbol{\beta})}{\sum_{i\in R_j}\exp(\boldsymbol{x}_j\boldsymbol{\beta})}\right\} \quad (2)$$

Because the variable of enrollment in the LSP is endogenous, we still want to leverage our lottery process to identify causal effects in our survival analysis. The survival analysis routines offered do not provide for a two stage process in which the first stage predicts the probability of enrollment in an LSP private school based on receiving a scholarship to the student's first choice school. We manually compute the first stage (6) using a probit model[38] and use the predicted probability of enrollment in an LSP school as our variable of interest in our Cox hazard models.[39]

$$E_i = \delta A_i + \boldsymbol{X}\boldsymbol{\beta} + u_{it} \quad (3)$$

Results

We utilize both the Cox proportional hazard models and discrete duration models to estimate the probability of special education identification and de-identification over the three years of the LSP. Our special education identifier comes from the annual testing data that indicates whether a student is in special education or general education.[40]

[38] *E* is the indicator for whether student *i* was awarded a scholarship. A is our variable identifying whether a student was awarded a scholarship for the LSP to attend their first choice school. X is a vector of individual baseline covariates, including student achievement in ELA and math, used to improve model precision.
[39] The stcox routine in Stata is used for these estimations.
[40] In Year 3, disability category included gifted and talented, which we exclude from the categorization of special education.

We present the results of our analysis over the three years of the LSP in Table 15. Hazard ratios are presented and should be interpreted as a one percent higher probability of disability identification for students who enrolled in their LSP first choice school for every 0.01 above one. For example, in our most specified model (Column 4), our estimate on LSP enrollment is 1.373 for identification, which equates to a 37.3 percent higher probability of special education identification for students who enrolled in their first choice LSP private school compared to the control group, though the difference is not statistically significant. Over eighteen percent of students are newly identified for special education, and about 25 percent of students lost their special education identifications over the three years the program was in place. Interestingly, we also see a lower likelihood of students having their special education identification removed if they won a lottery to attend their first choice school. As none of the results in Table 15 are statistically significant, we cannot conclude with confidence that an LSP scholarship award affected the identification or de-identification of students with disabilities.

Appendix Table 1: Cox hazard ratios for the likelihood of identification and de-identification for special education, lotteried sample

	(1)	(2)	(3)	(4)
Identification	0.531*	1.313	1.400	1.373
	(0.195)	(0.590)	(0.579)	(0.601)
Observations	2,570	2,570	2,570	2,570
De-Identification	1.822***	0.925	0.855	0.856
	(0.356)	(0.242)	(0.201)	(0.190)
Observations	353	353	353	353
Demographics		X	X	X
Total Choices			X	X
NOLA				X

*** - p<.01, ** - p<.05, * - p<0.10

Notes. Performance measures are standardized within test type and grade based on the score distributions of members of the control group. All models control for modified assessment. Standard errors (presented in parentheses) account for nesting of observations at in lottery risk sets. Excluded comparison group is African American students.

UNIVERSITY OF ARKANSAS

Office of Research Compliance
Institutional Review Board

February 6, 2017

MEMORANDUM

TO:	Patrick J. Wolf Jonathan N. Mills Albert Cheng Heidi Erickson Sivan Tuchman Yujie Sude	Jay P. Greene Anna Jacob Egaliate Collin Hitt Corey DeAngelis Mohammad Danish Shakeel
FROM:	Ro Windwalker IRB Coordinator	
RE:	PROJECT CONTINUATION	
IRB Protocol #:	13-02-501	
Protocol Title:	*State Mandated Evaluation of the Louisiana Students Scholarships for Excellence Program and Course Choice Program*	
Review Type:	☒ EXEMPT ☐ EXPEDITED ☐ FULL IRB	
Previous Approval Period:	Start Date: 02/22/2013 Expiration Date: 02/21/2017	
New Expiration Date:	02/21/2018	

Your request to extend the referenced protocol has been approved by the IRB. If at the end of this period you wish to continue the project, you must submit a request using the form *Continuing Review for IRB Approved Projects*, prior to the expiration date. Failure to obtain approval for a continuation on or prior to this new expiration date will result in termination of the protocol and you will be required to submit a new protocol to the IRB before continuing the project. Data collected past the protocol expiration date may need to be eliminated from the dataset should you wish to publish. Only data collected under a currently approved protocol can be certified by the IRB for any purpose.

This protocol is closed to enrollment. If you wish to make *any* modifications in the approved protocol, including enrolling more participants, you must seek approval *prior to* implementing those changes. All modifications should be requested in writing (email is acceptable) and must provide sufficient detail to assess the impact of the change.

If you have questions or need any assistance from the IRB, please contact me at 109 MLKG Building, 5-2208, or irb@uark.edu.

Conclusion

Financial incentives are powerful when considering identification and de-identification in special education. Even successful policies can have incentives that intend to invoke one behavior while simultaneously inducing another behavior. Policy makers, in their attempts to improve education in the United States, sometimes develop policies that overlook the issues concerning students with disabilities. Students in special education make up just over 10 percent of students in schools. This small constituency within the K-12 education policy sphere wields federal, state, and local funds required to uphold the individual entitlement to a free and appropriate education (FAPE) under the Individuals with Disabilities in Education Act (IDEA). The regulations surrounding special education are mandates with few subtle incentives. The purpose of IDEA and special education is to ensure that students with disabilities are educated alongside their non-disabled peers to the maximum extent possible for them to still receive FAPE. Placing the label of "special education" on a student can have a multitude of unintended consequences despite having the intention of adequately educating a student.

Special education may bring positive academic affects (Hanushek, Kain., & Rivkin, 2002), but it can also bring with it the stigma of low expectations (Shifrer, 2013) and bullying of the student with a disability. Furthermore, millions of dollars go into supporting special education programs. For these reasons, it is important that educational policies do not create perverse incentives to identify or mislabel students as needing special education services when they do not or vice versa. The purpose of these three studies is to further the literature regarding educational policies that may influence the decision making process around special education eligibility.

Special education has long been seen as an incentive for schools to identify students. Prior research analyzed how state finance formula changes in the 1990's were associated with special education enrollment changes (Cullen, 2003; Dhuey & Lipscomb, 2011; Greene & Forster, 2002; Mahitivanichcha and Parrish, 2005). Like these studies, the current research using an event study framework to analyze data that continues until 2013 finds similar results. The most aggregate analyses appear to be sensitive to the categorization of at least one state, but disaggregated results appear to be in line with economic theory. Capitation based funding formulas that do not allocate funding for each additional student in special education, but cap funding based on a state average special education enrollment, appear to decrease the number of students with non-severe disabilities. In particular, students with specific learning disabilities saw just under a one percentage point decrease after becoming a capitation funding system from a prospective system. This seems to also result in a change in the distribution of students with disabilities. We see this in an increase in students with severe and non-severe disabilities in less inclusive setting, signaling that there is a higher proportion of students in special education with higher needs.

Another important contribution of this line of research is preliminary evidence that there is a correlation between the implementation of a special education private school voucher program and special education enrollment. States that implement a private school voucher see an increase in the percent of students identified as have a specific learning disability and small marginally significant decrease in the percent of students with intellectual disabilities. Moreover, students with both severe and non-severe disabilities experienced a decrease in public special day school placements, with a decrease for students with severe disabilities in the aggregated percent educated outside of a regular school. This rise in specific learning disabilities

should be explored further to determine whether these identifications are a means of students obtaining a voucher and leaving the public school system. Given the reduction in students educated in public special day schools once a voucher program exists indicates that these may be students who are more likely to use a voucher in order to choose a private day school option rather than public. It may also demonstrate that students with higher needs, even within disability categories, are utilizing private school vouchers. It is also important that future research analyzes the characteristics of different private school choice programs and how these policies can be designed to encourage the most participation by students without resulting in a push for unnecessary identification.

The studies by both Greene and Forster (2002) and Dhuey and Lispcomb (2011) that analyze special education finance formula impacts on special education enrollment also attempt to determine whether accountability systems similarly induce perverse incentives to identify students as needing special education. Neither of these studies, nor Hanushek and Raymond (2005), find evidence that this occurs despite Figlio and Getzler's (2002) research on the same topic. Important for policy development is the difference in the ability for students with disabilities to opt-out of testing regimes. Figlio and Getzler analyzed data in Florida during a time in which students with specific disabilities were exempt from testing. No Child Left Behind (NCLB) and IDEA, which was reauthorized in 2004, close on the heels of NCLB, only allowed for a very small portion of the special education population to receive exemptions. This is important when considering a policy, as we do in our study on minimum subgroups, that can enable schools to avoid being held accountability under specific circumstances. In the example of subgroups under NCLB, the size of these subgroups were determined at the state-level to maximize both the number of schools held accountable and the statistical reliability of estimates

of a given sample. Schools with a special education population that hovered around the minimum subgroup mark could have an incentive to avoid accountability for this subgroup.

In alignment with these incentives, our research finds that in the year after a school falls below the minimum subgroup size for special education students to be accountable under NCLB, there is a decrease in the percent of students with disabilities enrolled in the school. Further confirming our hypothesis, schools that are closest to the cutoff see the largest declines. These behaviors are not surprising given that the majority of schools that included students with disabilities in their calculation of AYP were unable to meet their annual goals (Harr-Robins et al, 2013). If schools do not believe that they can successfully move students with disabilities to a level of proficiency at a given rate, then they have a great incentive to under-identify them to avoid sanctions. Including students with disabilities in accountability systems is essential for ensuring schools are adequately educating them. Expecting those students to progress at an identical pace to their non-disabled peers, however, is unrealistic, resulting in attempts to game the system. The consequence of this is twofold. One, students who may need special education services are not provided them. Two, schools that should be held accountable for their ability to educate students with disabilities are not. Both the policies of minimum subgroup size and obtainable annual measurable goals must be reevaluated to ensure neither services nor accountability are denied.

In the midst of policies that directly aim to alter incentives in public schools, school choice became an important policy consideration. Students with disabilities have continued to be a portion of the discussion when discussing school choice. Charter schooling has taken the brunt of criticism regarding possible discriminatory practices to deter the enrollment of students with disabilities. Private school choice programs directly targeting students with disabilities have

quietly sprung up in large numbers over the last 20 years. We only know the first inklings of how students with disabilities experience school choice. Researchers have started using enrollment data more frequently to at least address issues of possible discrimination in charter schools, and our research is the first to experimentally estimate this topic for a private school choice program. Unlike charter schools, private schools have very little incentive to identify new students or maintain old labels for special education. The Louisiana Scholarship Program (LSP) gives private schools a very small window to access supplemental special education funds, but this is not likely a good inducement to identify new students.

Despite only having vague evidence over the course of the LSP's first three years, it is clear that over the course of the program, private schools attempt to achieve an equilibrium in special education identifications. In the first years, private schools seem to remove labels at very higher rates and identify students at lower rates than the public schools. Whether these trends occur due to school mission, academic interventions, or parental choice, the process of identifying students for special education is certainly not equivalent across schooling sectors. This is an essential aspect of school choice that researchers and policy makers have to consider when analyzing data and attempting to determine what is best for students. Since it is not clear that the LSP is beneficial for students (Mills & Wolf, 2017), the quality of the educational experience is likely a more important policy consideration than the special education label of a student.

It is the job of the American school system to give every student an equal opportunity to learn. Special education is the mechanism that exists to support do so for students with disabilities. Determining who has a disability is not always a simple process when it is not clearly visible. We rely on teams of people with various perspectives to made decisions about

which students truly need services and which do not. These perspectives can be altered by policies, intentionally or unintentionally. The purpose of the current line of research is to investigate how policies make people behave in the special education decision making process. Policies will never be flawless, but they should take into account this at-risk group of students however small they may be.

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