THE EFFECTS OF CHARTER SCHOOL PROLIFERATION AND LOCATIONAL DECISIONS ON THE FINANCES OF PUBLIC DISTRICT SCHOOLS

by

MARK ALAN WEBER, JR.

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ABSTRACT OF THE DISSERTATION

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Dissertation Director:
Bruce D. Baker, Ed.D.

Charter schools have become a substantial part of the U.S. school system; however, relatively little is known about how charter proliferation affects the finances of the public school districts within whose boundaries charters reside. This three-paper dissertation leverages unique datasets to ascertain the effects of charter growth on school spending and other resource measures. In paper one, I employ fixed-effects models on national data to estimate the effects of charter proliferation on a variety of school resource measures. In many states, charter growth correlates with increased spending; however, inconsistencies in federal data suggest that in some states this increase may be mechanical. Further analysis of state-level data from Minnesota and New Jersey finds evidence, however, that the increased spending is due to fixed costs in public school districts that are inelastic to enrollment decreases due to charter proliferation. The second paper further examines New Jersey data. I find that school district spending increases in the early stages of charter growth, then falls after a "turnaround" point. Analysis of both fiscal and staffing measures suggests resources vary in their elasticity to charter proliferation. Paper three analyzes correlations between demographic characteristics of census tracts and the probability a charter school is inside the tract. I find that poverty significantly increases the chance a charter is present within a neighborhood, while an

increase in the percentage of white residents decreases that same probability. This suggests the growth in spending found in papers one and two, which appears to induce inefficiencies, is not evenly spread among tracts of differing socio-economic and racial characteristics. This dissertation makes contributions to the literature on charter schools by presenting empirical evidence that charter proliferation is not a fiscally neutral policy and that the consequences of charter growth are not evenly distributed across socioeconomic status or race.

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Table of Contents

List of Tables

List of Figures

Dissertation Introduction

In this dissertation, I endeavor to answer several questions about charter schools in the United States: How does the growth of charters affect the finances of public school districts? Do the structures of public school districts affect how those districts respond to charter proliferation? How are charter schools distributed across areas with differing class and racial makeups? Do charters of varying organizational structures target different potential students with their locational choices?

In this introductory essay, I ask: Why should we care about these questions?

There is little doubt that the growth in charter schools over the last two decades is one of the most profound changes in America's K-12 education system. As I note in the first paper of this dissertation, charter schools, as of 2015, account for about five percent of the population of students enrolled in regular public or charter schools. More important for this dissertation, however, is the fact that half of all of these students now attend a school district, or a charter within a district, where at least one charter school is located. If charters have an effect on the public district schools nearby, many students will be subject to that effect.

Considering the growing reach of charter schools' influence, and considering how much research has been conducted on charter schools over the last two decades, it is remarkable that so little of this research is focused on the question of how charter proliferation might affect the finances of neighboring public school districts. My review of the literature in this dissertation's first paper shows that only a few studies have attempted to measure the effects of charter growth on public school district finances. These studies are all limited in their scope, focusing only on a single state or a few cities.

And only a scant few are empirical in the sense that they use fiscal data to analyze correlations between changes in resource measures and changes in charter proliferation.

And yet the charter school movement is built around the premise that charter growth will affect how public school districts operate. The "theory of chartering," which I refer to throughout this dissertation[1], argues that charter competition will improve public district schools through competitive pressures (Bulkley & Fisler, 2003). This argument extends back to the very beginnings of the modern "school choice" movement. Milton Friedman, generally acknowledged as the intellectual godfather of American school choice, argued explicitly that injecting market forces into the provision of public education "… would permit competition to develop. The development and improvement of all schools would thus be stimulated." (Friedman, 1962, p. 93) If charter school advocates believe that charter proliferation could influence a public school to become more effective, it stands to reason the influence of charters might extend to other aspects of schooling, including finances and resources.

The question of how charter growth affects school district finances, however, remains underexplored. The research that has been conducted on the influence of charters on public district schools instead focuses largely on two areas: how charter proliferation influences school segregation, and how it influences student achievement outcomes. I include a review of the literature on charter schools and segregation in the third paper of this dissertation; to summarize, there is substantial evidence that charters do reinforce segregative patterns, and that at least some charter parents respond to the racial

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[1] Katrina Bulkley and Jennifer Fisler's article, "A decade of charter schools: From theory to practice" (2003), was a large influence on my thinking as I wrote this dissertation. I thank them both for their scholarship.

composition of a school's student body when participating in a school choice system. The literature on charters' influence on public school district student achievement is described by Epple, Romano, and Zimmer as "mixed" (2015, p. 55). A more recent study found small improvements in test scores for public district schools located near to charters (Cordes, 2017). Notably, these same schools also saw an increase in per pupil spending as charter competition increased.

As I note repeatedly throughout this dissertation, there is a substantial and growing body of research that shows school funding has a meaningful impact on student outcomes (Baker, 2016a; Baker, Weber, Srikanth, Kim, & Atzbi, 2018; Jackson, Johnson, & Persico, 2016; Lafortune, Rothstein, & Schanzenbach, 2016). If charter school proliferation affects public school finances, there is sufficient reason to believe student achievement will be affected as well. On the other hand – and as I explore more deeply in this dissertation's second paper – spending increases that accompany charter school growth may be the byproduct of increased inefficiency due to enrollment losses in public district schools.

Inefficiency is an important component of education cost modeling, as it is spending that does not impact measured student outcomes (W. D. Duncombe, Yinger, & Nguyen-Hoang, 2015). There has been, to my knowledge, no empirical research employing cost functions that addresses the question of whether charter proliferation induces greater inefficiency in public district schools. However, and as I argue in this dissertation, before attempting this type of cost modeling – which is likely to be quite complex – we should first determine whether spending, as opposed to cost, is affected by charter proliferation. Duncombe et al. describe "cost" as: "… the minimum spending required to produce a given level of output. Applied to education, cost represents the minimum spending required to bring students in a district up to a given performance level" (2015, p. 260). Spending, on the other hand, represents the outlays of schools, including both the cost of achieving certain outcomes, and extra monies attributed to inefficiency. Spending functions, which are at the heart of the first two papers of this dissertation, are less complex than cost functions, which must account for inefficiency, educational outcomes, and the simultaneous determination of spending and outcomes.

I therefore encourage readers to view the first two papers herein as a necessary first step – but only a first step – toward a more complete understanding of the effect of charter proliferation on educational costs. In the first paper, I leverage a national dataset to explore how charter proliferation correlates to changes in spending, revenue, and student:teacher ratios within public, district schools. A clear pattern emerges in many states: charter proliferation does affect public school district finances. One of the most important conclusions of this paper, however, is that the fiscal data for schools collected by the federal government would benefit greatly from renewed and consistent reporting standards. This finding spurs me to compare the effects of charter growth in two states – Minnesota and New Jersey – using both federal and state data sources. In the second paper, I go further into my exploration of the New Jersey data, utilizing a unique dataset of staffing characteristics to analyze how charter proliferation affects the deployment of school personnel.

If, in fact, charter school proliferation does affect public school district finances, another important question follows: Are the effects of charter growth distributed equally? Charters that affect public school finances but are concentrated in areas with greater socio-economic disadvantage or higher percentages of racial minorities will distribute the effects of their growth unevenly among different student populations, raising equity concerns. In addition, and as I document herein, charter school growth may unevenly distribute charter schools that engage in rent-seeking activities, to the detriment of students and taxpayers. The third paper of this essay explores how charter schools are distributed across neighborhoods with varying demographic profiles. While there is a substantial research base that explores this question, I contribute to this literature through a unique set of logistic regression models that I deploy using data from areas with significant charter penetration. My findings reveal that charters are not distributed evenly across neighborhoods, and that certain demographic characteristics significantly increase or decrease the chances a neighborhood will have a charter school present.

A note about the format of this dissertation: the three papers herein are written to stand as separate but related pieces of research, each publishable on its own. As such, each paper has its own title page, abstract, table of contents, reference section, set of tables, and set of figures. Page numbering is restarted for each paper. I also include a master table of contents for the entire dissertation, as well as a master list of tables and list of figures. I conclude the dissertation with a short essay that synthesizes the findings of all three papers and suggests avenues for future study.

Chapter 1 – The Effects Of Charter Proliferation On Public School District Finances

Introduction

The role of charter schools in the United States is one of the most discussed and studied issues in modern education policy, a result of steady charter school growth over the past two decades. However, even as much of the focus has been on charter schools' academic outcomes, student demographics, and pedagogical methods, important aspects of the effects of charter school growth have remained relatively underexplored. Perhaps the most important of these aspects is the fiscal impact of charter school proliferation on public district schools. In this paper I present, for the first time, empirical evidence on the fiscal effects of charter school proliferation on neighboring public district schools using a national, uniformly reported source of data. Using established quantitative methods, I present evidence that charter school growth does, in fact, affect public district school finances, although statewide context has a profound impact on the correlations between charter growth and district school finances.

First established in 1992 (Epple et al., 2015), charter schools, as of 2015, enroll 6 percent of all public[2] school students ("The condition of education: Public charter school enrollment," 2018). Despite the national attention charter schools have received, charter policy, like most education policy, is largely left to the states. Consequently, a patchwork of different state laws and regulations has created a heterogenous national charter sector and charter policy environment. This includes both the extent of charter school proliferation and charter funding policies, both of which may have an impact on public

[2] Whether charter schools are "public" schools remains a matter of dispute among legal scholars. (Green III, Baker, & Oluwole, 2013; Green, Baker, & Oluwole, 2015; J. Schneider, 2017) It is possible to refer to charter schools as "publicly-financed" schools, but that term could be construed to include private schools receiving public monies through vouchers or other transfer systems. For the sake of clarity, throughout this paper I refer to charter schools and charter school students as "public" when including them in the population of public district schools and public district students.

schools within the same geographic area. The variations in charter proliferation, charter growth, and charter funding across and within states provide an opportunity to create viable counterfactuals using observational data and ascertain whether a causal relationship exists between charter school proliferation and changes in public district school finances.

The question of whether charter schools affect public district schools' finances is particularly important in light of an emerging body of research that shows school funding has a meaningful effect on student achievement (Baker, 2016a). If charter proliferation causes public district schools to spend less money, students in those school districts where there is substantial charter sector enrollment may be at a disadvantage compared to students in districts where charter enrollment is minimal. If charter proliferation leads to increased spending in schools, however, there is not necessarily an advantage for public district students: it may be that increased spending improves student learning conditions, or it may be that increased spending is due to increased inefficiency within the public district school system. In this paper, I delve deeper into the changes in school spending and resources causally linked to charter proliferation in two states: Minnesota and New Jersey. The models for both states suggest that charter proliferation does increase spending, but not necessarily in ways that improve student learning environments in public district schools.

The remainder of this paper proceeds as follows. First, I summarize the literature on charter school proliferation and its effects on public district schools, particularly on district school finances. Building on this summary, I then present the conceptual framework for this study and list the research questions it attempts to answer. The next section describes the data. After, I describe the methodology and models I employ, including the fixed-effect models at the center of this study. I provide the results in the next section, which are the estimates of how charter proliferation correlates to various fiscal and school resource measures. I then discuss these results and put them into a relevant policy context. The paper concludes with policy recommendations and potential avenues for future research.

Review of the Literature

Over the past decade, a substantial body of research has emerged which explores the effects of charter schools (Epple et al., 2015). Charter research includes work on the effectiveness of charters in improving student achievement outcomes (Abdulkadiroglu, Angrist, Hull, & Pathak, 2014; Betts & Tang, 2011; Bifulco & Ladd, 2006; Chabrier, Cohodes, & Oreopoulos, 2016; Jeynes, 2012), the differences between charter and public district school student population characteristics (Epple et al., 2015; Weber & Rubin, 2018; R. Zimmer et al., 2009), and the processes through which students and their families chose charter schools (Altenhofen, Berends, & White, 2016; Lacireno-Paquet & Brantley, 2008; Makris, 2015).

Included in this work is research on how charter proliferation affects the productivity and student academic outcomes of public district schools. Arsen and Ni (2008) summarize this literature and find "…that results from available empirical studies are mixed and do not yet allow for firm conclusions about the effects of competition on traditional schools and non-choosing students" (p. 1). In a later review, Epple et al. (2015) come to a similar conclusion: "In aggregate, the current body of evidence on the competitive effects of charter schools is mixed, which may be disappointing to the advocates of charter schools" (p. 55). In a review that includes many of the same studies, Gill and Booker (2015) are somewhat more optimistic: "Among the existing studies of charter schools' effects on students in nearby conventional public schools, most find either small positive effects or no effects…. In one respect, the findings across all of the studies are consistent: no study has found *large* effects, positive or negative, of charters on conventional public schools" (p. 215).

Studies on the effects of charter competition on public district schools since these reviews include a recent paper by Cordes (2017), which finds small gains in student outcomes in New York City traditional public schools (TPSs) correlate to proximity to a charter school. Colocation of a charter and a TPS has a larger effect, but still under 0.1 standard deviations. Importantly, Cordes notes that the TPSs in her study that experienced increased charter competition saw a commensurate rise in financial resources:

> Specifically, all TPSs experience a significant increase in instructional PPE [per pupil expenditures] that is increasing with charter school proximity: co-located TPSs experience an 8.9 percent increase, TPSs within 0 to 1⁄2 mile experience a 4.4 percent increase, and TPSs within 1⁄2 to 1 mile experience a 2.0 percent increase after charter school entry. To put these estimates in perspective, instructional expenditures increased by an average 7 percent per year over the sample period. These point estimates, therefore, are equivalent to approximately 50-125 percent of a full year's growth in expenditures…. Overall, these results indicate that increases in TPS student performance may reflect, in part, higher PPE on instruction following the entry of a charter into the neighborhood. Such

> increases may reflect a number of factors such as a reduction in class sizes or a more experienced TPS teacher labor force after charter entry. (p. 28)

Cordes's finding here highlights a limitation of many of the other studies on the competitive effects of charter proliferation: without taking into account changes in public district school resources induced by charter proliferation, there is no way to determine if the effects of that proliferation are fiscally neutral. If charter schools proliferate and draw students away from public district schools, but the district schools do not lower their spending due to fixed costs or structural characteristics, per pupil expenses will rise, possibly to the benefit of student outcomes. This is an important point given a substantial and growing body of evidence which shows that increasing school funding has a positive effect on student outcomes (Baker & Weber, 2016; Baker, Weber, et al., 2018; Jackson et al., 2016; Lafortune, Schanzenbach, & Rothstein, 2016). It may be, however, that increased spending due to charter proliferation is doing little more than increasing inefficiency. In either case, Cordes's study, limited to one unusually large school district, does not provide enough evidence to arrive at a conclusion as to the effects of charter proliferation on school spending, let alone on student outcomes. Put simply: before we can determine if fiscal changes to public district schools due to charter proliferation impact student learning, we must first determine whether those changes actually exist.

There is a small body of research focused on the fiscal effects of charter proliferation on public district schools. While limited in various ways, all of it suggests that charter schools do have an impact on the finances of the public school districts in whose boundaries those charters reside. Bifulco and Reback (2014) find charter school expansion in Albany and Buffalo, New York, has had negative fiscal impacts on both districts. The authors compare the loss of enrollments in each district to charter schools, and the commensurate loss in revenues, to the reduction in expenses due to reduced enrollment. In each district, the revenue loss exceeds the reduction in expenses. In addition, the authors assert charter expansion draws students into publicly-financed schools who would have otherwise enrolled in private schools, thus increasing the total number of students for whom revenues must be raised to support their education. Using similar methodologies, Ladd & Singelton (2017) examine the fiscal impact of charter expansion in North Carolina. Limiting their study to six school districts, the authors divide costs into “fixed” and “variable” categories. They then assume three different elasticities for the expenditures deemed “variable”; in other words, they project what the additional costs would be based on assumptions of how much variable costs could change as students leave district schools for charters. In a large, urban district (Durham), this methodology estimates additional fiscal costs of approximately $500 to $700 per pupil. Smaller districts are projected to have smaller additional costs.

While these two studies are valuable, they are limited in several ways. First, because both studies are confined to a small number of districts with significant levels of charter penetration, there is no opportunity to compare them to counterfactual districts with similar characteristics but little charter proliferation. Second, while Ladd et al. describe their approach as “empirical,” it is more accurate to say it is a projection of what might occur in the absence of charter schools. While the assumptions about costs and enrollments are reasonable, they are still assumptions; the conclusions of these studies then rely heavily on theoretical, and not observational, evidence. Third, the cross-sectional nature of the data used in these studies precludes the use of panel data models, such as fixed-effects estimators, to make a causal claim based on actual changes in charter proliferation and fiscal measures over time.

Arsen and Ni (2012), in contrast, have used fixed-effects models to study the effects of charter expansion on hosting public school districts in Michigan. The authors find higher levels of charter competition reduce hosting district school fund balances, thus increasing fiscal pressures. The authors also show that districts with large losses of enrollment to charters do have significantly larger class sizes. In addition, they present evidence that districts decrease instructional spending, as a proportion of total spending, as a result of charter proliferation; however, other subcategories of spending are not affected. This stands in contrast to a study by Welsch (2011), which also uses Michigan data from almost exactly the same time period. The author finds charter proliferation leads to a greater proportion of spending on instructors, and less spending on staff who support instructors. One reason for the difference may be the way the models are specified: in Arsen and Ni's models, total expenditures and scale are independent, time-varying variables, while Welsch's models assume these factors are included in the district-level fixed effect. The contrast illustrates how the specification of the model can have a profound effect on a claim of causality.

Cook (2016) examines the effects of charter proliferation in Ohio, a state with a significant number of districts experiencing sizable charter penetration, in a working paper. The author finds: "…increasing the fraction of students transferring to a charter school by one percentage point decreases total revenues by 1.8 percent" (p. 22). The mechanism through which revenues decrease at the local level appears to be a decrease in property values. Cook also finds increased charter transfers decrease negotiated teacher salaries even as they increase spending on capital outlays. Bruno's (2017) recent working paper explores the fiscal effects of charter proliferation in California. The author finds that charter school enrollment is associated with lower levels of per pupil spending, particularly when charter enrollment rates are relatively low. The fiscal stresses are lower than those found by Arsen and Ni in Michigan, and by Cook in Ohio.

All of these papers benefit from the use of panel data, allowing for fixed-effect models that suggest causal links based on empirical evidence. Each is important in that it refines the methods employed to ascertain causal effects. The primary limitation on each paper, however, is that each is limited to only one state. State policy environments for charter schools are heterogeneous, with authorizing systems, oversight systems, and funding systems varying from state to state (Wixom, 2018). It may well be that that the effects found in these papers differ significantly in other policy contexts; indeed, the differing effects found in the different states in which these papers are situated highlights the importance of state policy context. In addition, and as I show below in Table 4, California, Michigan, and Ohio have relatively high charter penetration rates – but not the very highest in the United States. If the effects of charter proliferation on public district school finances do not manifest until a particular level of charter penetration is reached, or change after a certain level of penetration is passed, it may be that the effects found in these papers are not generalizable to states with different charter proliferation rates.

Baker (2016b) presents a series of quantitative case studies, based on large school districts in different states across the United States, that shows the growth of the charter sector, the decline in enrollments in hosting public school districts, and the proportion of charter enrollments in various charter management organizations (CMOs). The author also describes the changes in revenues and expenditures over time for hosting school districts. An important insight of this brief is that charter expansion may lead to the enrollment of more students in inefficiently small schools, an assertion supported by previous empirical work on school size and economies of scale (Andrews, Duncombe, & Yinger, 2002). This study presents a national context for understanding for how charter proliferation may affect public school districts' finances. The descriptive nature of this brief, however, does not leverage econometric methods to argue for causal relationships between charter school proliferation and fiscal effects in hosting school districts. Limiting the districts studied to a few large urban districts also constrains the scope of the research.

Conceptual Framework

This research base, while small, still gives ample reason, based on both theoretical and empirical evidence, to believe that charter school proliferation may influence public school district finances. Ultimately, an analysis of the causal effects of charter expansion on public district school fiscal measures will lead to three possible conclusions. First: charter school expansion may have negative effects on district expenditures and/or revenues. In this scenario, funds allocated for public education are limited, and the redundant systems of administration and organization created by charter school proliferation move monies away from public district schools and toward charters to support that redundancy. Second: charter school expansion may have positive effects on district expenditures, possibly with aligned positive effects on revenues. In this case, charters enroll students who would otherwise attend public district schools. Those district schools, however, have fixed costs or cannot reduce overall spending due to structural realities. Per pupil spending, consequently, rises as the fixed amount of spending is now aligned with a smaller number of students. Third: charter school expansion may have no effect on public district school spending. Here, redundant systems induce no additional inefficiencies; charters simply proliferate, and overall spending at public district schools drops exactly proportionally to enrollments.

Again: it is likely that these scenarios play out differently in different states. A nationwide model of the effects of charter proliferation on public district fiscal measures, therefore, is not appropriate. In addition: while states vary in their charter school and school funding policies, they also vary in how they collect and report data on school finances. It is possible that differences in the effects of charter proliferation from state to state would differ in part because data systems also vary between states. A state-by-state analysis using a uniform, longitudinal data source – even if, as I show below, that data source is not entirely consistent across states – would therefore be the best method for determining whether charter expansion impacts public school district finances across the United States. The previous work of researchers using fixed-effects estimators provides a template for conducting this analysis.

This paper, then, contributes to the small body of existing literature on charter proliferation's effects on public district schools' finances by leveraging a new, longitudinal, national data source to conduct state-by-state analyses using fixed-effects models. Specifically, I address the following research questions:

RQ1: How does the overall level of spending change in public district schools as charter schools proliferate?

RQ2: How do levels of spending in different categories – instructional, support, and administration – change in public district schools as charter schools proliferate?

RQ3: Holding overall spending constant, how does spending in these same categories change in public district schools as charter schools proliferate?

RQ4: How does the overall level of revenue change in public district schools as charter schools proliferate?

RQ5: Holding overall revenues constant, how do local and state revenues change in public district schools as charter schools proliferate?

RQ6: How do pupil-teacher ratios change in public district schools as charter schools proliferate?

Data

Student, District, and Fiscal Data

Student enrollment data, student population characteristics, district characteristics, and federal fiscal data used in this paper comes from the School Funding Fairness Data System (SFF) (Baker, Srikanth, & Weber, 2017). The SFF is a panel of data running from 1987 to 2015; however, reliable and consistent data marking charter schools is only available from 2000 onward. The original data sources found in the SFF and used in this paper include:

- National Center for Education Statistics (NCES) Common Core of Data (CCD): local education agency (LEA) level. These data includes student enrollment counts and staff counts.

- NCES CCD: school level. These data are "rolled up" to the LEA level to provide another measure of student enrollments. I also use the panel of school-level data for geographical coordinates of charter schools, and to determine student and staff counts in charter schools that operate under district LEAs.
- Decennial District and County Population Density, 2000 & 2010. These data are measured in population per square mile for the county in which the school district is located.
- Education Comparable Wage Index (ECWI). This measure was developed as a way to account for variation in school wage costs across both time and geography (Taylor & Glander, 2006). While it is possible to use ECWI as a covariate within the models I specify, I elect instead to linearly transform the spending and revenue variables used. Dollar amounts are transformed to equivalents in the New York City labor market in FY 2015.
- Small Area Income and Poverty Estimates (SAIPE). This district-level measure of poverty for the population of students ages 5 to 17 has the advantage over other measures, such as free and reduced-price lunch eligibility, of covering all children within a district’s boundaries, regardless of where they attend school.
- F33 School District Fiscal Data, full and reduced datasets. These data provide fiscal measures of spending and revenue for the school districts studied.

The relevant fiscal measures for this analysis are per pupil figures: spending per pupil, revenues per pupil, and so on. These measures require two figures: in the numerator, the fiscal measure for each school district within the population studied; in the denominator, the student enrollment count. Having a consistent fiscal measure in per pupil terms would allow for comparisons between states, which have varying school funding policies. Unfortunately, the F33 measures used herein present a particular challenge to this analysis: there is ample evidence that what the fiscal measures actually represent varies from state to state, especially with regards to charter school proliferation.

Fleeter (2018), for example, finds that enrollment counts in federal data for school districts in Ohio do not include students who are residents of the district yet attend "community schools" (Ohio's term for charter schools); instead, the F33 count only includes those students attending a district school. Yet the amount of funding reported in the Census Bureau data includes "pass through" funds, which go from the state, through the host district, and then on to the charter school. This creates an artificially high spending per pupil figure for districts with large numbers of resident students attending charter schools, because not all of the students covered by the revenue figure are included in the enrollment count. In contrast, Fleeter notes that Michigan, a state which funds charter schools directly, does not report revenues for charter schools within its fiscal measures, and does not include resident students attending charter schools in its enrollment counts.

Because these fiscal measures and enrollment counts vary from state to state, we cannot be certain that the analysis herein is addressing the same research question from state to state. In some cases, the dependent variable may measure the per pupil spending/revenue for all students within a district, whether they attend charter or public district schools. An analysis using this measure addresses the question of how charter proliferation affects the aggregate finances of all publicly-funded schools, both charter and district. In other cases, however, that same variable may measure per pupil spending/revenue only for those students attending public district schools. An analysis using this measure addresses the question of how charter proliferation affects the finances of only public district schools, the goal of this paper. And in some other cases, the measure may be of spending for all students, charter or district, but divided only by the students enrolled in district schools. The variable may also measure the spending for district students, divided by both public district enrollment and charter enrollment. These last two measures do little to answer the question of how charter proliferation affects the finances of publicly-funded schools, because the relevant, aligned figures needed for the numerator and denominator are impossible to ascertain.

As I describe below, there is a defensible method for determining whether the F33 enrollment figure includes charter school students. Determining whether the fiscal figures include funds passed through to charter schools, however, is much more difficult. I draw on several methodologies to address this problem, including substituting other school resource measures for fiscal figures, using overall spending as an independent variable within models to determine the effects of charter proliferation on various categories of spending, and comparing the estimates from models using state-level fiscal data to models using federal data. In addition, I include within the conclusion a discussion of how the federal government might standardize the collection and reporting of school district fiscal data to ameliorate the problems brought about by this inconsistency within the data.

GIS data

School district boundary data comes from the TIGER/Line Shapefiles from 2000 to 2016, prepared by the U.S. Census Bureau. There are three types of school districts included: elementary, secondary, and unified. Because elementary and secondary districts overlap, a charter school located in one type of district will also be located in another. For charters located in these overlapping districts I split the student population into separate elementary (grades Pre-K to 8) and secondary (grades 9 to 13) populations. Ungraded students in charter schools are allocated to the elementary or secondary population only if all other students in the charter are either elementary or secondary students; otherwise, ungraded students are not included in either population. The elementary and secondary charter school student populations are then allocated to the overlapping elementary and secondary public school districts.

Charter school locations are from the NCES CCD Public School Universe for all years of the data. Lat/lon coordinates from this dataset were used to place charter schools within the boundaries of school districts in each year, using a point-in-polygon method.

State-level data

New Jersey fiscal data from 1999 to 2017 is from the Taxpayers Guide to Education Spending data files, published by the New Jersey Department of Education. Minnesota fiscal data from 2011 to 2017 is from the Financial Profile Reports; Minnesota data prior to 2011 is from the Financial Profile Spreadsheets 1997 – 2010. Both sources are published by the Minnesota Department of Education. I elaborate on these data in the Findings section below.

Methods and Models

Charter proliferation

The variable of interest in this study is the percentage of the student population in a district that attends a charter school. Charters, however, may be independent entities, essentially run as their own local education agencies (LEAs), or may exist as part of an LEA which also includes traditional district schools. The CCD Public School Universe (PSU) data, which I use to identify charter schools and determine their enrollment counts, assigns an LEA identifier (LEAID) to each charter school; however, even if a charter shares an LEAID with district schools in the same district geographical boundary, it does not mean that charter is operated as part of that LEA. In Illinois, for example, charter schools in the City of Chicago share an LEAID with district schools operating as part of the Chicago City Public Schools. Yet these same schools are not necessarily authorized by the local district, and do not necessarily operate under the local district's authority; consequently, we cannot be sure whether the federal fiscal data applies to these schools. The PSU data does not distinguish between these different forms of charter governance. Nevertheless, I do mark whether a charter school has the same LEAID as the public school district within whose boundaries the charter is located. Charters sharing the same LEAID are identified as "district" charters; charters with a separate LEAID are "independent."

The measure of charter proliferation, then, is the number of students enrolled in charters of any type within a school district's boundaries, divided by the total population of students in publicly funded schools located within those same boundaries. The PSU data, however, is at the school level, and not the student level; consequently, there is no way to determine which portion of the school population actually resides within the boundaries of the hosting public school district. As Weber and Rubin (2018) note in their study of New Jersey charter school enrollments, some portion of charter school students may reside outside of the district where their school is located; however, the vast majority of charter students come from the same locality where the charter is located. Arsen and Ni's (2012) paper on the fiscal effects of charter proliferation in Michigan finds that estimates from models using a measure of competition that does not account for non-resident charter enrollments show a consistent bias downward. In most of their models, however, statistical significance does not change when switching between charter enrollment percentages that do and do not account for non-resident enrollments. In addition, there is substantial evidence that families in choice systems prioritize school proximity, making it more likely charter students live within the boundaries of the school districts where the charters are located (Bruno, 2017; Harris & Larsen, 2015; Hastings, Kane, & Staiger, 2005). While the presence of non-resident students in charters may somewhat distort the charter proliferation figures used here, using enrolled charter students within a district, divided by all students within that district, is the most reasonable proxy measure of charter proliferation for hosting public school districts given the data available.

Figure 1-1 shows the growth in charter proliferation between FY 2000 (the 1999-2000 school year) and FY 2015 (the 2014-15 school year), the bounds of the data used in this analysis. The graph shows the level of proliferation for all charter schools, for charter schools operating under a public school district LEAID, and for charters operating under an independent LEAID. In 2000, charter enrollments accounted for only 0.6 percent of the total US publicly-financed school student population enrolled in regular school districts or charters operating as independent districts[3]; that figure grew to 5.3 percent by 2015. While the 2000 charter student population was evenly split between district and independent charters, by 2015 charter students attending schools operating under their own LEAID outnumbered those in schools under a public district ID by 3 to 2. Once again, however, I note that charters operating as their own *de facto* school districts may have LEAIDs that match the school districts where they are located.

Figure 1-2 shows the percentage of regular US school districts with charter schools located within their borders. In 2000, 499 districts had at least one charter school within their borders, representing 3.4 percent of all districts. By 2015, that number of districts had increased to 1,583, or 11.8 percent of all districts. This figure, however, does not account for the fact that charters are more likely to be located in large, densely-populated, urban school districts; consequently, if charter schools affect the finances of their hosting districts, more students are likely to be affected by that proliferation.

Figure 1-3 shows the percentage of all US students (including those enrolled in charters) attending a school within a regular district's boundaries where at least one

[3] According the NCES documentation (Glander, 2015), a "regular" school district, coded as "Type 1" in federal data, is defined as: "A public elementary/secondary school providing instruction and education services that does not focus primarily on special education, career/technical education, or alternative education, or on any of the particular themes associated with magnet/special program-emphasis schools." Regular districts may also be part of a supervisory union, coded as "Type 2": "Local school district that is a component of a supervisory union - Regular local school district that shares its superintendent and administrative services with other school districts participating in the supervisory union." The dataset for this paper only includes districts coded as Type 1, Type 2, or Type 7: "Independent Charter District - Agency that consists entirely of one or more charter schools." Throughout this paper, "regular" school districts are defined as those coded either Type 1 or Type 2.

charter school is present. In 2000, 24.8 percent of US students in publicly-funded regular schools attended schools subject to charter proliferation; by 2015, that percentage had increased to 50.0 percent.

Table 1-1 shows the level of charter school proliferation in FY 2015 for all regular districts in the US with over 40,000 students enrolled in district and charter schools. Orleans Parish, which moved to an all-charter model after Hurricane Katrina, had a charter proliferation rate of 93.1 percent, the highest among all large districts. There are few large districts nationally that have not seen at least some charter proliferation; however, the proportion of students enrolled in charters varies significantly between districts. New York City, that nation's largest school district, has a proliferation rate of 7.8 percent; Los Angeles, the second largest district, has a much higher proliferation rate of 23.2 percent, while Chicago, the third largest district, has a 14.6 percent rate.

Table 1-2 shows the FY 2015 charter proliferation rates for the top 100 US school districts. The seemingly illogical rates for the top two districts is explained by California charter regulations, which allow school districts to sponsor charter schools that are beyond that district's boundaries (California State Auditor, 2017). Orleans Parish, Detroit, and Washington, D.C. are the only districts with more than 40,000 enrolled students on the list. Muskegon Heights, Michigan was the focus of national attention when the entire district was converted to charter schools under a state takeover (Maddow, 2013; Moore, 2014).

Per Pupil Spending & Revenue

As discussed above, the dependent variables in this analysis are expressed in per pupil figures. This requires two separate measures: a student enrollment count in the denominator, and a fiscal measure in the numerator. The student count in the F33 data, however, may or may not include charter school students who are residents of the district. To determine which count a state reports, I compare the F33 enrollment count to a "roll-up" of the enrollments, as counted in the PSU, in all district and charter schools sharing the same LEAID, and to a roll-up of the district schools and the charters located within the district's borders, even if they have a separate LEAID. If the correlation, across all districts in a state and in all available years, between the F33 enrollment and "district schools + district charters" is greater, I assume the F33 enrollment count for districts in that state does not include students in independent charters. If, however, the correlation between F33 enrollments and "district schools + district charters + independent charters" is greater, I assume the F33 enrollment includes students who are residents of districts yet attend independent charter schools.

The second column of Table 1-3 shows the results (states without charter schools are omitted); the third column shows the highest correlation for each state. In most states, the F33 enrollment does not include independent charter school students who are district residents. The fourth column shows the number of independent charter LEAs in each state that appear at any time within the 15 year scope of the dataset. In the 10 states where there is a stronger correlation between the F33 enrollment and "district schools + district charters + independent charters," the number of independent charter LEAs that are listed in any year is generally very low: only in Oregon and New Hampshire are there more than 5 independent charter LEAs. This analysis suggests that, in the vast majority of cases, the F33 enrollment count for a state can be accurately described.

Describing the fiscal measures, however, is more problematic. Documentation of the F33 data files states the following regarding charter schools:

> In Census Bureau government finance statistics, only charter schools whose charters are held by operators that are governmental bodies are considered to be in scope. For example, if a city or county obtains a charter to operate a school from a sponsoring local school district, the finances of the resulting charter school are included in Census Bureau education finance statistics (and thus are included in this report). The finances for these charter schools are often included within the finances of the sponsoring school district.
>
> Charter schools whose charters are held by operators that are not governmental are considered to be out of scope for the purposes of Census Bureau government finance statistics. In these cases, school district payments to charter schools are included (within the expenditures of the paying school district), but the finances of the charter schools themselves are excluded from the statistics (and thus are excluded from this report). (2018)

The last paragraph of this passage suggests that even if charter payments are included in the F33 data, the student enrollment counts are aligned with the fiscal measures of only those schools operated by the district. Yet Fleeter's (2018) analysis calls this claim into question. Adding to the uncertainty is an additional measure within the F33 data: "Exhibit – Payments to charter schools," coded "V92." My inspection of this variable suggests this measure is inconsistently reported, even within states, across districts and years. Deriving reliable, consist fiscal measures that either do or do not include payments to charters schools, therefore, is highly problematic.

To resolve this issue, I employ three different strategies. First, in addition to models using overall spending or revenue measures as the dependent variable, I include models using categories of spending (instructional, support, administration, etc.) as the dependent variable, with and without overall spending as an independent variable. While these models still suffer from inconclusive definitions of the fiscal measures, they may provide insight into how categorical spending shifts, as we could reasonably assume the categorical measures are applied to the same group of schools. Second, in addition to fiscal measures, I include Pupil-Teacher ratios as a resource measure. Using the PSU data, we can be sure that the ratio only counts students and teachers in non-charter schools. In FY 2015, 81.1 percent of current expenditures in the United States on elementary and secondary education was attributed to salaries, wages, and benefits (Cornman, Ampadu, Wheeler, & Zhou, 2018, p. 3). Because spending on staff consumes such a large part of school district budgets, it is reasonable to assume that estimates of spending within the models below reflect causal changes that affect public district schools if estimates pupil-teacher ratios show similar changes.

Third, I use state-level fiscal data from two states – Minnesota and New Jersey – in similar models, and compare the estimates to models using federal data. While these state-level measures are not directly comparable to the federal data or each other, they do provide an opportunity to evaluate whether the federal data and state data yield aligned estimates within the models. In both states, charter school fiscal measures are reported along with public district measures; it is much more likely, therefore, that the measures do not count funds going to students in non-district charters.

National Models

The variable of interest in all models is the ratio of charter students enrolled in schools within a public school district's boundaries to the enrollment of both charter and regular public district students within the hosting district's boundaries, designated as *C*. This ratio represents what I refer to within this paper as charter proliferation: the percentage of students[4] in charter schools. All models herein follow this basic form:

$$Y_{it} = \beta_1 C_{it} + \beta_2 D_{it} + \gamma_t + \delta_i + \varepsilon_{it}$$

Y is a fiscal or resource measure: spending per student, revenue per student, pupils per staff member, or some subcategory of these three (e.g., instructional spending per pupil, pupils per administrator, etc.). *D* is a vector of school district characteristics described below. γ is a set of year dummy variables to control for secular trends, δ is a set of time-invariant district fixed-effects, and ε is an idiosyncratic error term. The advantage of a fixed-effects model in this research is that it sweeps away all time-invarying characteristics of school districts, yet allows for time-varying characteristics to be added to the model, strengthening any claims of a causal effect. I cluster robust standard errors at the district level.

The composition of the vector of school district characteristics closely follows the empirical work of Baker and Farrie (2010), who use similar variables in their regression models. The variables are:

- SAIPE poverty estimates, ages 5-17. As Duncombe and Yinger (2005) note, federal poverty estimates have the advantage of not being susceptible to manipulation by school officials. In addition, this measure captures the

[4] This figure excludes students in private schools or who are home schooled from the denominator, even if their schools receive public funding.

poverty level for all children within a geographical area, and not just students enrolled in public district schools. The effect of student economic disadvantage on both student outcomes and education cost functions has been well established (W. D. Duncombe et al., 2015; W. Duncombe & Yinger, 2011).

- Population density. This measure accounts for changes in school spending that may occur when student populations must be transported over greater distances. Following Baker (2011), I interact the poverty and density measures to account for the differences between rural and urban poverty and how they affect school costs.
- Grade levels enrolled. In this variable I measure the proportion of students in a school district who are enrolled in Grades 9 through 13, acknowledging that secondary districts may have different fiscal realities compared to elementary or unified districts.
- Scale. Here I use a natural log transformation of the total charter and district enrollment within a district's boundaries. A large body of research demonstrates that economies of scale have significant effects on education cost functions (W. D. Duncombe et al., 2015). The log transformation acknowledges that these economies tend to level off as enrollment rises.

Table 1-4 shows descriptive statistics for each of the states on these explanatory variables. Column 3 gives the mean charter proliferation rate for all regular districts within the state; column 5 gives the same rate but only for those districts that have any charter schools within their boundaries. Washington D.C. and Hawaii have only one school district within their jurisdiction; consequently, there is no standard deviation given for the point estimates. I exclude both jurisdictions from the fixed-effects models below. According to the data compiled for this paper, there are no school districts with any charter proliferation in Alabama, Kentucky, Mississippi, Montana, Nebraska, North Dakota, South Dakota, Vermont, Washington, and West Virginia; these states have also been excluded from this analysis.

When the dependent variables use dollars as a measure, I subject them to two transformations. First, as I explain above, I use the ECWI to standardize the measures, thus accounting for both year-to-year inflation and labor market-to-labor market differences in wages. Next, I use a natural log transformation to account for the positive skew these measures tend to exhibit. The transformation creates a "log-level" model; the interpretation of the resulting estimate, or the semielasticity (Wooldridge, 2010, pp. 15–18), for the variable of interest is: a one unit change in charter proliferation (0% to 100%) results in a change in the dependent variable of $100*\beta_1$ percent. I do not use a log transformation of pupil-teacher ratios.

The dependent variables used herein are:

- Model 1: Log total current spending per pupil
- Model 2: Log instructional spending per pupil
- Model 3: Log instructional spending per pupil, with log total current spending per pupil as an independent variable
- Model 4: Log support spending per pupil
- Model 5: Log support spending per pupil, with log total current spending per pupil as an independent variable.

- Model 6: Log administrative spending per pupil
- Model 7: Log administrative spending per pupil, with log total current spending per pupil as an independent variable.
- Model 8: Log total revenue per pupil.
- Model 9: Log state & local revenue per pupil.
- Model 10: Log state revenue per pupil, with log total revenue as an independent variable.
- Model 11: Log local revenue per pupil, with log total revenue as an independent variable.
- Model 12: Pupil-teacher ratio (local education agency-level data).
- Model 13: Pupil-teacher ratio (school-level data, rolled up to LEA level).

Table 1-5 shows the descriptive statistics for Total Elementary-Secondary Expenditures and Total Current Spending (elementary-secondary), both untransformed and log-transformed. Total Expenditures differs from Total Current Spending in that expenditures include capital outlays, debt, and payments to other governmental entities (U.S. Census Bureau, 2017). Because expenditures may include spending that is based on historical decisions, I elect to use current spending as an independent variable in the categorical spending models. Table 1-6 shows descriptive statistics for three subcategories of spending: instructional, support, and Administrative. Table 1-7 shows similar statistics for Total Revenue and State and Local Revenue (combined), while Table 1-8 describes state and local revenues separately. Finally, Table 1-9 shows statistics for pupil-teacher ratios, from both district-level and rolled-up school-level data; these measures are not log transformed. California's statewide mean for 2015 is clearly a result of data error; estimates based on this data should be ignored.

State Models

The form of the models using state-level data is similar to that of the federal data models. Only the dependent variables change in the state models; the vector of district characteristics is still comprised of variables from the SFF dataset. I describe the variables in the Findings section.

Findings

Federal Data Models

In all of the tables showing the regression estimates of β_1, the coefficient of the charter proliferation variable *C*, I mark its statistical significance at the $p<0.1$ (*), $p<0.05$ (**), and $p<0.01$ (***) level. While it is useful to consider statistical significance in evaluating a causal claim of charter proliferation on fiscal and resource measures, it is important to note that these models use population data (with the school district as the unit of analysis) and are descriptive in nature; in other words, they present the correlations between *C* and the dependent variables "as-is," regardless of any tests of statistical significance.

Table 1-10 compares the estimates for β_1 in three models: Model 1, with total current spending per pupil as the dependent variable; Model 6, with total revenue per pupil; and Model 13, with non-charter pupil-teacher ratios, rolled up from school-level data. The estimates from the models for each state are ordered by charter proliferation in FY 2015. If the estimates of these three models are aligned, a rise in per pupil spending or revenue should be accompanied by a decline in the pupil-teacher ratio, as more spending on staff would lead to a decrease in the numbers of students per teacher. Conversely, a decline in per pupil spending should be accompanied by an increase in the number of students for each teacher, as fewer teachers would be employed. Again, the pupil-teacher ratio here is rolled-up from the school level for all non-charter schools in regular districts; consequently, we can be confident the measure is not influenced by unintentionally including charter staff or charter students in the counts.

In Models 1 and 6, the fiscal measure is log transformed; the interpretation of the estimate is that a one unit change in charter proliferation (from 0 to 100 percent) will lead to a change of the estimate times 100 percent in the dependent variable. For example: if a school district in Arizona sees an increase in charter proliferation of 10 percent, its total current spending per pupil will rise 1.8 percent (significant at the $p<0.05$ level). For 18 of the 39 states analyzed, the estimate is significant at the standard $p<0.05$ level. In all but one of those states (Indiana), the estimate is positive, suggesting that in 17 states, as charter proliferation increases in a school district, total current spending per pupil in that district rises. In 15 of these 17 states, total revenues per pupil also increase as charter proliferation increases. And in 13 of these 17 states, pupil-teachers ratios fall as expected (although not all of these estimates of the ratios are statistically significant; in addition, as I mention above, California's pupil-teacher ratio is clearly incorrect and the estimate in the model should be ignored). Pupil-teacher ratios also fall as charter proliferation rises in four states (Florida, Wisconsin, Alaska, and Iowa) by a statistically significant amount, even as changes in current spending are not significant.

Table 1-11, Table 1-12, and Table 1-13 repeat the estimates with total current spending as the dependent variable, followed by estimates from models using categorical spending variables: instructional, support, and administrative spending. Models 2, 4, and 6 regress the log transformed categorical spending variable solely on the vector of district characteristics: the appropriate interpretation here is that a one unit change in charter proliferation will change the fiscal measure “100 times the estimate” percent. Models 3, 5, and 7 use the same log transformation; however, because the model includes total current spending per pupil (log transformed) as an independent variable, the interpretation is “100 times the estimate” percent, *holding overall spending constant*. Another way to conceptualize the estimates is that Models 2, 4, and 6 are changes in absolute categorical spending, while Models 3, 5, and 7 are shifts in categorical spending given the overall amount spent.

In 16 of the 39 states studied, instructional spending per pupil changed ($p<0.05$) as charter proliferation increased. In all but 3 of those 16 states (Texas, Wisconsin, and Oregon), instructional spending per pupil rose as charter proliferation increased. When total current spending per pupil was added to the model, 17 states saw statistically significant changes in instructional spending per pupil; however, 16 of those states saw a decrease in instruction spending. States that saw an increase in absolute instructional spending but a decrease in the proportion of overall spending going toward instruction (both estimates $p<0.05$) include Louisiana, Pennsylvania, New York, and Wyoming.

Twenty-three (23) states saw statistically significant changes in support spending per pupil as charter proliferation changed; in all but one (Florida), support spending increased as proliferation increased. In 17 states, support spending as a portion of overall spending changed by a statistically significant amount; again, except for Florida, all were increases. In 20 states, absolute administrative spending per pupil changed as charter proliferation increased ($p<0.05$); in all but three (Florida, Oregon, and Kansas), the amount increased. In 14 states, the proportion of overall spending allotted to administration changed ($p<0.05$); in 11 of those states, the proportion increased.

Table 1-14 shows estimates from regressions of measures of revenue. Model 8 uses all sources of revenue per pupil as the dependent variable; Model 9 uses only state and local revenue. Because state and local revenue make up the vast majority of public school funding ("The condition of education: Public school revenue sources," 2018), the estimates for each state are closely aligned. 20 states saw a statistically significant change ($p<0.05$) in state and local revenues per pupil as charter proliferation increased; of those 20, only Wisconsin and Indiana saw a decrease in those revenues. Some of these increases were large; in Maryland, for example, a 10 percent increase in charter proliferation led to a 30 percent increase in state and local revenue per pupil. States where districts saw that a 10 percent increase in charter proliferation led to at least a 20 percent rise in state and local revenue per pupil include New York, Tennessee, New Hampshire, and Wyoming. States where that 10 percent increase in charter proliferation led to at least a 10 percent rise in those revenues also includes Louisiana, Pennsylvania, Massachusetts, and Connecticut (Ohio is close).

Models 10 and 11 present estimates for state and local revenues with total revenue as an independent variable added to the model. Again, state and local revenues account for the bulk of total revenues going to publicly-funded schools; therefore, a decrease in the proportion of local revenues should lead to an increase in the proportion of state levels, and vice versa. Adding total revenue to these models holds that amount constant; the estimates, then, show changes in the proportions of revenue sources. The estimates in

Models 10 and 11 demonstrate this relationship: in every case where both revenue estimates are statistically significant (12 states, $p<0.05$), a negative estimate for state revenues is accompanied by a positive estimate for local revenues, or vice versa. The states where local revenues declined and state revenues increased are Pennsylvania and Idaho; the states where state revenues declined and local revenues increased are Arizona, Michigan, Ohio, New Mexico, Texas, Massachusetts, Georgia, South Carolina, Missouri, and Virginia. Alaska (decreased state revenue share), New Jersey and Maryland (both increased state revenue share), follow the same pattern, but at the $p<0.1$ significance level.

Table 1-15 displays estimates from Models 12 and 13, which use measures of pupil-teacher ratios as the dependent variable; again, these are not log-transformed. In many cases, the estimates are significantly different depending on whether the teacher and pupil counts come from LEA-level data, or from school-level data rolled-up to the district level. One possible explanation for this discrepancy is that staff not assigned to specific schools (central office staff, staff shared between schools etc.) may be excluded from the school-level counts. Data error is also a likely problem.[5] This said, in every case but one where there are two statistically significant estimates (7 states, $p<0.05$), those estimates show that pupil-teacher ratios decrease as charter proliferation increases. Only in Wisconsin do the two estimates show statistical significance with opposing slopes.

State Data Models

Because the fiscal measures in federal data likely are inconsistent, I use data from two states' departments of education – Minnesota and New Jersey – for comparison

[5] This is almost certainly the issue with Idaho's very large difference in estimates.

models. Both states publish data with measures of overall spending, and spending on instruction, support, and administration, as well as measures of the ratio of pupils to teachers. I do not use state-level measures in place of the independent variables, but only the dependent variables. I transform these using the ECWI and a natural log transformation, similar to the federal fiscal measures.

Minnesota

Data in these models are from the Minnesota Department of Education's Financial Profile Reports[6] and Financial Profile Spreadsheets 1997 – 2010.[7] Total spending is from the "Total PK-12 General Fund Expenditures" column. Instructional spending combines the "Regular Instruction," "Career and Technical Instruction," and "Special Education" columns. Support spending combines the "Instructional Support Services," and "Pupil Support Services," columns, and administrative spending combines the "District Level Administration" and "School Level Administration" columns. Per pupil figures are derived from using the District ADM [Average Daily Membership] Served Plus Tuitioned Out" column in the denominator. The pupil-teacher ratio is from the "ADM Served Per Licensed Instructional Staff" column of the staffing file; the ratio is the department's own calculation.

Table 1-16 shows the correlations between the MNDOE data and the F33 federal data. With one exception, the correlations are very high, over r=0.9. Only the Support Spending category has a low correlation between the federal and state data. Table 1-18 gives the descriptive statistics for these dependent variables.

[6] http://w20.education.state.mn.us/MDEAnalytics/DataTopic.jsp?TOPICID=142
[7] http://w20.education.state.mn.us/MDEAnalytics/DataTopic.jsp?TOPICID=42

A comparison of the estimates of charter proliferation from the federal and state models, given in Table 1-17, shows a remarkable consistency. A 10 percent rise in charter proliferation correlates to a 4.1 percent rise in overall spending based on the federal data, and a 4.8 percent rise based on the state data. Notably, support spending rises similarly in each model: given a 10 percent increase in charter proliferation, there is a 5.9 percent increase in the federal model, and a 5.8 percent increase in the state model. Again, the correlation between the federal and state measure of support spending is not high. The coefficients are also very similar for administrative spending. Charter proliferation also leads to a decrease in pupil-teacher ratios, although the coefficients are less similar.

New Jersey

New Jersey Data comes from the NJDOE's Taxpayers' Guide to Education Spending (formerly the Comparative Spending Guide) data files.[8] Per pupil calculations use the enrollment figures given in the data files. Total spending is from the "Budgetary Cost" column (Indicator 1); instructional spending from the "Total Classroom Instruction" column (Indicator 2); support spending from the "Total Support Services" column (Indicator 6); and administrative spending from the "Total Administrative Costs" column (Indicator 8). Pupil-teacher ratios are the department's own calculation, using the "Strat01vv" variable. All data is "actual" (not "revised" or "anticipated") and comes from the data files dated two years after the fiscal year.

Again, Table 1-16 shows the correlations between federal and state data. With one exception, these are generally high (ranging from 0.71 to 0.86), although not as high as

[8] https://www.nj.gov/education/guide/

the correlations using Minnesota data. The pupil-teacher ratios have a low correlation of r=0.30. Table 1-20 gives the descriptive statistics for these dependent variables.

Table 1-19 gives the estimates using federal and state data. Like Minnesota, New Jersey data and federal data show that an increase in charter proliferation correlates to an increase in total spending. A 10 percent increase in proliferation correlates to a 5.2 percent increase using federal data, and a 3.7 increase using state data. Also like Minnesota, both federal data and state data models shows a rise in charter proliferation correlates with a rise support services spending; a 10 percent rise in proliferation correlates to an 8.0 percent increase using federal data and a 7.0 increase using state data. Estimates of changes in administrative spending or pupil-teacher ratios in these models, using either federal or New Jersey data, are not statistically significant.

Discussion

An evaluation of the estimates from these models must begin with two fundamental questions about the data used: do the student enrollment counts include charter students, and do the fiscal measures align with those student counts? Again: by using the school-level, "rolled-up" data, and by comparing it to the enrollment counts in the fiscal data, we can be reasonably confident that our description of the enrollment counts is accurate. In most cases, the count is only of public district schools students, and charter schools that operate under a public district school's ID code. In many of the cases where the correlation between the F33 enrollment count and the total student population – district, district charter, and independent charter – is higher, it appears that there are very few independent charters; Florida, Georgia, Illinois, Kansas, and Maryland are notable examples.

The question then is whether the federal fiscal measures are aligned with the counts given in the F33 data. If the fiscal measures are only related to public school districts, and if the F33 enrollment counts are of only district schools, the estimates are true measures of the effects of charter proliferation on public district schools. If the F33 enrollment counts include both charters and district schools and fiscal measures are aligned with district and charter finances, however, the estimates measure the fiscal effects of charter proliferation on all schools, both charter and district. Most problematic, however, is when the F33 counts include both charters and district school enrollments but the fiscal measures only align with district schools. Because we cannot, at this time, be sure this is not the case with those districts whose F33 enrollment correlates with the total count of district and charter schools students, I omit the following states from the remainder of this discussion: Florida, Oregon, Illinois, Maryland, New Hampshire, Kansas, Wyoming, Virginia, and Iowa. It is worth noting the last five states on this list all have low charter share rates (under 1.5 percent), so the effects of charter proliferation may not be evident anyway.

Excluding these states leaves us with 30; setting an arbitrary floor of 2 percent charter share in 2015 eliminates two more. The unusual nature of California's charter authorizing system, manifested in the logically impossible high proliferation rates in several districts, appears to make the methodology and data sources used here suspect when analyzing the state; I therefore remove California from the discussion below. This leaves 27 states for evaluation; what can their estimates tell us?

First, in all but two cases – Wisconsin and Indiana – charter growth is associated with a rise in total spending. In 14 of those states, this correlation is statistically significant at the $p<0.05$ level (three other states are significant at the $p<0.1$ level). 13 of those states saw a commensurate, statistically significant rise in revenues. But is this increase in spending and/or revenue a mechanical effect or real effect? If mechanical, the per pupil fiscal figures increase because the fiscal and enrollment figures are out of alignment: transfers to charters are included in total spending or revenue figures, but student enrollments in charters are not. If, however, the effect is real, charters are inducing greater spending in many states, possibly because, as explained by Bifulco and Reback (2014) and Ladd and Singleton (2017), districts have fixed costs that cannot be reduced as enrollments decline due to charter proliferation.

I proposed three approaches toward analyzing this issue: comparing spending with changes in pupil-teacher ratios, examining changes in categorical spending, and comparing model estimates using state data to estimates using federal data. I now discuss these in turn.

First, regarding pupil-teacher ratios: if public school district spending rises solely due to a mechanical effect from charter proliferation, we would expect pupil-teacher ratios to remain the same. If, however, pupil-teacher ratios fall while spending rises, there is more reason to believe that charter proliferation is inducing real increases in spending. As Table 1-9 shows, the point estimates of the pupil-teacher ratios as measured in either the district-level or the rolled-up school-level data are similar; however, the regression estimates from the models based on these two different data sources are quite different in many states. The rolled-up school-level data has the advantage of being aligned only with non-charter schools; estimates from the model using this measure (Model 13) are in Table 10. The school-level data also has the disadvantage of not including district staff who are not assigned to schools; however, we can be much more confident that any estimates from the model using this data showing a drop in pupil-teacher ratios are describing a real, as opposed to mechanical, effect of charter proliferation on district resources. In Pennsylvania, Ohio, Minnesota, Massachusetts, and New York, statistically significant increases in spending correlated with charter proliferation are accompanied by statistically significant ($p<0.05$) decreases in pupil-teacher ratios. If we broaden the definition of statistically significant to $p<0.1$, Colorado, Louisiana, South Carolina, and Oklahoma join the list. While hardly definitive, these correlations suggest that charter proliferation in these states is inducing a real and positive effect on public district spending.

Second, regarding categorical spending: if pupil support services and administrative spending is a fixed cost for districts, we would expect per pupil spending to rise as charter proliferation expands. Even if charter transfers were included in total spending amounts, we would still expect support and administrative spending to rise holding total spending equal; in other words, support and administrative costs would take up a greater proportion of total spending as charters grow, even if charter transfers were included in the total spending figure (this assumes charter transfers are not included in measures of support or administration spending). In 11 of the 27 states left for analysis, support spending, holding total spending constant, rises at a statistically significant level ($p<0.05$) as charter proliferation rises (in an additional three states, support spending rises at the $p<0.1$ level). Only in Rhode Island does support spending decrease significantly holding total spending constant. The same rise is found in eight of these states in administrative costs (with two more added at the $p<0.1$ level); in two states, administrative spending, holding total spending constant, significantly decreases.

While the results here are mixed, there is at least some evidence that, in particular state policy contexts, there is a correlation between charter proliferation and increased spending on support and administration as a proportion of total spending. Assuming these are at least somewhat fixed in cost, this is then evidence that the relationship between charter growth and district spending is more than mechanical.

Third, regarding comparisons to models with state data: this is the most promising avenue for validating the estimates from the models using federal data, as it is easier to ascertain exactly what the fiscal measures represent. In the case of both Minnesota and New Jersey, the states make clear that the fiscal measures only pertain to the students listed in the enrollment counts. The estimates of total spending per pupil for both states and with both sets of data show a similar pattern: total per pupil spending rises as charter share increases. In Minnesota, this appears to be largely attributable to a rise in support and administrative spending; in New Jersey, support spending accounts for much of the rise in federal- and state-data models. Again, this supports the theory that charter proliferation increases spending due to districts having fixed costs that cannot be easily cut even as enrollments fall. The fact that the estimates show this in both federal and state data suggests that this pattern could found in other states as well.

As an additional method of analysis, I compare the results here to previous research discussed earlier in the paper. Arsen and Ni (2012) find that there were statistically significant declines in revenue in Michigan due to charter proliferation, but no declines in spending or shifting of resources between instructional and other spending.

The largest caution in comparing their estimates to the ones here for Michigan is that the data cover different time periods: 1994 to 2006 for Arsen and Ni, but 2000 to 2015 for this paper. In 2006, the authors put the mean charter competition rate for the state between 2.4 and 3.2 percent (depending on how it is calculated). In contrast, this paper puts Michigan's 2015 mean charter proliferation rate at 9.7 percent (see Table 1-4). The difference in the intensity of the treatment over the two different time periods is a likely cause of the differences in the model estimates.

Bruno's (2017) and Cook's (2016) work is more recent and uses data that span time frames closer to the panel used in this paper: Bruno's data set runs from 2004 to 2015, and Cook's from 1996 to 2011. While Bruno's models are the closest to the ones I employ herein, Bruno uses state-level data that he subjects to significant transformation and validation procedures. As noted above, the federal data for California used in this study yields illogically high charter proliferation rates, an indication that there may be data integrity issues. This may explain why Bruno's estimates show a decrease in spending correlated to charter growth, while the estimates here show no such correlation. In addition: Bruno opts to use a quadratic functional form for his model, while I opt to use a simple linear model. It may be that the appropriate functional form of the model changes given different state policy contexts, even when using federal data (I explore this possibility further in the next paper of this dissertation). All this said, the fact that Bruno's study shows a decrease in expenditures in California correlating with charter expansion, while the models herein show an increase in many other states, is ample reason to study the state policy contexts that would lead to such different results.

Cook’s dataset includes many state-level variables from Ohio, but it also includes many of the same federal fiscal and district characteristics data used herein. His “charter competition” measure is based on state data that shows actual transfers of funds to charters from public school districts, which likely leads to different measures than the method employed in this paper. Cook also subjects his data to an extensive “cleaning” (p. 5) procedure. Cook’s models are also different than the fixed-effects models employed by Bruno and herein; they include an instrumental variables framework to account for endogenous changes in charter growth. All this said, it is still notable that Cook’s methods show a decrease in revenues due to increased charter competition, while the models herein show an increase. It may well be that this discrepancy is due to the issue Fleeter (2018) outlines in his analysis of Ohio school funding: specifically, that the revenue increases found in the F33 data reflect purely mechanical increases in revenues due to enrollment loss in public school districts.

While further research is needed, I am inclined to endorse the findings of both Cook’s and Bruno’s studies over the findings presented here with regards to California and Ohio. In both cases, charter proliferation reduces spending and/or revenues. Yet my initial analysis of state-level data in Minnesota and New Jersey shows the opposite trend. Further study of these two states, using other data sources and perhaps other methodologies, is necessary to determine if the findings herein regarding both states are valid. If so, this would provide further evidence that the effects of charter proliferation on public district finances is greatly dependent on state policy contexts.

As a final limitation of this paper, I note that school districts vary greatly in size, which can have an effect on the number of districts within a state. Maryland, for example, has only 24 county-wide school districts in this dataset, while Wisconsin, which has roughly the same sized population, has 422. Florida also has county-wide districts, numbering 67 in this dataset; New York, again with a roughly similar population, has 677. There are at least two consequences for the methodology employed herein. First, statistical power is diminished when there are fewer observations. The school district is the appropriate unit of analysis given this data, as it is the unit where revenues are collected locally or received from the state or federal government. States with small numbers of districts, however, such as Delaware or Nevada, may have an inappropriately small number of districts for these fixed-effects models. Second, it is possible that larger districts can "spread out" the effects of charter proliferation on fiscal measures in their aggregated reporting of those measures. Depending on how the district's schools and finances are structured, a large district may find charter proliferation only affects the finances of schools in certain areas of the district, and not others. Again, Cordes (2017) found that per pupil spending within a single school district varied with proximity to a charter school. When aggregated, however, the total effect may not appear to be significant, as only those schools within a large district that are proximate to a charter may experience the effects of charter proliferation. In addition, if a state has a small number of districts, it may also not have significant variation between those districts in charter proliferation so that an effect could be detected. Further study may reveal that within states such as Florida, Maryland, and Nevada, the district is not the appropriate unit of study for this research.

Conclusions and Recommendations

The largest limitation on this study is the ambiguity of the federal data employed in the models. There is little reason for the U.S. government to invest in the collection and dissemination of fiscal data on public schools if that data is not consistent, precise, and clear. Yet it appears that there is no consistent reporting on charter school finances that would allow for between-state comparisons. For that reason, the most obvious conclusion of this paper is the most important: the U.S. Department of Education should immediately begin developing guidelines for the uniform reporting of fiscal information regarding charter schools. Charters are already enrolling a significant number of American students, and there is no evidence their growth will slow, let alone reverse, any time soon. If this nation is to make sound K-12 school policy, it should make sure the data on which it bases its policy is worthy of the task.

Despite the problems with the data, however, this paper presents more than enough evidence to conclude that charter school proliferation can have an impact on public school district finances. That impact appears to be highly reliant on state context: further empirical work is needed to ascertain exactly why and how states vary in how their school districts' finances respond to charter proliferation. Arsen and Ni's, Bruno's, and Cook's work suggests that further studies using panel datasets built from state-level data are likely the most fruitful avenues for further research; my initial work here using Minnesota and New Jersey data is a first step.

Yet despite the conflicting results from some research based on state-level data, the evidence presented here suggests a unifying trend: in most cases where district spending is affected by charter school growth, the trend is toward greater spending per pupil. This will surprise many charter school critics: the typical argument against charter schools is that they remove money from public school districts, leading to less spending per pupil (Burris, 2017). In general, the models presented here do not support this argument. It would be a mistake, however, for charter supporters to use the evidence here to support a claim that charter proliferation helps public district schools. If the rise in overall per pupil spending is due to fixed costs being spread around to fewer students – and the estimates of the models from Minnesota and New Jersey provide evidence that supports this case – then the extra spending does not necessarily translate into more resources for students in public district schools. More likely, the extra spending is due to the imposition of redundant systems of school administration and support created by charter expansion. Future study of this issue should include the use of models that incorporate student outcomes so as to determine whether the extra spending created by charter expansion leads to improved academic achievement for both district and charter students, or is simply an expansion of inefficiency within the overall system of schooling. Of course, charter school supporters may still contend that even if charter expansion raises spending, it is worth it just because it offers families a choice in schooling. No matter what one thinks about the inherent value of "choice," however, this paper presents evidence that choice does come at a price. Policymakers should be well aware of this price before instituting laws and regulations that further charter expansion.

Tables

Table 1-1

Charter Share of Large U.S. School Districts (Local Education Agency, LEA) (>40,000), 2015.

LEA	State	Total District & Charter Students	Pct. Charter Share
Orleans Parish	LA	48,007	93.1%
Detroit	MI	85,222	44.5%
District Of Columbia	DC	80,742	42.8%
Columbus	OH	82,441	38.9%
Cleveland	OH	59,975	34.4%
Philadelphia	PA	198,687	32.4%
Indianapolis	IN	45,502	30.1%
Newark	NJ	48,257	27.8%
St. Paul	MN	51,758	26.6%
Oakland	CA	50,394	26.4%
St. Louis	MO	40,646	24.1%
San Antonio	TX	60,486	24.1%
Los Angeles	CA	656,778	23.2%
Clayton	GA	67,205	22.6%
Gilbert	AZ	47,199	21.4%
Minneapolis	MN	46,877	21.1%
Milwaukee	WI	85,709	20.2%
Oklahoma	OK	51,373	20.0%
Tucson	AZ	60,121	19.4%
Houston	TX	249,692	19.4%
Stockton	CA	42,647	18.7%
San Juan	CA	49,114	18.3%
Douglas Co, No. RE-1	CO	67,027	18.1%
Adams 12 Five Star	CO	43,597	18.1%
Deer Valley	AZ	41,050	17.7%
Alief	TX	57,182	17.5%
San Diego	CA	132,750	17.1%
Boston	MA	65,467	17.0%
Denver	CO	89,327	17.0%
Sacramento	CA	49,397	16.9%
Mesa	AZ	76,305	16.3%
Atlanta	GA	53,746	16.0%

LEA	State	Total District & Charter Students	Pct. Charter Share
East Baton Rouge Parish	LA	46,131	15.8%
Broward	FL	266,944	15.6%
Dallas	TX	189,186	15.6%
Dade	FL	356,964	15.6%
Baltimore	MD	84,976	14.9%
Buffalo	NY	41,348	14.8%
Sarasota	FL	41,912	14.7%
Chicago	IL	393,480	14.6%
Jordan	UT	60,628	13.8%
Lee	FL	89,364	13.6%
Albuquerque	NM	101,577	13.6%
Lewisville	TX	61,597	13.4%
Osceola	FL	59,320	13.3%
Shelby	TN	120,586	12.8%
Lake	FL	42,152	12.6%
Manatee	FL	47,883	12.5%
Polk	FL	99,723	12.3%
Peoria	AZ	41,755	12.2%
Joint No. 2	ID	41,380	12.0%
Chandler #80	AZ	47,524	11.1%
Austin	TX	94,147	11.0%
Davis	UT	79,305	10.7%
Jefferson No. R-1	CO	87,594	10.4%
Palm Beach	FL	186,605	10.3%
Aurora	CO	42,620	10.3%
St. Lucie	FL	41,462	10.2%
Alpine	UT	83,441	9.9%
Charleston 01	SC	47,719	9.4%
Brownsville	TX	53,293	9.3%
San Francisco	CA	58,707	9.0%
Duval	FL	129,290	9.0%
Capistrano	CA	54,721	8.9%
Arlington	TX	70,053	8.8%
Granite	UT	76,581	8.6%
Washoe	NV	68,602	8.0%
Dekalb	GA	101,846	7.9%
New York City	NY	1,079,502	7.8%
Santa Ana	CA	56,975	7.6%
San Bernardino	CA	54,373	7.6%
Hillsborough	FL	207,469	7.4%

LEA	State	Total District & Charter Students	Pct. Charter Share
Charlotte-Mecklenburg	NC	156,541	7.0%
Davidson	TN	84,342	7.0%
Fulton	GA	95,754	6.6%
Clark	NV	340,174	6.5%
Fresno	CA	75,395	6.3%
Richardson	TX	41,205	6.3%
North East	TX	72,394	6.1%
Guilford	NC	78,125	6.0%
Orange	FL	191,648	6.0%
Pinellas	FL	103,774	6.0%
Brevard	FL	72,285	5.9%
Garland	TX	60,984	5.8%
Round Rock	TX	50,166	5.8%
Wake	NC	165,289	5.7%
Hawaii	HI	182,384	5.7%
Tulsa	OK	42,422	5.7%
Greenville 01	SC	76,961	5.7%
Anchorage	AK	48,089	5.4%
Jefferson Parish	LA	48,350	5.3%
Fort Worth	TX	90,531	5.0%
Cobb	GA	111,751	4.9%
Corpus Christi	TX	40,321	4.8%
Winston Salem/Forsyth	NC	57,451	4.7%
Portland 1J	OR	48,208	4.5%
Pasco	FL	69,295	4.5%
El Paso	TX	63,508	4.2%
Collier	FL	45,228	4.2%
Prince George's	MD	127,576	3.4%
Aldine	TX	72,153	3.4%
Northside	TX	107,193	3.3%
Gwinnett	GA	177,411	3.3%
Union	NC	43,062	3.3%
Escambia	FL	40,735	3.2%
Ysleta	TX	43,906	3.2%
Volusia	FL	61,777	3.2%
Pasadena	TX	57,261	2.9%
United	TX	44,703	2.9%
Clear Creek	TX	41,305	2.7%
Katy	TX	72,162	2.5%
Elk Grove	CA	63,786	2.5%

LEA	State	Total District & Charter Students	Pct. Charter Share
Clovis	CA	41,845	2.4%
Fort Bend	TX	73,866	2.3%
Riverside	CA	42,978	2.2%
Cherokee	GA	41,583	2.2%
Cypress-Fairbanks	TX	115,505	2.1%
Plano	TX	55,819	2.0%
Frederick	MD	40,782	2.0%
Horry 01	SC	42,364	2.0%
Hamilton	TN	43,797	1.9%
Salem-Keizer 24J	OR	40,948	1.7%
Henry	GA	41,277	1.7%
Cherry Creek, No. 5	CO	54,880	1.7%
Cumberland	NC	52,475	1.7%
Caddo Parish	LA	41,337	1.6%
Seminole	FL	66,134	1.5%
Humble	TX	40,122	1.5%
Anne Arundel	MD	79,518	1.4%
Sweetwater Union High	CA	41,018	1.4%
Mesquite	TX	40,801	1.3%
Marion	FL	42,517	1.1%
Frisco	TX	50,164	1.0%
Conroe	TX	56,911	1.0%
Killeen	TX	42,998	0.8%
Long Beach	CA	79,792	0.8%
Socorro	TX	44,900	0.8%
Garden Grove	CA	46,446	0.6%
Virginia Beach	VA	70,121	0.3%
Klein	TX	49,503	0.2%
Loudoun Co	VA	73,418	0.2%
Fairfax Co	VA	185,541	0.0%
Montgomery	MD	154,434	0.0%
Baltimore	MD	109,830	0.0%
Jefferson	KY	100,602	0.0%
Prince William Co	VA	86,641	0.0%
Knox	TN	59,733	0.0%
Chesterfield Co	VA	59,725	0.0%
Mobile	AL	57,910	0.0%
Corona-Norco	CA	53,739	0.0%
Howard	MD	53,685	0.0%
Seattle	WA	52,834	0.0%

LEA	State	Total District & Charter Students	Pct. Charter Share
Omaha	NE	51,928	0.0%
Henrico Co	VA	50,971	0.0%
Wichita	KS	50,947	0.0%
Forsyth	GA	42,435	0.0%
Rutherford	TN	41,893	0.0%
Fayette	KY	40,590	0.0%
U-46	IL	40,400	0.0%

Table 1-2

100 U.S. School Districts (Local Education Agency, LEA) with the Largest Charter Proliferation Rates, 2015.

LEA	State	Total District & Charter Students	Pct. Charter Share
Julian Union High	CA	157	463.7%
East Nicolaus Joint Union High	CA	301	172.1%
Muskegon Heights	MI	883	100.0%
Wiseburn Elementary	CA	308	100.0%
Douglas County SD 15	OR	165	100.0%
Ready Springs Union Elementary	CA	13	100.0%
Joseph SD 6	OR	229	98.7%
Midland Borough SD	PA	10,312	97.2%
Dunham Elementary	CA	201	95.5%
Gravenstein Union Elementary	CA	704	94.9%
Orleans Parish	LA	48,007	93.1%
Mattole Unified	CA	780	92.7%
Cinnabar Elementary	CA	257	91.8%
Campbell Union	CA	7,642	91.0%
Scio SD 95	OR	4,330	83.3%
Old Adobe Union	CA	1,886	82.0%
Gratton Elementary	CA	137	80.3%
Cambrian	CA	3,378	80.2%
Union Hill Elementary	CA	634	79.2%
Fort Sage Unified	CA	643	79.2%
Whitepine Jt	ID	941	77.3%
Oak Grove Union Elementary	CA	975	76.8%
Wainscott Common	NY	88	76.1%
Buckeye Union High	AZ	4,356	75.3%
Forestville Union Elementary	CA	354	74.3%
Mark West Union Elementary	CA	1,537	74.2%
Harney County Union High SD 1J	OR	54	74.1%
Anthony Wayne Local	OH	15,586	72.4%
Piner-Olivet Union Elementary	CA	1,419	72.0%
Warren	AR	1,655	71.8%
Radnor Township SD	PA	12,948	71.7%
Marcum-Illinois Union Elementary	CA	2,283	69.8%
Liberty Elementary	AZ	3,955	69.2%
Sausalito Marin City	CA	521	68.5%

LEA	State	Total District & Charter Students	Pct. Charter Share
Maricopa Unified	AZ	8,864	68.5%
Mother Lode Union Elementary	CA	3,449	68.5%
Rincon Valley Union Elementary	CA	3,632	64.2%
Shiloh Elementary	CA	141	63.8%
Harper Woods	MI	4,986	63.8%
Paradise Elementary	CA	196	61.7%
Toltec	AZ	1,185	61.4%
Mohave Valley Elementary	AZ	1,851	61.1%
Frenchglen SD 16	OR	129	58.9%
North Bend SD 13	OR	4,231	58.0%
Manistee Area	MI	3,580	57.9%
Northwood	WI	357	56.9%
Banta Elementary	CA	795	56.5%
Sebastopol Union Elementary	CA	1,168	56.3%
Waterford Unified	CA	3,954	54.9%
Alba	MI	308	54.9%
Humboldt Unified	AZ	7,476	54.8%
Coolidge Unified	AZ	7,798	54.6%
Boyne Falls	MI	331	54.4%
Wickenburg Unified	AZ	1,177	53.6%
Castaic Union	CA	3,544	53.3%
Julian Union Elementary	CA	4,142	53.2%
Chester-Upland SD	PA	7,110	53.0%
Blochman Union Elementary	CA	1,063	52.6%
Milroy	MN	95	51.6%
San Carlos Elementary	CA	3,457	51.3%
Nevada City Elementary	CA	1,632	49.5%
Atherton Community	MI	1,772	49.3%
Arcata Elementary	CA	1,059	49.3%
Sunol Glen Unified	CA	541	48.6%
Cave Creek Unified	AZ	5,889	48.1%
Westwood Unified	CA	382	47.9%
San Lorenzo Valley Unified	CA	4,613	47.6%
Moffat, No. 2	CO	196	47.4%
Colorado City Unified	AZ	1,106	47.4%
Surry	NH	206	47.1%
Queen Creek Unified	AZ	9,971	46.6%
Mount Clemens Community	MI	2,071	46.5%
College Elementary	CA	408	45.8%
Frelinghuysen Township	NJ	274	45.6%
Simi Valley Unified	CA	32,681	45.5%

LEA	State	Total District & Charter Students	Pct. Charter Share
Hamtramck	MI	5,126	45.4%
Auburn Union Elementary	CA	2,292	45.2%
Central Dauphin SD	PA	19,975	44.6%
Mcfarland	WI	4,304	44.6%
Detroit City	MI	85,222	44.5%
Phoenix Elementary	AZ	12,843	44.0%
Pontiac City	MI	7,694	43.8%
Reedsport SD 105	OR	631	42.9%
Junction Elementary	CA	431	42.9%
District Of Columbia	DC	80,742	42.8%
Westwood Heights	MI	2,305	42.6%
Northern Ozaukee	WI	1,220	42.5%
Grass Valley Elementary	CA	2,123	42.4%
Curtis Creek Elementary	CA	773	41.9%
Southfield	MI	11,859	41.7%
Ypsilanti Community	MI	7,118	41.7%
Oro Grande Elementary	CA	3,857	41.3%
Lincoln	AR	1,253	41.3%
Victor Valley Union High	CA	15,575	41.1%
Calhoun County	GA	1,169	40.5%
Columbia Elementary	CA	1,366	40.0%
Kansas City 33	MO	25,583	39.9%
Greene County	GA	2,348	39.7%
Grantsburg	WI	1,402	39.4%
Union Parish	LA	2,993	39.2%

Table 1-3

Description of F33 Enrollment Count.

State	F33 Description	rho	Independent Charter LEAs
AK	District & District Charters	1.0000	0
AZ	District & District Charters	0.9981	573
AR	District & District Charters	1.0000	31
CA	District & District Charters	0.9998	46
CO	District & District Charters	0.9999	1
CT	District & District Charters	0.9999	33
DE	District & District Charters	0.9996	35
DC	District & District Charters	1.0000	93
FL	District & ALL Charters	1.0000	2
GA	District & District Charters	1.0000	26
HI	District & ALL Charters	1.0000	0
ID	District & District Charters	0.9999	42
IL	District & ALL Charters	1.0000	5
IN	District & District Charters	0.9996	101
IA	District & ALL Charters	1.0000	0
KS	District & ALL Charters	1.0000	1
LA	District & District Charters	0.9999	81
ME	District & District Charters	1.0000	7
MD	District & ALL Charters	1.0000	0
MA	District & District Charters	1.0000	99
MI	District & District Charters	0.9996	404
MN	District & District Charters	0.9999	239
MS	District & District Charters	1.0000	0
MO	District & District Charters	0.9972	52
NV	District & District Charters	1.0000	2
NH	District & ALL Charters	0.9997	26
NJ	District & District Charters	0.9967	129
NM	District & District Charters	1.0000	60
NY	District & District Charters	1.0000	277
NC	District & District Charters	0.9999	206
OH	District & District Charters	0.9998	840
OK	District & District Charters	1.0000	27
OR	District & ALL Charters	0.9998	17
PA	District & District Charters	0.9998	204
RI	District & District Charters	0.9999	19
SC	District & District Charters	1.0000	1
TN	District & District Charters	1.0000	1

State	F33 Description	rho	Independent Charter LEAs
TX	District & District Charters	1.0000	297
UT	District & District Charters	1.0000	118
VA	District & ALL Charters	1.0000	0
WI	District & District Charters	1.0000	36
WY	District & ALL Charters	1.0000	0

Table 1-4

Descriptive Statistics by State, Model Independent Variables, 2015.

State	N	Pct. Charters, All Types, All Districts		Pct. Charters, All Types, Districts w/Charters		Pct. Grade 9-12		Pct. Age 5-17 Poverty		Density, Pop. per Sq. Mile		Enrollment	
		Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
AL	132	-	-	-	-	30.0%	2.6%	28.8%	9.8%	146	165	5,551	7,595
AK	53	1.1%	2.9%	7.1%	3.9%	28.4%	6.3%	21.2%	11.3%	11	40	2,467	7,188
AZ	206	9.4%	15.6%	20.8%	17.4%	21.9%	27.0%	26.0%	11.2%	134	172	5,314	10,433
AR	233	1.9%	7.7%	16.6%	17.1%	29.7%	2.4%	25.8%	8.3%	74	81	2,100	3,415
CA	926	6.7%	21.5%	20.0%	33.6%	20.5%	27.2%	20.5%	10.8%	657	1,073	6,672	23,864
CO	178	3.2%	7.0%	12.4%	8.9%	28.6%	5.8%	18.4%	9.5%	117	336	5,019	13,128
CT	166	0.4%	1.9%	6.2%	3.6%	24.5%	18.9%	9.2%	7.1%	819	530	3,093	3,995
DE	16	5.9%	6.5%	10.5%	5.0%	26.8%	6.0%	18.3%	4.8%	556	493	7,917	5,640
DC	1	42.8%	-	42.8%	-	24.6%	-	28.8%	-	9,857	-	80,742	-
FL	67	5.6%	6.9%	8.1%	6.9%	28.3%	3.1%	25.0%	6.9%	338	523	41,016	66,370
GA	180	1.8%	6.7%	12.1%	13.4%	27.9%	3.8%	29.8%	9.7%	234	454	9,688	20,248
HI	1	5.7%	-	5.7%	-	27.9%	-	13.1%	-	1,587	-	182,384	-
ID	115	2.3%	8.0%	10.9%	14.8%	27.9%	7.5%	18.1%	5.7%	54	96	2,528	5,361
IL	846	0.1%	0.8%	5.0%	4.5%	24.7%	30.7%	15.8%	8.3%	1,287	2,009	2,417	13,852
IN	289	0.9%	3.8%	7.5%	8.9%	30.8%	2.8%	16.3%	7.3%	305	462	3,604	4,857
IA	336	0.0%	0.2%	2.3%	0.2%	28.2%	9.1%	12.7%	5.3%	79	132	1,503	2,901
KS	286	0.4%	2.4%	9.1%	8.8%	28.9%	5.3%	14.7%	5.9%	88	219	1,737	4,483
KY	173	-	-	-	-	27.7%	5.3%	28.6%	10.6%	166	282	3,980	8,521
LA	68	5.3%	13.3%	15.6%	19.3%	27.5%	2.6%	28.9%	8.8%	180	353	10,407	12,229
ME	176	0.1%	0.8%	4.4%	1.7%	19.9%	19.5%	17.0%	7.2%	89	101	961	1,132
MD	24	1.0%	3.1%	4.8%	5.7%	29.2%	2.0%	15.0%	8.0%	806	1,567	36,421	43,253
MA	235	1.7%	5.4%	12.4%	8.7%	20.5%	12.7%	10.1%	7.3%	1,226	1,597	3,471	5,502
MI	541	3.8%	9.7%	16.5%	13.9%	32.2%	8.9%	18.6%	9.0%	486	766	2,745	4,876
MN	330	1.6%	5.1%	9.4%	9.0%	30.1%	5.8%	12.4%	5.9%	235	590	2,589	5,393
MS	140	-	-	-	-	27.1%	2.7%	33.4%	10.3%	80	77	3,434	4,280

State	N	Pct. Charters, All Types, All Districts		Pct. Charters, All Types, Districts w/Charters		Pct. Grade 9-12		Pct. Age 5-17 Poverty		Density, Pop. per Sq. Mile		Enrollment	
		Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
MO	516	0.1%	2.0%	32.0%	11.1%	26.2%	11.0%	21.5%	9.0%	192	475	1,769	3,748
MT	405	-	-	-	-	29.9%	42.4%	18.0%	11.4%	12	15	356	928
NE	243	-	-	-	-	30.2%	3.8%	13.3%	5.4%	83	275	1,283	4,577
NV	17	2.7%	4.0%	6.6%	3.5%	29.2%	8.4%	17.3%	5.6%	48	105	27,012	82,292
NH	160	0.5%	2.0%	5.6%	4.4%	17.8%	22.6%	10.2%	6.9%	224	170	1,150	1,779
NJ	542	0.5%	3.1%	9.2%	9.5%	19.9%	26.1%	11.1%	8.4%	2,087	2,391	2,583	4,088
NM	89	2.6%	6.2%	9.6%	8.8%	29.7%	5.4%	28.4%	12.8%	23	63	3,820	11,401
NY	677	0.4%	3.6%	13.9%	17.3%	29.9%	8.6%	15.1%	8.3%	933	1,657	4,035	41,524
NC	115	3.9%	6.4%	7.4%	7.2%	30.2%	2.0%	25.5%	6.9%	201	248	13,350	23,301
ND	173	-	-	-	-	25.6%	13.8%	11.9%	7.2%	14	20	608	1,653
OH	609	1.5%	5.7%	10.6%	11.9%	29.6%	4.3%	16.1%	8.4%	555	740	2,828	5,213
OK	515	0.1%	1.8%	15.1%	12.1%	23.4%	11.9%	20.8%	7.5%	106	234	1,335	3,849
OR	177	5.2%	15.5%	16.2%	24.0%	30.1%	11.5%	20.6%	8.2%	163	367	3,162	6,413
PA	499	1.7%	7.6%	16.4%	17.8%	30.9%	3.7%	15.8%	8.2%	589	826	3,451	9,272
RI	32	2.5%	5.7%	10.2%	7.4%	26.1%	10.3%	14.2%	9.2%	1,165	471	4,076	4,772
SC	81	1.8%	4.1%	5.7%	5.4%	28.2%	1.9%	27.9%	8.5%	181	142	9,314	12,221
SD	149	-	-	-	-	28.6%	6.2%	15.7%	10.0%	24	45	890	2,337
TN	140	0.2%	1.2%	7.2%	5.4%	26.8%	10.5%	24.9%	7.7%	187	282	7,089	14,359
TX	1023	1.0%	3.4%	6.6%	6.4%	27.3%	7.1%	21.6%	9.4%	256	540	5,116	15,174
UT	41	5.5%	6.7%	10.2%	5.8%	29.2%	1.9%	13.7%	5.7%	244	468	15,496	22,558
VT	15	-	-	-	-	29.0%	23.5%	13.0%	7.5%	168	121	1,426	929
VA	130	0.0%	0.3%	1.1%	1.3%	29.8%	3.7%	19.1%	8.5%	887	1,582	9,739	20,929
WA	295	-	-	-	-	27.1%	12.7%	17.7%	7.6%	180	258	3,635	6,455
WV	55	-	-	-	-	28.9%	1.7%	24.0%	6.1%	97	102	5,083	4,967
WI	422	2.0%	6.1%	8.5%	10.3%	29.2%	15.2%	12.7%	6.6%	335	784	2,062	5,004
WY	48	0.4%	2.0%	6.5%	5.6%	29.1%	4.7%	11.0%	4.5%	6	7	1,956	2,927

Table 1-5

Descriptive statistics by state, school district total expenditure and current spending, 2015.

State	N	Total Elementary-Secondary Expenditure per pupil		Log Total Elem-Sec Expenditure per pupil		Total Current Spending (Elem-Sec) per pupil		Log Total Current Spending (Elem-Sec) per pupil	
		Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
AL	131	14,623	1,749	9.583	0.118	13,183	1,426	9.481	0.105
AK	53	43,325	19,029	10.584	0.447	38,408	13,847	10.483	0.407
AZ	206	16,681	12,062	9.602	0.451	15,263	11,055	9.509	0.459
AR	231	16,620	3,434	9.700	0.186	14,790	2,531	9.588	0.162
CA	911	16,463	10,316	9.602	0.448	14,299	7,511	9.469	0.444
CO	178	24,648	30,480	9.882	0.533	16,963	8,154	9.673	0.333
CT	166	27,345	7,613	10.184	0.245	24,098	6,362	10.062	0.224
DE	16	20,920	5,403	9.919	0.250	17,645	3,023	9.765	0.170
DC	1	28,307	-	10.251	-	18,620	-	9.832	-
FL	67	15,024	3,257	9.598	0.192	13,433	2,223	9.492	0.163
GA	180	15,032	3,052	9.599	0.190	13,686	2,563	9.508	0.180
HI	1	18,004	-	9.798	-	16,744	-	9.726	-
ID	113	15,428	7,877	9.557	0.389	14,580	7,616	9.498	0.392
IL	831	18,655	6,210	9.797	0.253	16,072	4,096	9.657	0.228
IN	287	15,895	2,440	9.663	0.143	13,607	2,132	9.507	0.147
IA	336	19,666	4,521	9.866	0.195	15,661	2,434	9.647	0.152
KS	277	20,357	5,518	9.892	0.232	17,573	3,613	9.753	0.210
KY	173	15,925	2,838	9.661	0.172	13,936	2,191	9.530	0.155
LA	68	17,951	4,585	9.771	0.211	16,182	2,769	9.678	0.164
ME	145	24,906	8,951	10.073	0.301	21,606	8,953	9.904	0.393
MD	24	18,575	3,517	9.814	0.176	16,831	3,132	9.715	0.177
MA	235	23,886	16,291	10.008	0.318	19,565	8,822	9.832	0.277
MI	541	17,592	8,950	9.720	0.281	15,393	7,568	9.591	0.266
MN	321	20,378	7,008	9.886	0.247	15,990	3,437	9.659	0.200
MS	137	14,107	2,218	9.543	0.152	12,940	2,087	9.456	0.155
MO	516	17,647	4,418	9.751	0.225	15,146	3,671	9.600	0.223
MT	399	28,944	19,291	10.136	0.481	26,052	16,741	10.041	0.464
NE	234	26,657	8,768	10.145	0.296	22,825	6,255	10.001	0.263
NV	17	22,514	10,911	9.929	0.427	18,696	8,517	9.760	0.381
NH	158	25,232	6,305	10.107	0.236	20,855	6,197	9.901	0.303
NJ	541	23,520	7,150	10.034	0.236	19,492	4,733	9.857	0.191
NM	89	27,453	21,476	10.093	0.442	22,319	10,648	9.923	0.409
NY	675	31,238	14,607	10.298	0.279	27,739	11,965	10.189	0.251
NC	115	14,074	2,783	9.535	0.180	13,127	2,591	9.465	0.181

State	N	Total Elementary-Secondary Expenditure per pupil		Log Total Elem-Sec Expenditure per pupil		Total Current Spending (Elem-Sec) per pupil		Log Total Current Spending (Elem-Sec) per pupil	
		Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
ND	165	27,489	10,106	10.165	0.328	22,313	7,787	9.962	0.313
OH	609	17,874	29,825	9.702	0.265	15,145	25,489	9.546	0.230
OK	514	15,240	5,201	9.590	0.269	13,843	4,137	9.500	0.254
OR	177	22,262	17,717	9.890	0.413	19,806	16,486	9.755	0.451
PA	498	22,066	4,503	9.985	0.178	17,969	2,949	9.784	0.153
RI	32	21,923	6,745	9.964	0.235	19,134	5,682	9.831	0.220
SC	79	15,857	3,310	9.640	0.295	13,912	2,628	9.511	0.302
SD	144	20,667	8,581	9.879	0.313	17,089	6,626	9.702	0.273
TN	133	13,435	1,749	9.497	0.129	12,316	1,583	9.411	0.127
TX	1023	21,518	25,287	9.787	0.491	14,555	5,291	9.536	0.302
UT	40	13,730	4,721	9.476	0.317	11,378	3,727	9.293	0.300
VT	15	32,247	9,418	10.349	0.251	27,824	9,908	10.179	0.342
VA	130	15,244	2,977	9.615	0.180	13,623	2,407	9.505	0.165
WA	295	22,038	16,611	9.859	0.464	17,366	8,644	9.682	0.367
WV	55	18,171	3,932	9.788	0.191	16,304	2,001	9.692	0.124
WI	418	19,396	5,374	9.844	0.229	16,183	4,071	9.670	0.195
WY	48	33,663	12,517	10.370	0.317	26,151	8,506	10.131	0.271

Table 1-6

Descriptive Statistics by State, School District Spending Categories, 2015.

		Instructional Spending per pupil		Log Instructional Spending per pupil		Support Services Spending per pupil		Log Support Services Spending per pupil		Administration (General and School) Spending per pupil		Log Administration Spending per pupil	
State	N	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
AL	131	7,453	791	8.911	0.102	4,749	876	8.450	0.173	1,293	278	7.142	0.210
AK	53	19,888	6,192	9.839	0.374	16,993	8,142	9.627	0.489	3,923	2,358	8.123	0.563
AZ	206	7,700	4,544	8.847	0.428	6,753	6,285	8.640	0.536	1,366	1,793	6.929	0.673
AR	231	8,285	1,277	9.011	0.146	5,589	1,284	8.605	0.213	1,196	313	7.057	0.237
CA	911	8,349	3,702	8.949	0.420	5,332	3,712	8.436	0.510	1,605	1,463	7.140	0.636
CO	178	9,272	3,338	9.084	0.304	6,921	4,754	8.746	0.388	2,154	2,386	7.476	0.546
CT	166	14,601	3,800	9.562	0.221	8,758	2,845	9.035	0.282	2,201	921	7.629	0.355
DE	16	11,087	1,941	9.300	0.167	5,699	1,187	8.628	0.204	1,322	188	7.177	0.150
DC	1	9,984	-	9.209	-	7,901	-	8.975	-	3,424	-	8.139	-
FL	67	7,758	1,058	8.947	0.135	4,938	1,258	8.476	0.239	1,025	386	6.874	0.332
GA	180	8,154	1,326	8.994	0.159	4,608	1,326	8.401	0.258	1,164	474	7.000	0.330
HI	1	9,839	-	9.194	-	5,969	-	8.694	-	1,226	-	7.111	-
ID	113	8,550	4,611	8.963	0.392	5,347	3,212	8.467	0.454	1,457	1,165	7.129	0.525
IL	831	9,389	2,404	9.119	0.235	6,121	2,095	8.674	0.289	1,957	869	7.505	0.369
IN	287	7,674	1,235	8.934	0.154	5,240	1,091	8.545	0.190	1,301	376	7.130	0.287
IA	336	10,083	1,673	9.205	0.164	4,834	836	8.469	0.165	1,407	361	7.218	0.246
KS	277	11,013	2,336	9.284	0.215	5,636	1,282	8.611	0.232	1,872	767	7.458	0.391
KY	173	8,033	1,302	8.978	0.163	4,974	955	8.495	0.183	1,351	439	7.166	0.284
LA	68	8,950	1,402	9.088	0.151	6,246	1,440	8.716	0.216	1,435	422	7.230	0.276
ME	145	12,185	5,511	9.296	0.513	8,594	4,172	8.982	0.372	2,475	1,555	7.697	0.449

		Instructional Spending per pupil		Log Instructional Spending per pupil		Support Services Spending per pupil		Log Support Services Spending per pupil		Administration (General and School) Spending per pupil		Log Administration Spending per pupil	
State	N	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
MD	24	10,334	1,954	9.227	0.178	5,950	1,174	8.674	0.186	1,320	438	7.140	0.298
MA	235	12,018	4,845	9.351	0.264	7,044	4,024	8.793	0.316	1,287	1,123	7.034	0.424
MI	541	9,518	4,037	9.119	0.247	5,197	3,577	8.470	0.345	1,406	1,202	7.132	0.398
MN	321	10,109	2,041	9.203	0.190	5,072	1,465	8.496	0.260	1,233	473	7.058	0.333
MS	137	7,230	1,052	8.876	0.144	4,838	1,201	8.456	0.233	1,290	365	7.128	0.254
MO	516	8,907	2,207	9.067	0.230	5,418	1,513	8.564	0.255	1,862	777	7.453	0.385
MT	399	15,356	9,456	9.521	0.450	9,687	7,910	8.983	0.584	2,542	2,702	7.598	0.780
NE	234	14,906	4,007	9.576	0.257	6,915	2,296	8.791	0.314	2,222	958	7.622	0.412
NV	17	9,866	3,677	9.143	0.323	8,281	4,800	8.903	0.473	2,394	1,895	7.531	0.702
NH	158	12,438	3,846	9.378	0.330	7,898	2,796	8.920	0.324	2,519	1,460	7.720	0.447
NJ	541	11,580	2,679	9.339	0.179	7,381	2,109	8.876	0.237	1,434	358	7.242	0.223
NM	89	11,227	4,956	9.251	0.370	10,135	5,695	9.099	0.486	2,260	1,451	7.554	0.571
NY	675	17,723	7,794	9.747	0.232	9,470	5,054	9.093	0.310	2,193	1,648	7.589	0.389
NC	115	7,893	1,217	8.963	0.147	4,465	1,332	8.368	0.257	1,080	402	6.932	0.310
ND	165	11,974	3,467	9.352	0.276	8,550	4,758	8.946	0.450	2,575	1,834	7.695	0.592
OH	609	8,540	4,541	9.021	0.201	6,063	21,192	8.539	0.288	1,528	7,099	7.097	0.327
OK	514	7,580	1,971	8.905	0.227	5,139	2,039	8.487	0.322	1,439	691	7.187	0.392
OR	177	10,778	7,730	9.174	0.423	8,363	9,129	8.817	0.544	1,844	1,514	7.346	0.558
PA	498	11,025	1,809	9.296	0.152	6,239	1,293	8.719	0.193	1,347	380	7.172	0.252
RI	32	11,285	3,412	9.303	0.218	7,408	2,367	8.874	0.258	1,279	618	7.091	0.319
SC	79	7,400	1,213	8.884	0.281	5,668	1,468	8.600	0.339	1,067	279	6.934	0.307
SD	144	9,813	3,459	9.151	0.266	6,433	3,309	8.704	0.324	1,718	1,433	7.333	0.409
TN	133	7,654	941	8.936	0.121	3,918	708	8.258	0.175	998	215	6.884	0.213
TX	1023	8,781	2,986	9.035	0.289	4,968	2,336	8.437	0.356	1,594	1,167	7.210	0.537

		Instructional Spending per pupil		Log Instructional Spending per pupil		Support Services Spending per pupil		Log Support Services Spending per pupil		Administration (General and School) Spending per pupil		Log Administration Spending per pupil	
State	N	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
UT	40	6,923	1,975	8.807	0.265	3,794	1,687	8.158	0.402	1,028	623	6.803	0.489
VT	15	16,977	5,783	9.687	0.336	9,982	4,339	9.137	0.384	2,380	1,217	7.684	0.418
VA	130	8,178	1,339	8.997	0.155	4,872	1,118	8.468	0.211	1,136	400	6.990	0.286
WA	295	9,600	4,459	9.100	0.341	6,889	4,095	8.730	0.422	1,556	1,096	7.188	0.528
WV	55	9,258	1,125	9.126	0.125	6,012	991	8.689	0.158	1,273	317	7.120	0.242
WI	418	9,277	1,904	9.119	0.176	6,259	2,263	8.704	0.253	1,497	610	7.252	0.327
WY	48	14,942	4,342	9.579	0.249	10,323	4,030	9.184	0.328	2,368	1,417	7.653	0.452

Table 1-7

Descriptive Statistics by State, School District Revenues, 2015.

State	Total Revenue per pupil		Log Total Revenue per pupil		State and Local Revenue per pupil		Log State and Local Revenue per pupil	
	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
AL	14,373	1,614	9.567	0.109	12,636	1,481	9.438	0.112
AK	43,018	18,311	10.584	0.427	39,657	17,397	10.501	0.430
AZ	16,710	11,199	9.608	0.437	14,902	10,889	9.479	0.462
AR	16,875	3,225	9.718	0.169	14,874	2,782	9.593	0.160
CA	16,249	8,535	9.603	0.421	14,929	7,709	9.520	0.416
CO	23,661	22,723	9.899	0.481	22,563	22,484	9.842	0.493
CT	28,085	7,650	10.212	0.240	27,352	7,513	10.185	0.243
DE	21,147	5,188	9.934	0.226	19,544	4,896	9.855	0.225
DC	28,751	-	10.266	-	26,784	-	10.196	-
FL	14,576	2,389	9.575	0.158	12,640	1,899	9.434	0.143
GA	15,311	2,943	9.619	0.183	13,512	2,424	9.497	0.170
HI	19,309	-	9.868	-	17,697	-	9.781	-
ID	16,555	8,330	9.630	0.382	14,749	7,684	9.509	0.394
IL	18,768	5,571	9.805	0.254	17,822	5,595	9.749	0.267
IN	17,377	2,500	9.754	0.131	16,285	2,066	9.691	0.120
IA	20,306	3,017	9.908	0.143	19,352	2,858	9.860	0.141
KS	20,138	3,784	9.894	0.183	19,099	3,644	9.840	0.184
KY	16,115	2,623	9.675	0.155	14,040	2,025	9.540	0.135
LA	18,038	4,879	9.774	0.215	15,318	3,602	9.616	0.192
ME	25,767	7,915	10.110	0.321	24,262	7,869	10.046	0.332

State	Total Revenue per pupil		Log Total Revenue per pupil		State and Local Revenue per pupil		Log State and Local Revenue per pupil	
	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
MD	18,889	3,334	9.833	0.165	17,613	2,943	9.765	0.154
MA	23,832	16,069	10.009	0.307	22,997	15,272	9.973	0.310
MI	18,021	9,476	9.741	0.283	16,821	8,766	9.674	0.279
MN	19,561	4,162	9.861	0.196	18,567	3,613	9.812	0.184
MS	14,176	2,368	9.546	0.159	11,845	1,903	9.368	0.152
MO	17,772	4,706	9.759	0.218	16,021	4,411	9.654	0.221
MT	30,025	20,464	10.169	0.487	28,190	19,579	10.099	0.499
NE	27,365	7,968	10.178	0.278	25,935	7,564	10.124	0.280
NV	21,711	14,996	9.860	0.452	20,335	14,834	9.784	0.470
NH	25,656	6,518	10.124	0.237	24,507	6,303	10.077	0.238
NJ	24,166	7,103	10.062	0.235	23,416	6,992	10.029	0.237
NM	25,570	12,495	10.063	0.395	23,075	11,990	9.952	0.410
NY	32,279	15,631	10.329	0.283	31,006	14,121	10.290	0.282
NC	13,567	2,694	9.498	0.183	11,810	2,352	9.360	0.179
ND	25,482	8,720	10.097	0.306	23,674	7,947	10.023	0.312
OH	19,798	36,291	9.802	0.252	18,566	35,202	9.735	0.252
OK	15,302	5,467	9.592	0.276	13,614	5,296	9.470	0.287
OR	23,770	23,549	9.922	0.447	21,665	20,907	9.832	0.444
PA	22,304	4,226	9.998	0.162	21,380	3,877	9.957	0.159
RI	22,296	6,925	9.981	0.233	21,033	6,900	9.919	0.244
SC	16,119	3,221	9.658	0.293	14,151	2,755	9.530	0.279
SD	20,808	8,956	9.892	0.289	18,894	6,754	9.806	0.262
TN	13,514	1,735	9.503	0.128	11,850	1,516	9.372	0.125
TX	21,620	23,771	9.809	0.467	20,129	23,744	9.720	0.483

State	Total Revenue per pupil		Log Total Revenue per pupil		State and Local Revenue per pupil		Log State and Local Revenue per pupil	
	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
UT	14,393	4,331	9.533	0.287	13,239	4,077	9.448	0.293
VT	32,805	9,514	10.368	0.242	31,118	9,306	10.313	0.249
VA	14,999	2,826	9.600	0.177	13,805	2,590	9.517	0.174
WA	20,105	9,372	9.833	0.362	18,645	8,898	9.756	0.364
WV	18,145	3,193	9.792	0.168	16,213	3,066	9.677	0.178
WI	19,370	4,689	9.851	0.192	18,219	4,319	9.791	0.184
WY	34,067	12,660	10.381	0.319	32,386	12,156	10.330	0.322

Table 1-8

Descriptive Statistics by State, School District State and Local Revenues, 2015.

State	State Revenue per pupil		Log State Revenue per pupil		Local Revenue per pupil		Log Local Revenue per pupil	
	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
AL	8,234	928	9.010	0.114	4,394	1,757	8.324	0.345
AK	30,148	13,021	10.229	0.413	6,258	9,096	8.013	1.300
AZ	4,835	2,328	8.330	0.631	9,152	11,197	8.726	0.867
AR	12,822	2,028	9.448	0.143	2,047	1,031	7.542	0.378
CA	8,085	4,928	8.824	0.636	6,758	6,284	8.513	0.777
CO	12,314	18,962	8.965	0.951	10,202	7,600	9.014	0.661
CT	9,540	5,268	9.013	0.560	17,812	7,368	9.702	0.435
DE	13,102	3,813	9.446	0.262	6,441	3,328	8.671	0.438
DC	-	-	-	-	25,707	-	10.155	-
FL	6,613	2,536	8.715	0.425	6,016	2,921	8.601	0.444
GA	7,422	1,692	8.887	0.224	6,059	2,345	8.644	0.358
HI	17,008	-	9.741	-	448	-	6.105	-
ID	10,986	6,404	9.211	0.385	3,650	3,124	7.981	0.642
IL	7,528	3,129	8.862	0.347	10,279	5,664	9.098	0.538
IN	11,081	1,351	9.306	0.121	5,201	1,449	8.522	0.262
IA	9,678	1,412	9.166	0.157	9,672	2,892	9.136	0.283
KS	13,751	2,373	9.513	0.182	5,304	2,447	8.473	0.464
KY	9,936	2,115	9.181	0.213	4,104	1,832	8.242	0.388
LA	7,815	2,090	8.924	0.298	7,490	4,588	8.791	0.487
ME	7,668	4,113	8.781	0.627	16,590	9,559	9.557	0.619
MD	8,781	3,168	9.022	0.343	8,810	3,982	9.001	0.408
MA	7,866	6,413	8.835	0.468	15,130	11,277	9.476	0.527
MI	9,348	2,627	9.075	0.440	7,433	9,734	8.592	0.690
MN	13,380	2,518	9.485	0.182	5,039	2,004	8.453	0.382

State	State Revenue per pupil		Log State Revenue per pupil		Local Revenue per pupil		Log Local Revenue per pupil	
	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
MS	7,341	1,000	8.892	0.133	4,500	1,821	8.335	0.393
MO	8,497	2,149	9.017	0.247	7,498	3,639	8.844	0.373
MT	14,309	11,531	9.412	0.496	12,069	9,820	9.183	0.640
NE	5,807	3,524	8.540	0.476	19,858	7,933	9.798	0.494
NV	11,232	4,175	9.257	0.402	8,963	14,218	8.617	0.826
NH	8,328	3,748	8.952	0.373	16,178	5,148	9.643	0.314
NJ	7,409	5,412	8.682	0.670	15,946	7,564	9.559	0.538
NM	18,400	9,871	9.708	0.458	4,234	4,022	8.120	0.628
NY	13,942	7,073	9.390	0.601	17,018	15,232	9.538	0.588
NC	8,791	2,054	9.059	0.207	2,994	1,145	7.944	0.337
ND	13,880	5,272	9.484	0.484	9,283	5,927	8.965	0.630
OH	8,537	8,813	8.947	0.395	10,029	27,128	9.032	0.416
OK	7,666	2,279	8.899	0.314	5,723	4,797	8.433	0.618
OR	14,409	17,277	9.329	0.593	7,245	6,055	8.710	0.576
PA	9,566	4,622	9.059	0.469	11,812	4,483	9.302	0.397
RI	6,349	3,388	8.647	0.459	14,644	8,296	9.385	0.848
SC	7,982	1,346	8.952	0.352	6,167	2,356	8.659	0.376
SD	5,318	2,222	8.463	0.555	12,120	7,240	9.272	0.532
TN	7,492	1,498	8.900	0.212	4,352	1,856	8.300	0.392
TX	7,226	4,023	8.708	0.648	12,850	24,292	8.985	0.825
UT	7,311	3,177	8.814	0.424	5,874	2,993	8.568	0.465
VT	27,219	4,265	10.201	0.147	3,899	5,451	7.600	1.188
VA	6,946	1,799	8.805	0.306	6,839	3,244	8.736	0.425
WA	13,434	7,655	9.403	0.413	4,870	3,024	8.307	0.661
WV	10,726	2,508	9.256	0.217	5,487	2,692	8.507	0.459
WI	8,885	2,632	9.039	0.348	9,246	4,596	9.048	0.387
WY	19,235	11,567	9.595	0.866	12,238	8,198	9.196	0.680

Table 1-9

Descriptive Statistics by State, School Pupil-Teacher Ratios, 2015.

State	Pupil-Teacher Ratio, LEA-level data		Pupil-Teacher Ratio, school-level data (rolled up)	
	Mean	St. Dev.	Mean	St. Dev.
AL	17.207	1.175	17.262	1.162
AK	15.467	10.511	15.566	10.578
AZ	17.905	4.857	17.144	4.571
AR	12.950	1.722	12.980	1.773
CA	21.715	4.422	57.943	1089.306
CO	13.698	4.143	13.530	3.952
CT	12.174	1.772	12.375	1.884
DE	15.212	2.078	15.224	2.072
DC	12.409	-	12.413	-
FL	15.281	1.367	15.738	1.261
GA	15.359	2.495	15.589	2.476
HI	15.638	-	16.209	-
ID	15.306	3.931	15.549	4.071
IL	14.436	2.475	14.288	2.437
IN	17.108	2.628	17.661	6.150
IA	13.509	2.080	13.738	2.593
KS	11.065	2.644	11.765	2.571
KY	16.282	2.064	16.282	2.064
LA	15.084	2.206	15.023	2.179
ME	12.265	3.822	10.858	2.322
MD	14.327	1.207	14.542	1.315
MA	13.049	2.153	13.054	2.154
MI	17.837	2.926	17.979	2.982
MN	14.306	2.374	14.422	2.480
MS	14.883	1.491	15.074	1.560
MO	12.415	2.600	12.052	2.661
MT	10.485	4.146	10.510	4.172
NE	11.276	2.483	11.281	2.481
NV	18.850	8.634	18.781	8.628
NH	13.197	4.192	10.964	2.206
NJ	13.299	5.185	12.309	15.152
NM	12.854	3.385	13.105	3.444
NY	11.902	2.013	12.822	2.337
NC	14.827	1.237	14.941	1.258
ND	10.067	3.219	9.654	3.009
OH*	16.792	3.925	17.489	3.909

State	Pupil-Teacher Ratio, LEA-level data		Pupil-Teacher Ratio, school-level data (rolled up)	
	Mean	St. Dev.	Mean	St. Dev.
OK	14.599	2.581	14.603	2.584
OR	17.880	5.064	17.805	5.217
PA	14.191	1.644	14.201	1.666
RI	14.738	2.383	14.644	2.370
SC	15.211	1.496	15.319	1.485
SD	11.883	2.677	11.875	2.681
TN	14.850	1.278	16.984	20.974
TX	12.721	2.498	12.746	2.503
UT*	20.865	3.162	21.047	3.118
VT	11.739	4.174	11.224	1.570
VA	13.463	1.699	14.433	1.699
WA	15.707	4.075	15.705	4.125
WV	13.769	0.952	13.841	1.028
WI*	13.957	2.195	13.953	2.134
WY	11.042	2.207	11.045	2.205

Table 1-10

Model Estimates Of "Charter Share" Coefficient, Models 1, 6 and 13.

State	F33 Description	Charter Share, 2000	Charter Share, 2015	Model 1: Total Current Spending	s.e.	N districts	Model 6: Total Revenue	s.e.	N districts	Model 13: Pupil-Teacher Ratio	s.e.	N districts
AZ	District & District Charters	2.6%	17.6%	0.181**	(0.082)	209	0.075	(0.096)	209	-2.643	(2.438)	209
CO	District & District Charters	2.1%	11.3%	0.480***	(0.153)	178	0.714***	(0.147)	178	-2.335*	(1.388)	178
LA	District & District Charters	0.3%	9.7%	1.107***	(0.229)	68	1.400***	(0.357)	68	-2.832*	(1.685)	68
UT	District & District Charters	0.0%	9.7%	0.465	(0.284)	40	-0.027	(0.239)	40	0.593	(4.014)	41
MI	District & District Charters	2.2%	9.5%	0.372***	(0.067)	554	0.397***	(0.063)	554	8.269	(9.903)	554
FL	District & ALL Charters	0.6%	9.2%	0.153	(0.131)	67	0.272	(0.282)	67	-4.263***	(1.491)	67
DE	District & District Charters	0.0%	9.1%	0.534**	(0.200)	16	0.225	(0.400)	16	2.262	(2.084)	16
CA	District & District Charters	1.6%	8.4%	0.004	(0.062)	980	-0.005	(0.068)	980	-0.738	(0.956)	995
PA	District & District Charters	0.6%	7.7%	0.910***	(0.109)	500	1.176***	(0.107)	500	-7.549***	(2.183)	501
OH	District & District Charters	0.5%	7.1%	0.377**	(0.149)	613	0.915***	(0.092)	613	-2.996**	(1.231)	611
NM	District & District Charters	0.0%	6.7%	0.068	(0.136)	89	0.140	(0.202)	89	-0.389	(1.351)	89
ID	District & District Charters	0.4%	6.6%	0.424*	(0.241)	114	0.336	(0.255)	114	111.648	(132.939)	116
NV	District & District Charters	0.2%	6.3%	0.849*	(0.428)	17	-0.063	(0.591)	17	-5.918	(16.065)	17
MN	District & District Charters	0.7%	5.6%	0.416***	(0.095)	342	0.526***	(0.111)	342	-6.422***	(1.744)	352
TX	District & District Charters	0.5%	5.0%	0.029	(0.088)	1038	0.194*	(0.114)	1038	-0.965	(0.968)	1038
WI	District & District Charters	0.4%	4.9%	-0.168	(0.119)	426	-0.095	(0.079)	426	-3.791***	(1.201)	430

State	F33 Description	Charter Share, 2000	Charter Share, 2015	Model 1: Total Current Spending	s.e.	N districts	Model 6: Total Revenue	s.e.	N districts	Model 13: Pupil-Teacher Ratio	s.e.	N districts
RI	District & District Charters	0.3%	4.8%	0.777***	(0.121)	36	0.600***	(0.196)	36	5.279	(6.402)	36
AK	District & District Charters	1.1%	4.8%	0.872	(0.600)	53	1.117*	(0.648)	53	-12.108***	(1.831)	53
OR	District & ALL Charters	0.0%	4.6%	-0.223*	(0.117)	197	0.158***	(0.054)	197	1.312	(5.720)	197
NC	District & District Charters	0.7%	4.6%	0.072	(0.074)	117	0.036	(0.103)	117	0.044	(2.426)	117
MA	District & District Charters	1.4%	4.4%	0.939***	(0.095)	247	1.057***	(0.094)	247	-4.565***	(0.841)	249
GA	District & District Charters	0.5%	4.1%	0.008	(0.026)	180	-0.020	(0.033)	180	-0.878	(0.787)	180
AR	District & District Charters	0.0%	4.0%	0.156*	(0.081)	320	0.146**	(0.072)	320	-1.369	(0.875)	322
NY	District & District Charters	0.0%	3.9%	2.118***	(0.339)	688	2.066***	(0.181)	688	-7.199***	(1.375)	690
IN	District & District Charters	0.0%	3.6%	-0.268**	(0.125)	292	-0.435***	(0.114)	292	5.300	(3.730)	294
SC	District & District Charters	0.0%	3.6%	0.417***	(0.104)	87	0.566***	(0.156)	87	-3.285*	(1.779)	89
IL	District & ALL Charters	0.3%	3.0%	-0.190	(0.449)	895	0.225	(0.297)	895	19.607	(22.869)	910
NJ	District & District Charters	0.0%	2.6%	0.526***	(0.105)	551	0.759***	(0.226)	551	0.189	(1.676)	552
OK	District & District Charters	0.0%	2.4%	0.154**	(0.066)	544	0.470***	(0.111)	544	-9.156*	(5.346)	545
TN	District & District Charters	0.0%	2.2%	1.530	(1.272)	137	2.067*	(1.142)	137	13.505*	(6.982)	137
MD	District & ALL Charters	0.0%	2.2%	3.120***	(0.585)	24	2.804***	(0.367)	24	-12.972	(7.827)	24
MO	District & District Charters	0.4%	2.2%	0.116	(0.543)	522	-0.019	(0.442)	522	1.557	(3.174)	522
CT	District & District Charters	0.4%	1.6%	-0.027	(0.363)	166	0.898**	(0.393)	166	12.613	(9.380)	166
NH	District & ALL Charters	0.0%	1.2%	2.258***	(0.254)	162	2.166***	(0.180)	162	-9.907***	(3.188)	164

State	F33 Description	Charter Share, 2000	Charter Share, 2015	Model 1: Total Current Spending	s.e.	N districts	Model 6: Total Revenue	s.e.	N districts	Model 13: Pupil-Teacher Ratio	s.e.	N districts
KS	District & ALL Charters	0.0%	0.6%	0.102*	(0.057)	306	0.058	(0.068)	306	-4.268	(3.585)	315
WY	District & ALL Charters	0.0%	0.5%	2.226***	(0.460)	48	1.755***	(0.558)	48	-15.922***	(5.866)	48
ME	District & District Charters	0.0%	0.5%	0.210	(0.422)	226	0.484	(0.339)	226	-11.973	(20.793)	257
VA	District & ALL Charters	0.0%	0.1%	0.801	(0.998)	132	1.161	(1.592)	132	-8.277	(29.110)	132
IA	District & ALL Charters	0.0%	0.1%	0.262	(0.325)	373	-0.196	(0.383)	373	-10.511***	(3.094)	373

Note. Robust standard errors clustering at the district level are in parentheses. All models include district and year fixed effects. 16 year panel (unbalanced). In addition to charter share, which is the variable of interest, covariates in the model are: SAIPE poverty pct., population density, pct. of students in Grades 9-13, total enrollment (ln). See the text for further descriptions.

*$p < 0.1$, **$p < 0.05$, ***$p<0.01$.

Table 1-11

Model Estimates of "Charter Share" Coefficient, Models 1, 2 And 3.

State	Model 1: Total Spending	s.e.	N districts	Model 2: Instructional Spending	s.e.	N districts	Model 3: Inst. Spending (Total Spending in model)	s.e.	N districts
AZ	0.181**	(0.082)	209	0.120	(0.084)	209	-0.054	(0.046)	209
CO	0.480***	(0.153)	178	0.287**	(0.118)	178	-0.045	(0.087)	178
LA	1.107***	(0.229)	68	0.738***	(0.208)	68	-0.269***	(0.074)	68
UT	0.465	(0.284)	40	0.179	(0.239)	40	-0.260*	(0.130)	40
MI	0.372***	(0.067)	554	0.305***	(0.073)	554	-0.053	(0.034)	554
FL	0.153	(0.131)	67	0.599***	(0.122)	67	0.445***	(0.068)	67
DE	0.534**	(0.200)	16	0.159	(0.196)	16	-0.339***	(0.102)	16
CA	0.004	(0.062)	980	-0.032	(0.045)	980	-0.036	(0.024)	980
PA	0.910***	(0.109)	500	0.765***	(0.110)	500	-0.175***	(0.029)	500
OH	0.377**	(0.149)	613	0.068	(0.176)	613	-0.288***	(0.062)	613
NM	0.068	(0.136)	89	0.025	(0.150)	89	-0.046	(0.095)	89
ID	0.424*	(0.241)	114	0.410*	(0.209)	114	-0.039	(0.113)	114
NV	0.849*	(0.428)	17	0.008	(0.319)	17	-0.734***	(0.188)	17
MN	0.416***	(0.095)	342	0.166	(0.282)	342	-0.294	(0.230)	342
TX	0.029	(0.088)	1038	-0.212**	(0.085)	1038	-0.240***	(0.056)	1038
WI	-0.168	(0.119)	426	-0.308**	(0.129)	426	-0.153***	(0.040)	426
RI	0.777***	(0.121)	36	0.698***	(0.154)	36	0.104	(0.090)	36
AK	0.872	(0.600)	53	0.861	(0.614)	53	0.132	(0.127)	53
OR	-0.223*	(0.117)	197	-0.344**	(0.151)	197	-0.138**	(0.058)	197
NC	0.072	(0.074)	117	-0.129	(0.105)	117	-0.207**	(0.084)	117
MA	0.939***	(0.095)	247	0.790***	(0.104)	247	-0.038	(0.045)	247
GA	0.008	(0.026)	180	-0.025	(0.036)	180	-0.033	(0.022)	180
AR	0.156*	(0.081)	320	-0.069	(0.071)	320	-0.185***	(0.035)	320
NY	2.118***	(0.339)	688	1.879***	(0.302)	688	-0.253***	(0.050)	688

State	Model 1: Total Spending	s.e.	N districts	Model 2: Instructional Spending	s.e.	N districts	Model 3: Inst. Spending (Total Spending in model)	s.e.	N districts
IN	-0.268**	(0.125)	292	-0.217	(0.188)	292	0.057	(0.151)	292
SC	0.417***	(0.104)	87	0.006	(0.138)	87	-0.359***	(0.111)	87
IL	-0.190	(0.449)	895	-0.349	(0.497)	895	-0.160	(0.122)	895
NJ	0.526***	(0.105)	551	0.381***	(0.105)	551	-0.126*	(0.067)	551
OK	0.154**	(0.066)	544	-0.037	(0.075)	544	-0.138**	(0.060)	544
TN	1.530	(1.272)	137	0.572	(1.204)	137	-0.762*	(0.412)	137
MD	3.120***	(0.585)	24	3.011***	(0.611)	24	0.038	(0.159)	24
MO	0.116	(0.543)	522	0.052	(0.564)	522	-0.068	(0.060)	522
CT	-0.027	(0.363)	166	-0.813*	(0.440)	166	-0.787***	(0.200)	166
NH	2.258***	(0.254)	162	2.223***	(0.335)	162	-0.131	(0.183)	162
KS	0.102*	(0.057)	306	0.232***	(0.056)	306	0.105*	(0.057)	306
WY	2.226***	(0.460)	48	1.703***	(0.390)	48	-0.454***	(0.130)	48
ME	0.210	(0.422)	226	-1.057	(0.735)	226	-1.257***	(0.360)	226
VA	0.801	(0.998)	132	0.708	(0.709)	132	-0.058	(0.405)	132
IA	0.262	(0.325)	373	0.352	(0.404)	373	0.069	(0.082)	373

Note. Robust standard errors clustering at the district level are in parentheses. All models include district and year fixed effects. 16 year panel (unbalanced). In addition to charter share, which is the variable of interest, covariates in the model are: SAIPE poverty pct., population density, pct. of students in Grades 9-13, total enrollment (ln). See the text for further descriptions.

*p < 0.1, **p <0 .05, ***p<0.01

Table 1-12

Model Estimates of "Charter Share" Coefficient, Models 1, 4 and 5.

State	Model 1: Total Spending	s.e.	N districts	Model 4: Support Spending	s.e.	N districts	Model 5: Support Spending (Total Spending in model)	s.e.	N districts
AZ	0.181**	(0.082)	209	0.231**	(0.108)	209	0.052	(0.053)	209
CO	0.480***	(0.153)	178	0.552**	(0.224)	178	0.019	(0.114)	178
LA	1.107***	(0.229)	68	1.807***	(0.296)	68	0.525***	(0.091)	68
UT	0.465	(0.284)	40	0.990**	(0.465)	40	0.481*	(0.239)	40
MI	0.372***	(0.067)	554	0.450***	(0.090)	554	0.038	(0.055)	554
FL	0.153	(0.131)	67	-0.545***	(0.170)	67	-0.705***	(0.089)	67
DE	0.534**	(0.200)	16	1.122***	(0.278)	16	0.512**	(0.176)	16
CA	0.004	(0.062)	980	0.052	(0.085)	980	0.048*	(0.026)	980
PA	0.910***	(0.109)	500	1.174***	(0.122)	500	0.298***	(0.048)	500
OH	0.377**	(0.149)	613	0.724***	(0.134)	613	0.307***	(0.069)	613
NM	0.068	(0.136)	89	0.112	(0.186)	89	0.047	(0.099)	89
ID	0.424*	(0.241)	114	0.471	(0.314)	114	0.062	(0.127)	114
NV	0.849*	(0.428)	17	1.991***	(0.673)	17	1.036***	(0.323)	17
MN	0.416***	(0.095)	342	0.589***	(0.213)	342	0.257	(0.232)	342
TX	0.029	(0.088)	1038	0.347**	(0.158)	1038	0.314***	(0.093)	1038
WI	-0.168	(0.119)	426	0.045	(0.124)	426	0.230***	(0.058)	426
RI	0.777***	(0.121)	36	0.729***	(0.175)	36	-0.365**	(0.142)	36
AK	0.872	(0.600)	53	0.876	(0.614)	53	-0.173	(0.150)	53
OR	-0.223*	(0.117)	197	-0.144	(0.114)	197	0.101**	(0.044)	197
NC	0.072	(0.074)	117	0.359*	(0.190)	117	0.294*	(0.161)	117
MA	0.939***	(0.095)	247	1.237***	(0.116)	247	0.082	(0.071)	247
GA	0.008	(0.026)	180	0.062*	(0.035)	180	0.055*	(0.033)	180
AR	0.156*	(0.081)	320	0.468***	(0.126)	320	0.242***	(0.052)	320

State	Model 1: Total Spending	s.e.	N districts	Model 4: Support Spending	s.e.	N districts	Model 5: Support Spending (Total Spending in model)	s.e.	N districts
NY	2.118***	(0.339)	688	2.547***	(0.399)	688	0.413***	(0.080)	688
IN	-0.268**	(0.125)	292	-0.368	(0.245)	292	-0.095	(0.207)	292
SC	0.417***	(0.104)	87	0.901***	(0.187)	87	0.475***	(0.153)	87
IL	-0.190	(0.449)	895	0.018	(0.465)	895	0.215	(0.144)	895
NJ	0.526***	(0.105)	551	0.803***	(0.177)	551	0.272**	(0.109)	551
OK	0.154**	(0.066)	544	0.318***	(0.092)	544	0.142	(0.089)	544
TN	1.530	(1.272)	137	2.351	(1.683)	137	0.494	(0.756)	137
MD	3.120***	(0.585)	24	3.975***	(0.691)	24	0.439	(0.295)	24
MO	0.116	(0.543)	522	0.211	(0.584)	522	0.099	(0.093)	522
CT	-0.027	(0.363)	166	1.610**	(0.637)	166	1.638***	(0.472)	166
NH	2.258***	(0.254)	162	2.415***	(0.417)	162	0.203	(0.344)	162
KS	0.102*	(0.057)	306	-0.051	(0.090)	306	-0.123*	(0.064)	306
WY	2.226***	(0.460)	48	3.166***	(0.625)	48	0.814***	(0.210)	48
ME	0.210	(0.422)	226	2.445***	(0.465)	226	2.330***	(0.546)	226
VA	0.801	(0.998)	132	0.766	(1.688)	132	-0.126	(0.680)	132
IA	0.262	(0.325)	373	0.507	(0.418)	373	0.267	(0.226)	373

Note. Robust standard errors clustering at the district level are in parentheses. All models include district and year fixed effects. 16 year panel (unbalanced). In addition to charter share, which is the variable of interest, covariates in the model are: SAIPE poverty pct., population density, pct. of students in Grades 9-13, total enrollment (ln). See the text for further descriptions.

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

Table 1-13

Model Estimates of "Charter Share" Coefficient, Models 1, 6 and 7.

State	Model 1: Total Spending	s.e.	N districts	Model 6: Administrative Spending	s.e.	N districts	Model 7: Admin. Spending (Total Spending in model)	s.e.	N districts
AZ	0.181**	(0.082)	209	-0.129	(0.157)	208	-0.299***	(0.109)	208
CO	0.480***	(0.153)	178	0.943***	(0.294)	178	0.572**	(0.229)	178
LA	1.107***	(0.229)	68	1.672***	(0.160)	68	0.787***	(0.172)	68
UT	0.465	(0.284)	40	0.058	(0.446)	40	-0.250	(0.484)	40
MI	0.372***	(0.067)	554	0.361***	(0.096)	554	0.024	(0.073)	554
FL	0.153	(0.131)	67	-0.560***	(0.145)	67	-0.659***	(0.175)	67
DE	0.534**	(0.200)	16	0.374	(0.354)	16	0.017	(0.394)	16
CA	0.004	(0.062)	980	0.062	(0.095)	980	0.072	(0.044)	980
PA	0.910***	(0.109)	500	1.034***	(0.119)	500	0.368***	(0.092)	500
OH	0.377**	(0.149)	613	0.611***	(0.167)	613	0.291***	(0.068)	613
NM	0.068	(0.136)	89	0.595	(0.441)	89	0.524	(0.375)	89
ID	0.424*	(0.241)	114	0.522**	(0.242)	113	0.153	(0.124)	113
NV	0.849*	(0.428)	17	2.551***	(0.812)	17	1.781**	(0.615)	17
MN	0.416***	(0.095)	342	0.688***	(0.154)	342	0.313*	(0.168)	342
TX	0.029	(0.088)	1038	0.202	(0.173)	1038	0.182	(0.161)	1038
WI	-0.168	(0.119)	426	-0.053	(0.109)	426	0.078	(0.086)	426
RI	0.777***	(0.121)	36	1.011***	(0.251)	36	0.257	(0.279)	36
AK	0.872	(0.600)	53	0.635	(0.472)	53	-0.090	(0.144)	53
OR	-0.223*	(0.117)	197	-0.269**	(0.133)	197	-0.035	(0.047)	197
NC	0.072	(0.074)	117	0.408	(0.267)	117	0.348	(0.265)	117
MA	0.939***	(0.095)	247	1.032***	(0.106)	247	0.608***	(0.102)	247
GA	0.008	(0.026)	180	0.057	(0.055)	180	0.050	(0.052)	180
AR	0.156*	(0.081)	320	0.018	(0.173)	320	-0.053	(0.187)	320

State	Model 1: Total Spending	s.e.	N districts	Model 6: Administrative Spending	s.e.	N districts	Model 7: Admin. Spending (Total Spending in model)	s.e.	N districts
NY	2.118***	(0.339)	688	2.322***	(0.450)	688	0.326*	(0.174)	688
IN	-0.268**	(0.125)	292	-0.079	(0.367)	292	0.139	(0.309)	292
SC	0.417***	(0.104)	87	1.013***	(0.268)	87	0.696**	(0.275)	87
IL	-0.190	(0.449)	895	0.764**	(0.382)	895	0.944**	(0.438)	895
NJ	0.526***	(0.105)	551	0.215	(0.204)	551	-0.120	(0.208)	551
OK	0.154**	(0.066)	544	0.666***	(0.181)	544	0.541***	(0.176)	544
TN	1.530	(1.272)	137	3.657	(2.278)	137	2.256	(1.435)	137
MD	3.120***	(0.585)	24	6.088***	(1.039)	24	3.662***	(1.027)	24
MO	0.116	(0.543)	522	-0.427	(0.659)	522	-0.521**	(0.247)	522
CT	-0.027	(0.363)	166	0.944	(0.974)	166	0.967	(1.123)	166
NH	2.258***	(0.254)	162	2.276***	(0.593)	162	0.460	(0.609)	162
KS	0.102*	(0.057)	306	-0.187**	(0.082)	306	-0.226***	(0.076)	306
WY	2.226***	(0.460)	48	3.529***	(0.289)	48	1.644***	(0.338)	48
ME	0.210	(0.422)	226	0.756	(0.564)	226	0.672	(0.452)	226
VA	0.801	(0.998)	132	2.685	(3.314)	132	1.948	(2.512)	132
IA	0.262	(0.325)	373	0.915	(0.574)	373	0.636	(0.395)	373

Note. Robust standard errors clustering at the district level are in parentheses. All models include district and year fixed effects. 16 year panel (unbalanced). In addition to charter share, which is the variable of interest, covariates in the model are: SAIPE poverty pct., population density, pct. of students in Grades 9-13, total enrollment (ln). See the text for further descriptions.

*p < 0.1, **p <0 .05, ***p<0.01

Table 1-14

Model Estimates of "Charter Share" Coefficient, Models 8, 9, 10 and 11.

State	Model 8: Total Revenue	s.e.	N districts	Model 9: Total State & Local Revenue	s.e.	N districts	Model 10: State Revenue (Total Rev. in model)	s.e.	N districts	Model 11: Local Revenue (Total Rev, in model)	s.e.	N districts
AZ	0.075	(0.096)	209	0.025	(0.102)	209	-0.371***	(0.134)	209	0.297**	(0.116)	209
CO	0.714***	(0.147)	178	0.638***	(0.149)	178	-0.339	(0.580)	178	0.203	(0.200)	178
LA	1.400***	(0.357)	68	1.165***	(0.206)	68	-0.018	(0.185)	68	0.564	(0.382)	68
UT	-0.027	(0.239)	40	0.036	(0.225)	40	-0.590	(0.508)	40	0.140	(0.239)	40
MI	0.397***	(0.063)	554	0.349***	(0.064)	554	-0.356***	(0.122)	554	0.504***	(0.096)	554
FL	0.272	(0.282)	67	0.384	(0.302)	67	-1.054*	(0.575)	67	0.754	(0.558)	67
DE	0.225	(0.400)	16	0.094	(0.459)	16	-0.328	(0.243)	16	0.323	(0.397)	16
CA	-0.005	(0.068)	980	-0.004	(0.063)	980	-0.028	(0.032)	980	-0.014	(0.033)	980
PA	1.176***	(0.107)	500	1.210***	(0.110)	500	0.476***	(0.084)	500	-0.320***	(0.076)	500
OH	0.915***	(0.092)	613	0.927***	(0.088)	613	-0.219***	(0.070)	613	0.375***	(0.114)	613
NM	0.140	(0.202)	89	0.082	(0.187)	89	-0.392***	(0.057)	89	1.104***	(0.413)	89
ID	0.336	(0.255)	114	0.337	(0.226)	114	0.586***	(0.200)	114	-1.328***	(0.414)	114
NV	-0.063	(0.591)	17	0.044	(0.502)	17	1.283**	(0.564)	17	-1.236	(0.796)	17
MN	0.526***	(0.111)	342	0.461***	(0.115)	342	0.058	(0.161)	342	0.039	(0.368)	342
TX	0.194*	(0.114)	1038	0.006	(0.118)	1038	-1.006***	(0.377)	1038	0.484***	(0.160)	1038
WI	-0.095	(0.079)	426	-0.164**	(0.073)	426	-0.354	(0.304)	426	0.360*	(0.194)	426
RI	0.600***	(0.196)	36	0.448*	(0.231)	36	0.503	(0.334)	36	-1.328***	(0.444)	36
AK	1.117*	(0.648)	53	1.000	(0.700)	53	-0.177*	(0.099)	53	0.650**	(0.279)	53
OR	0.158***	(0.054)	197	0.140**	(0.061)	197	-0.112	(0.125)	197	-0.148	(0.124)	197
NC	0.036	(0.103)	117	0.002	(0.113)	117	-0.033	(0.064)	117	0.168	(0.207)	117
MA	1.057***	(0.094)	247	1.058***	(0.100)	247	-0.401**	(0.178)	247	0.482***	(0.147)	247
GA	-0.020	(0.033)	180	-0.024	(0.043)	180	-0.150**	(0.058)	180	0.135***	(0.045)	180

State	Model 8: Total Revenue	s.e.	N districts	Model 9: Total State & Local Revenue	s.e.	N districts	Model 10: State Revenue (Total Rev. in model)	s.e.	N districts	Model 11: Local Revenue (Total Rev, in model)	s.e.	N districts
AR	0.146**	(0.072)	320	0.093*	(0.053)	320	0.035	(0.032)	320	-0.387***	(0.116)	320
NY	2.066***	(0.181)	688	2.108***	(0.169)	688	-0.019	(0.229)	688	0.216	(0.188)	688
IN	-0.435***	(0.114)	292	-0.512***	(0.134)	292	0.198	(0.527)	292	-0.600	(0.612)	292
SC	0.566***	(0.156)	87	0.498**	(0.246)	87	-1.071***	(0.278)	87	0.805**	(0.307)	87
IL	0.225	(0.297)	895	0.213	(0.280)	895	-0.575	(0.422)	895	0.513***	(0.158)	895
NJ	0.759***	(0.226)	551	0.729***	(0.231)	551	0.212*	(0.124)	551	-0.547**	(0.215)	551
OK	0.470***	(0.111)	544	0.512***	(0.123)	544	-0.055	(0.135)	544	0.766***	(0.250)	544
TN	2.067*	(1.142)	137	2.172**	(1.024)	137	0.949*	(0.565)	137	-1.781	(1.468)	137
MD	2.804***	(0.367)	24	3.007***	(0.352)	24	1.743***	(0.453)	24	-1.034*	(0.521)	24
MO	-0.019	(0.442)	522	-0.251	(0.399)	522	-2.196***	(0.130)	522	1.202***	(0.166)	522
CT	0.898**	(0.393)	166	1.130***	(0.289)	166	-0.787	(0.554)	166	-0.436	(0.995)	166
NH	2.166***	(0.180)	162	2.142***	(0.148)	162	-0.168	(0.776)	162	-0.354	(0.488)	162
KS	0.058	(0.068)	306	0.025	(0.067)	306	-0.114	(0.123)	306	0.189	(0.147)	306
WY	1.755***	(0.558)	48	2.105***	(0.711)	48	-0.255	(0.572)	48	1.042***	(0.378)	48
ME	0.484	(0.339)	226	0.814**	(0.339)	226	2.152**	(1.071)	226	-0.165	(1.241)	226
VA	1.161	(1.592)	132	1.128	(1.719)	132	-6.109***	(1.457)	132	2.437**	(1.008)	132
IA	-0.196	(0.383)	373	-0.320	(0.358)	373	-0.037	(0.465)	373	-0.281	(0.319)	373

Note. Robust standard errors clustering at the district level are in parentheses. All models include district and year fixed effects. 16 year panel (unbalanced). In addition to charter share, which is the variable of interest, covariates in the model are: SAIPE poverty pct., population density, pct. of students in Grades 9-13, total enrollment (ln). See the text for further descriptions.

$^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table 1-15

Model Estimates of "Charter Share" Coefficient, Models 12 and 13.

State	Model 12: Pupil-Teacher Ratio (LEA data)	s.e.	N districts	Model 13: Pupil-Teacher Ratio (school roll-up data)	s.e.	N districts
AZ	-5.291**	(2.403)	207	-2.643	(2.438)	209
CO	-5.171	(3.405)	178	-2.335*	(1.388)	178
LA	-2.199	(1.472)	68	-2.832*	(1.685)	68
UT	-2.209	(3.327)	41	0.593	(4.014)	41
MI	-3.810***	(0.895)	554	8.269	(9.903)	554
FL	-4.037**	(1.926)	67	-4.263***	(1.491)	67
DE	-1.522	(2.544)	16	2.262	(2.084)	16
CA	0.457	(0.300)	995	-0.738	(0.956)	995
PA	-8.036***	(1.738)	501	-7.549***	(2.183)	501
OH	-3.632***	(1.326)	613	-2.996**	(1.231)	611
NM	-2.460**	(1.059)	89	-0.389	(1.351)	89
ID	-0.487	(5.630)	116	111.648	(132.939)	116
NV	12.709	(14.712)	17	-5.918	(16.065)	17
MN	-1.790	(2.039)	352	-6.422***	(1.744)	352
TX	-0.259	(1.319)	1038	-0.965	(0.968)	1038
WI	3.062***	(1.029)	430	-3.791***	(1.201)	430
RI	7.554	(7.575)	36	5.279	(6.402)	36
AK	-3.106	(2.782)	53	-12.108***	(1.831)	53
OR	2.697**	(1.056)	197	1.312	(5.720)	197
NC	1.415	(1.552)	117	0.044	(2.426)	117
MA	-4.309***	(1.254)	249	-4.565***	(0.841)	249
GA	-0.514	(0.525)	180	-0.878	(0.787)	180
AR	-1.916**	(0.819)	322	-1.369	(0.875)	322
NY	-8.752***	(1.346)	690	-7.199***	(1.375)	690
IN	6.372**	(2.580)	294	5.300	(3.730)	294
SC	-4.423***	(1.648)	89	-3.285*	(1.779)	89
IL	13.876	(11.386)	910	19.607	(22.869)	910
NJ	-2.776	(1.695)	552	0.189	(1.676)	552
OK	-1.929	(1.481)	545	-9.156*	(5.346)	545
TN	11.099	(8.885)	144	13.505*	(6.982)	137
MD	-54.094	(41.343)	24	-12.972	(7.827)	24
MO	1.656	(3.591)	522	1.557	(3.174)	522
CT	10.056	(10.398)	166	12.613	(9.380)	166
NH	-13.006***	(2.196)	164	-9.907***	(3.188)	164
KS	3.338	(2.352)	315	-4.268	(3.585)	315
WY	-9.650	(6.368)	48	-15.922***	(5.866)	48
ME	8.614	(6.120)	257	-11.973	(20.793)	257

State	Model 12: Pupil-Teacher Ratio (LEA data)	s.e.	N districts	Model 13: Pupil-Teacher Ratio (school roll-up data)	s.e.	N districts
VA	-1.947	(39.389)	132	-8.277	(29.110)	132
IA	-8.525	(6.903)	373	-10.511***	(3.094)	373

Note. Robust standard errors clustering at the district level are in parentheses. All models include district and year fixed effects. 16 year panel (unbalanced). In addition to charter share, which is the variable of interest, covariates in the model are: SAIPE poverty pct., population density, pct. of students in Grades 9-13, total enrollment (ln). See the text for further descriptions.

**p < 0.1, **p <0 .05, ***p<0.01*

Table 1-16

Correlations Between Federal And State Fiscal Measures, Minnesota and New Jersey

	Total Spending (ln)		Instructional Spending (ln)		Support Spending (ln)		Administration Spending (ln)		Pupil-Teacher Ratio	
	N	rho	N	rho	N	rho	N	rho	N	rho
Minnesota	3654	0.948	3654	0.933	3653	0.145	3654	0.906	3696	0.924
New Jersey	9076	0.856	9076	0.818	9076	0.711	9076	0.813	9180	0.303

Table 1-17

Model estimates of "charter share" coefficient, Minnesota, federal and state data.

	Total Spending (ln)		Instructional Spending (ln)		Support Spending (ln)		Administration Spending (ln)		Pupil-Teacher Ratio	
	Federal	MN	Federal	MN	Federal	MN	Federal	MN	Federal	MN
Charter Proliferation	0.416***	0.483***	0.166	0.175*	0.589***	0.579**	0.688***	0.744***	-6.422***	-3.188*
	(0.095)	(0.110)	(0.282)	(0.104)	(0.213)	(0.250)	(0.154)	(0.170)	(1.744)	(1.928)
Pct.Grade 9-13	0.023	0.117	0.073	0.207	-0.008	0.182	0.101	0.017	0.847	-1.575
	(0.083)	(0.205)	(0.101)	(0.231)	(0.088)	(0.291)	(0.190)	(0.222)	(1.079)	(2.933)
SAIPE poverty rate	0.488***	0.179**	0.612***	0.149	0.181**	0.183	0.392**	0.396***	1.518	1.280
	(0.089)	(0.088)	(0.107)	(0.104)	(0.084)	(0.316)	(0.165)	(0.127)	(1.157)	(0.930)
Density	0.000	0.001***	0.000	0.001***	0.000	0.001***	0.000***	0.000**	0.000	-0.003*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)
Poverty*Density	0.000***	0.000**	0.001***	0.001***	-0.000	-0.000	0.000	0.000	-0.002	-0.002
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.002)
Enrollment(ln)	-0.326***	-0.326***	-0.274***	-0.257***	-0.429***	-0.046	-0.471***	-0.616***	2.473***	2.913***
	(0.042)	(0.052)	(0.050)	(0.053)	(0.033)	(0.097)	(0.062)	(0.082)	(0.372)	(0.578)
constant	11.837***	11.725***	10.986***	10.704***	11.437***	6.692***	10.192***	11.422***	-2.771	-4.671
	(0.306)	(0.324)	(0.361)	(0.351)	(0.236)	(0.675)	(0.436)	(0.539)	(2.453)	(3.872)
N	5341	3641	5341	3641	5341	3640	5341	3641	5378	3678
Districts	342	341	342	341	342	341	342	341	352	350

Note. Robust standard errors clustering at the district level are in parentheses. All models include district and year fixed effects. *$p < 0.1$. **$p < 0.05$. ***$p < 0.01$.

"Federal" refers to models using F33 data as the dependent variable; "MN" refers to models using MNDOE data as the dependent variable.
16-year panel (FY 2000-2015), unbalanced, for federal data. 11-year panel (FY 2005-2015), unbalanced, for MN data.

Table 1-18

Descriptive Statistics, Minnesota Models, Dependent Variables, Federal and MN Data.

	Federal Data			MNDOE Data		
	N	Mean	St. Dev	N	Mean	St. Dev.
Total Spending	321	15,990	3,437	321	16,455	3,538
Total Spending (ln)	321	9.659	0.200	321	9.687	0.203
Instructional Spending	321	10,109	2,041	321	9,646	1,908
Instructional Spending (ln)	321	9.203	0.190	321	9.156	0.187
Support Spending	321	5,072	1,465	321	952	371
Support Spending (ln)	321	8.496	0.260	321	6.779	0.423
Administration Spending	321	1,233	473	321	1,619	614
Administration Spending (ln)	321	7.058	0.333	321	7.328	0.344
Pupil-Teacher Ratio	330	14.42	2.48	330	14.32	2.33

Table 1-19

Model Estimates of "Charter Share" Coefficient, New Jersey, Federal and State Data.

	Total Spending (ln)		Instructional Spending (ln)		Support Spending (ln)		Administration Spending (ln)		Pupil-Teacher Ratio	
	Federal	NJ	Federal	NJ	Federal	NJ	Federal	NJ	Federal	NJ
Charter Proliferation	0.526***	0.370***	0.381***	0.191	0.803***	0.703***	0.215	0.114	0.189	-2.195
	(0.105)	(0.121)	(0.105)	(0.134)	(0.177)	(0.266)	(0.204)	(0.164)	(1.676)	(1.694)
Pct.Grade 9-13	0.823***	0.532***	0.800***	0.450***	0.741***	0.740***	0.113	0.177	-4.790***	-9.950**
	(0.092)	(0.077)	(0.087)	(0.075)	(0.113)	(0.148)	(0.155)	(0.138)	(1.185)	(3.850)
SAIPE poverty rate	1.168***	1.150***	1.117***	1.169***	1.203***	2.489***	-0.794***	-0.568***	-8.946***	-2.089
	(0.092)	(0.091)	(0.088)	(0.092)	(0.117)	(0.201)	(0.169)	(0.164)	(1.862)	(2.261)
Density	0.000	0.000	0.000	0.000	0.000	0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Poverty*Density	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000**	0.000	0.000	-0.000	-0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Enrollment(ln)	-0.130***	-0.044***	-0.125***	-0.040***	-0.133***	-0.061***	-0.106***	-0.026***	0.835***	0.341***
	(0.039)	(0.010)	(0.039)	(0.010)	(0.040)	(0.014)	(0.037)	(0.009)	(0.185)	(0.118)
constant	10.377***	9.662***	9.835***	9.154***	9.430***	7.571***	8.149***	7.720***	8.957***	12.197***
	(0.291)	(0.101)	(0.287)	(0.086)	(0.297)	(0.214)	(0.272)	(0.081)	(1.261)	(1.281)
N	8773	8755	8773	8755	8773	8755	8773	8755	8749	8766
Districts	551	551	551	551	551	551	551	551	552	552

Note. *Robust standard errors clustering at the district level are in parentheses. All models include district and year fixed effects.* *$p < 0.1$. **$p < 0.05$. ***$p < 0.01$. *16-year panel (FY 2000-2015), unbalanced, for both federal and NJ data*
"Federal" refers to models using F33 data as the dependent variable; "NJ" refers to models using NJDOE data as the dependent variable.

Table 1-20

Descriptive statistics, New Jersey models, dependent variables, federal and NJ data.

	Federal Data			NJDOE Data		
	N	Mean	St. Dev	N	Mean	St. Dev.
Total Spending	541	19,492	4,733	540	16,174	4,002
Total Spending (ln)	541	9.857	0.191	540	9.671	0.190
Instructional Spending	541	11,580	2,679	540	9,651	2,294
Instructional Spending (ln)	541	9.339	0.179	540	9.156	0.185
Support Spending	541	7,381	2,109	540	2,559	968
Support Spending (ln)	541	8.876	0.237	540	7.795	0.310
Administration Spending	541	1,434	358	540	1,761	374
Administration Spending (ln)	541	7.242	0.223	540	7.453	0.198
Pupil-Teacher Ratio	542	12.31	15.15	542	11.41	2.35

Figures

Figure 1-1

US Charter Schools, Enrollment as a Share of Regular School District and Charter District Enrollment, 2000-2015

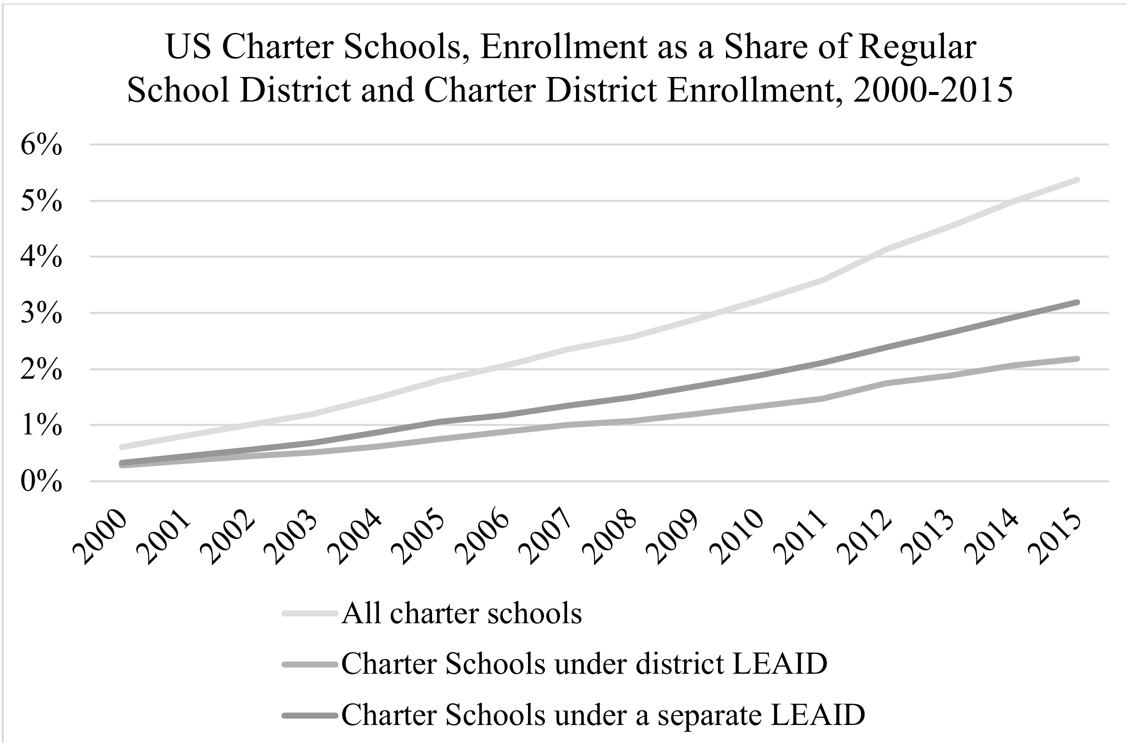


Figure 1-2

Percentage of US school districts with charter schools within its borders

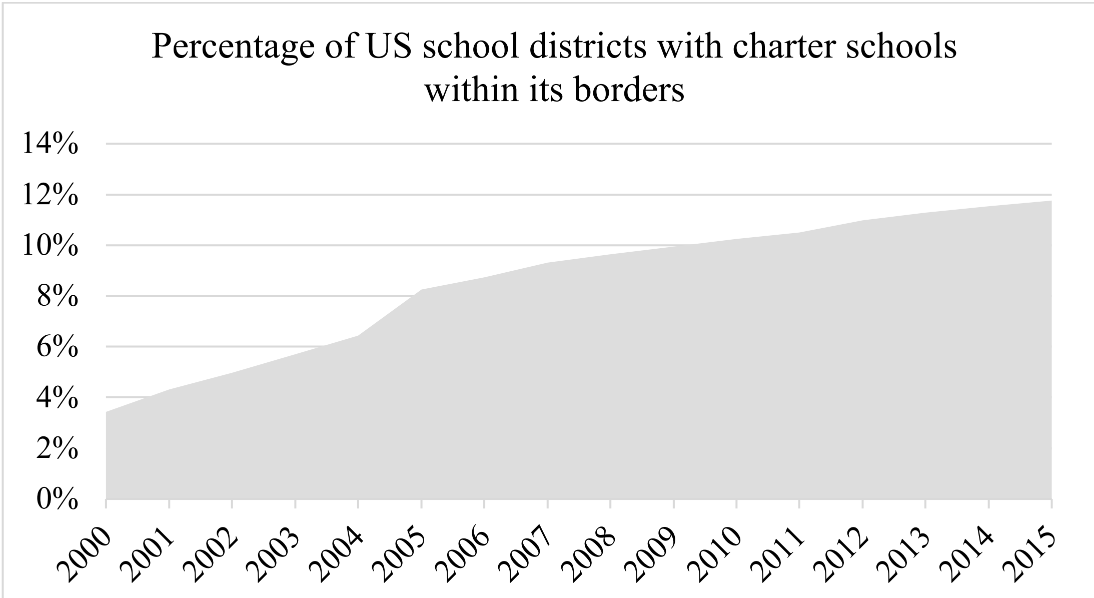
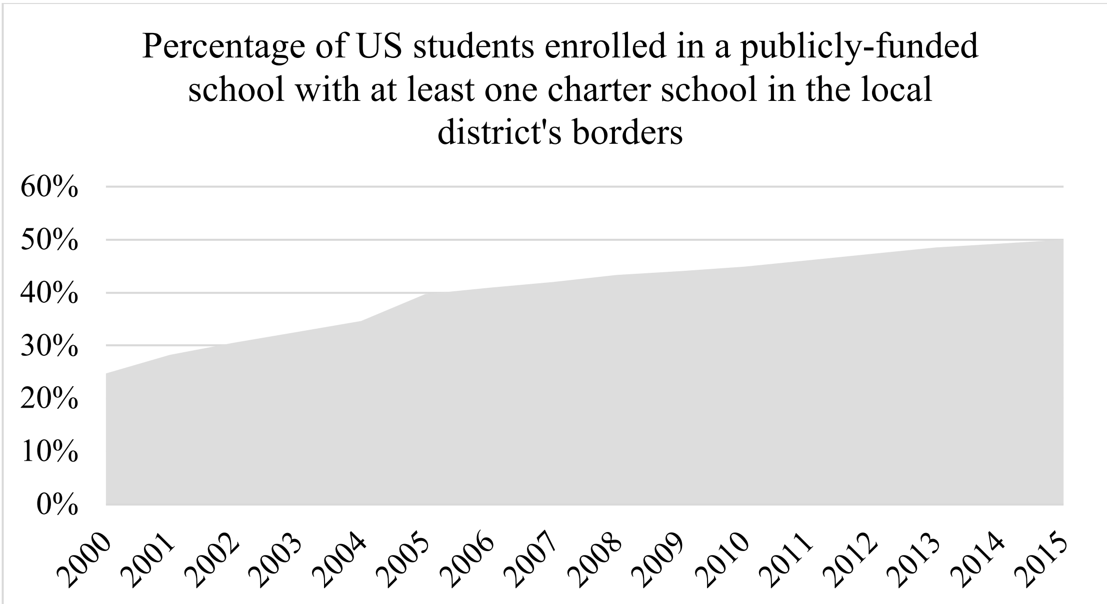


Figure 1-3

Percentage of US students enrolled in a publicly-funded school with at least one charter school in the local district's borders



Chapter 2 – The Effects of Charter School Proliferation on Public District School Spending: Evidence From New Jersey

Introduction

The expansion of charter schools is perhaps the most important development in United States education policy in the past two decades; consequently, and as I recount in the first paper of this dissertation, charter schools have been the subject of a large and growing body of research. Yet one of the most critical questions regarding charter school expansion – does charter growth affect the finances of public school districts? – remains underexplored. Only a handful of empirical studies address the topic; of those, scant few employ methods that use actual spending and/or revenue data. Considering charter schools have been proliferating since 1992, it is remarkable that little empirical research has, until this point, attempted to ascertain how charter growth affects school district finances.

The first paper of the dissertation contributes to the literature by leveraging a national database of school district fiscal measures to determine if correlations between public school district resource measures – spending, revenues, and staff-to-student ratios – exist. In many states with significant levels of charter penetration, I find that charter proliferation correlates with spending increases in hosting public school districts. There is significant variation, however, between states, suggesting that state policy context plays an important role in how charter growth affects public school districts. In addition, there is reason to believe that federal data varies between states in how it accounts for charter funding. It may be that some of the spending growth shown in federal data is simply mechanical, as some states appear to report public district enrollments without charter school enrollments, yet report fiscal figures that include “pass-through” funding to charters (Fleeter, 2018).

This apparent inconsistency in federal data motivates the study of the effect of charter growth on district finances with state-level data. States that report fiscal measures for school districts and charter schools separately match student enrollments, both district and charter, to the relevant fiscal measures. In the first paper of this dissertation, I conducted a preliminary analysis using state-level fiscal data from New Jersey and Minnesota and compared the results to models employing federal data. In both states, I find that charter proliferation is positively correlated with public school district spending. Yet those analyses continue to rely on federal student enrollment and demographic data, which, as I explain below, may not give the most precise measurement of charter proliferation. In addition, important explanatory and outcome variables are not available in the federal data as they are in state-level data.

This paper, therefore, continues my analysis of the correlations between public school district finances and charter school growth, specifically focusing on spending and staff intensity for districts in the State of New Jersey. I leverage a more comprehensive dataset, including variables unavailable in the federal data, to develop fixed-effects models that more accurately estimate these correlations. In particular, I employ a rich dataset of staffing characteristics, aggregated to the district level, to determine how staffing intensity in specific job categories changes as charter schools expand. I also use state data to more precisely estimate the level of charter proliferation in districts across the state.

This paper contributes to the literature by showing that public district spending does, in fact, increase as charters proliferate, and presents evidence this increased spending is due, at least in part, to varying elasticities in different categories of spending. Specifically, school district spending on “indirect” costs – costs that are not related to the “direct” delivery of instruction – does not decline in perfect proportion to the loss of student enrollments due to charter schools. Policymakers should be aware of this additional spending as they regulate the growth of charters, as it may contribute to inefficiencies in the provision of schooling within public school districts.

The remainder of this paper proceeds as follows: first, I review the literature on charter proliferation’s effect on public school district finances, the literature on the effects of enrollment decline on public schools, and the literature on scale economies in schools. Next, I describe factors specific to New Jersey public schools, particularly regarding charter schools and school finances. I next develop a conceptual framework for this study, and state the research questions it addresses. I then describe the data used herein, followed by the empirical strategies used, including descriptions of the fixed-effects models. I then report the results, followed by a discussion of those results. Finally, I review the policy implications of this research and suggest future avenues of study.

Review of the Literature

The fiscal effects of charter proliferation on district schools.

The first paper in this dissertation reviewed the small body of empirical research on the effects of charter proliferation on public district schools; here, I quickly summarize that paper’s review. Some studies have simulated these effects by classifying district spending as either fixed or elastic, then calculating how student enrollments in charters mechanically increase the per pupil spending on those fixed costs (Bifulco & Reback, 2014; H. Ladd & Singleton, 2017). This research relies heavily on the assumptions of the inelasticity of fixed costs; it does not analyze actual changes in spending over time and correlations with changes in charter proliferation. A separate avenue of research uses quantitative case studies to show that charter proliferation moves students into smaller *de facto* school districts (Baker, 2016b). The literature on scale efficiencies in schooling, which I explore below, has established a research consensus that economies of scale do exist in education. Many charter schools are, by these standards, inefficiently small; however, this research, which is largely descriptive, does not establish a causal link between spending patterns in public school districts over time and scale inefficiencies. There is also a possibility the reduction in enrollments in public district schools due to charter proliferation may reduce diseconomies of scale, as research suggests larger districts, once their enrollments pass a point of maximal scale efficiency, become less efficient as they grow.

A handful of papers (Arsen & Ni, 2012; Bruno, 2017; Cook, 2016; Welsch, 2011) have used fixed-effects models to determine how public school district spending is affected by charter school growth. This research has the advantage of using longitudinal data, including actual spending and/or revenue figures, to determine the correlations between district finances and charter growth as that growth changes over time. The results of this research varies, even when using data from the same state and time period; this suggests the specification of the fixed effect model can greatly impact the estimations of the impact of charter proliferation. All of this research is limited to a single state; the differences in outcomes is likely, at least in part, the result of different statewide charter school and school funding policy contexts.

The role of decline in public school finances

Implicit in much of this research is the assumption that charter school enrollments consist of students who would otherwise attend their local public school. There is evidence, however, that some portion of the charter school population is drawn from the private school population. Research using national data finds that approximately 8 percent of charter elementary students, and 11 percent of charter middle and high school students, are drawn from private schools. The amount is substantially higher in urban districts, reaching up to 32 percent for elementary students (Buddin, 2012). Research from Michigan shows approximately 20 percent of the students who enroll in charter schools were previously enrolled in private schools (Toma, Zimmer, & Jones, 2006); other research shows a smaller effect of charter growth on private school enrollment declines in Michigan (Chakrabarti & Roy, 2011). While private school declines may correlate with charter school growth, no evidence suggests that the majority of charter enrollments would not enroll in public school districts in the absence of charters; it is, therefore, reasonable to assume charter growth will lead to declining public school enrollments. Below, I show that charter proliferation in New Jersey is clearly correlated with district enrollment decreases.

Given this reality, it is surprising to find that there is little empirical research on the effects of declining enrollments in those districts that experience charter proliferation. In fact, there is little recent peer-reviewed research on how decline affects school finances, no matter the reason for the decline. This is not to say there is not contemporary research on how enrollment scale affects school district efficiency, or on the costs and benefits of district consolidation; to the contrary, there is a sizable body of research on school district scale efficiencies, which I review below. Rather, there has been little research done recently which explores the dynamics of how district finances change as enrollments shrink.

Much of the theoretical and empirical work on school district decline actually extends back decades, when the post-war demographic bubble was passing through the K-12 school system. In a 1979 report for the National Institute of Education, the authors declare: “The phenomenon of declining enrollments will most likely have a greater impact on education in the next decade than any other foreseeable trend” (Abramowitz & Rosenfeld, 1978, p. iii). It was during this era that researchers turned their attentions to building a theoretical framework for understanding how enrollment decline might affect school finances. Freeman and Hannan (1975) note that much of the literature of that time exploring the effects of scale was cross-sectional, leaving no room for the possibility that growing and declining enrollments may have different fiscal effects on school districts. They argue instead for a longitudinal approach, although their models only compare growth across two time periods. They theorize that organizations like schools can be divided into two components: “direct,” which for schools would consist of teachers and other parts of a school system that deliver instruction to students; and “supportive,” which consists of school functions that do not directly provide instruction. The authors’ hypothesis is built on a “’featherbedding’ logic,” (p.217) which assumes that cutbacks in the supportive component are more difficult in the short term than cutbacks in the direct component. Using data from California, they find:

> When demand is increasing, the size of the direct component increases as does the supportive component. But when demand declines, the loss in direct component is not matched by loss in the supportive component. That is, the supportive component tends to increase on the upswings but decreases less on the downswings. (p.227)

This research, over four decades old, may appear dated in both its dataset and its econometric methodologies. Yet its theoretical framework remains highly relevant: school district spending is conceptualized as not perfectly elastic to changes in enrollments. Unlike enrollment increases, declining enrollments will not track perfectly with declines in school spending, because some components of that spending are resistant to cuts.

This framework is expanded on a few years later by Cavin, Murnane and Brown (1985). Using data from Michigan, the authors develop a model with per pupil expenditures as the dependent variable, and the average change in enrollment over the previous two years as the variable of interest. The authors claim this is the first use of a fixed-effects model applied to school expenditures; however, they caution that they are unable to account for variations in educational quality, which leads them to a spending, as opposed to a cost, analysis. Similar to Freeman and Hannan, the authors find that district spending during enrollment declines does not drop as quickly as it rises during enrollment increases. In their analysis of student-to-staff ratios, the authors find a pattern similar to changes in spending: declines in enrollment lead immediately to increases in per pupil staffing. There are, however, differences in how different categories of staffing change: "In both the short run and the long run, the size of the teaching staff is much more sensitive to enrollment changes than is the size of the administrative staff. Particularly insensitive to enrollment changes is the size of the central administrative staff" (p.438).

Other empirical research from this period comes to similar conclusions: enrollment declines lead to increases in per pupil spending, at least in the short term (Alter & Moore, 1979). Research based on data from Missouri confirms administrative spending is less elastic to enrollment declines than instructional spending (Anderson & Mark, 1985). Other research based on Iowa data finds significant differences in short-term and long-term spending, again suggesting different types of school costs are less elastic to enrollment declines than others (Edelman & Knudsen, 1990b).

As the post-war "baby boom" passed through the K-12 system, research on enrollment declines and their effect on school finances shifted. Much of the focus was specifically on declining school enrollments in rural communities (Bard, Gardener, & Wieland, 2006; Mathis, 2003; Schwartzbeck, 2003; Strange, Johnson, Showalter, & Klein, 2012), often concentrating on specific states such as Colorado (Pacey Economics Group, 2010), Maryland (Hartman & Schoch, 2015), Massachusetts (Massachusetts Department of Elementary and Secondary Education, 2018), or Vermont (Baker & Geller, 2015). This research is less germane for the study herein, however, as charter schools tend to be much more concentrated in urban areas (Epple et al., 2015). There is a small amount of recent work written about enrollment declines due to charter proliferation; however, it is neither empirical nor peer reviewed (Center On Reinventing Public Education, 2017; Fullerton & Roza, 2015; Roza & Fullerton, 2013).

Scale literature

Unlike the research body on student decline, there is a substantial and continuously updated body of literature related to scale economies in public school finances. In a review of the literature, William Fox (1981) summarizes the research on economies of size in education for the previous three decades. Fox's paper is important in that it develops a theory of size economies which informs much of the research that followed. Fox finds: "Based on those studies which are conceptually acceptable and which use the appropriate unit of analysis, per pupil school costs appear to be characterized by a U-shaped average cost curve" (p.285). In other words, per pupil costs (or, more accurately, per pupil spending) decreases as district size grows until it reaches a point of maximal efficiency; from there, costs rise as enrollment rises. Later research confirmed the shape of this curve (Edelman & Knudsen, 1990a). Fox also notes: "Size economies research also is inappropriate for explaining expenditure responses to population change because it deals only with the supply or cost side of the market. Population adjustments affect local income levels, as well as that group identified as the median voter" (p.290). This may be not be true regarding enrollment declines due to charter schools, however, as charter students' families remain part of the tax base for a local school system even as their children withdraw from the public district schools.

Andrews, Duncombe and Yinger (2002) summarize more recent scale economies literature, using Fox's review as a chronological starting point. They divide the research into two large categories: cost function studies, which use education costs as the dependent variable; and production function studies, which use outcome or performance measures as the dependent variable. The authors note that researchers often substitute expenditures for costs in the cost function; however, cost functions require controlling for unobserved factors such as inefficiency. A further complication arises as expenditures and outcomes are determined simultaneously, leading to problems of endogeneity in the models (p.247). The authors note that the cost function studies use a variety of methodologies to account for these issues; however, despite their differences, most of the studies find some degree of economies of scale: “Sizeable potential cost savings may exist by moving from a very small district (500 or less pupils) to a district with ca [sic] 2000–4000 pupils, both in instructional and administrative costs. Per pupil costs may continue to decline slightly until an enrollment of roughly 6,000, when diseconomies of scale start to set in” (p.255).

Later work by Duncombe and Yinger (2007), based on data from district consolidation in rural New York State, finds substantial economies of scale in operating spending (although savings from these economies in district consolidations are offset somewhat by adjustment costs). The small sizes of the districts in the dataset preclude making any conclusions as to whether very large districts see diseconomies. In a later study based on data from Indiana school districts (T. Zimmer, DeBoer, & Hirth, 2009), a U-shaped cost curve is found where optimal efficiency for school district enrollments is between 1,300 and 3,000 students; diseconomies are found in districts with greater enrollments. Research based on Texas data using stochastic frontier modeling (Gronberg, Jansen, Karakaplan, & Taylor, 2015), however, finds economies of scale in districts as large as 47,000 students. This study also finds that district consolidation, which decreases competition, increases inefficiency. Another study using stochastic frontier modeling based on California data (Karakaplan & Kutlu, 2017) also finds economies of scale;

however, the specification of the model, especially whether it addresses endogeneity, can profoundly change estimations of the savings from district consolidation.

To summarize: there is ample reason to believe, based on a large body of empirical evidence, that economies of scale exist in education. Consequently, enrollment loss in public school districts due to charter proliferation could conceivably lead to increases in per pupil costs and, therefore, per pupil spending. But it is also conceivable that charter proliferation could bring costs down, as diseconomies have been found in larger districts and losses from charter enrollments could move districts closer to a point of maximal efficiency. In any case, scale changes could be one mechanism through which charter proliferation affects public district spending.

The New Jersey Context

New Jersey has several unique features that should be considered in any study of charter proliferation and school finance. The state has one of the highest-performing statewide school systems in the nation, as judged by a variety of education outcome measures (Lloyd, 2018; New Jersey Department of Education, 2018). It has also been a leader in education finance reform, the result of a series of court cases extending back more than four decades. Repeated evaluations of statewide school funding systems have found that New Jersey's school funding system is one of the most progressive in the nation, although the fiscal effort the state makes toward schooling has receded in recent years (Baker, Farrie, & Sciarra, 2018).

Charter schools were first established in New Jersey in 1995. The state is the sole authorizer and regulator of charters, making all charter approval, renewal, and closure decisions. A study of charter school survival in New Jersey (Schwenkenberg &

VanderHoff, 2015) finds that scores on statewide tests are a strong predictor of charter school renewals. Charter school funding uses a “pass-through” system, where charters receive funding from the districts where their pupils reside. The district must pay 90 percent of either the “thorough and efficient” amount or 90 percent of the relevant budgeted per pupil amount to any resident student who enrolls in a charter, no matter where that charter school is located. This means that many public school districts without a charter school within its borders must still fund charters. Charter payments are calculated using a formula that parallels the state’s school aid formula as articulated in the School Funding Fairness Act (SFRA) of 2008; this means that charters receive more funding if they enroll students qualifying for free or reduced-price lunch, have a learning disability, or are Limited English Proficient (LEP). The formula also gives more funding for students in higher grade levels (Rubin, 2015).

Descriptive analysis shows that New Jersey charter schools tend to spend more per pupil on administration and operations, and less on instruction and student support. Charter school certificated staffs tend to be less experienced than public district school staffs, and are less likely to hold an advanced degree. Charter certificated staff are paid less than similarly credentialed and experienced staff; however, two large charter schools in Newark, affiliated with national charter management organizations, pay their staffs considerably more (Weber, 2016).

A study of New Jersey charter enrollments (Gulosino & d’Entremont, 2011) finds that charters tend to cluster just outside African-American neighborhoods, which explains why the state’s urban charters tend to enroll a disproportionally high percentage of African-American students compared to their hosting public school districts. Multiple descriptive studies show that charters across the state tend to enroll fewer LEP students and students with disabilities (SWDs); the SWDs charters do enroll tend to have the least-costly disabilities. In many but not all cases, the charter student population differs substantially from the local public district population in the proportion of students eligible for free or reduced-price lunch (Weber & Rubin, 2014, 2018). While both Camden and Newark have implemented "universal enrollment" systems in recent years in the hopes of making charter enrollment easier, charter school students' families must still affirmatively apply to a charter to gain admission. This creates the possibility that charter school students differ from public district school students in unobserved characteristics that correlate with their willingness to apply to a charter school. The issue is further compounded by the use of lotteries for charters where the demand for seats is greater than the supply; families willing to enter a lottery may differ from families that are not willing.

In 2013, the New Jersey Department of Education (NJDOE) commissioned a study of charter effectiveness from the Center on Research in Educational Outcomes (CREDO). The report found that there was no gain in reading or math tests scores due to charter school in any New Jersey city save Newark (Center for Research on Education Outcomes, 2012). In a later report, CREDO characterized Newark's charter sector as one of the most effective sectors it had studied in urban areas across the nation (Center for Research on Education Outcomes, 2015). A later study of the effects of educational reforms in Newark since 2011 found that Newark's charter sector realized substantial gains in statewide tests over the Newark Public Schools (NPS); it further asserted that the Newark system as a whole, including both NPS and the charter sector, saw gains in test score growth during the period of the reforms (Chin, Kane, Kozakowski, Schueler, &

Staiger, 2017). In a review of that study, however, Weber and Baker (2017b) find that the gains were tied to a change in the statewide assessment, and that geographically close and demographically similar districts showed similar effects. The authors' further exploration of Newark's charter sector also finds that the gains attributed to Newark charters are likely due to a combination of factors outside of superior instructional methods, including resource advantages, student attrition, and a focus on test-taking strategies.

To summarize: New Jersey is a relatively high-performing state in many educational outcomes, and has one of the more progressive school funding systems in the nation. It also has a robust and growing charter sector; however, charter students and staff differ significantly from public district students and staff in many measured (and perhaps unmeasured) characteristics.

Conceptual Framework

As I state in the first paper of this dissertation, the small body of empirical work on charter school proliferation and public district finances suggests that charter growth can have an impact on public school district spending and revenues. The inconsistencies in federally reported fiscal data, which manifests in differences between states in fiscal measures related to charter school funding, motivates further study at the state level using state data. New Jersey is a prime candidate for further study, not only because many districts in the state have experienced significant growth in charters, but also because many have not. While many of the districts with charters are in urban districts with significant enrollments of economically disadvantaged children, there are relatively affluent districts with significant charter sector penetration (Weber & Rubin, 2018). In addition, there are many New Jersey districts enrolling economically disadvantaged students that have little to no charter students as residents. This variation allows for plausible counterfactuals to be derived from observational data, leading to a stronger claim of causality.

Unlike some of the previous work on charter proliferation and hosting district finances, this paper explores the correlation between absolute spending and staff-student changes as opposed to shifts in proportions of categorical spending. As stated in the first paper of this dissertation, there is a sizeable and growing body of evidence that shows school spending has a meaningful effect on educational outcomes (Baker & Weber, 2016; Baker, Weber, et al., 2018; Jackson et al., 2016; Lafortune, Schanzenbach, et al., 2016). If charter proliferation decreases the absolute amount spent in public school districts, there is a greater chance of a negative effect on student outcomes in those districts. That said, increased spending due to charter proliferation is not automatically indicative of improved learning conditions. As suggested by the scale efficiencies literature, increased spending may be the result of increased inefficiencies: spending that does not have an impact on measured educational outcomes.[9]

Ultimately, a cost function model, accounting for inefficiencies, endogeneity, and educational outcomes, is necessary to determine the effects of charter proliferation on school costs (as opposed to school spending). But the difficulties in including these factors in the model, well-articulated in the scale economies literature (as well as in other research), is further compounded when studying charter school proliferation. The interplay between scale efficiencies/inefficiencies in both charters and public school

[9] I note here that "inefficiency" in this context does not necessarily mean spending that has no impact on educational outcomes; rather, it does not affect the outcomes measured. Spending, for example, on a music program may improve students' abilities in the arts, but those abilities may not be measured in a way to be included within a cost function model.

districts is only one possible complication. District schools may adjust spending in response to charter competition, but that adjustment could conceivably lead to greater spending, as district residents demand more quality from their district schools, or less spending, as local political will shifts toward improving the charter sector over the public sector. That spending may or may not be related to educational outcomes, as districts may choose to focus on spending that makes schools more attractive but not necessarily more effective (e.g., spending on capital projects, spending on extracurriculars, spending on marketing the district's schools, etc.).

The complexity of the interplay of charter proliferation and school costs suggests that developing a fully valid cost model incorporating charter school growth will be ongoing work. But the substantial challenges in developing this model will be greatly aided by research that develops models of school spending and charter proliferation as a preliminary step. Determining whether or not public district school spending changes due to charter growth is not the same as determining whether cost changes due to charter growth, but there would be little point in developing a cost model if there was no indication spending changed. Put simply: developing spending models based on charter growth will help us determine whether developing cost models based on charter growth is a worthwhile task.

The research herein, therefore, is best thought of as descriptive: holding other factors equal, do spending in various categories and staff-student ratios change as charters proliferate? As explained in the first paper of this dissertation, there are generally three possible answers: spending does not change, spending falls as charters grow, or spending rises as charters grow. The first possibility is often associated with supporters of charter schools: since "money moves with the child," there should be no impact on public district spending. This position, however, relies on several assumptions: first, that charter and district student populations are similar, so students who require more resources, such as LEP students or SWDs, are not concentrated in either sector more than another; second, that all spending in public school districts is perfectly elastic to enrollment declines dues to charter proliferation; and third, that additional efficiencies/inefficiencies will not materialize within public district schools due to scale changes.

Given the review of the research above, however, there is ample reason to believe at least some of these assumptions will not hold and that there will be an effect of charter proliferation on public district spending. In the first paper, my initial analysis of New Jersey data showed charter growth correlates with an increase in total district spending; this matches my preliminary analysis of Minnesota data as well as my analysis of federal data for many states. Of particular note is that both the model using NJDOE data and the model using federal data showed an increase in support spending, but only the federal model showed an increase in instructional spending. Instructional spending is what Freeman and Hannan would characterize as "direct" spending, while support spending would be thought of as "indirect." The New Jersey data-based models support the theory of different elasticities for different types of school spending: if public district schools have fixed costs for student support, per pupil spending would rise as total enrollments drop due to charter school proliferation, but instructional spending would not. The problem would be exacerbated if the students in need of more support services did not enroll in the charters but stayed in the public district schools; this is, indeed, the case with New Jersey's charter sector (Weber & Rubin, 2018).

Given these findings, the research herein leverages data on staffing within public district schools, which includes "job codes" that designate the assignments of certificated staff within a school district. While it is difficult to disentangle some these codes, others clearly indicate the instructional, support, or administrative function within a school district. Determining how the student-staff ratios of these specific jobs correlates to charter growth aids in the understanding of how various public school resources may be more or less elastic to enrollment declines due to charter growth.

This paper seeks to answer the following research questions:

RQ1: Holding other factors constant, how does charter proliferation affect the overall spending in New Jersey public district schools?

RQ2: Holding other factors constant, how does charter proliferation affect spending on instruction, student support, administration, and operations/maintenance in New Jersey public district schools?

RQ3: Holding other factors constant, how does charter proliferation affect staff-student ratios in New Jersey public district schools?

RQ4: Holding other factors constant, how does charter proliferation affect staff-student ratios in specific instructional and support positions in New Jersey public district schools?

Data

Following Arsen and Ni (2012), I use two measures of charter school proliferation in the models below. First, and as in the first paper of this dissertation, I designate *C* as the number of students enrolled in charter schools within the geographical boundaries of a public school district divided by that same number plus all of the students enrolled within the public district's schools. Geocoding of the public district host for each charter school was done by address as given in NJDOE school directory data[10], and confirmed by lat/lon coordinates from the School Funding Fairness Data System (Baker et al., 2017), as in this dissertation's first paper. Charter schools were matched to districts serving similar grades; for example, if a charter school enrolling K-5 students is located within both a regional high school district and a K-8 district, it is matched with the K-8 district only. In all incidents where a charter enrolled students in Grades K-12, that charter was geocoded to a K-12 "unified" district.

While this measure of charter proliferation is the most reasonable measure to use with federal data, it does run the risk of not being wholly accurate because it does not account for students who attend charters yet reside in a district different from the one where the charter is located. Because charter funding "passes through" public school districts, the NJDOE must calculate charter payments districts must make to every charter where resident students are enrolled, regardless of the charter's location. I leverage these charter aid notices[11] to calculate another measure of charter proliferation, C^*, which I define as: the number of district resident students attending any charter school in New Jersey for which the district must make payments, divided by that number plus the number of students enrolled in within the public district's schools. The charter aid notice data begins with the 2007-08 school year. To summarize:

$$C = \frac{students\ enrolled\ in\ charters\ within\ the\ district's\ boundaries}{students\ above + students\ enrolled\ in\ the\ district}$$

[10] https://homeroom5.doe.state.nj.us/directory/

[11] The charter aid notices were obtained through an Open Public Records Act request by Dr. Julia Sass Rubin of the Bloustein School of Public Policy and Planning at Rutgers, the State University of New Jersey. I thank Dr. Rubin for her generosity in allowing me to use this data.

$$C^* = \frac{resident\ students\ enrolled\ in\ charters\ anywhere\ in\ New\ Jersey}{students\ above + students\ enrolled\ in\ the\ district}$$

Table 2-1 shows the level of correlation between these two measures. While the correlation is already high (r=0.86) for all observations in the data panel, it increases as the observations are limited only to those districts with significant charter penetration. This suggests that there are substantial numbers of districts with lower levels of charter proliferation that do not host charters within their boundaries. Models using C^* will capture the effects of that proliferation, while models using *C* will not. On the other hand, models using *C* extend back further in time, allowing for more observations in the panel. I elect to use both measures and compare them; throughout this study, models using *C* are designated as "Model #1," and models using C^* are designated as "Model #2."

All student demographic, enrollment, and grade level data comes from NJDOE files. Limited English Proficient data only began to be collected in the 2005-06 school year. Fiscal data, following Schwenkenberg and VanderHoff (2015), comes from the NJDOE's Taxpayers' Guide to Education Spending (TGES), formerly the Comparative Cost Guide; I use the enrollment figures from these files to calculate per pupil costs. Spending figures within the TGES are categorized by various "indicators." Indicator 1 is "Budgetary Spending," which NJDOE defines as follows:

> While these costs do not provide an exhaustive picture of the cost for educating all students, they do allow school administrators and citizens to compare specific measures of school district spending. Generally, the BPP measures the annual costs incurred for students educated within district schools, using local taxes and state aid. These costs are considered to be more comparable among districts, and may be useful for budget considerations. Examples of costs that are not included

> in the BPP are: expenditures funded by restricted grants, Teachers' Pension and Annuity Fund (TPAF), tuition payments to other districts and private schools, debt service expenditures, and principal and interest payments for the lease purchase of land and buildings. Consistent with the exclusion of tuition expenditures, the measure excludes the enrollment for students sent out of district (Indicators 1 through 13, and 15). ("Taxpayers' Guide to Education Spending – 2017," 2017)

All TGES data used here is from the latest file available; in other words, if data for 2004 is available in the 2004, 2005, and 2006 files, I use the 2006 file as it is the most recent data source. Fiscal figures are adjusted by the Education Comparable Wage Index (ECWI) from the School Funding Fairness Data System; this allows for comparisons across both time and labor markets (Taylor & Glander, 2006).

Staffing files are from the NJDOE.[12] The files are structured with staff members as observations. For staff members with multiple job codes, I create separate observations, weighted by full time equivalency (FTE) as reported by the district to NJDOE. I then compress these files to the district level, weighting each observation by FTE. Throughout the time period of the final panel, job codes in the files were changed several times, which required me to recode earlier observations to match later ones.[13] The district-level FTE figures for different job codes were divided by district enrollment and multiplied by 100 to give a "staff per 100 students" measure.

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[12] The staffing files were obtained through Open Public Records Act requests by the Education Law Center, Newark, NJ. I thank Dr. Danielle Farrie, Research Director for the ELC, for her generosity in allowing me to use this data.

[13] My methodology is outlined in comments within my Stata code, which is available as an on-line supplement.

Methods and Models

As is standard in the literature (Wooldridge, 2010), I use a natural log transformation of the dependent variables in the models described below. This transformation creates a "log-level" interpretation of the estimates, where *x* change in charter proliferation results in *y* percentage change in the dependent variable. Measures of staff per 100 students are also log transformed.

Bruno (2017) finds that the relationship between district spending and charter proliferation in California data is best modeled as a quadratic function. Figure 2-1 and Figure 2-2 show a similar pattern in the New Jersey data. Both figures plot logged budgetary spending against the two different measures of charter proliferation (observations exclude districts with no charter proliferation). In both cases, logged spending increases initially with charter growth, then decreases as proliferation further rises; the red line is a quadratic fit curve that shows this pattern. A function following this curve would have the independent variable – in this case, charter proliferation – as two right-hand variables: untransformed and squared. The arch shape results from a positive coefficient for the untransformed variable and a negative coefficient for the squared variable.

The top of the curve is the "turnaround," where the relationship between spending and charter proliferation changes direction. The turnaround is derived from a formula that uses both the model estimate of the coefficient on charter proliferation and the coefficient on its squared term (Wooldridge, 2010). Conceptually, the turnaround is where district spending stops increasing as charters proliferate and instead begins decreasing. The turnaround is, therefore, also the point where charter proliferation has the greatest impact on district spending. Beyond the turnaround, charter growth has less impact; however, district spending will still be higher than it would be if there are no charters until the curve reaches the height where it started when there was no charter proliferation. Conceivably, district spending could fall below where it was with no charter proliferation if proliferation becomes great enough; however, that point is beyond the scope of the data.

Because of the curvilinear nature of the relationship between budgetary spending and charter proliferation, I include a quadratic term in the two models using budgetary spending as a dependent variable. Modeling with the quadratic term consistently showed a better fit with the data than simple linear modeling; therefore, and for the sake of consistency, I employ this functional form in all other models using different outcome variables.

The literature on scale economies suggests that the correlation between spending and scale yields a u-shaped curve. Yet the skewedness and depth of the curve is unknown and likely varies depending on context. To address this issue, I substitute a series of dummy variables for a continuous measure of scale. The dummies extend those used in previous research using cost functions (Baker, Farrie, et al., 2018; Baker, Weber, et al., 2018), adding categories for the largest districts in the New Jersey dataset.

As stated above, the measure of the percentage of the student population that is LEP is not available in NJDOE data until 2005-06. New Jersey's school aid formula has a provision that interacts a student's LEP status and free lunch-eligibility (FL). There is reason to believe, then, that LEP and FL should be interacted within the model; my development of these models revealed that interacting these two measures did, in fact, lead to a better fit. However, LEP data is not available throughout the entire time of the panel. Because C^* is also limited to a smaller time frame, I choose to interact LEP and FL only in the models with C^* as the variable of interest. Model #1, therefore, is based on 16 years of spending data but has fewer covariates; Model #2 is based on 7 years of spending data, but adds LEP and its interaction with FL.

New Jersey's aid formula also provides more funding for students who are in grades 6 to 8 or grades 9 to 12; I include covariates for the percentages of both grade level categories in the models. I note here again that these models are best understood as descriptive. Although it is well established that students with different characteristics require different amounts of resources to equalize educational opportunity (W. Duncombe & Yinger, 2005), a true cost model would at least acknowledge the possibility that extra revenues, such as the ones received from New Jersey districts for variations in student population, may induce extra spending over and above the amount of maximal efficiency. The goal of this research, however, is to show the correlation between spending and charter proliferation, holding all other factors constant. As other factors may contribute to spending variations, it is useful to include them as covariates within the model.

Consistent with the other research on charter proliferation and district resources, and with the first paper in this dissertation, I employ a fixed-effect model using panel data. This model sweeps away all time-invarying characteristics of districts, yet allows for time-varying characteristics to be added to the model. As in the first paper, all models herein follow this basic form:

$$Y_{it} = \beta_1 C_{it} + \beta_2 C^2{}_{it} + \beta_3 D_{it} + \gamma_t + \delta_i + \varepsilon_{it}$$

Y is a school district resource measure: spending per student in a variety of categories or staff of varying job codes per 100 pupils (natural log transformed). D is the vector of school district and student population characteristics described herein. γ is a set of year dummy variables to control for secular trends, δ is a set of time-invariant district fixed-effects, and ε is an idiosyncratic error term. Descriptive statistics for the covariates of the models and for the dependent variables are reported in Table 2-2.

The use of a quadratic term for charter proliferation in both models complicates both the interpretation of coefficients and tests of statistical significance; both the untransformed and the squared coefficients must be considered together. I use a standard joint significance F-test and report the p-value in each regression table. For the budgetary and categorical spending models, I report the marginal effects of the model at a variety of levels of charter proliferation at the means of the continuous covariates for a district with enrollment between 10,000 and 25,000 pupils. This reporting allows readers to see how the model predicts a "typical," moderately large district's spending would change as it was subject to increased charter proliferation. I also report the predicted effects at 75 percent FL; this is particularly useful for interpreting the results as the largest communities where charters have proliferated have high FL rates (Weber & Rubin, 2014, 2018).

Findings

Before presenting the estimates from the fixed-effects models, I first show the relationship between charter proliferation and enrollment decline. Figure 2-3 shows the correlation between changes in charter share (as expressed by C) and enrollments between 2000 and 2017 (only districts that experienced charter proliferation in 2017, as measured by *C*, are plotted). While charter proliferation does not explain the entirety of enrollment changes in these districts, there is a clear negative correlation between charter growth and enrollment. This aligns with the literature that finds the majority of charter students would otherwise enroll in public district schools.

Table 2-2 shows the descriptions of the variables used in the models. Over the time period of the panel, charter proliferation ranged from 0 to 38 percent as measured by *C*; the amount measured by *C** is slightly less. There is great variation in student population characteristics in New Jersey, with both low and high FL percentages and LEP percentages. New Jersey has several regional high schools, which serve as their own school districts; this explains the districts where all students are between grades 9 and 12. New Jersey also has a substantial number of small districts that enroll grades kindergarten through 8. A plurality of districts have between 1,000 and 3,000 students; there are a small number of urban districts enrolling more than 25,000 students. During the time encompassed by the data, New Jersey public school districts spent, on average, $12,099 per pupil, using the TGES "Budgetary Spending" indicator as the measure; this figure is adjusted in 2014 dollars for the greater Newark/Union County, NJ labor market. Public district schools averaged 8.5 staff per 100 students.

Charter Proliferation Effects on Budgetary Spending

Table 2-3 shows the estimates of the models using *C* (Model #1) and *C** (Model #2) of charter proliferation's effect on budgetary spending per pupil (natural log). The effects of the scale dummies in the models are both significant and substantial; this will be the case with nearly every model herein. Free lunch eligibility in Model #1 is significant, as is the interaction term for FL and LEP in Model #2. Grade level percentages have an effect on spending, with districts enrolling higher grade levels spending more.

The variable of interest is charter proliferation, as measured by *C* and *C**. In both models, the F-test shows the coefficients on the untransformed and squared terms are jointly significant in both models at the $p<0.05$ level. Charter proliferation, then, has a statistically significant effect on budgetary spending per pupil. In both models, the coefficient on the untransformed term is positive while the coefficient term on the squared term is negative; this means the effect of charter proliferation on spending is an arch shape, where early growth in charter proliferation leads to increased spending, while later growth leads to reductions. The turnaround is the highest point of the arch; at this level of charter proliferation, spending increases due to charter proliferation will be the highest.

To aid in interpreting these coefficients, Figure 2-4 and Figure 2-5 show the fitted (or predicted) values for the two models at different levels of charter proliferation, assuming a district has between 10,000 and 25,000 students and that all continuous independent variables are at the mean for the dataset. The arch in each figure is predicted by the model, with the highest point as the turnaround. Again: spending increases as charters proliferate until the turnaround, when spending begins to decrease. There is a substantial difference in the estimate of the turnaround between the two models: the model using more years of data but fewer covariates and a less precise measure of charter proliferation has the turnaround at a higher level of charter proliferation (24 percent) than the model using fewer years of data but more covariates and a more precise measure of proliferation (11 percent). The expanding confidence intervals on the plot are the result of decreasing statistical power as the number of districts above a threshold of proliferation decrease. I note again that this analysis is best thought of as descriptive; there are only a few districts in New Jersey with very high rates of proliferation, but how they respond the charter proliferation compared to the others is still informative for policy purposes. Tables 1B and 2B list the districts that saw charter proliferation over the turnaround predicted in each model, with the years they were over; many more districts are over the turnaround in Model #2 than in Model #1.

It is a standard procedure to log transform dependent variables in spending and cost models; however, interpretation is difficult when polynomial terms are used in the right side of the model equation. To aid in interpretation, I show in Table 2-4 the predicted effects of charter proliferation on budgetary spending at several different levels of proliferation in two different scenarios as described above: first, a hypothetical district with between 10,000 and 25,000 students with all other variables at the statewide mean; and second, a district with the same number of enrollments but with 75 percent of students eligible for free lunch, and all other variables at the statewide mean. To aid in interpretation, I retransform the predictions into 2014 dollars for the Newark/Union County labor market.

In Model #1, the first hypothetical district spends $12,384 per pupil when it has no charter proliferation. That figure grows by $1,701 when the district reaches a 20 percent charter share. In contrast, Model #2 shows the same hypothetical district spends $13,631 per pupil when none of its residents attend charters; that figure grows by $625 at 10 percent proliferation, but then begins to fall. At 20 percent proliferation, the district spends nearly what it spends with no proliferation; however, spending continues to fall as charter enrollments grow. At 25 percent proliferation, which is close to the boundaries of the data on this model, districts are spending $297 dollars less than they would with no charter proliferation.

The second hypothetical district, which has large numbers of students in disadvantage, follows a somewhat similar pattern, although there are differences in scale. In Model #1, a district with 20 percent charter proliferation spends $2,147 more than a district with no proliferation; there is a slow turnaround at higher levels. In Model #2, this district spends $640 dollars more when it reaches 10 percent proliferation. The change after the turnaround is steeper; by the time the district reaches 25 percent proliferation, it is spending $304 less per pupil than it would if none of its residents enrolled in a charter.

Charter Proliferation Effects on Categorical Spending

To test the theory of different elasticities to changes in charter proliferation for different categories of district spending, I next apply the fixed-effects models to four spending subcategories: instructional, support, administration, and operations/maintenance. Table 2-5 shows the estimates from the two models; the estimates from Table 2-3 are repeated for comparison. To aid with interpretation, I include tables showing the fitted values on this spending, similar to the table of fitted values on budgetary spending, in Tables 2-1A through 2-4A.

As with budgetary spending, most of these spending subcategories are significantly correlated with variations in scale and student population characteristics. Grade levels have an effect on instructional and support spending, although the effect is stronger in Model #1. Higher enrollments of grades 9-12 increases operations & maintenance spending. In every subcategory, *C* has a significant effect on spending in

Model #1. *C** has a significant effect at the $p<0.05$ level on instructional and administrative spending in Model #2. The p-values do not meet the traditional $p<0.05$ significance level for support and operations/maintenance spending, but they are under $p=0.10$. In all of the estimates, the untransformed charter proliferation term is positive while the squared term is negative, again leading to an arch-shaped estimate of the effect. The turnaround of Model #1 for support spending, however, is above 1, which is a logical impossibility. In all cases save administration spending, the turnaround estimated by Model #2 is lower than the turnaround estimated by Model #1.

Figures 2-6 through 2-13 plot the fitted values of the two models using categorical spending under the same assumptions as above for budgetary spending: continuous variables at their means and an enrollment size between 10,000 and 25,000 pupils. In Model #1, instructional spending has a steeper decline after the turnaround than budgetary spending; this suggests instructional spending, which includes teacher salaries, is more elastic after the turnaround to losses from charter proliferation than overall spending. In Model #2, instructional spending declines sharply after the turnaround; however, this instructional spending barely rises before the turnaround compared to total spending. This suggests instructional spending does not increase much in the early stages of charter growth, possibly because it is easier to cut instructional staff (what Freeman and Hannan would term a "direct" cost) during that period than other staff ("indirect" costs). Table 2-1A shows this to be the case: for Model #2, the first hypothetical district sees a spending rise of only $85 per pupil at 10 percent charter proliferation; at 25 percent, however, spending drops by $581. The second hypothetical district follows a similar pattern.

Support spending shows very different fitted values for Model #1 and Model #2, as shown in Figures 2-8 and 2-9. In Model #1 there is no turnaround for support spending; it simply continues to grow as charters proliferate. In Model #2, support spending follows a pattern more like total spending, rising to roughly the same turnaround (12.5 percent) and then falling. The pattern is similar in operations and maintenance spending, where Model #1's turnaround is nearly outside the scope of the data, while Model #2's is closer to the turnaround for budgetary spending.

The plots of fitted values on administrative spending show the greatest similarities between Model #1 and Model #2. The turnarounds are notably similar: 12 percent for Model #1, and 13 percent for Model #2. The plots for the hypothetical district show a similar pattern: administrative spending rises as charters proliferate in the early stages, then falls in the later stages.

Charter Proliferation Effects on Staffing

To further explore the effects of charter proliferation on district resources, I use staffing intensity, as measured by staff per 100 students (ln), as a dependent variable in further models.[14] As stated in the first paper of this dissertation, 81.1 percent of current expenditures in the United States on elementary and secondary education was attributed to salaries, wages, and benefits in FY 2015 (Cornman et al., 2018, p. 3). Staff changes due to charter proliferation, therefore, are a way to further understand how districts may respond to the fiscal pressures of charter proliferation. Table 2-6 divides staff into three categories: instructional, support, and administrative. In Freeman and Hannan's

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[14] I note here that the panel gains two additional years for both Model #1 and Model #2. This is because I limit spending to years with "actual" figures as denoted by NJDOE, as opposed to "budgeted" figures, which can differ significantly for the same school year. Also, since I adjust spending by ECWI, I am restricted to years where that figure is available; there is no such restriction on staffing data.

framework, instructional staff would be a “direct” cost; administrative and support staff would be “indirect.” The joint test of significance for the charter proliferation terms shows that charter growth has no effect on the intensity of instructional staff in ether of the models. In other words, variations in instructional staff to student ratios cannot be explained, in these models, by charter proliferation. On the other hand, Model #1 shows that administrative and support staff intensity is significantly affected by charter growth. Yet the estimates from Model #2, while showing a similar direction, do not rise to the traditional level of statistical significance ($p<0.05$).

Table 2-7 and Table 2-8 apply the models to specific areas of support and instructional staffing. A problem when looking a specific job codes is that many instructional staff functions in a district could be fulfilled by staff with overlapping codes; for example, Grade 5 math teachers in different districts (or even the same district) could be classified as elementary teachers, elementary math teachers, Grade 5-8 math teachers, general math teachers, and so on. To avoid this issue, I choose support and staff job codes that can be grouped together with the reasonable assumption that they will not overlap with other job codes that may include staff with different functions.

Table 2-7 shows that the effect of charter proliferation on school counselors per 100 students follows the same arch-like pattern of budgetary spending; however, Model #2’s joint F-test is only significant at the $p<0.10$ level. The effects of proliferation on learning disabilities teacher coordinators (LDTC) in Models #1 and #2 are very different as evidenced by the coefficients on both charter proliferation terms, as they are for occupational and physical therapists (OT/PT). Only for social worker staffing levels do both models show a statistically significant and similar effect from charter proliferation.

Table 2-8 shows that only staffing intensity for world language staff is affected by charter proliferation in both models; however, the turnarounds are very different, with Model #1's outside the scope of the data. English as a Second Language (ESL) staffing intensity appears to be affected the most similarly to budgetary spending; however, Model #2's joint F-test is significant at the $p<0.10$ level, but not at $p<0.05$. Model #2 includes a covariate for Limited English Proficiency; this covariate is likely picking up the differences in ESL staffing intensity in a way Model #1 cannot.

Discussion

With every different dependent variable, there were clear differences in the estimates from Model #1 and Model #2. Again: Model #1 uses a dataset with more years, which may explain part of the differences in the estimations. The inclusion of LEP as a covariate in Model #2 is another important difference, but likely just as important is the greater number of districts showing some charter proliferation as measured by C^* as opposed to C. This variation is not picked up in Model #1; however, most of the variation is at the lower end of the scale of charter proliferation, as many of the districts showing proliferation greater than zero in C^* but not C will only have a few resident pupils attending charters located in a distant district.

This said: while the estimates and fitted values may differ between the models, a clear pattern does emerge. As charter schools begin to proliferate in New Jersey districts, per pupil budgetary spending – again, the spending NJDOE describes as "more comparable among districts" – increases in the public school districts where charters draw their pupils. At some point, however, spending begins to fall. Whether the spending at high levels of charter proliferation falls below the level of spending with no charter proliferation is an open question, dependent on the modeling of the effect and the influence on the model of a small number of districts in a few years with large levels of charter penetration.

But even if the results herein are not definitive as to what happens at the later stages of charter proliferation, it is clear the early stages show charter growth is associated with higher spending. The theory that this increase in spending is due, at least in part, to the differing elasticities of categories of school spending to enrollment losses is, however, more difficult to support, although there is some evidence this is the case. The correlations between spending and staff per 100 variations and changes in charter proliferation depend greatly on both the model and the dependent variable resource measure used. But one trend does emerge: whether measured by spending or staff intensity, administration per pupil tends to increase during the early stages of charter proliferation, which suggests that administrative expenses are less elastic to enrollment loss due to charter proliferation at its early stages.

Were one to rely only on Model #1, one could make a similar case for support resources: fitted values show a clear pattern of increased support spending and staff intensity in the early stages of charter growth. Model #2's weaker statistical significance, particularly in the model using staff per 100 as a resource, however, should give us pause before viewing the effect of charter proliferation on administrative and support resources in the same way. This said, it is notable that school social workers (and, to a lesser degree, school counselors) fit the budgetary spending model closely. It may be that some support services are more elastic than others to charter growth.

The same may also be true of instructional spending. World language staff intensity is strongly correlated with charter growth; ESL staff intensity somewhat less so. But the lack of a clear and significant correlation in other staff functions may also suggest that districts respond to the fiscal effects of charter proliferation in different ways. Again, Model #2 has many more districts included that are measured as having experienced charter proliferation than Model #1, due to the difference in *C* and *C**. Given this, it is notable that while Model #2's estimates on budgetary spending show a clear, significant ($p<0.05$) effect of charter proliferation on total spending, only instructional spending, administrative spending, and social workers per 100 meet the same level of significance and have an arch-shaped trend. It may be that when more districts with low levels of proliferation are added to the data, the variability in particular responses grows. The notion that districts respond in different ways to charter proliferation does not, however, change the fact that overall spending rises and then falls in response to charter growth.

The literature on enrollment decline gives a simple explanation for this rise in budgetary spending: because public school districts have indirect costs that are less elastic to enrollment loss, they will not respond perfectly to enrollment loss with spending cuts. Estimates from the models herein give at least some support for this theory. The literature on scale economies also suggests that districts may move away from their optimal point of efficiency as they lose enrollments to charters, particularly districts that were modest in size to begin with. It does not seem likely that most New Jersey districts, whose largest enrollment in this dataset is nearly 44,000, would gain in efficiency due to shrinking, but the possibility should not be completely discounted.

There is also the possibility that factors others than inelasticity to enrollment loss or scale inefficiencies are responsible for the gain, and then loss, in spending as charter proliferate. It may be that public school districts increase spending in response to competition from charters – again, in ways that may or may not have effects on educational outcomes. As charters proliferate, however, the demand for public school spending may shift, as charters gain political power through the families whose children they enroll. Research has shown that charter families often rely on social networks to access charter schools (Altenhofen et al., 2016), and that the social and economic status of charter and public school families can differ significantly (Brown & Makris, 2018; Makris, 2015). These same conditions may make charter families more effective advocates for their own children's school at the expense of spending in public district schools. Education can be conceived as a positional good (Hollis, 1982); charter families may prefer that spending in other schools, including local public district schools, be less than the spending at their own children's school.

Conclusions and Recommendations

The research herein opens several new avenues for further study. Further development of spending models on charter proliferation using other sources of data may yield further insights, as would applying the models herein to other states. How the loss of enrollments affects scale efficiencies is still unknown and worthy of further inquiry, as the point of maximal efficiency (if it exists) for New Jersey districts has not been determined. How charter proliferation affects revenues is another potential area of study. Adding outcomes to the models will move them closer to becoming true cost models, although modeling the simultaneous determination of spending and outcomes with added complexity of charter proliferation will likely prove to be difficult.

While further study is needed to explore these issues, the finding of this initial research – that public district school spending rises in the earlier stages of charter growth – is important, even if it is not exactly clear how categorical resource elasticities, scale efficiencies, and other factors may lead to these increases. Again: while it is possible these increases improve learning conditions and educational outcomes, it is likely they are simply increases in inefficiencies. Further study incorporating educational outcomes into the models here may yield insights into the efficiency of these spending increases. Yet even if there are some gains in outcomes from the increases, the distribution of these spending surges is not deliberate; they are made solely on the basis of charter proliferation. Spending increases due to charter proliferation, then, are at best an accidental benefit to public district schools, but at worst a system-wide increase in inefficiency.

It is worth noting that rhetoric from charter advocates suggests that these increases should not be occurring; instead, these advocates suggest district spending should be completely elastic to charter growth. Roza and Fullerton (2013), for example, warn against state policies that supposedly fund "phantom students," such as holding districts' state aid harmless when those districts lose enrollments to charter schools. They suggest districts have the ability to weather enrollment losses through innovation, yet give no actual examples of how districts have done this. The research herein, which shows a strong correlation between budgetary spending and charter proliferation and presents evidence of differences in the elasticities of different categories of spending to charter growth, suggests that even if districts could adjust to enrollment losses due to charter expansion, they have not yet found a way to do so.

In addition: there is no reason to believe districts would "innovate" their way to lower spending only in the face of enrollment loss to charters. Other forces, such as political pressure from taxpayers, could be just as effective at inducing these alleged cost saving innovations. Further, the arch shape of the fitted values of both models suggests district do respond to charter proliferation with spending cuts eventually; although the data is limited, it is possible that when charter share grows to high levels public school districts may reduce spending to levels lower than they would be in the absence of any charter schools. But the structure of districts, with fixed, "indirect" costs, likely make perfectly elastic reductions in spending impossible.

Even if districts could respond to enrollment declines due to charters more quickly, there is sufficient reason to believe spending increases would still occur. Policymakers should weigh the costs of these increases against the benefit of charter growth. The literature suggests charter gains on student outcomes, in the aggregate, are relatively small. In addition, research on charters in Newark, New Jersey shows other factors, such as cohort attrition, resource advantages, and "teaching to the test" explain much of the outcome gain that higher-performing charters exhibit (Weber & Baker, 2017b). Charter advocates might contend that the ability of parents to choose the type of education their children receive has an inherent worth, regardless of any outcome differences. Again: this, and any other benefits from charter school growth, must be balanced against the empirical evidence presented herein that shows charter growth leads to increased spending in public district schools.

Tables

Table 2-1

Correlations of measures of charter proliferation

	Level of Charter Proliferation			
	All obs.	> 0%	> 1%	> 10%
rho	0.86	0.841	0.839	0.96
N	4895	288	254	72

Table 2-2

Descriptions of Model Variables

	N	Mean	Std. Dev.	Min.	Max.
Charter Proliferation					
Geocoded	10368	0.004	0.023	0	0.381
From Aid Notices	4895	0.007	0.025	0	0.359
Covariates					
Pct. Free Lunch Eligible	10368	0.166	0.188	0	0.998
Pct. Limited English Proficient	6538	0.026	0.042	0	0.888
Pct. Grades 6-8	10364	0.242	0.097	0	0.796
Pct. Grades 9-12	10367	0.194	0.257	0	1
Enrollment	10368	2395	3480	32	43609
Enrollment Categories					
<300	1353				
301-600	1528				
601-1000	1627				
100-3000	3371				
3001-10000	2179				
10001-25000	261				
>25000	49				
Dependent Variables					
Spending Per Pupil					
Budgetary (ind 1)	10356	12099	3629	4827	112761
Classroom Instruction (ind 2)	10356	7246	2087	3099	63363
Support (ind 6)	10356	1782	817	101	18142
Administration (ind 8)	10356	1408	409	497	16248
Operations & Maintenance (ind 10)	10356	1380	565	381	14313
Staff per 100 Students	10324	0.737	0.373	0.011	8.889
Instructional	10351	8.464	2.477	0.24	100.306
Administrative	10324	0.737	0.373	0.011	8.889
Support	10304	1.249	0.462	0.065	13.379
Counselors	7825	0.246	0.133	0.008	3
English as a Second Language (ESL)	6380	0.157	0.163	0.003	1.508
Learning Disabilities Teacher Coordinators (LDTC)	8696	0.132	0.092	0.01	2.273
Occupation/Physical Therapists (OT/PT)	3201	0.086	0.078	0.002	0.952
Psychologists	8994	0.16	0.092	0.012	1.682
Social Workers	9054	0.145	0.101	0.009	1.563
Speech	9240	0.206	0.131	0.01	3.084
Music	10140	0.295	0.149	0.015	4.444
Visual Arts	10087	0.231	0.113	0.015	2.778
World Language	9413	0.565	0.419	0.015	12.117

Table 2-3

Effect of Charter Proliferation on Budgetary Spending per pupil (natural log).

	Model #1: Geocoded	Model #2: Aid Notices
Charter Proliferation	1.111***	0.806**
	(0.307)	(0.364)
Charter Proliferation sq.	-2.339	-3.577***
	(1.664)	(1.262)
Pct. Free-Lunch Eligible	0.394***	0.082**
	(0.036)	(0.040)
Pct. Limited English Proficient	-	0.404**
		(0.199)
Pct. FL*Pct. LEP	-	-1.509***
		(0.340)
Enrollment (baseline <300)		
301-600	-0.131***	-0.079***
	(0.024)	(0.017)
601-1000	-0.216***	-0.142***
	(0.028)	(0.022)
1001-3000	-0.303***	-0.191***
	(0.034)	(0.026)
3K-10K	-0.341***	-0.230***
	(0.038)	(0.029)
10K-25K	-0.392***	-0.268***
	(0.045)	(0.035)
>25K	-0.327***	-0.366***
	(0.060)	(0.037)
Pct. Grades 6-8	0.384***	0.170
	(0.136)	(0.124)
Pct. Grades 9-12	0.539***	0.253**
	(0.084)	(0.104)
constant	9.554***	9.678***
	(0.048)	(0.044)
N	8722	3800
Districts	547	547
Max Obs. of Districts (years)	16	7
Charter Proliferation Turnaround	0.238	0.113
Test: Charter Prolif. & Charter Prolif. sq.		
Prob > F	0.000***	0.016**

**p<0.10, **p<0.05, ***p<0.01*

Note: Robust standard errors clustering at the district level are in parentheses. All models include district and year fixed effects. Panels are unbalanced.

Table 2-4

Predicted Effects of Charter Proliferation on Budgetary Spending per pupil (natural log).

Proliferation	Model #1: Geocoded				Model #2: Aid Notices			
	At means	Dollars	Pct. FL = 75%	Dollars	At means	Dollars	Pct. FL = 75%	Dollars
0.0	9.424***	$12,384	9.657***	$15,629	9.520***	$13,631	9.544***	$13,963
	(0.028)		(0.035)		(0.022)		(0.032)	
0.01	9.435***	$12,519	9.668***	$15,800	9.528***	$13,736	9.552***	$14,071
	(0.028)		(0.035)		(0.022)		(0.032)	
0.05	9.474***	$13,015	9.707***	$16,426	9.551***	$14,065	9.575***	$14,407
	(0.029)		(0.035)		(0.026)		(0.033)	
0.10	9.512***	$13,520	9.745***	$17,062	9.565***	$14,256	9.589***	$14,603
	(0.032)		(0.037)		(0.033)		(0.038)	
0.15	9.538***	$13,880	9.771***	$17,518	9.561***	$14,193	9.585***	$14,539
	(0.037)		(0.041)		(0.038)		(0.042)	
0.20	9.553***	$14,085	9.786***	$17,776	9.538***	$13,880	9.562***	$14,218
	(0.048)		(0.052)		(0.043)		(0.047)	
0.25	9.556***	$14,126	9.789***	$17,828	9.498***	$13,334	9.522***	$13,658
	(0.067)		(0.072)		(0.050)		(0.054)	
0.30	9.547***	$14,003	9.780***	$17,673	9.440***	$12,581	9.464***	$12,888
	(0.097)		(0.101)		(0.062)		(0.066)	
0.35	9.527***	$13,720	9.759***	$17,315	9.364***	$11,661	9.388***	$11,945
	(0.137)		(0.141)		(0.081)		(0.085)	
N	8722				3800			

**p<0.10, **p<0.05, ***p<0.01*

Table 2-5

Effect of Charter Proliferation on Categorical Spending per pupil (natural log).

	Budgetary, ln		Instructional, ln		Support, ln		Administration, ln		Operations/Maintenance, ln	
	Model #1	Model #2	Model #1	Model #2	Model #1	Model #2	Model #1	Model #2	Model #1	Model #2
Charter Proliferation	1.111***	0.806**	0.802***	0.366	1.447*	1.176*	1.159**	1.703***	2.272***	1.591**
	(0.307)	(0.364)	(0.298)	(0.422)	(0.849)	(0.638)	(0.467)	(0.569)	(0.549)	(0.680)
Charter Proliferation sq.	-2.339	-3.577***	-2.527*	-2.629*	-0.141	-4.688**	-4.418***	-4.597**	-3.548	-4.868*
	(1.664)	(1.262)	(1.506)	(1.390)	(4.517)	(2.102)	(1.405)	(1.797)	(2.376)	(2.609)
Pct. Free-Lunch Eligible	0.394***	0.082**	0.398***	0.093**	0.888***	0.429***	-0.189***	-0.179***	0.448***	-0.153**
	(0.036)	(0.040)	(0.038)	(0.042)	(0.074)	(0.066)	(0.052)	(0.060)	(0.058)	(0.078)
Pct. Limited English Proficient	-	0.404**	-	0.559***	-	0.993***	-	-0.538	-	-0.100
		(0.199)		(0.187)		(0.357)		(0.328)		(0.450)
Pct. FL*Pct. LEP	-	-1.509***	-	-1.568***	-	-2.511***	-	-0.114	-	-1.363*
		(0.340)		(0.318)		(0.533)		(0.520)		(0.803)
Enrollment (baseline <300)										
301-600	-0.131***	-0.079***	-0.118***	-0.071***	-0.181***	-0.110***	-0.076**	-0.055**	-0.176***	-0.109***
	(0.024)	(0.017)	(0.024)	(0.016)	(0.040)	(0.039)	(0.033)	(0.027)	(0.041)	(0.031)
601-1000	-0.216***	-0.142***	-0.206***	-0.128***	-0.257***	-0.226***	-0.162***	-0.107***	-0.268***	-0.169***
	(0.028)	(0.022)	(0.028)	(0.021)	(0.052)	(0.050)	(0.037)	(0.033)	(0.049)	(0.040)
1001-3000	-0.303***	-0.191***	-0.285***	-0.171***	-0.326***	-0.302***	-0.272***	-0.148***	-0.377***	-0.209***
	(0.034)	(0.026)	(0.033)	(0.025)	(0.061)	(0.059)	(0.043)	(0.037)	(0.058)	(0.047)
3K-10K	-0.341***	-0.230***	-0.321***	-0.204***	-0.390***	-0.388***	-0.282***	-0.170***	-0.401***	-0.248***
	(0.038)	(0.029)	(0.036)	(0.026)	(0.069)	(0.066)	(0.048)	(0.046)	(0.065)	(0.057)
10K-25K	-0.392***	-0.268***	-0.349***	-0.245***	-0.521***	-0.423***	-0.357***	-0.211***	-0.419***	-0.216***
	(0.045)	(0.035)	(0.045)	(0.030)	(0.083)	(0.070)	(0.058)	(0.056)	(0.072)	(0.077)
>25K	-0.327***	-0.366***	-0.287***	-0.375***	-0.411***	-0.466***	-0.300***	-0.208***	-0.361***	-0.320***
	(0.060)	(0.037)	(0.055)	(0.036)	(0.117)	(0.071)	(0.060)	(0.066)	(0.086)	(0.080)
Pct. Grades 6-8	0.384***	0.170	0.353***	0.166*	0.560**	0.239	0.452***	0.227	0.328	-0.048
	(0.136)	(0.124)	(0.124)	(0.093)	(0.230)	(0.191)	(0.111)	(0.146)	(0.267)	(0.246)
Pct. Grades 9-12	0.539***	0.253**	0.457***	0.203**	0.804***	0.265**	0.120	0.232*	0.740***	0.336**
	(0.084)	(0.104)	(0.083)	(0.100)	(0.147)	(0.132)	(0.120)	(0.130)	(0.126)	(0.149)
constant	9.554***	9.678***	9.054***	9.158***	7.444***	7.761***	7.531***	7.480***	7.374***	7.599***
	(0.048)	(0.044)	(0.045)	(0.038)	(0.081)	(0.070)	(0.051)	(0.053)	(0.085)	(0.078)
N	8722	3800	8722	3800	8722	3800	8722	3800	8722	3800
Districts	547	547	547	547	547	547	547	547	547	547
Max Obs. of Districts (years)	16	7	16	7	16	7	16	7	16	7
Charter Proliferation Turnaround	0.238	0.113	0.159	0.07	5.134	0.125	0.131	0.185	0.32	0.163
Test: Charter Prolif. & Charter Prolif. sq.										
Prob > F	0.000***	0.016**	0.022**	0.037**	0.001***	0.083*	0.004***	0.011**	0.000***	0.065*

*$p<0.10$, **$p<0.05$, ***$p<0.01$

Note: Robust standard errors clustering at the district level are in parentheses. All models include district and year fixed effects. Panels are unbalanced.

Table 2-6

Effect of Charter Proliferation on Categorical Staffing per 100 Students (natural log)

	Instructional Staff per 100, ln		Administrative Staff per 100, ln		Support Staff per 100, ln	
	Model #1	Model #2	Model #1	Model #2	Model #1	Model #2
Charter Proliferation	0.278	-0.504	1.291**	1.734*	1.400	0.850
	(0.488)	(1.224)	(0.621)	(1.022)	(0.891)	(1.156)
Charter Proliferation sq.	-0.214	-0.230	-1.591	-5.864**	-1.694	-6.274*
	(1.791)	(2.882)	(1.609)	(2.736)	(4.170)	(3.652)
Pct. Free-Lunch Eligible	0.289***	-0.067	0.184***	0.068	0.455***	0.034
	(0.042)	(0.069)	(0.067)	(0.109)	(0.090)	(0.124)
Pct. Limited English Proficient	-	0.404	-	1.260*	-	0.286
		(0.297)		(0.717)		(0.825)
Pct. FL*Pct. LEP	-	-0.906	-	-1.262	-	-0.840
		(0.901)		(1.028)		(1.323)
Enrollment (baseline <300)						
301-600	-0.181***	-0.172***	-0.208***	-0.111**	-0.224***	-0.162**
	(0.028)	(0.044)	(0.037)	(0.053)	(0.063)	(0.068)
601-1000	-0.287***	-0.291***	-0.379***	-0.256***	-0.354***	-0.277***
	(0.038)	(0.076)	(0.046)	(0.088)	(0.072)	(0.102)
1001-3000	-0.365***	-0.385***	-0.488***	-0.338***	-0.488***	-0.403***
	(0.042)	(0.081)	(0.054)	(0.094)	(0.082)	(0.108)
3K-10K	-0.402***	-0.437***	-0.571***	-0.396***	-0.562***	-0.471***
	(0.044)	(0.083)	(0.057)	(0.097)	(0.087)	(0.111)
10K-25K	-0.456***	-0.457***	-0.651***	-0.429***	-0.658***	-0.565***
	(0.051)	(0.096)	(0.061)	(0.109)	(0.099)	(0.122)
>25K	-0.460***	-0.520***	-0.646***	-0.359**	-0.675***	-0.637***
	(0.081)	(0.102)	(0.118)	(0.180)	(0.138)	(0.128)
Pct. Grades 6-8	0.381***	0.031	0.261	-0.078	0.573***	0.311
	(0.122)	(0.177)	(0.303)	(0.475)	(0.201)	(0.277)
Pct. Grades 9-12	0.569***	0.303***	0.334***	0.493***	0.816***	0.317*
	(0.082)	(0.117)	(0.111)	(0.189)	(0.172)	(0.191)
constant	2.151***	2.405***	-0.154*	-0.214	0.180*	0.401***
	(0.053)	(0.104)	(0.091)	(0.163)	(0.101)	(0.140)
N	10347	4875	10320	4858	10300	4855
Districts	553	550	553	549	553	550
Max Obs. of Districts (years)	19	9	19	9	19	9
Charter Proliferation Turnaround	0.65	-1.097	0.406	0.148	0.413	0.068
Test: Charter Prolif. & Charter Prolif. sq.						
Prob > F	0.502	0.564	0.006***	0.070*	0.003***	0.140

$^*p<0.10$, $^{**}p<0.05$, $^{***}p<0.01$

Note: Robust standard errors clustering at the district level are in parentheses. All models include district and year fixed effects. Panels are unbalanced.

Table 2-7

Effect of Charter Proliferation on Categorical Support Staffing per 100 Students (natural log).

	Counselors, ln		Librarians, ln		LDTC, ln		OTPT, ln	
	Model #1	Model #2	Model #1	Model #2	Model #1	Model #2	Model #1	Model #2
Charter Proliferation	4.556***	3.214**	-0.302	-0.279	-0.047	0.324	0.487	-0.812
	(1.659)	(1.556)	(1.131)	(1.758)	(1.261)	(2.094)	(1.471)	(1.809)
Charter Proliferation sq.	-11.450*	-16.814**	-2.216	-5.310	3.708	-0.433	9.084*	13.016***
	(6.540)	(8.095)	(3.855)	(5.686)	(3.362)	(5.034)	(4.975)	(4.303)
Pct. Free-Lunch Eligible	1.577***	0.159	-0.819***	-0.766***	0.213*	-0.274	2.371***	1.733***
	(0.170)	(0.126)	(0.137)	(0.175)	(0.116)	(0.171)	(0.359)	(0.386)
Pct. Limited English Proficient	-	1.329*	-	-1.964*	-	0.073	-	0.116
		(0.691)		(1.116)		(0.841)		(1.457)
Pct. FL*Pct. LEP	-	-3.190***	-	0.180	-	0.321	-	-1.534
		(1.052)		(1.584)		(1.252)		(3.174)
Enrollment (baseline <300)								
301-600	-0.243**	-0.264*	-0.332***	-0.342***	-0.091	-0.099	-0.389*	-0.364
	(0.095)	(0.155)	(0.054)	(0.130)	(0.073)	(0.121)	(0.213)	(0.250)
601-1000	-0.438***	-0.550***	-0.476***	-0.472***	-0.258***	-0.193	-0.652***	-0.533**
	(0.119)	(0.187)	(0.072)	(0.167)	(0.088)	(0.148)	(0.231)	(0.263)
1001-3000	-0.601***	-0.723***	-0.577***	-0.584***	-0.402***	-0.318**	-0.867***	-0.759***
	(0.128)	(0.196)	(0.093)	(0.180)	(0.099)	(0.154)	(0.278)	(0.286)
3K-10K	-0.617***	-0.853***	-0.701***	-0.609***	-0.431***	-0.378**	-0.873***	-0.809**
	(0.143)	(0.200)	(0.112)	(0.192)	(0.110)	(0.159)	(0.300)	(0.326)
10K-25K	-0.652***	-1.019***	-0.939***	-0.748***	-0.449***	-0.338*	-1.196***	-0.435
	(0.189)	(0.233)	(0.155)	(0.210)	(0.119)	(0.186)	(0.423)	(0.570)
>25K	-0.799***	-1.149***	-0.889***	-0.997***	-0.401***	-0.359*	-1.259***	-0.452
	(0.190)	(0.237)	(0.263)	(0.215)	(0.120)	(0.189)	(0.431)	(0.575)
Pct. Grades 6-8	1.393***	0.815*	-0.142	-0.118	0.806***	0.709	2.076***	1.423*
	(0.452)	(0.485)	(0.244)	(0.421)	(0.307)	(0.454)	(0.799)	(0.768)
Pct. Grades 9-12	1.591***	0.071	-0.892***	0.575*	0.461*	0.380	2.377*	-0.055
	(0.406)	(0.317)	(0.277)	(0.293)	(0.253)	(0.364)	(1.226)	(0.809)
constant	-2.026***	-0.983***	-1.023***	-1.371***	-2.161***	-2.072***	-3.329***	-2.602***
	(0.208)	(0.271)	(0.118)	(0.236)	(0.119)	(0.162)	(0.420)	(0.375)
N	7821	4053	8436	3977	8692	4041	3198	2023
Districts	508	494	526	503	531	509	324	315
Max Obs. of Districts (years)	19	9	19	9	19	9	19	9
Charter Proliferation Turnaround	0.199	0.096	-0.068	-0.026	-0.006	0.374	0.027	-0.031
Test: Charter Prolif. & Charter Prolif. sq.								
Prob > F	0.001***	0.080*	0.166	0.065*	0.000***	0.978	0.000***	0.000***

**p<0.10, **p<0.05, ***p<0.01*

Note: Robust standard errors clustering at the district level are in parentheses. All models include district and year fixed effects. Panels are unbalanced.

Table 2-7 (continued)

	Psychologists, ln		Social Workers, ln		Speech, ln	
	Model #1	Model #2	Model #1	Model #2	Model #1	Model #2
Charter Proliferation	-1.246	1.972*	3.470**	2.483**	1.792	1.914
	(1.221)	(1.034)	(1.444)	(1.012)	(1.453)	(1.542)
Charter Proliferation sq.	6.352	-3.920	-2.781	-9.721***	-1.895	-3.170
	(3.988)	(2.516)	(6.044)	(3.024)	(5.312)	(4.328)
Pct. Free-Lunch Eligible	-0.321**	0.705***	0.684***	0.060	0.923***	0.345***
	(0.152)	(0.150)	(0.122)	(0.140)	(0.114)	(0.133)
Pct. Limited English Proficient	-	1.626**	-	-0.459	-	-0.272
		(0.795)		(0.851)		(0.765)
Pct. FL*Pct. LEP	-	-4.461***	-	-0.197	-	-0.610
		(1.180)		(1.222)		(1.002)
Enrollment (baseline <300)						
301-600	-0.187**	-0.124*	-0.283***	0.044	-0.138***	-0.129*
	(0.081)	(0.065)	(0.109)	(0.188)	(0.042)	(0.069)
601-1000	-0.232**	-0.239***	-0.371***	-0.090	-0.250***	-0.197*
	(0.099)	(0.073)	(0.125)	(0.202)	(0.063)	(0.111)
1001-3000	-0.341***	-0.411***	-0.430***	-0.207	-0.307***	-0.252**
	(0.114)	(0.097)	(0.138)	(0.208)	(0.074)	(0.119)
3K-10K	-0.527***	-0.458***	-0.438***	-0.233	-0.354***	-0.316**
	(0.135)	(0.104)	(0.152)	(0.214)	(0.086)	(0.125)
10K-25K	-0.583***	-0.464***	-0.514***	-0.409*	-0.527***	-0.412***
	(0.205)	(0.129)	(0.179)	(0.217)	(0.120)	(0.140)
>25K	-0.565**	-0.466***	-0.536**	-0.616***	-0.498***	-0.440***
	(0.243)	(0.133)	(0.223)	(0.217)	(0.130)	(0.146)
Pct. Grades 6-8	0.524***	0.458***	0.634***	0.565***	0.566***	0.572***
	(0.064)	(0.034)	(0.044)	(0.031)	(0.051)	(0.037)
Pct. Grades 9-12	0.283**	0.337***	0.429**	0.222***	0.348**	0.143**
	(0.116)	(0.058)	(0.190)	(0.041)	(0.157)	(0.066)
constant	-1.755***	-1.995***	-2.110***	-2.063***	-1.840***	-1.672***
	(0.110)	(0.091)	(0.134)	(0.193)	(0.074)	(0.113)
N	8994	4242	9054	4255	9240	4286
Districts	523	510	532	516	535	523
Max Obs. of Districts (years)	19	9	19	9	19	9
Charter Proliferation Turnaround	-0.098	0.252	0.624	0.128	0.473	0.302
Test: Charter Prolif. & Charter Prolif. sq. Prob > F	0.161	0.112	0.000***	0.005***	0.127	0.315

**p<0.10, **p<0.05, ***p<0.01*

Table 2-8

Effect of Charter Proliferation on Categorical Instructional Staffing per 100 Students (natural log)

	Music, ln		Visual Arts, ln		World Language, ln		Health/PE, ln		ESL, ln	
	Model #1	Model #2	Model #1	Model #2	Model #1	Model #2	Model #1	Model #2	Model #1	Model #2
Charter Proliferation	0.138	-0.542	0.570	0.915	4.627***	0.472	0.412	-0.184	3.081*	1.318
	(0.926)	(1.198)	(0.732)	(1.240)	(1.703)	(2.152)	(0.526)	(1.318)	(1.634)	(1.339)
Charter Proliferation sq.	-0.237	-3.253	0.797	-4.411	-2.490	-5.717	0.606	-0.715	-9.760**	-7.888**
	(3.353)	(3.364)	(3.066)	(2.994)	(7.257)	(4.761)	(1.733)	(2.794)	(3.997)	(3.834)
Pct. Free-Lunch Eligible	0.042	-0.261**	0.236***	-0.111	3.255***	0.116	0.231***	-0.123	0.787***	0.457**
	(0.082)	(0.125)	(0.082)	(0.109)	(0.196)	(0.174)	(0.061)	(0.085)	(0.169)	(0.193)
Pct. Limited English Proficient	-	-0.073	-	0.641	-	1.445	-	0.044	-	5.145***
		(0.547)		(0.516)		(0.895)		(0.475)		(1.038)
Pct. FL*Pct. LEP	-	-0.716	-	-1.564	-	-2.613**	-	-1.132	-	-4.688***
		(1.010)		(1.012)		(1.241)		(0.866)		(1.469)
Enrollment (baseline <300)										
301-600	-0.211***	-0.178**	-0.232***	-0.183***	-0.399***	-0.120	-0.203***	-0.165***	-0.934***	-1.098***
	(0.040)	(0.072)	(0.045)	(0.056)	(0.127)	(0.095)	(0.037)	(0.061)	(0.225)	(0.332)
601-1000	-0.410***	-0.334***	-0.381***	-0.303***	-0.541***	-0.183	-0.362***	-0.284***	-0.971***	-1.207***
	(0.055)	(0.100)	(0.055)	(0.088)	(0.149)	(0.138)	(0.047)	(0.090)	(0.232)	(0.335)
1001-3000	-0.525***	-0.439***	-0.555***	-0.422***	-0.719***	-0.293*	-0.443***	-0.378***	-1.004***	-1.419***
	(0.064)	(0.108)	(0.069)	(0.098)	(0.186)	(0.149)	(0.056)	(0.094)	(0.241)	(0.344)
3K-10K	-0.594***	-0.452***	-0.611***	-0.479***	-0.526**	-0.316**	-0.490***	-0.423***	-1.125***	-1.528***
	(0.073)	(0.114)	(0.077)	(0.101)	(0.229)	(0.153)	(0.058)	(0.096)	(0.252)	(0.354)
10K-25K	-0.712***	-0.477***	-0.665***	-0.547***	-0.475*	-0.328**	-0.538***	-0.458***	-1.332***	-1.617***
	(0.094)	(0.146)	(0.087)	(0.117)	(0.287)	(0.165)	(0.064)	(0.102)	(0.266)	(0.379)
>25K	-0.551***	-0.373**	-0.530***	-0.472***	-0.226	-0.351	-0.517***	-0.448***	-1.313***	-1.641***
	(0.135)	(0.179)	(0.100)	(0.132)	(0.401)	(0.261)	(0.075)	(0.113)	(0.269)	(0.386)
Pct. Grades 6-8	0.436*	0.011	0.163	-0.408	3.306***	0.599	0.517**	0.222	1.528***	-0.824
	(0.239)	(0.305)	(0.344)	(0.529)	(0.544)	(0.492)	(0.204)	(0.243)	(0.532)	(0.556)
Pct. Grades 9-12	0.452***	0.140	0.807***	0.135	4.152***	0.654*	0.883***	0.228	1.128***	-0.325
	(0.174)	(0.201)	(0.152)	(0.180)	(0.607)	(0.386)	(0.183)	(0.140)	(0.422)	(0.740)
constant	-1.083***	-0.906***	-1.345***	-1.064***	-2.517***	-0.563***	-0.744***	-0.489***	-2.070***	-0.797*
	(0.087)	(0.141)	(0.107)	(0.171)	(0.254)	(0.212)	(0.082)	(0.125)	(0.315)	(0.446)
	-0.063	-0.06	0.115	0.122	0.04	0.038	-0.072	-0.139	0.088	0.087
N	10136	4760	10083	4731	9409	4650	10278	4829	6376	3108
Districts	551	547	550	547	547	542	553	550	413	382
Max Obs. of Districts (years)	19	9	19	9	19	9	19	9	19	9
Charter Proliferation Turnaround	0.29	-0.083	0.357	0.104	0.929	0.041	0.34	-0.129	0.158	0.084
Test: Charter Prolif. & Charter Prolif. sq.										
Prob > F	0.971	0.023**	0.008***	0.162	0.000***	0.000***	0.064*	0.192	0.004***	0.061*

**p<0.10, **p<0.05, ***p<0.01*

Note: Robust standard errors clustering at the district level are in parentheses. All models include district and year fixed effects. Panels are unbalanced.

Table 2-1A

Predicted Effects of Charter Proliferation on Instructional Spending per pupil (natural log).

Proliferation	Model #1: Geocoded				Model #2: Aid Notices			
	At means	Dollars	Pct. FL = 75%	Dollars	At means	Dollars	Pct. FL = 75%	Dollars
0.0	8.943***	$7,654	9.178***	$9,679	9.019***	$8,260	9.049***	$8,506
	(0.030)		(0.038)		(0.018)		(0.030)	
0.01	8.951***	$7,713	9.185***	$9,754	9.023***	$8,288	9.052***	$8,535
	(0.030)		(0.038)		(0.018)		(0.030)	
0.05	8.977***	$7,917	9.211***	$10,011	9.031***	$8,357	9.060***	$8,606
	(0.031)		(0.038)		(0.023)		(0.032)	
0.10	8.998***	$8,086	9.233***	$10,225	9.029***	$8,345	9.059***	$8,594
	(0.034)		(0.040)		(0.033)		(0.038)	
0.15	9.006***	$8,155	9.241***	$10,313	9.015***	$8,224	9.044***	$8,469
	(0.040)		(0.045)		(0.040)		(0.044)	
0.20	9.002***	$8,122	9.237***	$10,270	8.987***	$7,999	9.016***	$8,238
	(0.049)		(0.055)		(0.045)		(0.049)	
0.25	8.986***	$7,987	9.220***	$10,100	8.946***	$7,679	8.976***	$7,908
	(0.067)		(0.072)		(0.051)		(0.055)	
0.30	8.956***	$7,755	9.191***	$9,807	8.892***	$7,275	8.922***	$7,492
	(0.093)		(0.098)		(0.063)		(0.067)	
0.35	8.914***	$7,436	9.149***	$9,403	8.825***	$6,802	8.854***	$7,005
	(0.128)		(0.132)		(0.082)		(0.086)	
N	8722				3800			

*p<0.10, **p<0.05, ***p<0.01

Predicted effects at means for continuous variables; enrollment between 10,000 and 25,000.

Table 2-2A

Predicted Effects of Charter Proliferation on Support Spending per pupil (natural log).

Proliferation	Model #1: Geocoded				Model #2: Aid Notices			
	At means	Dollars	Pct. FL = 75%	Dollars	At means	Dollars	Pct. FL = 75%	Dollars
0.0	7.358***	$1,568	7.881***	$2,648	7.546***	$1,894	7.748***	$2,318
	(0.054)		(0.069)		(0.036)		(0.052)	
0.01	7.372***	$1,591	7.896***	$2,686	7.558***	$1,916	7.760***	$2,344
	(0.054)		(0.068)		(0.036)		(0.052)	
0.05	7.430***	$1,685	7.953***	$2,845	7.594***	$1,985	7.795***	$2,430
	(0.060)		(0.070)		(0.043)		(0.056)	
0.10	7.501***	$1,810	8.025***	$3,056	7.617***	$2,033	7.819***	$2,488
	(0.069)		(0.076)		(0.057)		(0.065)	
0.15	7.572***	$1,942	8.095***	$3,279	7.617***	$2,033	7.819***	$2,488
	(0.075)		(0.081)		(0.067)		(0.074)	
0.20	7.641***	$2,083	8.165***	$3,516	7.594***	$1,987	7.796***	$2,431
	(0.094)		(0.099)		(0.076)		(0.081)	
0.25	7.711***	$2,232	8.234***	$3,768	7.548***	$1,896	7.749***	$2,320
	(0.141)		(0.145)		(0.087)		(0.091)	
0.30	7.779***	$2,390	8.303***	$4,035	7.477***	$1,768	7.679***	$2,163
	(0.217)		(0.221)		(0.105)		(0.108)	
0.35	7.847***	$2,558	8.371***	$4,318	7.384***	$1,610	7.586***	$1,970
	(0.320)		(0.324)		(0.135)		(0.137)	
N	8722				3800			

*p<0.10, **p<0.05, ***p<0.01

Predicted effects at means for continuous variables; enrollment between 10,000 and 25,000.

Table 2-3A

Predicted Effects of Charter Proliferation on Administration Spending per pupil (natural log).

Proliferation	Model #1: Geocoded				Model #2: Aid Notices			
	At means	Dollars	Pct. FL = 75%	Dollars	At means	Dollars	Pct. FL = 75%	Dollars
0.0	7.278***	$1,448	7.166***	$1,295	7.321***	$1,512	7.220***	$1,367
	(0.037)		(0.048)		(0.038)		(0.052)	
0.01	7.289***	$1,464	7.178***	$1,310	7.337***	$1,537	7.237***	$1,389
	(0.037)		(0.048)		(0.038)		(0.052)	
0.05	7.325***	$1,517	7.213***	$1,357	7.395***	$1,627	7.294***	$1,471
	(0.043)		(0.052)		(0.044)		(0.055)	
0.10	7.349***	$1,555	7.238***	$1,391	7.445***	$1,712	7.344***	$1,548
	(0.051)		(0.058)		(0.055)		(0.063)	
0.15	7.352***	$1,559	7.241***	$1,395	7.473***	$1,760	7.372***	$1,591
	(0.057)		(0.064)		(0.063)		(0.070)	
0.20	7.333***	$1,529	7.221***	$1,368	7.478***	$1,768	7.377***	$1,598
	(0.061)		(0.067)		(0.069)		(0.075)	
0.25	7.291***	$1,467	7.180***	$1,313	7.459***	$1,736	7.358***	$1,569
	(0.063)		(0.069)		(0.075)		(0.081)	
0.30	7.228***	$1,377	7.116***	$1,232	7.418***	$1,666	7.317***	$1,506
	(0.067)		(0.073)		(0.086)		(0.091)	
0.35	7.142***	$1,264	7.031***	$1,131	7.354***	$1,562	7.253***	$1,412
	(0.078)		(0.083)		(0.106)		(0.111)	
N	8722				3800			

*p<0.10, **p<0.05, ***p<0.01

Predicted effects at means for continuous variables; enrollment between 10,000 and 25,000.

Table 2-4A

Predicted Effects of Charter Proliferation on Operations/Maintenance Spending per pupil (natural log).

Proliferation	Model #1: Geocoded				Model #2: Aid Notices			
	At means	Dollars	Pct. FL = 75%	Dollars	At means	Dollars	Pct. FL = 75%	Dollars
0.0	7.250***	$1,408	7.514***	$1,834	7.398***	$1,633	7.294***	$1,471
	(0.041)		(0.055)		(0.058)		(0.072)	
0.01	7.272***	$1,440	7.537***	$1,876	7.414***	$1,659	7.309***	$1,494
	(0.040)		(0.053)		(0.058)		(0.071)	
0.05	7.355***	$1,563	7.619***	$2,037	7.466***	$1,747	7.361***	$1,574
	(0.044)		(0.053)		(0.063)		(0.072)	
0.10	7.442***	$1,705	7.706***	$2,222	7.509***	$1,824	7.404***	$1,643
	(0.053)		(0.058)		(0.073)		(0.079)	
0.15	7.511***	$1,828	7.775***	$2,381	7.527***	$1,858	7.423***	$1,674
	(0.066)		(0.069)		(0.084)		(0.088)	
0.20	7.562***	$1,924	7.827***	$2,507	7.522***	$1,848	7.417***	$1,665
	(0.083)		(0.086)		(0.096)		(0.100)	
0.25	7.596***	$1,990	7.861***	$2,593	7.492***	$1,793	7.387***	$1,615
	(0.111)		(0.114)		(0.116)		(0.119)	
0.30	7.612***	$2,023	7.877***	$2,635	7.437***	$1,698	7.333***	$1,530
	(0.151)		(0.155)		(0.147)		(0.151)	
0.35	7.610***	$2,019	7.875***	$2,630	7.359***	$1,570	7.254***	$1,414
	(0.205)		(0.209)		(0.194)		(0.199)	
N	8722				3800			

*p<0.10, **p<0.05, ***p<0.01

Predicted effects at means for continuous variables; enrollment between 10,000 and 25,000.

Table 2-1B

Districts/Years Over Turnaround, Model #1 (geocoding).

District	Year	Charter Proliferation
CAMDEN CITY	2013	0.267
CAMDEN CITY	2014	0.279
HOBOKEN CITY	2010	0.276
HOBOKEN CITY	2011	0.293
HOBOKEN CITY	2012	0.312
HOBOKEN CITY	2013	0.292
HOBOKEN CITY	2014	0.315
NEWARK CITY	2013	0.249
NEWARK CITY	2014	0.301

Table 2-2B

Districts/Years Over Turnaround, Model #2 (aid notices).

District	Year	Charter Proliferation
ASBURY PARK CITY	2008	0.113
ASBURY PARK CITY	2009	0.132
ASBURY PARK CITY	2010	0.148
ASBURY PARK CITY	2011	0.142
ASBURY PARK CITY	2012	0.154
ASBURY PARK CITY	2013	0.150
ASBURY PARK CITY	2014	0.150
CAMDEN CITY	2008	0.162
CAMDEN CITY	2009	0.160
CAMDEN CITY	2010	0.157
CAMDEN CITY	2011	0.164
CAMDEN CITY	2012	0.214
CAMDEN CITY	2013	0.250
CAMDEN CITY	2014	0.262
HOBOKEN CITY	2008	0.143
HOBOKEN CITY	2009	0.150
HOBOKEN CITY	2010	0.205
HOBOKEN CITY	2011	0.235
HOBOKEN CITY	2012	0.254
HOBOKEN CITY	2013	0.241
HOBOKEN CITY	2014	0.266
JERSEY CITY	2011	0.118
JERSEY CITY	2012	0.129
JERSEY CITY	2013	0.131
JERSEY CITY	2014	0.142
MONTAGUE TWP	2008	0.115
MONTAGUE TWP	2009	0.124
MONTAGUE TWP	2010	0.193
MONTAGUE TWP	2011	0.161
MONTAGUE TWP	2012	0.183
MONTAGUE TWP	2013	0.177
MONTAGUE TWP	2014	0.155
NEWARK CITY	2009	0.120
NEWARK CITY	2010	0.163

District	Year	Charter Proliferation
NEWARK CITY	2011	0.182
NEWARK CITY	2012	0.208
NEWARK CITY	2013	0.240
NEWARK CITY	2014	0.290
PLAINFIELD CITY	2009	0.123
PLAINFIELD CITY	2010	0.140
PLAINFIELD CITY	2011	0.149
PLAINFIELD CITY	2012	0.151
PLAINFIELD CITY	2013	0.141
PLAINFIELD CITY	2014	0.138
PLEASANTVILLE CITY	2008	0.129
PLEASANTVILLE CITY	2009	0.133
PLEASANTVILLE CITY	2010	0.135
PLEASANTVILLE CITY	2011	0.133
RED BANK BORO	2008	0.154
RED BANK BORO	2009	0.152
RED BANK BORO	2010	0.149
RED BANK BORO	2011	0.147
RED BANK BORO	2012	0.135
RED BANK BORO	2013	0.143
RED BANK BORO	2014	0.136
TRENTON CITY	2008	0.148
TRENTON CITY	2009	0.166
TRENTON CITY	2010	0.182
TRENTON CITY	2011	0.116
TRENTON CITY	2013	0.115
TRENTON CITY	2014	0.161

Figures

Figure 2-1

Total Budgetary Spending (nl) and Charter Proliferation (from geocoding)

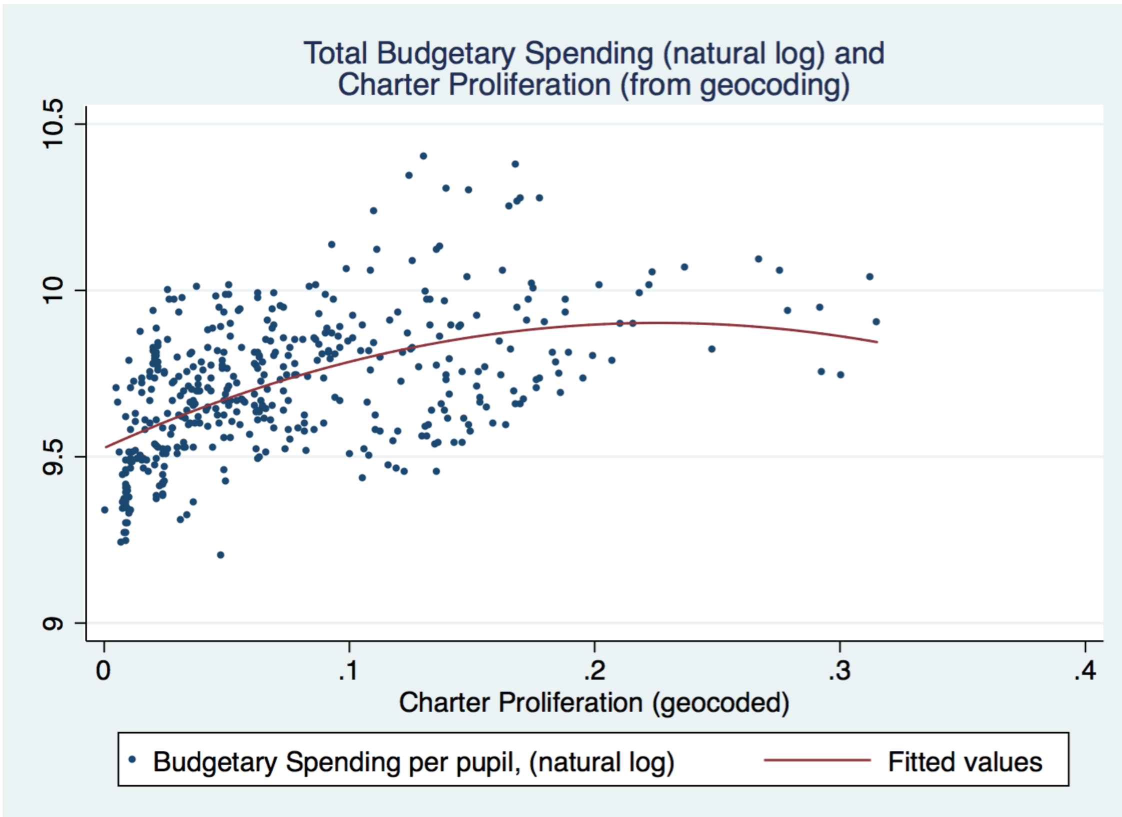


Figure 2-2

Total Budgetary Spending (nl) and Charter Proliferation (from aid notices)

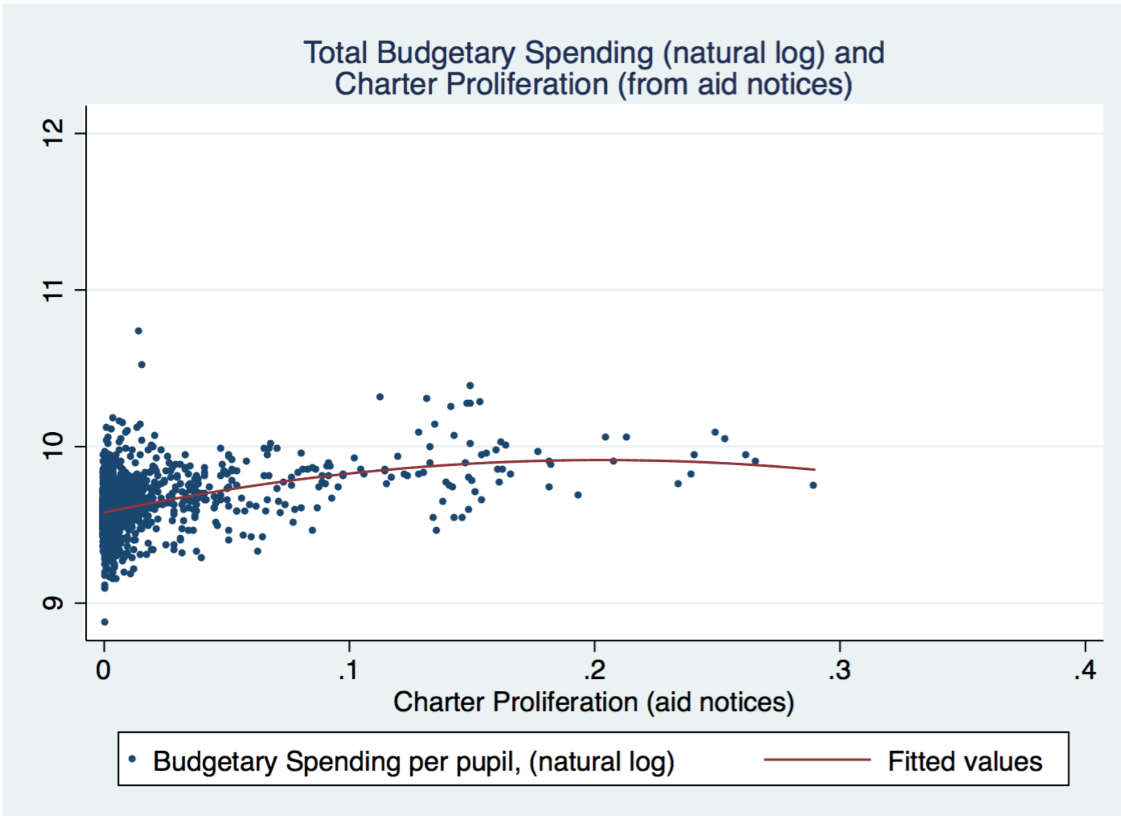


Figure 2-3

Changes in Enrollment and Charter Proliferation, 2000-2017

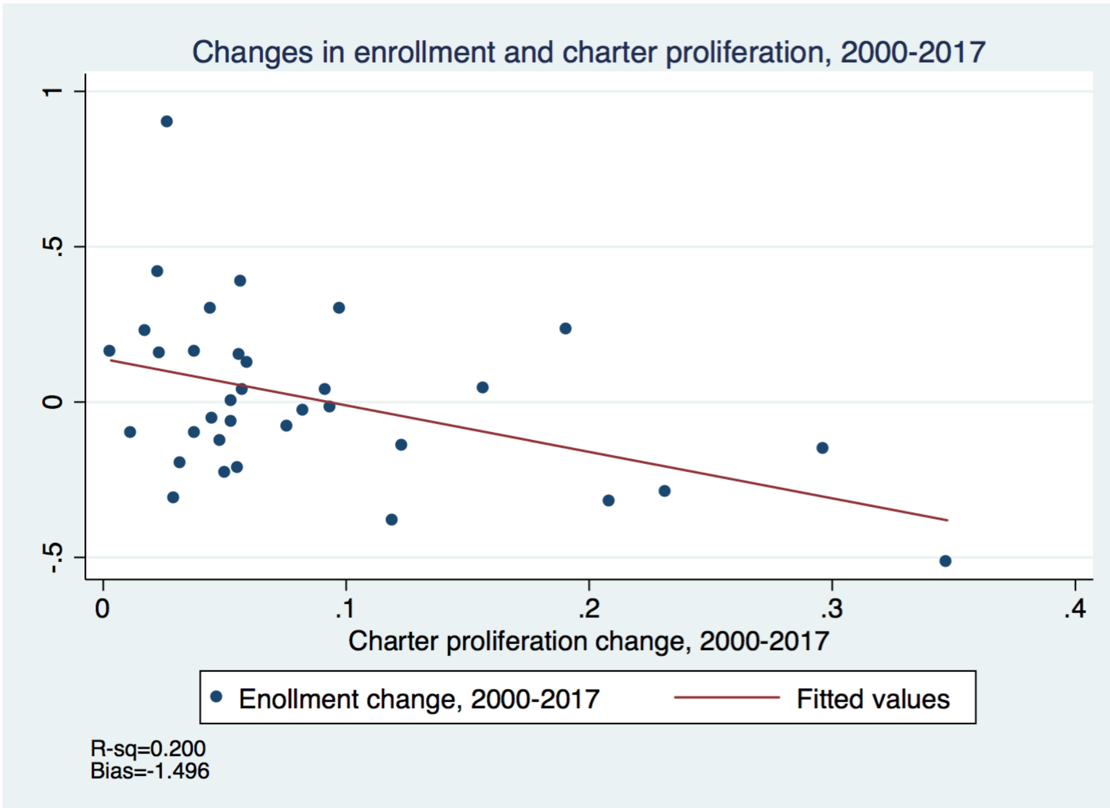


Figure 2-4

Model #1: Budgetary Spending per pupil (nl): Fitted Values of Charter Proliferation w/95% CIs

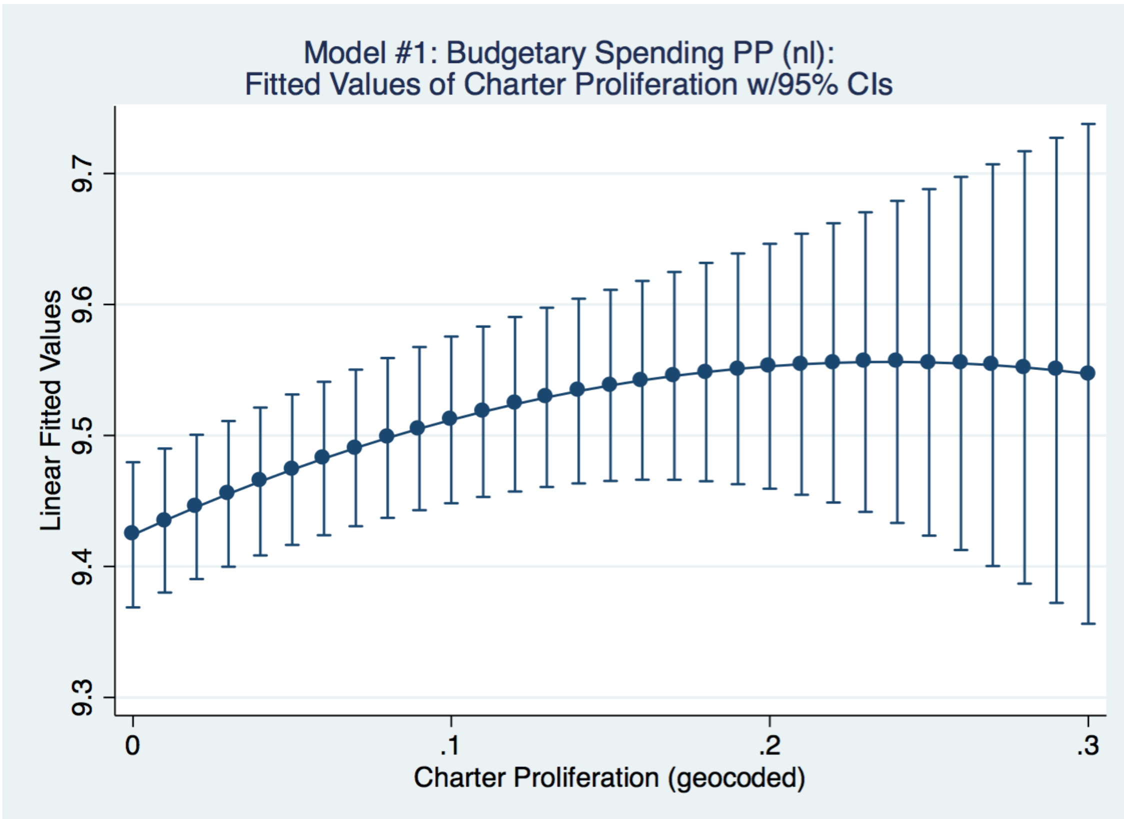


Figure 2-5

Model #2: Budgetary Spending per pupil (nl): Fitted Values of Charter Proliferation w/95% CIs

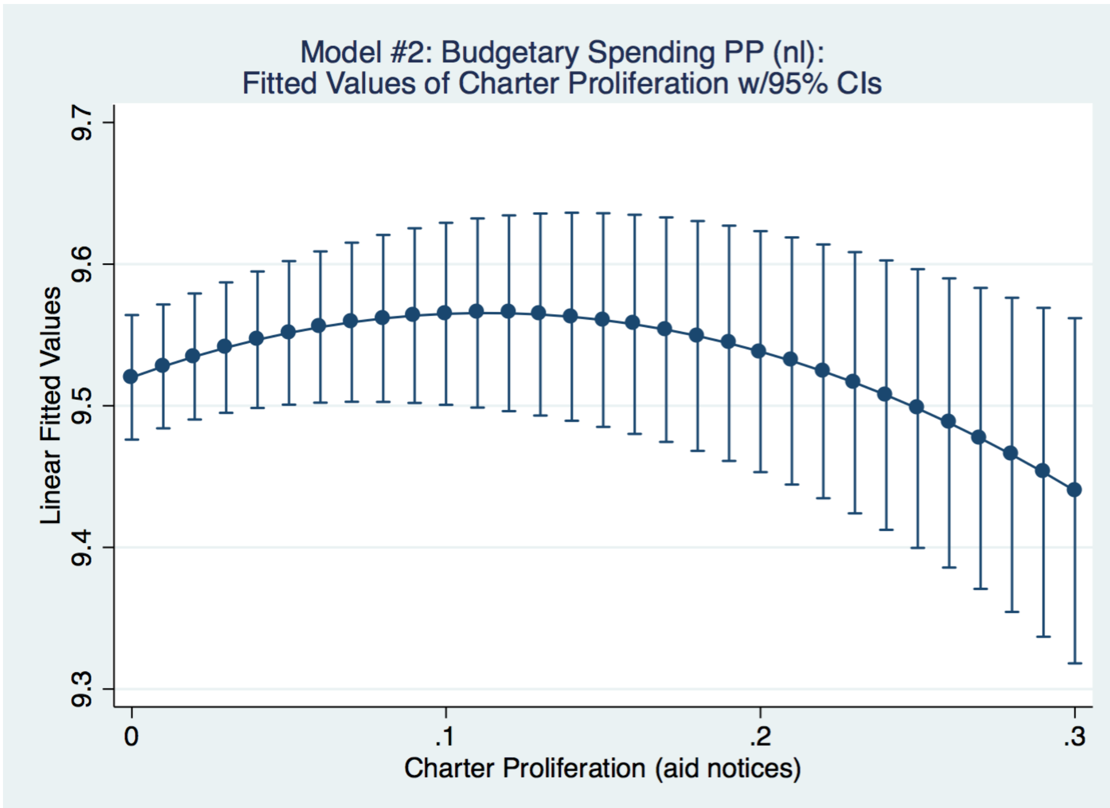


Figure 2-6

Model #1: Instructional Spending per pupil (nl): Fitted Values of Charter Proliferation w/95% CIs

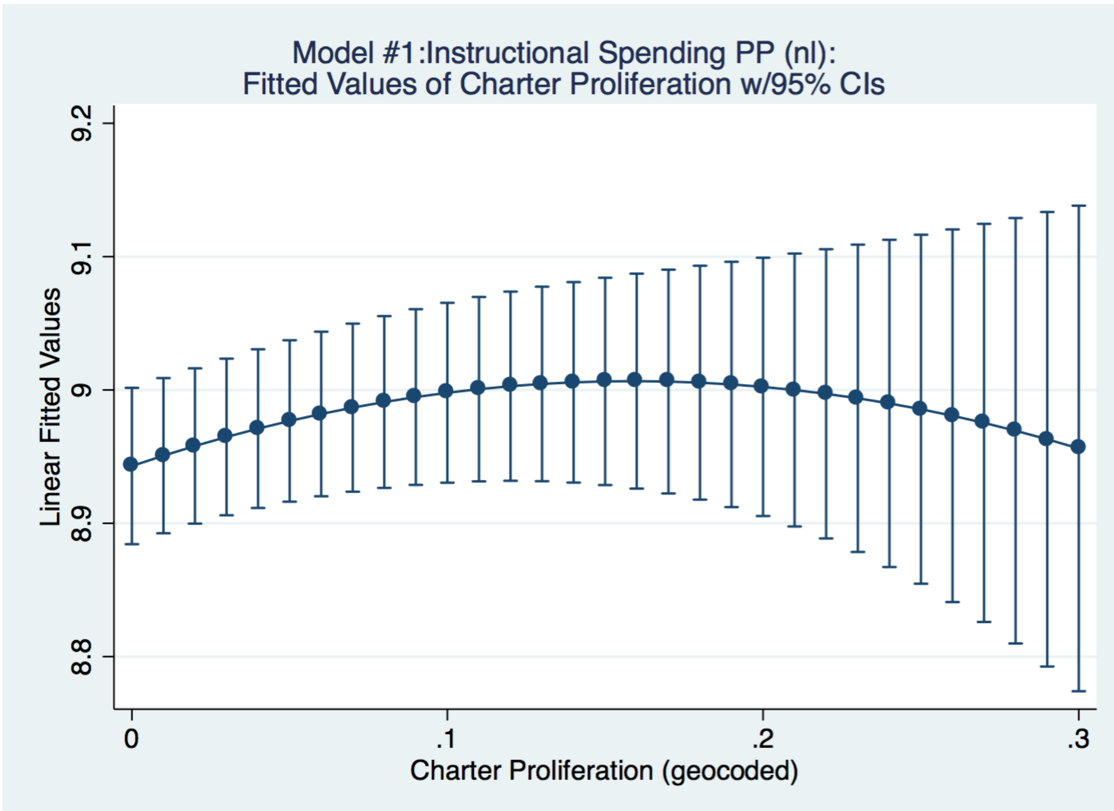


Figure 2-7

Model #2: Instructional Spending per pupil (nl): Fitted Values of Charter Proliferation w/95% CIs

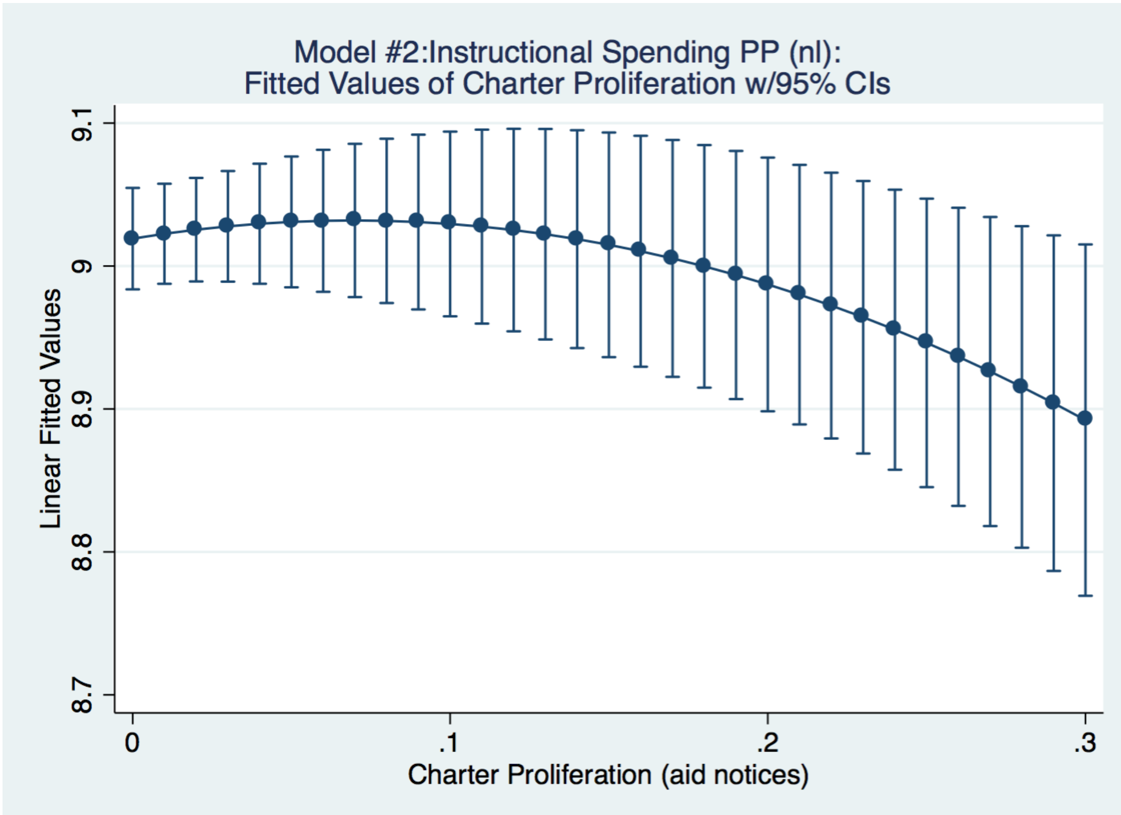


Figure 2-8

Model #1: Support Spending per pupil (nl): Fitted Values of Charter Proliferation w/95% CIs

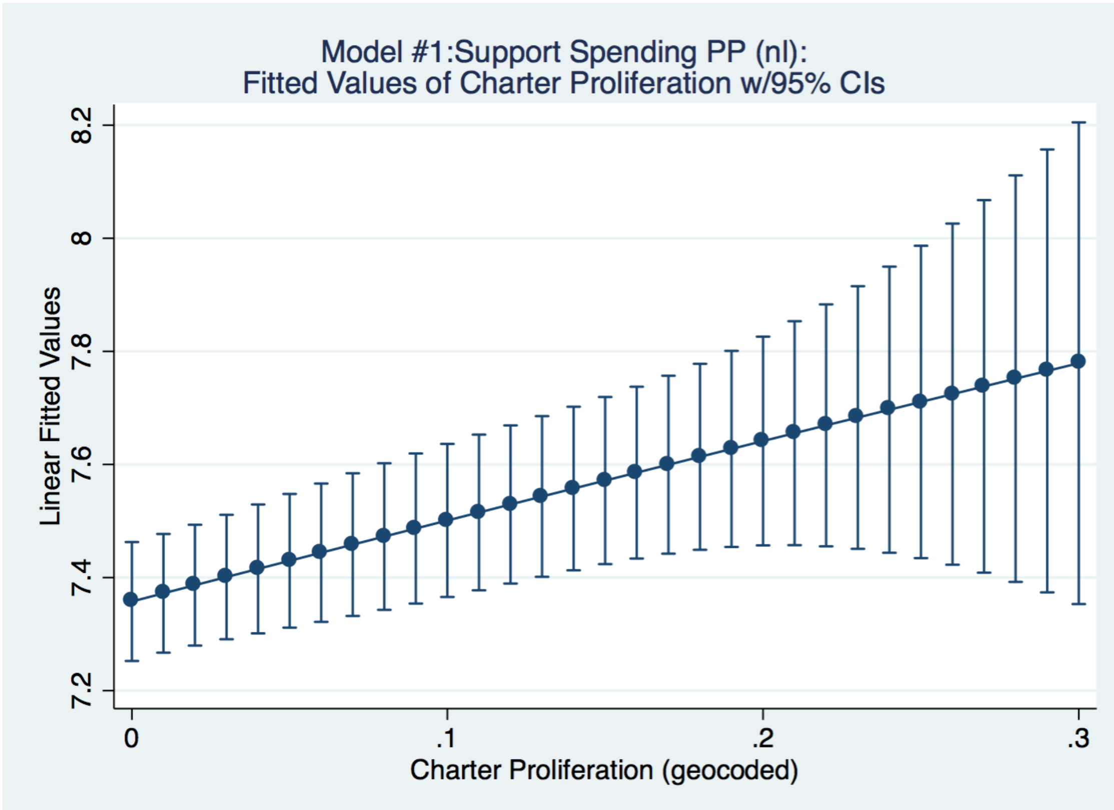


Figure 2-9

Model #2: Support Spending per pupil (nl): Fitted Values of Charter Proliferation w/95% CIs

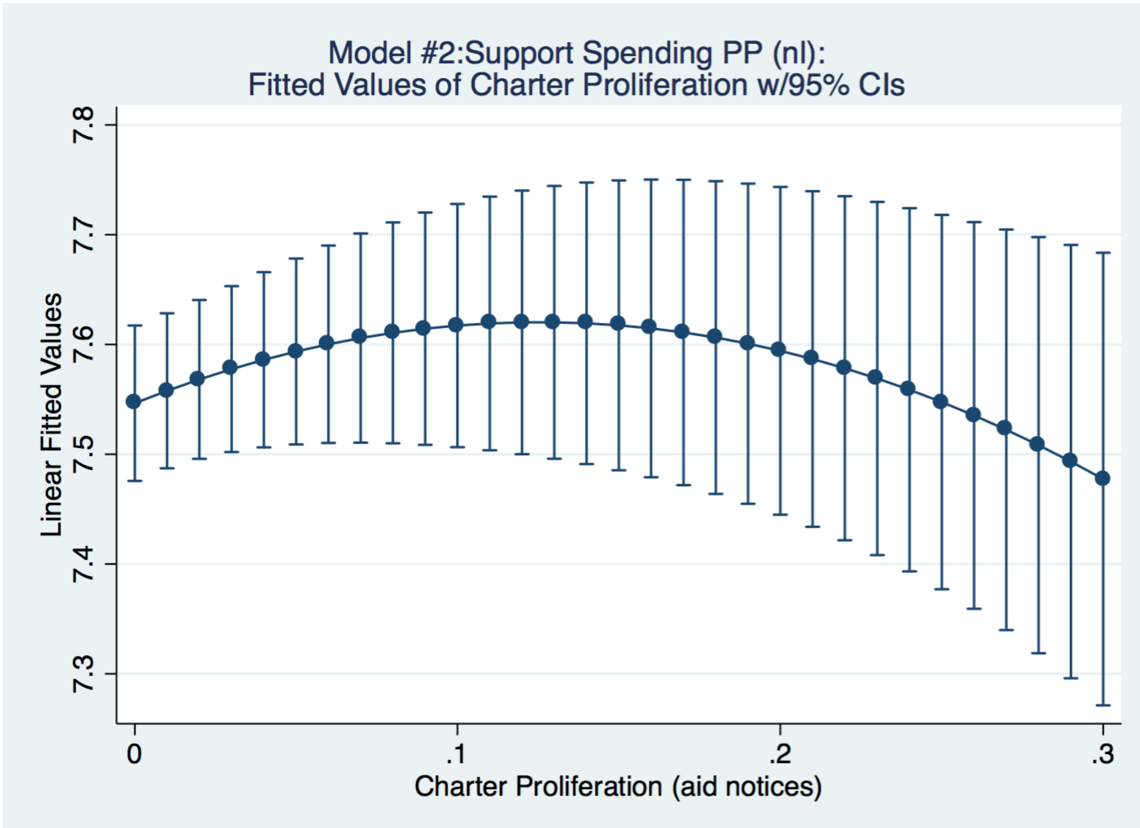


Figure 2-10

Model #1: Administration Spending per pupil (nl): Fitted Values of Charter Proliferation w/95% CIs

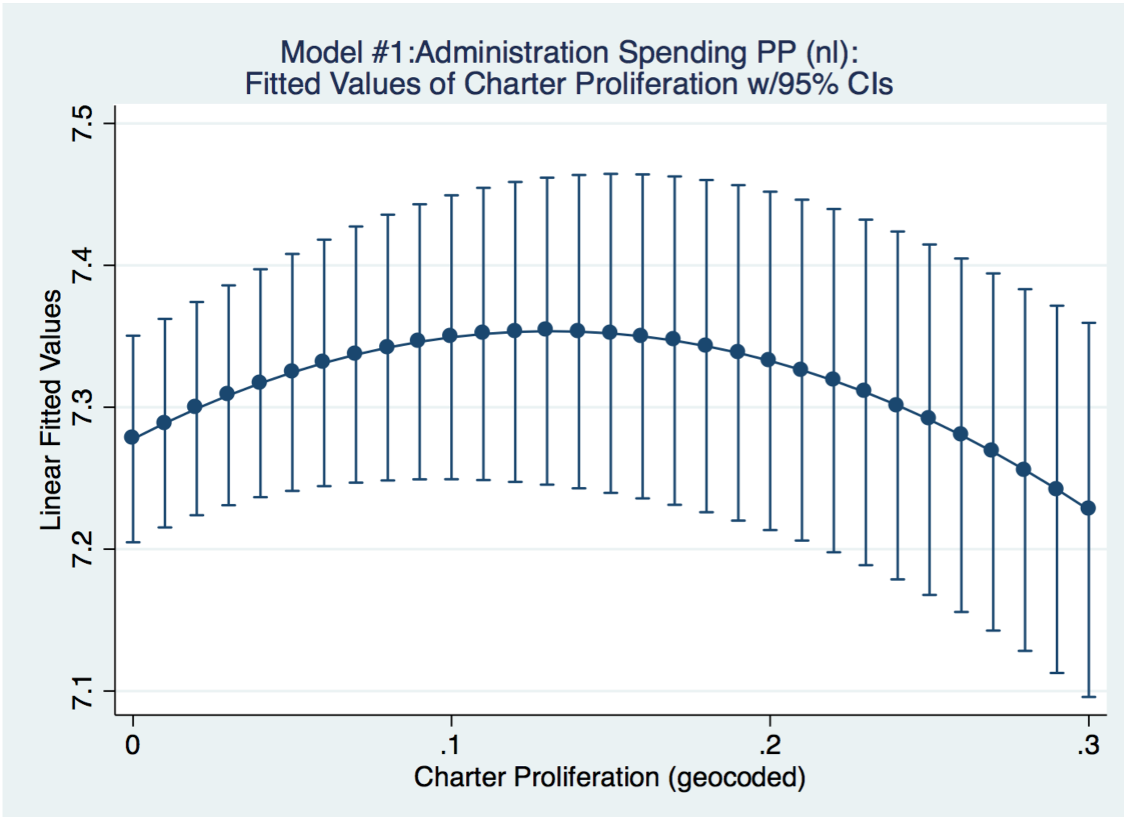


Figure 2-11

Model #2: Administration Spending per pupil (nl): Fitted Values of Charter Proliferation w/95% CIs

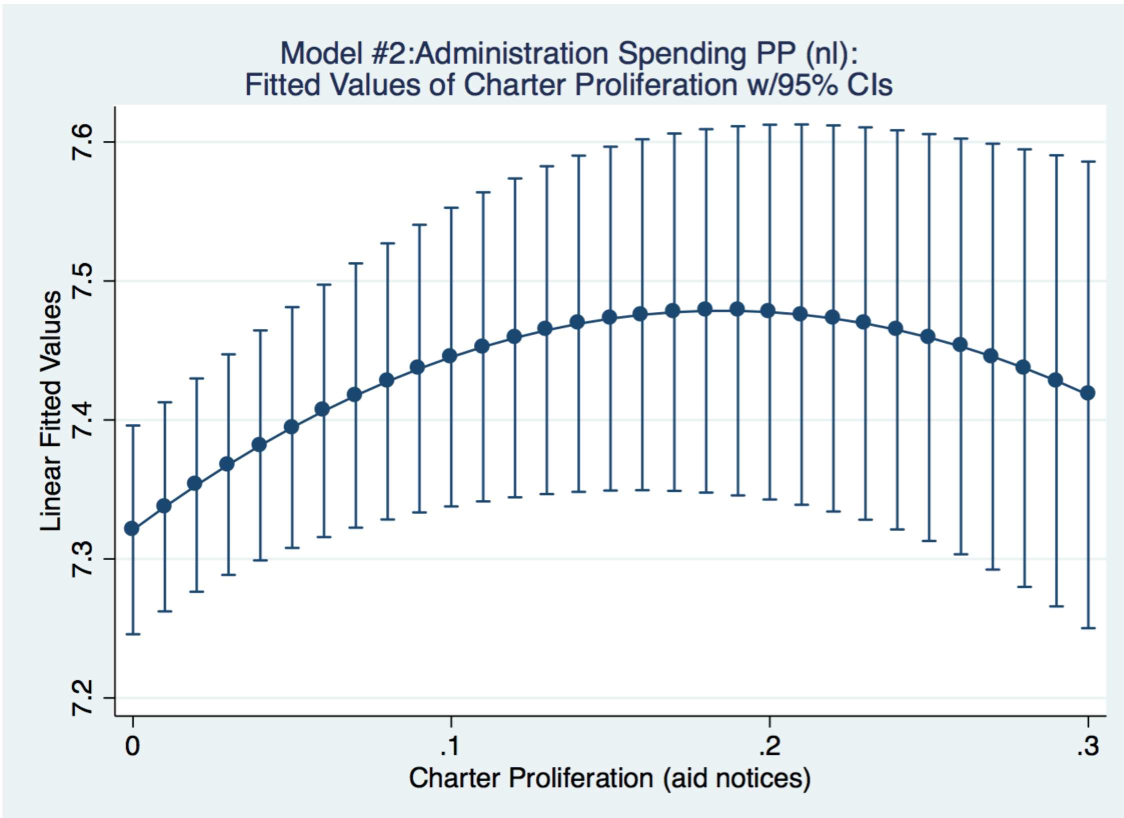


Figure 2-12

Model #1: Operations/Maintenance Spending per pupil (nl): Fitted Values of Charter Proliferation w/95% CIs

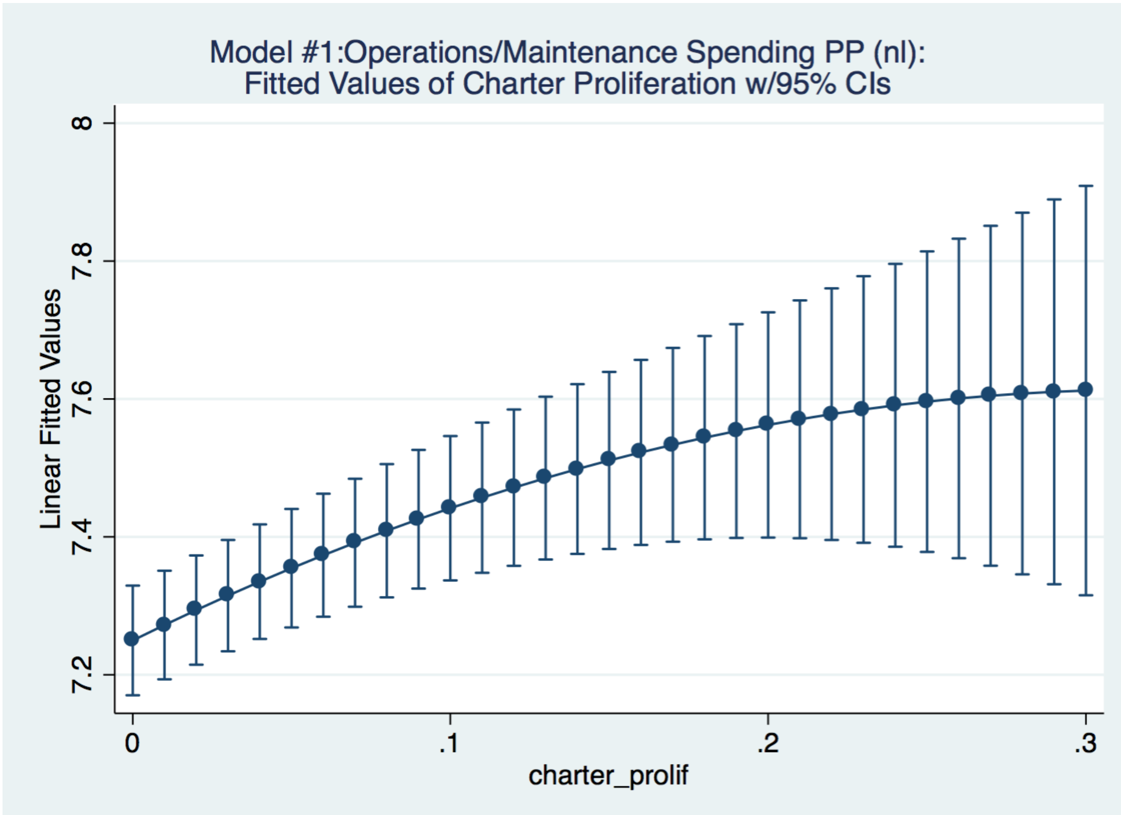
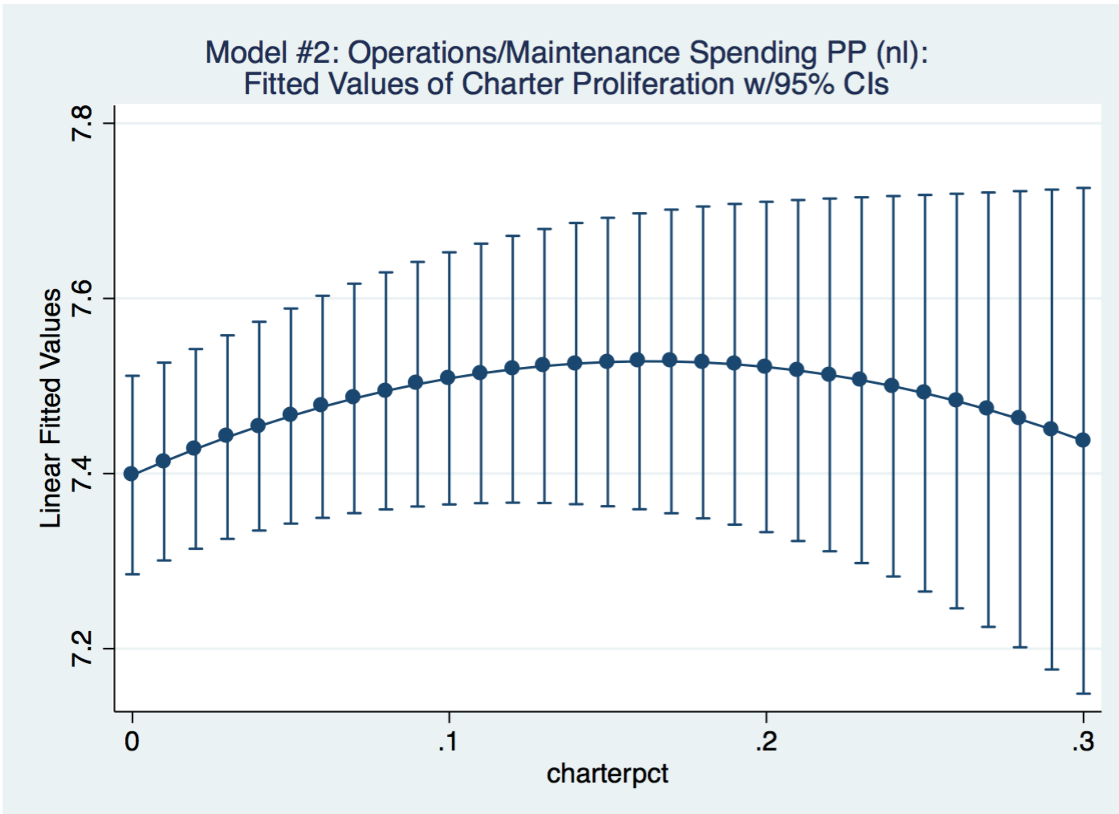


Figure 2-13

Model #2: Operations/Maintenance Spending per pupil (nl): Fitted Values of Charter Proliferation w/95% CIs



Chapter 3 – Charter School Site Selection, Charter School Organization, and Neighborhood Characteristics

Introduction

In a market system, producers make decisions toward the goal of optimizing their position within that market – and one of the most important decisions a producer can make is where to locate. Location not only affects the ability of producers to efficiently produce goods and services; critically, it affects their ability to gain access to the consumers they target. In the past several decades, "school choice" advocates have made the case that a market-based system of publicly-financed schools would not only improve the effectiveness and efficiency of the system, it would also improve student and family satisfaction as a variety of schools would be created that meet the different needs and wants of students and families. An important component of this choice system is charter schools, which are publicly financed and located within public school district boundaries, but operate autonomously. In the market system advocates envision, charter schools act like producers when making decisions about how to organize themselves; consequently, we would expect them to make deliberate decisions about their location as part of their strategy to target a particular part of the education market.

One of the factors that might influence the locational decisions of charter operators is the population demographics of the neighborhood in which they locate. If parents value the demographic composition of their children's school – and there is evidence that at least some parents do – charters may attempt to appeal to particular parents by shaping their student populations to match those parents' desires. Charters that target particular student populations as consumers would, therefore, likely seek to locate their schools where those students reside, especially if families were known to also value proximity when choosing schools. Analyzing the location of charter schools, particularly focusing on socio-economic and racial demographics, may reveal the consumer targeting strategies of these schools.

Charter schools also differ in how they are organized. Some charters are part of networks; some are not. Some are explicitly run by operators who are seeking to make a profit; some are nonprofit, although this can be difficult to ascertain, as nonprofits can have for-profit contractors take over a large portion of the operations of a school. We might expect that charters with different profit motives and different network affiliations behave differently when choosing where to locate.

There is a substantial body of research which examines the locational decisions of charter schools. The majority of these studies analyze these decisions at the local level, restricting the data used to a single city or state. A few studies have conducted analyses at the national level. But none has, until now, used a common set of national level data and consistent methods and models to examine the correlations between charter school placement and demographics, both aggregated at the national level and then by state. This paper contributes to the literature by using a logisitic regression methodology and a national-level database to ascertain those correlations, at both the national and state level. I find that charters are not distributed evenly across areas that vary demographically; instead, the evidence suggests that charters locate more often in neighborhoods with high levels of family poverty and higher concentrations of non-white residents. There are, however, substantial differences in how charter schools of different types locate across different states. There are also differences in how different types of charters respond to a neighborhood's demographics.

The remainder of this paper is as follows: first, I review the literature on school choice and charter school theory, charter schools and segregation, charter schools and location, and charter school organizational structures. Next, I synthesize the literature into a conceptual framework and pose several research questions this study seeks to answer. I also present a rationale for the organization of the geospatial and demographic data used in this study. After, I describe the data and the econometric models used. I then present the findings, followed by a discussion and recommendations for further study.

Review of Literature

Theories of Educational Choice

In the post-war era, no public intellectual has been more closely associated with the school choice movement than Milton Friedman. In a chapter of his best-selling book, *Capitalism and Freedom* (1962), Friedman lays out a detailed case for school vouchers. Among his arguments for parental choice in schools is what appears to be a complaint about school productivity: "… we are getting so little per dollar spent" (p. 94). Yet Friedman does acknowledge that differences in school spending may be a matter of "taste," and not necessarily a sign of inefficiency; in other words, increased spending in certain schools may yield benefits above basic schooling that certain parents want. In later works, Friedman explicitly argues that productivity in American schools has been on the decline, and that a school choice system would improve the efficiency of the education system. Yet the ability of parents to choose the type of schooling for their children that they desire remains at the core of his advocacy for school choice (Friedman & Friedman, 1980).

Later theorists would apply Friedman's ideas to charter schools, which, like private schools accepting vouchers (Friedman's preferred policy), introduce competition and choice into the publicly-financed education system. Their contention was that increased competitive pressures from charter proliferation would improve the productivity of public schools, and the education system as a whole (Betts, 2005; Hoxby, 2003; Kolderie, 1990). Bulkley and Fisler (2003) summarize this theory of chartering as a process where charters, because of their supposed greater autonomy, flexibility, and accountability through the market, become more effective and efficient at delivering education to students and parents. This, in turn, spurs public district schools to also improve in response to competition. This market orientation places students and their families into the role of consumers, while schools become producers. Other theorists note, however, that producers often divide their markets into segments, choosing to appeal only to certain niches (Levin & Belfield, 2003). A school choice marketplace, therefore, may wind up creating an educational system where students are separated by any number of characteristics, including class and race.

In his earlier work, Friedman did acknowledge that school choice would, in fact, likely lead to segregated schools (Friedman, 1955), although he later downplayed this possibility (Carl, 2011). Friedman acknowledges that there is a tension between the goal of giving parents the freedom to choose their children's classmates and the societal goal of school integration. In a market-like school system, however, economic theory suggests that producers will respond to the desire of some parents to enroll their children in schools that are segregated – by race, by class, by educational need, or by other student characteristics. Lubienski, Gulosino, and Weitzel (2009) note:

> However, while equity may be a goal for policy, it is an aggregate concern and, as a wider systemic issue, is not necessarily a driving force for individual schools seeking competitive advantages. Therefore, individual schools might sense incentives to shape their own student enrollment either directly through admissions policies or indirectly through location strategies. Understanding competitive incentive structures, as evidenced by the distribution of educational options, is the key to understanding internal dynamics of LEMs [local education markets] and their potential to advance policy goals such as equitable access. (p. 603)

The authors further note that market pressure may lead to "isomorphism," which would cause nonprofit organizations to act like for-profits within the same market. In this case, even charter schools that are managed by organizations without a profit motive could engage in behaviors designed to limit access to particular types of students.

Charter Schools and Segregation

There is a substantial body of research which explores the question of whether charter schools promote segregation. Several studies concentrate on students who move from public district schools to charters, comparing the racial makeup of their old school to their new one. One study of eight large cities finds the racial makeup of these students' old and new schools are similar; however, the same study finds African American transfer students are more likely to end up in a charter with a higher concentration of students their own race (R. Zimmer et al., 2009). A study of North Carolina schools finds the charter sector has divided into schools that are enrolling primarily white students and schools enrolling primarily non-white students (H. F. Ladd, Clotfelter, & Holbein, 2015).

The authors note: "…market forces will tend to lead not only to more satisfied consumers, but also to market segmentation, which in the case of schools is typically by the race of the student" (p.27). Evidence from Michigan suggests charter schools increase segregation by race and class in urban areas (Ni, 2012). Another study of Pennsylvania schools finds charter transfers were segregative, and that students who transferred to urban charters ended up in schools with a lower poverty concentration (Kotok, Frankenberg, Schafft, Mann, & Fuller, 2017). Research on Indianapolis, Indiana schools finds charter school choice lead to more racial isolation and less diversity in the public district schools (Stein, 2015). A study using data from Texas finds that whites, African Americans, and Latinos who transfer into charters enter schools with greater concentrations of their own race than the schools they leave (Weiher & Tedin, 2002). Studies using a national frame find charters are more racially isolated than public district schools in most states and urban areas (Frankenberg, Siegel-Hawley, & Wang, 2010).

Research also suggests that parents of different backgrounds approach school choice in different ways, relying on different social networks (Altenhofen et al., 2016; Holme, 2002; Makris, 2015) or access to different levels of social capital (Andre-Bechely, 2007; Bell, 2008) to navigate a school choice system. Consequently, different parents may value different factors when choosing a school for their children (Harris & Larsen, 2015). Among those factors may be the racial composition of the school; however, as Altenhofen et al. note (2016): "Studying the role of a school's racial/ethnic composition in parental school choice is difficult because parents' beliefs about integration do not always match their actions" (p.3). In a study of the internet behaviors of school choice information consumers in Washington, D.C., the authors found users accessed information about a school's demographic composition more than any other characteristics (M. Schneider & Buckley, 2002). Research conducted on elementary school choice in a large, urban school district finds white students were much more likely to participate in an intra-district program than nonwhite students (Phillips, Larsen, & Hausman, 2015). Another study using national data finds that even distributions of white and nonwhite students within public school districts spurs white charter school enrollment (Renzulli & Evans, 2005). Given this evidence and the historical background of school choice (Carl, 2011; Kruse, 2013), there is reason to believe at least some parents are responsive to the socio-economic and racial makeup of a school when making a decision within a choice system.

Charter Schools and Location

There is ample evidence that parents value a school's location when making choices about their child's school. Evidence from Colorado Springs (Theobald, 2005), Denver (Teske, Fitzpatrick, & O'Brien, 2009), Detroit (Bell, 2009), New Orleans (Harris & Larsen, 2015), North Carolina (Hastings et al., 2005), and Washington, D.C. (Glazerman & Dotter, 2016; M. Schneider & Buckley, 2002) all show that parents who engage in school choice systems prefer schools that are closer to their homes. At the same time, there is evidence that the level of preference varies across parents, and that relatively disadvantaged parents often value proximity more than more advantaged parents due to issues of inconvenience and practicality (Harris & Larsen, 2015). In an analysis of interviews of Texas parents, researchers found that while parents of all backgrounds were concerned about schools' academic effectiveness, Hispanic parents placed more importance on school location than black parents, who in turn placed more importance on location than white parents. Lower-income parents also cited location as a greater concern than higher-income parents (Kleitz, Weiher, Tedin, & Matland, 2000). Ethnographic research in Los Angeles finds transportation to school is a major hurdle for parents without the resources to move their children to more distant schools within a choice system (Andre-Bechely, 2007).

Concurrently, research shows charter school locational decisions are sensitive to the demographics of the areas in which they are established. In a study of charter locations in Washington, D.C., Henig and MacDonald (2002) find charters are more likely to locate in census tracts with higher percentages of African-American and Hispanic residents, and more likely to locate in middle-income neighborhoods with high levels of home ownership. A study of charter locations in Michigan by Glomm, Harris, and Lo (2005) shows charters are more likely to locate in school districts where populations are racially and socio-economically diverse. A separate analysis of California charter schools shows that racial heterogeneity is not correlated with charter school proliferation, but increased levels of poverty are. This suggests that both state policy and statewide demographic differences may play a pivotal role in charter locational decisions.

Gulosino and d'Entremont (2011), in a study of New Jersey charter schools, find that racial segregation is more evident in the immediate neighborhoods where charters are located than in the aggregated school districts that host them. Charters tend to cluster outside of African-American neighborhoods, even as they tend to enroll African-American students. Research on Chicago charters by Burdick-Will, Keels, and Schuble (2013) shows charters tended to locate in neighborhoods with many school-aged children, were more heavily minority, and were relatively disadvantaged. Bifulco and Buerger

(2015) examine the locations of charters in New York State; they find charters tend to locate in areas with higher levels of adult education. They also find charters tend to locate in school districts with higher operating expenses per pupil, but also with lower teacher wages and higher commercial vacancy. This suggests, again, that local and/or state context is important in determining charter locational decisions. LaFleur's (2016) analysis of the locations of Chicago charter schools finds charter schools locate in higher-need census tracts; however, there is evidence of a ceiling effect, where charters avoid the highest-need tracts.

In summary: there are two well-established realties regarding school choice and location. First, parents value proximity when selecting a school for their children. Second, charter schools are sensitive to the demographic characteristics of the areas in which they locate. I note here there is significant variation in how these realities play out in different contexts. Some parents, for example, appear to value proximity more than others; there appears to be a general trend where less-advantaged parents value proximity more, due to the inconvenience of transporting their children longer distances to school. And charter schools do not necessarily make the same locational decisions in different regions (Lubienski et al., 2009). Nonetheless, charters do appear to take neighborhood demographics into account when placing their schools, even as parents consider where charters are located in selecting charter schools.

One consequence of these two sets of research findings is that charter schools, through their locational decisions, may be replicating the segregative patterns found in housing. In a study of charter school locations and school choice in Washington, D.C., Jacobs (2011) finds:

> Parental preference for the neighborhood charter school is a significant predictor of racial segregation levels because de facto housing patterns replicate themselves in neighborhood charter schools. In addition, the revealed preferences of parents in Washington, D.C., indicate that a school's academic characteristics are not significant predictors of whether a student will choose a certain charter school. (p. 475)

In other words: proximity predicts whether parents will choose a school while academic outcomes do not. Consequently, a school choice system does little if anything to ameliorate the residential segregation evident in a community.

In addition: if charter schools wish to respond to the market pressures of parents who desire schools with particular racial and socio-economic characteristics, they might consider using location as a means of creating a student population with those characteristics. As Lubienski, Gulosino, and Weitzel (2009) note:

> Although charters, voucher programs, and other forms of publicly funded school choice often prohibit schools from charging additional fees on top of the government-subsidized amount, the ability of many schools—such as new charter schools and even some private schools—to select a location in effect allows them to impose added search and transportation costs on more distant families while reducing costs on those in the community in which the schools are located. (p. 613)

In effect, a charter school's locational choice is tantamount to a choice about the types of families to whom charters choose to market their services.

Charter School Organization Types

As the theory of chartering predicts, charter schools are not homogeneous in their organization. Some are lone operators of a single, "mom-and-pop" school; some belong to regional networks of various sizes; and some are part of large, national networks. Networked charters may be loosely affiliated and relatively autonomous, or tightly linked and adhering to similar administrative and instructional practices. Charters may also be directly sponsored and regulated by public school districts as part of their system of schools. Some charters are administered by education management organizations (EMOs) that explicitly operate the school for profit; others may have nonprofit "shell" organizations that contract with for-profit third parties for management services. Others may operate as nonprofit schools but enter into lease agreements with for-profit companies (Baker & Miron, 2015).

The complexity and variety of charter organizational systems makes hard and fast classifications of their structures difficult. Nevertheless, it is clear that there are charter schools that are operated by EMOs that seek to make a profit, and that charters often belong to EMO networks. Researchers have analyzed these schools to ascertain whether charters with different structures engage in different patterns of behavior. A study from Washington D.C. (Lacireno-Paquet, Holyoke, Moser, & Henig, 2002) finds that "market-oriented" charters enroll fewer special education and Limited English Proficient (LEP) students than other charters. Another study across 13 states finds small-EMO charters enrolled lower percentages of minority students than other types of charter schools (Lacireno-Paquet, 2004). In a study using a nationwide dataset, Weber and Baker (2017a) find that for-profit charters enroll proportionally more free lunch-eligible students than nonprofits, but somewhat lower percentages of English language learners and students with disabilities.

The differences between various types of charters extend beyond the characteristics of the students they serve. An early study of charter schools finds charters managed by private firms relied more heavily on uncredentialled teachers than locally managed charters. The teachers in local charters also had more experience on average than those run by private firms (Fuller, Gawlik, Park, & Gibbings, 2003). Evidence from Michigan, however, found no differences in efficiency between for-profit and nonprofit charters (Hill & Welsch, 2009). Weber and Baker (2017a) find charters spend less per pupil on instructional salaries compared to public district schools; in addition, for-profit charters spend less than nonprofit ones. There is, however, significant variation between states, suggesting statewide policy context plays an important role in the distribution of resources to charter schools.

Research on the differences between various types of charters includes studies on charters' locational choices. Henig and MacDonald's (2002) Washington D.C. study divides charters into "market-oriented" and "mission-oriented" schools, with for-profits included in the market-oriented category. The authors find market-oriented charters are more likely to locate in tracts with relatively high levels of home ownership but lower concentrations of Hispanic residents. Market-oriented charters were also more attracted to locations with vacant school buildings than other charters. Lubienski et al. (2009) divide charters into for-profit and "mission" categories in their study of the locational decisions of charters in Detroit. Mission charters locate in areas with greater socio-economic need, as measured by an index comprising multiple variables, compared to for-profit charters. Mission charters also locate in areas with a higher percentage of African-Americans compared to for-profit charters. Vacancy rates also appear to affect the locational decisions of for-profits.

A study by Ertas and Roch (2014), covering the entire state of Michigan, finds non-profit charters are more likely to locate in a census tract with a greater percentage of black residents, but EMO-managed charters are not. Burdick-Will et al.'s (2013) study of Chicago charter locations finds profit-oriented schools pay a premium to locate in more advantaged areas with lower vacancy rates. Robertson (2015) uses a national dataset of charter school locations to show that the percentage of white or black residents in a census block group does not predict the likelihood a charter is for-profit or nonprofit; however, higher homeownership in the block group increases the probability that a charter is for-profit. In a study using a 41-state dataset, Gulosino and Miron (2017) show the locations of education management organization (EMO)-operated schools are sensitive to the racial composition of the census tract in which the school is located; in addition, certain tract-level socio-economic characteristics correlate to these schools' locations. Lee (2018) finds that for-profit charter schools in Michigan tend to locate within school districts with larger proportions of African-American and Hispanic populations. These schools also locate in school districts that have relatively higher expenditures per pupil.

Conceptual Framework

The theoretical underpinnings of the charter school movement assert that offering parents a variety of choices for their children's education will improve the entire system by making schools more responsive to the wishes of students and their families. By transforming the education system into a marketplace – where school managers are producers and parents are consumers – education providers will have incentives to respond to the desires of families and supply them with schools that they want.

However, both historical scholarship and contemporary research suggest that at least some parents care greatly about the demographic composition of their children's schools. Responding to this desire, charter school operators have an incentive to appeal to different niches of the school consumer market, where niches are defined by families' race or socio-economic status. Knowing that families value proximity when making school choices, charters may choose to locate more often in areas where they expect greater market demand for their schools; these locational decisions, driven by a niche marketing strategy, could reinforce patterns of segregation within a school system that already exist in residential housing.

Whether charter schools of various types are distributed unevenly across residential demographics is an important question for multiple reasons. First, as Weber and Baker (2017a) have shown, charter schools of varying types have different spending patterns: for-profit charters spend less on instructional salaries than nonprofits, who spend less than public district schools. If charters of varying types are more likely to locate in areas with particular demographic characteristics, there may be an inequitable distribution of resources allocated for instruction based on race or class. Second, there are numerous reports of waste, fraud, and abuse attributed to charters (Center for Popular Democracy, 2017; In The Public Interest, 2018; The Network for Public Education, 2017). While there is no definitive evidence that the scope of malfeasance in charters is any greater than in public district schools, there is reason to believe that the incentives in current charter authorizing and oversight systems in various states are inducing rent-seeking activities from charter operators (Baker & Miron, 2015). Profit seeking charters may have more incentive to engage in these behaviors than nonprofits (Kelley III, 2014). To the extent that charters are distributed unevenly across race and class, the risks inherent in charter proliferation are also distributed unevenly.

Third, charter schools have higher rates of student suspension than public district schools, particularly for students with disabilities (Losen, Keith II, Hodson, & Martinez, 2016). Parents and students may not have access to the same due process rights in disciplinary matters as they enjoy with public district schools (Green, Baker, & Oluwole, 2015). In addition, because charters have been ruled by courts to not be state actors, they do not need to adhere to the same standards of transparency as public district schools (Green III, Baker, & Oluwole, 2013; Kelley III, 2014). Charters that are not equally distributed among residents of different classes and races are, in effect, creating separate school systems that differ in accountability and due process rights for different populations.

Fourth: as shown in the first two papers of this dissertation, charter schools impact the spending of the public district schools that host them. The likely explanation is that public school districts have costs that are relatively less elastic to changes in enrollment losses to charters. And while the unit of analysis of the first two papers was the school district, other studies suggest that differences in spending due to charter proliferation can occur due to differences in charter proximity within a school district (Cordes, 2017). If charters locate based on race or socio-economic status, certain communities of race or class may see the spending in their public schools change more than others – and not necessarily in ways that improve student learning conditions.

Finally, there is limited evidence that nonprofit charter schools get slightly higher gains in student growth than for-profits (Woodworth, Raymond, Han, Negassi, & Richardson, 2017). A major concern with studies such as these is that they do not account for differences in school resources, which are known to have a significant and positive effect on student outcomes (Baker, Weber, et al., 2018; Jackson et al., 2016; Lafortune, Schanzenbach, et al., 2016). It may be that the smaller spending levels on instructional salaries in for-profit charters manifests in smaller levels of student growth. If for-profit charters are distributed unequally among races and classes, certain groups of residents may be educationally disadvantaged.

All of these reasons require further study; however, the need for that study becomes more urgent if charters – both as a whole and of different organizational types – are unequally distributed across locations by resident demographic characteristics. With this conceptual framework in mind, this study seeks to address the following research questions (RQs):

RQ1: Do charter schools – in the aggregate and of various types – locate evenly across areas with different levels of economic disadvantage?

RQ2: Holding measures of economic disadvantage constant, do charter schools locate evenly across areas with different racial compositions?

RQ3: Holding measures of economic disadvantage constant, do charter schools with different organizational structures locate evenly across areas with different racial compositions?

RQ4: How do charter locational decisions vary between different statewide contexts?

Racial Interactions

Any quantitative study that examines differences or changes in racial or socio-economic composition must acknowledge several inherent problems. Racial and socio-economic classifications are often crude and dichotomous: e.g., in-poverty vs. not-in-poverty. Analyses of populations aggregated at the state, city, or even school district level may show different outcomes when disaggregated into smaller groups (Stein, 2015). Racial analyses are also highly dependent on local context: for example, changes in a dependent variable that correlate with the percentage of black residents in an area where the majority of other residents are white may display different correlations than if the majority of other residents are Hispanic, or a combination of white and Hispanic.

Some research takes the approach of aggregating all but one race into a "non-" category; for example, subjects could be coded "Black" or "non-Black" (Jacobs, 2011). Other research adds all but one race into an econometric model, reserving one race as a baseline against which estimates are compared (Gulosino & Miron, 2017). Neither of these approaches are correct or incorrect, but they do have limitations. Dichotomous coding may cause researchers to miss important differences between races that are aggregated together. An econometric model with all races included may miss important interactions between race variables. Theoretically, these might be captured in interaction terms; however, there is no guarantee they could be modeled accurately, and even if they were the interpretation of interaction terms between many categories of races would be complicated.

For this study, I choose to construct separate models for different racial categories. I limit the variable of interest to the percentages of three races: white, black, and Hispanic. While other racial categories (Asian, American Indian, Hawaiian/Pacific Islander, etc.) may be worthy of study regarding the research questions above, the percentages of these racial categories in the areas studied herein are generally small, and most tracts do not show substantial variation in their percentages. I choose not to interact the racial variables I use to keep interpretations simple, but I do run models using tracts from different geographic areas under the assumption that those areas will have different overall concentrations of different racial groups, leading to different model estimates.

Data Extent and Unit of Analysis

In a geospatial analysis, there are two levels that a researcher must choose to frame his research: the unit of analysis, or micro level; and the extent of the data, or the macro level. Choosing the micro and macro levels has important consequences. A geospatial unit of analysis that is too small or too large may misestimate the characteristics of the area that correlate with the dependent variable; in this case, the presence of a charter school. In the same way, the data extent should include areas only where there are plausible counterfactuals. As an example: if we wish to examine whether for-profit charter schools locate in areas with certain characteristics, we would not want to include states where for-profit charters are not allowed by law. Potentially, the inclusion of these states could bias the estimates from regression models, as areas that were prone to hosting a for-profit charter would never have the opportunity to do so. Of course, factors other than state laws and policies may preclude charters, or certain types of charters, from locating in particular areas; in this case, examining the level of for-profit charter penetration for a region would serve to gauge the potential for areas within that region to host a for-profit charter school.

Table 3-1 gives the micro and macro levels for the studies recounted in the literature review that analyze the characteristics of areas that host charter schools. Micro levels range from census block groups to school districts; macro levels run from single cities to the entire nation. Again, there are no universally correct macro and micro levels; however, employing the right levels, dependent on the research question, will make an analysis more relevant to the questions it seeks to answer.

Census tracts are often used at the micro level, particularly for larger data extents. In this paper, I also choose to make the unit of analysis the census tract. Tracts are delineated by the U.S. Census Bureau with the stated purpose of providing "…a stable set of geographic units for the presentation of statistical data" ("2010 Geographic Terms and Concepts - Census Tract," 2018). Tracts are designed to represent neighborhoods, in that they are "…relatively homogeneous with respect to population characteristics, economic status, and living conditions" (Iceland & Steinmetz, 2003). As the purpose of this study is to explore correlations between the placement of a charter school into a neighborhood and the demographic characteristics of that neighborhood, census tracts are the most suitable micro level delineation of place.

For the extent of the data, I choose to limit the dataset to areas where there is significant charter penetration of various types; this allows for the inclusion of tracts that both host charters and are plausible counterfactuals. I group the tracts included in the datasets at the county level. Counties are regional areas that, unlike labor markets or Core Based Statistical Areas, do not cross state lines. Considering the role state laws and regulations play in establishing charters, it is important to group tracts so that they are all subject to similar policy contexts. To determine whether to include a county in this paper's dataset, I apply the following criteria:

- The county should have a substantial number of students enrolled in publicly-financed schools, under the premise that charter operators of various types of charters will only enter an area if they perceive there is a large enough potential market for their schools. While any cut point in student enrollment will be arbitrary, I set this study's at 100,000 students. This leads to a dataset large enough to have substantial statistical power while eliminating many counties that likely do not have enough students to attract a wide variety of charter operators.
- At least 10 percent of the students in the county should be enrolled in charter schools. Again, the cut point here is somewhat arbitrary; however, significant charter penetration is a sign that the tracts in the county are amenable to hosting charter schools.
- No more than half of the charters should be "virtual" charters. According to the National Center for Education Statistics, the definition of a virtual school is as follows: "A virtual school is a public school that only offers instruction in which students and teachers are separated by time or location, and interaction occurs via computers or telecommunications technologies. A virtual school generally does not have a physical facility that allows students to attend classes on site" (Glander, 2015). The ambiguity as to whether a virtual charter may have a physical location

> where students spend the school day complicates this analysis; operators of fully on-line charters might have less reason to consider the characteristics of the neighborhoods they locate within than charter operators who run on-line schools where students report to a specific physical location. To mitigate against this complication, I exclude any county where more than 50 percent of the charter student population is enrolled in virtual charters. I do choose, however, to keep virtual charters within the dataset, as, again, they may represent schools with physical locations where student characteristics matter to charter operators. Of the 10,169 tracts in the dataset, 28 host a virtual charter but not a non-virtual charter; 34 tracts with a virtual charter also have a non-virtual charter. Running the models below with the 28 "virtual charter-only" tracts changed to "no charters" did not substantially change the estimates from those models, and had no effect on their statistical significance at the $p<0.05$ level.

The extent of the data for this study allows for between-state comparisons while eliminating areas that would lead to less plausible counterfactuals. Table 3-2 lists the 23 counties in 15 states that comprise the dataset.

Data

The list of charter schools is derived from the National Center for Education Statistics (NCES) Common Core of Data's Public School Universe (PSU) for 2014-15. Any school marked "charter" is included in the dataset. Geographic coordinates of the schools are from the PSU data. These coordinates were merged, using geographic information system (GIS) software (QGIS), to census tract shapefile data from the U.S. Census Bureau for 2014. Tracts were coded dichotomously as either having or not having a charter school, or a charter school of a particular type under study. Tracts with multiple charter schools are marked the same as tracts with one charter. Tracts were merged with demographic data from the U.S. Census Bureau's American Community Survey's (ACS) 5-year estimates for 2010-2014.

To determine the charter school's EMO affiliation and for-profit/nonprofit status, I began with Miron and Gulosino's *Profiles of for-profit and nonprofit education management organizations: Fourteenth Edition—2011-2012.* (2013) In previous work (Weber & Baker, 2017a), I had revised and updated this dataset, relying on charter school websites and state education department data. I further revised and updated the dataset to match the charter schools from the PSU. In addition to revisiting charter school websites and state-level data, I relied on news reports, state and national charter advocacy and authorizing organizations, and published resources from independent sources. Of particular help in coding Michigan charter schools was a report from the Education Policy Center of Michigan State University (Mao & Landauer-Menchik, 2013).

To categorize charters, I use the following methodology:

- "Any charters" are any schools designated as charters by the PSU data.
- "Nonprofit charters" are non-virtual charters that are not directly authorized or regulated by public school districts and were not found by a source to be operated by a for-profit.
- "Large EMO nonprofit charters" are the charters above that belong to an EMO network with greater than 10,000 students enrolled.

- "For-profit" charters are charters that a source confirms are operated by a for-profit organization.
- "Large EMO for-profit charters" are the charters above that belong to an EMO network with greater than 10,000 students enrolled.

Some previous studies have classified EMO size by the number of locations (Gulosino & Miron, 2017). For this study, I choose instead to classify EMO size by student enrollments. Previous research suggests enrollment size is a determinate of whether a school district can achieve economies of scale[15] (Andrews et al., 2002); as such, it may have more impact on an EMO's behavior than the number of locations a network establishes. Table 3-3 shows the number of tracts with charters of these various types in each of the study counties. Table 3-4 expresses these amounts in percentages of the total number of tracts.

Methods and Models

To determine the correlation between neighborhood characteristics and charter location, I employ a logistic regression methodology. Logistic regression uses a dichotomous dependent variable: in this case, whether a census tract does or does not contain at least one charter school. Because there are only two possible outcomes, the dependent variable is expressed as a probability that one outcome will occur relative to the other. The research questions herein call for using census tract demographic characteristics as independent variables within the logistic regression model to estimate the correlations between those characteristics and the probability of a charter being located in a tract.

[15] For a further discussion, see the second paper of this dissertation.

The models herein adhere to this basic form:

$$logit(Y_i) = \ln\left(P_i/(1 - P_i)\right)$$
$$= \beta_0 + \beta_1 Density_i + \beta_2 PctFamiliesChildrenInPoverty_i$$
$$+ \beta_3 PctSchoolAgedChildren_i$$

A logit is a standard transformation of the dependent variable where the outcome is expressed as the natural log of the odds that *Y* equals one of the outcomes (Wooldridge, 2010). Coefficients in this model are expressed as log odds (using the "logistic" command in Stata).

In this first model, three independent variables predict the outcome. The first, *Density*, is the relative density for the county of the tract, measured as the number of school-aged children per square mile of land. The rationale for including density is that education providers are more likely to enter a market if there are more potential students per square mile. To standardize densities across a variety of contexts, and to account for possible non-linearity in the measure, I express density as a dummy variable in quintiles. Next, *PctFamiliesChildrenInPoverty* serves initially as a variable of interest. Given its predictive power, as shown below, it later serves as a control variable. I choose not to include other measures of socio-economic status so as not to over-specify the model and potentially bias a variable of interest. The third variable, *PctSchoolAgedChildren*, is included as charter operators likely will be attracted to areas where school aged children comprise a greater share of the total population.

When race is added to the model, it is important to hold socio-economic disadvantage constant; otherwise, correlations between disadvantage and race may bias the estimates. The models with race employ the following form:

$$logit(Y_i) = \ln\left(P_i/(1-P_i)\right)$$
$$= \beta_0 + \beta_1 Density_i + \beta_2 PctFamiliesChildrenInPoverty_i$$
$$+ \beta_3 PctSchoolAgedChildren_i + \beta_4 PctRace_i$$

Where *PctRace* is the percent of the overall population that is a particular race.

Findings

Table 3-5 gives the descriptive statistics of the model covariates, aggregated for the entire dataset, and for each of the individual states. There is significant variation between states in the mean census tract percentage of families in poverty and density; in contrast, the percentage of school-aged children is relatively stable. Table 3-6 gives the percentages of the races used in the models. There is substantial variation between states in the relative percentage of each race; state-level models may yield substantially different estimates due to the differing racial compositions of the study areas.

National Model

Table 3-7 shows the estimates from the model for all tracts in the dataset. As expected, the percentage of school-aged children in a tract powerfully predicts the chances of that tract having a charter school of any type. This is strong evidence that charter operators are aware of and act upon the demographics of a tract when deciding where to place their schools. Density has much less influence on charter location; curiously, the most dense tracts within a county are less likely to host a charter.

The variable of interest in this model – the percentage of families with children who are in poverty – shows a strong, positive correlation with the likelihood of a charter being located within a tract. The only group of charters who are not more likely to be located in a higher-poverty tract are large-EMO, nonprofit charters. Any charter, all nonprofits, for-profits, and large-EMO for-profits are all more likely to locate in a higher-poverty tract; the estimates are all significant at the $p<0.01$ level. In addition, the poverty estimate for the model with for-profit charters is considerably larger than the estimate for the model with nonprofit charters, suggesting for-profits are more sensitive to tract-level family poverty than nonprofits.

Because poverty is such a powerful predictor of charter placement, I include it in the nationwide models employing race as the variable of interest. Table 3-8 has three models employing percent black, Hispanic, and white. Hispanic and white concentration have no significant power in predicting whether a tract has a charter of any type; the estimates essentially say the odds of charter placement are the same with low concentrations of either race as they are with high concentrations. In contrast, the percentage of blacks in a tract has a very powerful ($p<0.01$) effect on the probability that a tract will host a charter. A tract that has a 100 percent black population will see the log odds of charter placement rise 1.3 times more than a tract with a similar level of family poverty, similar density, and a similar concentration of school-aged children, but no black residents.

To illustrate this difference, Figures 3-1, 3-2 and 3-3 show how the variables of interest – percentages of blacks, Hispanics, or whites in a tract – change the probability of a "typical" tract hosting a charter school. The horizontal axis shows 11 possible percentages of racial concentration, ranging from 0 to 100 percent, in 10 percentage point increments. The vertical axis shows the fitted value of the probability[16] of a charter being in a census tract for the logistic regression models, with the assumption that poverty,

[16] To aid in interpretation, I use probabilities here rather than odds. Probabilities range from 0 to 1, where 1 is certainty an event will occur, and 0 is certainty it will not.

density, and concentration of school-aged children is at the mean. The plots, then, are projections of how the model estimates the probability of charter placement will change as racial concentrations change, holding all other factors constant at their average.

Figure 3-1 shows that a “typical” tract, according to this model, has an approximately 15 percent chance of hosting a charter school if it has no black residents. As the percentage of black residents rises, however, the chances of a charter being inside that tract grows. For a tract where 50 percent of residents are black, the probability of hosting a charter is about 17 percent; a tract with 100 percent black residents has a 20 percent chance of having a charter. In contrast: Figure 3-2 shows a tract with average poverty, density, and concentration of school-aged children but no Hispanic residents has a 16 percent chance of hosting a charter. That chance barely changes when the same tract has a population that is 100 percent Hispanic. The same is true for whites, as shown in Figure 3-3; although the plot shows a slight downward trend in charter placement probability as the concentration of whites rise, the correlation is not statistically significant. Note that in these three models, some of the density quintile dummy variables become statistically significant predictors of charter’s presence. A high density of school-aged children actually decreases the chance of a charter locating inside a tract.

To further explore the correlation between race and the odds that a census tract hosts a charter school, I run the model for different types of charter schools, again adding one of the three racial percentages as a covariate. This time, however, I restrict the data to the counties in the four states that have substantial levels of for-profit charter penetration: Arizona, Florida, Michigan, and Ohio. Again: the fact that counties in these states have considerable numbers of charter school enrollments suggests that tracts in these counties without charters of different types are viable counterfactuals. Readers will note that the number of observations (N) drops considerably when the data is restricted to these four states, although it is still quite high.

Unlike the nationwide model with "black" as the racial covariate, the four-state model, shown in Table 3-9, estimates that the percentage of a tract's residents who are black is not a significant predictor of whether that tract will host any type of charter school. This evidence suggests that statewide contexts are important and can meaningful change a charter operator's locational decisions. Percent black is not a significant predictor of the presence of any of the types of charters studied at the $p<0.05$ level. A high percentage of black residents decreases the chances of a tract hosting a large-EMO, nonprofit charter, but only at the $p<0.1$ level.

In contrast, the Hispanic and white covariates are strong predictors of the placement of certain types of charters within a tract. Table 3-10 shows a higher concentration of Hispanics increases the chances a tract has a charter school of any type; it also increases the odds of a tract hosting a non-profit charter, or a charter operated by a large, for-profit EMO. In contrast, estimates from

Table 3-11 shows a higher concentration of white residents decreases the chance of a nonprofit or a large-EMO, for-profit charter being in the tract. Again, this evidence suggests that there are significant differences between states in how charter operators choose locations.

State-level Models

To explore the differences in statewide contexts further, I run models for the dataset's counties in individual states. Table 3-12 shows the estimates from the model with the percentage of families with children in poverty as the variable of interest. In general, the density dummy variables have little effect on the model, although there are a few examples of a particular quintile having statistically significant predictive power in a particular state. Notably, the percentage of school-aged children in a tract – which had great predicative power in the nationwide models – now only has that power in a few states: Florida, Texas, and Utah. The coefficients are extremely high, suggesting the observations from these states were responsible for biasing the nationwide estimates. Yet the statewide models also show that poverty is a significant predictor of charter presence in most states. Only the models for Arizona, Colorado, Minnesota, and Utah estimate that family poverty is not a significant predictor of a charter school being located in a tract (Minnesota is significant at the $p<0.1$ level). Across many state contexts, the evidence suggests that charter schools locate in areas where family poverty is relatively high.

To examine the differences in correlations between the likelihood of a tract hosting a charter and that tract's racial composition, I run the models for different types of charters with the three racial covariates for the individual states in the dataset. Again, I only include tracts in Arizona, Florida, Michigan, and Ohio in the models that use the odds of a nonprofit, for-profit, and large-EMO for-profit charter being located in a tract as the dependent variable. As shown in Table 3-13, there are substantial differences in the power of the percentage of black residents to predict the presence of a charter in a tract. Unlike the national model, where black resident percentage significantly predicts a charter's presence, percentage black only significantly predicts any type of charter in California, Tennessee, and Wisconsin. It also significantly predicts a nonprofit charter being in a tract in Michigan and Florida, and a large-EMO, for-profit charter being in a tract in Arizona.

Table 3-14 shows percentage Hispanic is a significant predictor in Colorado, Minnesota, and New Mexico. It is a significant predictor of the presence of a nonprofit charter in Arizona; of a for-profit in Ohio; and of a large-EMO, for-profit in Florida and Ohio. Finally, Table 3-15 shows that the percentage of white residents in a tract is negatively correlated with the likelihood of a charter's presence in several states: Florida, Minnesota, New Mexico, Tennessee, Texas, and Wisconsin. Nonprofits are less likely to locate in a tract as white percentage rises in Florida, Michigan, and Ohio. In addition, increased white percentage significantly correlates with the likelihood that a tract will not have a for-profit charter or a large-EMO for-profit charter in Florida. It is notable that at the statewide level, percentage white appears to have a greater ability to predict that a tract will not have a charter than percentage black or percentage Hispanic has to predict a tract will have a charter.

Discussion

In response to the first research question – do charter schools locate equally across areas with different levels of economic disadvantage? – the estimates from the models herein provide strong evidence that they do not. In the national model, and in 11 of the 15 states in the dataset, higher percentages of families in poverty statistically significantly increased the likelihood a charter school would be located in a tract. Even in states where the estimate was not statistically significant at the $p<0.05$ level, estimates still showed a positive correlation between percentage of families in poverty and the likelihood of charter placement. If we accept the premise that education providers will make locational decisions based on the presence of their target consumers, it is clear charters are targeting families in economic disadvantage. This finding is particularly salient given the evidence that less advantaged families value school proximity more than more advantaged families.

It is notable that large-EMO, nonprofit charters are the exception to this trend. Often these charter networks claim to be specifically addressing the educational needs of the most disadvantaged students. Yet their locational decisions suggest otherwise. It may be, as d'Entremonet and Gulosino (2011) find, that the schools are encircling the neighborhoods where the students they are likely to enroll reside. But it may also be, as LaFleur (2016) finds, that these charters are targeting the students who are economically disadvantaged, but who do not have the greatest levels of that disadvantage. It is also notable that greater levels of poverty increase the odds of the presence of a for-profit charter more than the odds of a nonprofit one. If for-profits are more likely to engage in rent-seeking behaviors than nonprofits, the for-profits have concluded that greater gains are to be made in more disadvantaged neighborhoods.

Estimates from these models also shows that a higher percentage of school-aged children consistently predicts a greater likelihood of a charter's presence, while the quintiles of density of children per square mile of land often times do not. In addition: more density often leads to less likelihood of a charter's presence. Clearly, the charter school producers in this market respond positively to a higher concentration of school-aged children in a neighborhood, but density appears not to be viewed as an important consideration by these same producers.

The second research question asked whether charter schools locate equally across areas with different racial compositions. The national models using race as a covariate suggest that only a tract's percentage of black residents statistically significantly predicts the presence of a charter. When looking at different types of charters (as prompted by RQ3), however, a more complex picture emerges. In those states where there is a significant presence of for-profit charters, the percentage of black residents is not a predictor of a charter of any type locating in a tract. Instead, high concentrations of Hispanics increase the likelihood of a charter being present, especially a nonprofit or a large-EMO, for-profit charter. Conversely, high concentrations of white residents decrease the likelihood of nonprofit or large-EMO, for-profit charters.

Interpretations are even more complex when addressing the fourth research question, which asks whether locational decisions vary between different statewide contexts. Again, family poverty is a strong predictor of a charter's presence in most states. But clear patterns based on racial concentrations are difficult to detect. The most consistent pattern appears to be that an increased concentration of white residents decreases the odds of a tract hosting a charter. The statistical significance of that correlation, however, varies between states.

Conclusions and Recommendations

This study presents evidence that charter schools are disproportionally located in areas with greater levels of family economic disadvantage. The likelihood of any charter locating within a census tract increases as family poverty rises; in addition, as poverty rises the likelihood increases even more that the tract will host a for-profit charter. In addition, across many contexts charter location is negatively correlated with higher levels of white resident concentration.

The study herein takes a simple approach to analyzing the effect of racial concentrations on the odds that a charter will be located in a neighborhood. The realities of racial interactions, however, are more complex than can be explained in these regression models. Future work on the racial characteristics of areas that host charters should attempt to account for the various local contexts and racial interactions that likely affect the probability of charter placement. In the same way, the measure used herein for socio-economic status – family poverty – is dichotomous. Future work might use different class and economic disadvantage measures. However, caution should be exercised not to over-specify the model, as the variable of interest is socio-economic status, and over-specification might bias estimates.

The models herein employ binary dependent variables: either there is at least one charter school in a tract, or there is not. One limitation of this approach is that there is no accounting for the difference between having one or two or more charters within a tract, which may be important in understanding the locational decisions of charter operators. Indeed, the presence of public or private schools may also be important for a charter operator when deciding where to place their school. A model that accounts for these factors would benefit from access to longitudinal data, which could track when schools of all types entered and exited from areas.

The methodology of placing schools within census tracts should also be reexamined in future work. While tracts are reasonable proxies for charter neighborhoods, their boundaries are still somewhat arbitrary. Establishing zones around charters that cross tract boundaries could be useful, although determining the size of these zones presents another set of issues to be addressed.

Finally, the increasing complexity of charter organizational characteristics suggests that simple delineations of “nonprofit” and “for-profit” may be insufficient to capture the variety of charter types. Nonprofit charters may have lease agreements with for-profit entities, or farm out substantial amounts of their operations to contractors. More work in this area is needed to inform charter policy.

Whether one considers the uneven distribution of charter schools of various types across class and race to be problematic is, in part, a matter of ideology. If one values the ability of parents and students to “choose” their schools, one would likely tend to overlook the problems of differentiated spending on instruction, or the reports of waste, fraud, and abuse, or even the (admittedly weak) evidence on outcomes. “Choice,” in this line of thinking, is its own benefit; any additional benefits, or detriments, in a market system of schooling are secondary to the ability of education consumers to exercise their ability to attend the schools that match their predilections. I would argue, however, that the evidence presented in this paper is cause for concern even if one highly values “choice” in schooling, for at least two reasons:

First, as I show in the first two papers of this dissertation, charter proliferation does affect the finances of hosting public district schools. There is ample evidence to support the theory that school spending rises as charters proliferate; however, this spending is likely due to increasing inefficiencies, and likely does not positively impact students’ learning environments and, subsequently, student outcomes. If these inefficiencies are distributed unevenly across variations in socio-economic status and race, there is ample reason to be concerned that they will inequitably affect different student and family populations. This study presents evidence that charters are distributed unevenly; therefore, the inefficiencies they induce are likely also distributed unevenly.

Second: even if there were no negative repercussions from charter proliferation, the very fact that charters are being distributed unevenly across class and race should give all stakeholders pause. Any policy intervention, no matter its effects, that is not explicitly targeted to certain populations but is still distributed unevenly across all populations needs to be examined. A market system is predicated on the notion that producers will make decisions, such as where to locate, in their own best interests. Why, then, do charter operators appear to value locations with more disadvantaged families and fewer white residents? Is it because “choice” is being offered to neighborhoods instead of adequately funded public district schools? The unevenness of charter school distributions is more than enough reason to further pursue this question.

Tables

Table 3-1

Studies of Charter Schools and Location: Unit(s) of Analysis and Data Extent

Author(s)	Year	Unit(s) of Analysis (Micro)	Data Extent (Macro)
Bifulco & Beuerger	2015	Census tracts; school districts.	15 urban districts in NY State (not NYC)
Burdick-Will, Keels & Schuble	2013	Uniform quadrants (made by authors).	City of Chicago.
Ertas & Roch	2014	Census tracts.	State of Michigan.
Glomm, Harris & Lo	2005	School districts.	Two states: Michigan and California.
Gulosino & d'Entremont	2011	School districts; census tracts; census block groups.	State of New Jersey.
Gulosino & Miron	2017	Census tracts.	41 states.
Henig & MacDonald	2002	Census tracts.	Washington, D.C.
Jacobs	2011	Zip code zone.	Washington, D.C.
LaFleur	2016	Census tracts.	City of Chicago.
Lee	2018	School districts.	State of Michigan.
Lubienski, Gulosino & Weitzel	2009	Census block groups (DC, New Orleans); census tracts (Detroit).	Detroit, MI; New Orleans, LA; Washington, D.C.
Robertson	2015	Census block group.	Nationwide.

Table 3-2

Counties in Dataset: Total Enrollment, Charter Enrollment Percentage, Virtual Charter Enrollment percentage. (2014)

County	**State**	**District & Charter Enrollment**	**Pct. Charter Enrollment**	**Pct. Virtual Enrollment (of Charter Enrollment)**
Maricopa County	AZ	710,834	18.3%	9.0%
Pima County	AZ	145,947	17.1%	0.0%
Los Angeles County	CA	1,552,509	11.9%	1.6%
Sacramento County	CA	241,621	12.2%	0.0%
San Diego County	CA	512,202	11.4%	1.5%
Santa Clara County	CA	284,806	10.0%	0.0%
El Paso County	CO	121,512	13.6%	4.1%
Broward County	FL	266,944	15.6%	0.5%
Miami-Dade County	FL	356,964	15.6%	0.1%
Palm Beach County	FL	186,605	10.3%	0.0%
Marion County	IN	153,243	14.4%	32.8%
Kent County	MI	107,187	13.6%	19.2%
Wayne County	MI	274,772	23.7%	0.2%
Hennepin County	MN	161,855	10.5%	0.0%
Essex County	NJ	132,660	10.9%	0.0%
Bernalillo County	NM	101,577	13.6%	0.0%
Cuyahoga County	OH	174,202	14.6%	13.1%
Franklin County	OH	205,671	17.0%	42.6%
Philadelphia County	PA	198,687	32.4%	0.6%
Shelby County	TN	151,326	10.2%	0.0%
Dallas County	TX	492,739	10.2%	0.0%
Salt Lake County	UT	212,029	11.6%	9.8%
Milwaukee County	WI	139,914	12.7%	1.4%

Table 3-3

Study Counties: Total Census Tracts, Tracts Containing Charter Schools, Tracts Containing Types of Charter Schools (2014)

County	State	Tracts	Has Charter	Has Nonprofit Charter	Has Large EMO Nonprofit Charter	Has For-Profit Charter	Has Large EMO For-Profit Charter
Maricopa County	Arizona	916	261	177	22	66	17
Pima County	Arizona	241	74	57	5	22	1
Los Angeles County	California	2346	273	227	19	1	1
Sacramento County	California	317	36	26	2	0	0
San Diego County	California	628	82	72	4	0	0
Santa Clara County	California	372	43	28	12	0	0
El Paso County	Colorado	130	27	22	0	4	4
Broward County	Florida	362	61	36	3	34	24
Miami-Dade County	Florida	519	65	39	0	40	35
Palm Beach County	Florida	338	45	32	0	17	13
Marion County	Indiana	224	31	27	3	1	1
Kent County	Michigan	128	27	7	0	20	15
Wayne County	Michigan	611	125	45	0	85	23
Hennepin County	Minnesota	299	58	58	1	0	0
Essex County	New Jersey	210	15	15	1	0	0
Bernalillo County	New Mexico	153	39	26	0	0	0
Cuyahoga County	Ohio	447	58	30	0	34	24
Franklin County	Ohio	284	59	42	1	20	11
Philadelphia County	Pennsylvania	384	72	62	12	11	11
Shelby County	Tennessee	221	42	42	0	0	0
Dallas County	Texas	529	86	82	2	0	0
Salt Lake County	Utah	212	30	29	0	0	0
Milwaukee County	Wisconsin	298	49	23	1	1	1

Table 3-4

Study Counties: Percentage of Census Tracts Containing Charter Schools, Percentage of Tracts Containing Types of Charter Schools (2014)

County	State	Pct. Has Charter	Pct. Has Nonprofit Charter	Pct. Has Large EMO Nonprofit Charter	Pct. Has For-Profit Charter	Pct. Has Large EMO For-Profit Charter
Maricopa County	Arizona	28.5%	19.3%	2.4%	7.2%	1.9%
Pima County	Arizona	30.7%	23.7%	2.1%	9.1%	0.4%
Los Angeles County	California	11.6%	9.7%	0.8%	0.0%	0.0%
Sacramento County	California	11.4%	8.2%	0.6%	0.0%	0.0%
San Diego County	California	13.1%	11.5%	0.6%	0.0%	0.0%
Santa Clara County	California	11.6%	7.5%	3.2%	0.0%	0.0%
El Paso County	Colorado	20.8%	16.9%	0.0%	3.1%	3.1%
Broward County	Florida	16.9%	9.9%	0.8%	9.4%	6.6%
Miami-Dade County	Florida	12.5%	7.5%	0.0%	7.7%	6.7%
Palm Beach County	Florida	13.3%	9.5%	0.0%	5.0%	3.8%
Marion County	Indiana	13.8%	12.1%	1.3%	0.4%	0.4%
Kent County	Michigan	21.1%	5.5%	0.0%	15.6%	11.7%
Wayne County	Michigan	20.5%	7.4%	0.0%	13.9%	3.8%
Hennepin County	Minnesota	19.4%	19.4%	0.3%	0.0%	0.0%
Essex County	New Jersey	7.1%	7.1%	0.5%	0.0%	0.0%
Bernalillo County	New Mexico	25.5%	17.0%	0.0%	0.0%	0.0%
Cuyahoga County	Ohio	13.0%	6.7%	0.0%	7.6%	5.4%
Franklin County	Ohio	20.8%	14.8%	0.4%	7.0%	3.9%
Philadelphia County	Pennsylvania	18.8%	16.1%	3.1%	2.9%	2.9%
Shelby County	Tennessee	19.0%	19.0%	0.0%	0.0%	0.0%
Dallas County	Texas	16.3%	15.5%	0.4%	0.0%	0.0%
Salt Lake County	Utah	14.2%	13.7%	0.0%	0.0%	0.0%
Milwaukee County	Wisconsin	16.4%	7.7%	0.3%	0.3%	0.3%

Table 3-5

Descriptive Statistics, Model Covariates by Census Tract (2014)

Study Counties by State	School-Age Children (5-19) Density per sq. mi.					Pct. Families w/children in poverty					Pct. School-Age Children (5-19)				
	N	mean	s.d.	min	max	N	mean	s.d.	min	max	N	mean	s.d.	min	max
Study Group, All States	10157	1568	1783	0	31835	9998	21.9%	18.9%	0.0%	100.0%	10169	19.1%	7.1%	0.0%	78.0%
Arizona	1157	908	848	0	6828	1119	20.3%	18.8%	0.0%	100.0%	1157	20.1%	8.0%	0.0%	60.8%
California	3659	2178	2241	0	31835	3621	18.8%	16.3%	0.0%	100.0%	3663	19.3%	6.8%	0.0%	77.4%
Colorado	130	694	517	1	2237	129	15.7%	13.5%	0.0%	80.6%	130	20.4%	5.8%	6.9%	39.9%
Florida	1215	1193	1047	0	9249	1176	19.8%	16.2%	0.0%	100.0%	1219	16.4%	7.3%	0.0%	75.7%
Indiana	224	665	419	89	2401	224	28.8%	20.4%	0.0%	71.8%	224	19.1%	5.5%	5.0%	35.9%
Michigan	737	960	737	0	5077	727	31.5%	23.5%	0.0%	100.0%	739	20.2%	6.0%	0.0%	38.9%
Minnesota	299	927	835	11	5782	299	16.3%	18.4%	0.0%	100.0%	299	17.6%	6.4%	1.3%	48.6%
New Jersey	210	3066	2176	5	11156	209	23.9%	19.5%	0.0%	100.0%	210	20.6%	5.5%	0.1%	35.1%
New Mexico	153	793	573	3	3499	153	22.7%	17.7%	0.0%	78.3%	153	18.7%	5.5%	7.4%	42.2%
Ohio	730	945	969	0	19804	721	26.7%	23.0%	0.0%	100.0%	731	18.7%	6.7%	0.0%	78.0%
Pennsylvania	384	3390	2651	0	15436	372	27.5%	19.5%	0.0%	83.8%	384	17.3%	8.4%	0.0%	47.4%
Tennessee	221	628	424	0	2120	216	30.0%	22.4%	0.0%	88.3%	221	20.3%	6.5%	0.0%	41.2%
Texas	529	1134	1093	0	13237	526	23.8%	18.0%	0.0%	100.0%	529	20.7%	7.5%	0.0%	45.7%
Utah	212	1049	600	0	3234	210	15.5%	14.7%	0.0%	100.0%	212	21.4%	6.9%	0.0%	37.0%
Wisconsin	297	1721	1559	0	10740	296	27.4%	21.3%	0.0%	93.0%	298	20.4%	8.0%	0.0%	55.1%

Table 3-6

Descriptive Statistics, Racial Percentage by Census Tract (2014)

Study Counties by State	Pct. Black					Pct. Hispanic					Pct. White				
	N	mean	s.d.	min	max	N	mean	s.d.	min	max	N	mean	s.d.	min	max
Study Group, All States	10102	17.4%	26.6%	0.0%	100.0%	10102	28.5%	27.5%	0.0%	100.0%	10102	43.4%	30.8%	0.0%	100.0%
Arizona	1153	4.5%	5.0%	0.0%	35.4%	1153	30.0%	24.0%	0.0%	100.0%	1153	57.9%	25.8%	0.0%	100.0%
California	3644	6.9%	11.0%	0.0%	90.0%	3644	40.6%	28.0%	0.0%	100.0%	3644	34.1%	26.8%	0.0%	100.0%
Colorado	130	5.5%	4.7%	0.0%	22.1%	130	15.7%	9.7%	2.5%	52.0%	130	71.4%	14.5%	33.9%	92.7%
Florida	1204	19.1%	25.0%	0.0%	99.8%	1204	38.9%	29.7%	0.0%	100.0%	1204	38.3%	29.7%	0.0%	100.0%
Indiana	224	29.4%	25.6%	0.0%	97.4%	224	9.5%	8.9%	0.0%	50.5%	224	56.2%	26.9%	1.0%	99.6%
Michigan	729	40.9%	40.3%	0.0%	99.9%	729	6.3%	12.9%	0.0%	82.6%	729	48.0%	37.3%	0.0%	99.4%
Minnesota	299	12.5%	13.9%	0.0%	73.3%	299	7.6%	9.0%	0.0%	59.5%	299	69.5%	22.3%	4.7%	98.2%
New Jersey	210	45.2%	36.2%	0.0%	97.4%	210	20.7%	20.9%	0.3%	90.0%	210	27.5%	31.0%	0.0%	93.6%
New Mexico	153	2.5%	2.3%	0.0%	10.7%	153	45.9%	21.6%	7.3%	94.1%	153	43.3%	20.7%	1.5%	86.8%
Ohio	726	32.2%	33.1%	0.0%	99.7%	726	5.3%	7.4%	0.0%	53.5%	726	56.9%	31.9%	0.0%	100.0%
Pennsylvania	377	42.6%	35.3%	0.0%	99.7%	377	11.2%	16.8%	0.0%	91.6%	377	37.4%	32.4%	0.0%	100.0%
Tennessee	219	56.5%	34.6%	0.3%	100.0%	219	5.4%	7.7%	0.0%	47.7%	219	34.3%	32.3%	0.0%	95.5%
Texas	527	21.0%	22.8%	0.0%	99.0%	527	37.2%	24.8%	0.0%	95.6%	527	34.5%	25.5%	0.1%	96.5%
Utah	211	1.5%	2.0%	0.0%	12.0%	211	16.9%	13.9%	0.5%	61.2%	211	73.6%	17.0%	27.1%	95.0%
Wisconsin	296	30.0%	34.2%	0.0%	98.4%	296	13.4%	19.4%	0.0%	83.7%	296	50.1%	34.0%	0.0%	97.1%

Table 3-7

Logistic Regression: Charter School Presence Across Census Tracts

	Has Any Charters	Has Nonprofit Charters	Has Large EMO Nonprofit Charters	Has For-Profit Charters	Has Large EMO For-Profit Charters
Density Quintiles					
20%-40%	0.920	1.004	0.875	1.558**	1.212
	(0.081)	(0.165)	(0.467)	(0.312)	(0.308)
40%-60%	0.780***	0.992	0.479	0.995	0.775
	(0.070)	(0.164)	(0.304)	(0.215)	(0.216)
60%-80%	0.866	1.033	1.190	1.411*	0.937
	(0.078)	(0.171)	(0.604)	(0.288)	(0.255)
>80%	0.560***	0.669**	0.211*	0.910	0.648
	(0.056)	(0.124)	(0.183)	(0.203)	(0.197)
Pct. Families w/Children in poverty	7.114***	2.790***	0.147	4.970***	3.351***
	(1.024)	(0.672)	(0.197)	(1.262)	(1.214)
Pct. School Aged Children	6.393***	11.093***	797.505***	25.503***	8.606*
	(2.845)	(8.679)	(1955.993)	(22.853)	(10.098)
constant	0.106***	0.073***	0.004***	0.029***	0.024***
	(0.010)	(0.013)	(0.003)	(0.006)	(0.006)
N	9998	3743	3743	3743	3743
Chi-sq	221.055	34.823	16.584	74.790	18.493
prob > Chi-sq	0.000	0.000	0.011	0.000	0.005
Pseudo R-sq	0.024	0.011	0.045	0.028	0.012

**p<0.10, **p<0.05,*
****p<0.01*
Coefficients reported as odds ratios.
Robust stand errors.

Table 3-8

Logistic Regression: Charter School Presence Across Census Tracts with Race Covariates

	Has Any Charters (all states)		
Pct. Black	1.362***		
	(0.144)		
Pct. Hispanic		0.990	
		(0.099)	
Pct. White			0.952
			(0.103)
Density Quintiles			
20%-40%	0.912	0.920	0.918
	(0.081)	(0.081)	(0.081)
40%-60%	0.772***	0.780***	0.776***
	(0.070)	(0.071)	(0.071)
60%-80%	0.857*	0.867	0.860
	(0.077)	(0.079)	(0.079)
>80%	0.569***	0.561***	0.556***
	(0.057)	(0.058)	(0.057)
Pct. Families w/Children in poverty	5.719***	7.117***	6.898***
	(0.936)	(1.024)	(1.083)
Pct. School Aged Children	5.862***	6.428***	6.153***
	(2.626)	(2.884)	(2.808)
constant	0.108***	0.106***	0.111***
	(0.011)	(0.011)	(0.015)
N	9998	9998	9998
Chi-sq	234.206	221.151	221.035
prob > Chi-sq	0.000	0.000	0.000
Pseudo R-sq	0.025	0.024	0.024

**p<0.10, **p<0.05, ***p<0.01*
Coefficients reported as odds ratios. Robust stand errors.

Table 3-9

Logistic Regression: Charter School Presence Across Census Tracts with Pct. Black Covariate

	Has Any Charters	Has Nonprofit Charters	Has Large EMO Nonprofit Charters	Has For-Profit Charters	Has Large EMO For-Profit Charters
Pct. Black	0.873	0.841	0.114*	1.048	1.114
	(0.136)	(0.162)	(0.132)	(0.209)	(0.282)
Density Quintiles					
20%-40%	1.228	1.011	0.909	1.554**	1.205
	(0.166)	(0.167)	(0.488)	(0.312)	(0.308)
40%-60%	1.001	0.999	0.499	0.993	0.771
	(0.139)	(0.165)	(0.317)	(0.214)	(0.215)
60%-80%	1.161	1.046	1.314	1.405*	0.929
	(0.161)	(0.175)	(0.658)	(0.288)	(0.254)
>80%	0.686**	0.669**	0.212*	0.910	0.647
	(0.105)	(0.124)	(0.185)	(0.203)	(0.197)
Pct. Families w/Children in poverty	3.601***	3.195***	0.528	4.785***	3.072**
	(0.849)	(0.916)	(0.786)	(1.454)	(1.349)
Pct. School Aged Children	36.955***	11.467***	842.133***	25.276***	8.439*
	(24.054)	(8.935)	(2008.560)	(22.675)	(9.942)
constant	0.096***	0.073***	0.004***	0.029***	0.024***
	(0.014)	(0.013)	(0.003)	(0.006)	(0.006)
N	3743	3743	3743	3743	3743
Chi-sq	82.452	35.143	19.296	75.138	19.443
prob > Chi-sq	0.000	0.000	0.007	0.000	0.007
Pseudo R-sq	0.020	0.011	0.057	0.029	0.012

**p<0.10, **p<0.05, ***p<0.01*
Coefficients reported as odds ratios.
Models use observations only from states w/substantial enrollment in for-profit charters: AZ, FL, MI, & OH

Table 3-10

Logistic Regression: Charter School Presence Across Census Tracts with Pct. Hispanic Covariate

	Has Any Charters	Has Nonprofit Charters	Has Large EMO Nonprofit Charters	Has For-Profit Charters	Has Large EMO For-Profit Charters
Pct. Hispanic	1.339**	1.790***	1.292	1.132	2.052**
	(0.194)	(0.299)	(0.695)	(0.234)	(0.575)
Density Quintiles					
20%-40%	1.220	1.000	0.878	1.558**	1.206
	(0.165)	(0.165)	(0.468)	(0.312)	(0.306)
40%-60%	0.988	0.975	0.479	0.992	0.759
	(0.137)	(0.161)	(0.304)	(0.214)	(0.212)
60%-80%	1.132	1.000	1.182	1.402*	0.901
	(0.156)	(0.166)	(0.597)	(0.286)	(0.244)
>80%	0.655***	0.607***	0.206*	0.893	0.574*
	(0.102)	(0.115)	(0.175)	(0.200)	(0.175)
Pct. Families w/Children in poverty	3.234***	2.789***	0.141	4.992***	3.376***
	(0.648)	(0.687)	(0.190)	(1.272)	(1.272)
Pct. School Aged Children	35.721***	10.864***	775.043***	25.319***	8.097*
	(23.205)	(8.446)	(1892.331)	(22.647)	(9.373)
constant	0.091***	0.066***	0.004***	0.028***	0.021***
	(0.014)	(0.012)	(0.003)	(0.006)	(0.006)
N	3743	3743	3743	3743	3743
Chi-sq	85.378	43.913	17.161	75.960	26.550
prob > Chi-sq	0.000	0.000	0.016	0.000	0.000
Pseudo R-sq	0.021	0.015	0.045	0.029	0.017

**p<0.10, **p<0.05, ***p<0.01*
Coefficients reported as odds ratios.
Models use observations only from states w/substantial enrollment in for-profit charters: AZ, FL, MI, & OH

Table 3-11

Logistic Regression: Charter School Presence Across Census Tracts with Pct. White Covariate

	Has Any Charters	Has Nonprofit Charters	Has Large EMO Nonprofit Charters	Has For-Profit Charters	Has Large EMO For-Profit Charters
Pct. White	0.780	0.587***	1.527	0.773	0.390***
	(0.124)	(0.109)	(1.039)	(0.185)	(0.123)
Density Quintiles					
20%-40%	1.212	0.986	0.876	1.544**	1.172
	(0.164)	(0.163)	(0.469)	(0.310)	(0.299)
40%-60%	0.983	0.965	0.483	0.982	0.737
	(0.137)	(0.160)	(0.309)	(0.212)	(0.207)
60%-80%	1.120	0.976	1.229	1.372	0.848
	(0.156)	(0.164)	(0.636)	(0.283)	(0.233)
>80%	0.664***	0.623**	0.220*	0.881	0.575*
	(0.103)	(0.117)	(0.189)	(0.199)	(0.172)
Pct. Families w/Children in poverty	2.663***	1.848**	0.219	4.099***	1.642
	(0.637)	(0.533)	(0.341)	(1.338)	(0.786)
Pct. School Aged Children	32.877***	9.099***	923.335***	23.102***	5.993
	(21.516)	(7.171)	(2251.608)	(20.915)	(7.233)
constant	0.118***	0.112***	0.003***	0.036***	0.050***
	(0.023)	(0.025)	(0.003)	(0.011)	(0.019)
N	3743	3743	3743	3743	3743
Chi-sq	85.971	42.700	17.486	78.708	32.629
prob > Chi-sq	0.000	0.000	0.015	0.000	0.000
Pseudo R-sq	0.021	0.014	0.046	0.029	0.018

**p<0.10, **p<0.05, ***p<0.01*
Coefficients reported as odds ratios.
Models use observations only from states w/substantial enrollment in for-profit charters: AZ, FL, MI, & OH

Table 3-12

Logistic Regression: Charter School Presence Across Census Tracts by State

	Arizona	California	Colorado	Florida	Indiana	Michigan	Minnesota
Density Quintiles							
20%-40%	1.322	0.820	0.921	0.991	0.143***	1.995**	0.732
	(0.294)	(0.138)	(0.623)	(0.280)	(0.099)	(0.599)	(0.375)
40%-60%	1.319	0.695**	1.053	0.833	0.401	0.747	0.508
	(0.293)	(0.120)	(0.686)	(0.238)	(0.255)	(0.259)	(0.281)
60%-80%	1.626**	0.740*	0.726	1.066	0.333*	1.179	1. 572
	(0.366)	(0.124)	(0.510)	(0.296)	(0.197)	(0.383)	(0.724)
>80%	0.752	0.560***	0.372	0.712	0.222**	0.871	1.333
	(0.197)	(0.106)	(0.275)	(0.214)	(0.158)	(0.313)	(0.767)
Pct. Families w/Children in poverty	1.674	11.749***	4.169	3.460**	34.643***	3.980***	6.114*
	(0.625)	(3.899)	(7.676)	(1.738)	(34.137)	(1.509)	(5.645)
Pct. School Aged Children	4.432	2.458	0.349	205.196***	0.012	6.286	0.307
	(4.370)	(2.016)	(1.843)	(260.222)	(0.047)	(12.484)	(0.700)
constant	0.236***	0.091***	0.326	0.056***	0.317	0.099***	0.210***
	(0.055)	(0.017)	(0.424)	(0.016)	(0.249)	(0.042)	(0.102)
N	1119	3621	129	1176	224	727	299
Chi-sq	16.762	61.267	3.775	28.367	21.032	25.123	15.627
prob > Chi-sq	0.010	0.000	0.707	0.000	0.002	0.000	0.016
Pseudo R-sq	0.012	0.022	0.026	0.026	0.093	0.035	0.054

**p<0.10, **p<0.05, ***p<0.01*
Coefficients reported as odds ratios. Robust stand errors.

Table 3-12 (continued)

	New Jersey	New Mexico	Ohio	Pennsylvania	Tennessee	Texas	Utah	Wisconsin
Density Quintiles								
20%-40%	2.281	1.250	0.713	0.596	0.577	0.595	0.526	0.560
	(3.069)	(0.716)	(0.251)	(0.258)	(0.388)	(0.221)	(0.309)	(0.312)
40%-60%	3.440	0.652	0.913	0.443*	1.096	0.397**	0.397	0.547
	(3.990)	(0.371)	(0.308)	(0.209)	(0.638)	(0.162)	(0.249)	(0.307)
60%-80%	5.346	0.384	0.604	0.396*	1.526	0.482*	0.427	0.485
	(6.297)	(0.251)	(0.219)	(0.196)	(0.841)	(0.180)	(0.245)	(0.288)
>80%	1.333	0.326	0.558	0.303**	0.512	0.210***	0.128***	0.548
	(1.836)	(0.226)	(0.223)	(0.174)	(0.331)	(0.095)	(0.094)	(0.391)
Pct. Families w/Children in poverty	18.063***	27.795***	22.353***	22.996***	78.823***	11.585***	6.286	9.879**
	(17.538)	(29.972)	(10.261)	(17.987)	(63.840)	(6.941)	(9.302)	(8.767)
Pct. School Aged Children	0.045	0.154	1.955	1.853	0.118	54.361**	6169.735**	2.092
	(0.249)	(0.572)	(3.538)	(4.074)	(0.410)	(95.787)	(2.4e+04)	(5.587)
constant	0.024**	0.319	0.087***	0.170***	0.088***	0.089***	0.040***	0.140***
	(0.036)	(0.244)	(0.032)	(0.068)	(0.070)	(0.035)	(0.043)	(0.075)
N	209	153	721	372	216	526	210	296
Chi-sq	23.911	13.548	50.611	17.112	29.739	26.501	10.861	8.942
prob > Chi-sq	0.001	0.035	0.000	0.009	0.000	0.000	0.093	0.177
Pseudo R-sq	0.087	0.088	0.077	0.048	0.142	0.056	0.074	0.036

**p<0.10, **p<0.05, ***p<0.01*
Coefficients reported as odds ratios. Robust stand errors.

Table 3-13

Logistic Regression: Charter School Presence Across Census Tracts by State with Pct. Black Covariate (estimates for Pct. Black reported)

	Has Any Charters, All States			Has Nonprofit Charters			Has For-Profit Charters			Has Large EMO For-Profit Charters		
	coeff.	s.e.	N	coeff.	s.e.	N	coeff.	s.e.	N	coeff.	s.e.	N
Arizona	10.149*	(13.814)	1119	2.309	(3.501)	1119	33.613*	(69.532)	1119	5.9e+04***	(1.8e+05)	1119
California	7.934***	(2.951)	3621	-	-	-	-	-	-	-	-	-
Colorado	5.275	(32.274)	129	-	-	-	-	-	-	-	-	-
Florida	1.796*	(0.631)	1176	2.603**	(1.021)	1176	0.877	(0.428)	1176	0.467	(0.268)	1176
Indiana	1.722	(1.247)	224	-	-	-	-	-	-	-	-	-
Michigan	1.372	(0.452)	727	5.939***	(3.182)	727	0.532*	(0.201)	727	0.601	(0.302)	727
Minnesota	3.096	(4.131)	299	-	-	-	-	-	-	-	-	-
New Jersey	2.509	(2.571)	209	-	-	-	-	-	-	-	-	-
New Mexico	776.142	(7359.214)	153	-	-	-	-	-	-	-	-	-
Ohio	1.292	(0.466)	721	1.982	(0.845)	721	0.870	(0.436)	721	0.643	(0.383)	721
Pennsylvania	1.869	(0.836)	372	-	-	-	-	-	-	-	-	-
Tennessee	6.832**	(6.421)	216	-	-	-	-	-	-	-	-	-
Texas	2.142	(1.069)	526	-	-	-	-	-	-	-	-	-
Utah	282.228	(3066.850)	210	-	-	-	-	-	-	-	-	-
Wisconsin	3.757**	(2.356)	296	-	-	-	-	-	-	-	-	-

**p<0.10, **p<0.05, ***p<0.01*
Coefficients reported as odds ratios.
Model with 'Has any charters' as the dependent variable uses all observations.
The other four models use observations only from states w/substantial enrollment in for-profit charters: AZ, FL, MI, & OH

Table 3-14

Logistic Regression: Charter School Presence Across Census Tracts by State with Pct. Hispanic Covariate (estimates for Pct. Hispanic reported)

	Has Any Charters, All States			Has Nonprofit Charters			Has For-Profit Charters			Has Large EMO For-Profit Charters		
	coeff.	s.e.	N	coeff.	s.e.	N	coeff.	s.e.	N	coeff.	s.e.	N
Arizona	1.909*	(0.742)	1119	2.447**	(1.087)	1119	1.950	(1.183)	1119	0.677	(0.832)	1119
California	1.240	(0.271)	3621	-	-	-	-	-	-	-	-	-
Colorado	5.6e+04**	(2.6e+05)	129	-	-	-	-	-	-	-	-	-
Florida	1.248	(0.347)	1176	1.064	(0.368)	1176	1.912*	(0.682)	1176	2.857***	(1.105)	1176
Indiana	14.053	(37.416)	224	-	-	-	-	-	-	-	-	-
Michigan	1.630	(1.135)	727	0.269	(0.479)	727	2.455	(1.832)	727	2.478	(2.422)	727
Minnesota	28.782**	(47.192)	299	-	-	-	-	-	-	-	-	-
New Jersey	0.487	(0.751)	209	-	-	-	-	-	-	-	-	-
New Mexico	26.387**	(36.227)	153	-	-	-	-	-	-	-	-	-
Ohio	5.614	(6.590)	721	1.176	(1.719)	721	35.518**	(49.186)	721	68.357***	(98.618)	721
Pennsylvania	1.095	(0.948)	372	-	-	-	-	-	-	-	-	-
Tennessee	0.130	(0.388)	216	-	-	-	-	-	-	-	-	-
Texas	1.439	(0.919)	526	-	-	-	-	-	-	-	-	-
Utah	24.638	(49.921)	210	-	-	-	-	-	-	-	-	-
Wisconsin	0.479	(0.448)	296	-	-	-	-	-	-	-	-	-

**p<0.10, **p<0.05, ***p<0.01*
Coefficients reported as odds ratios.
Model with 'Has any charters' as the dependent variable uses all observations.
The other four models use observations only from states w/substantial enrollment in for-profit charters: AZ, FL, MI, & OH

Table 3-15

Logistic Regression: Charter School Presence Across Census Tracts by State with Pct. White Covariate (estimates for Pct. White reported)

	Has Any Charters, All States			Has Nonprofit Charters			Has For-Profit Charters			Has Large EMO For-Profit Charters		
	coeff.	s.e.	N	coeff.	s.e.	N	coeff.	s.e.	N	coeff.	s.e.	N
Arizona	0.596	(0.238)	1119	0.541	(0.242)	1119	0.428	(0.301)	1119	0.232	(0.361)	1119
California	0.700	(0.176)	3621	-	-	-	-	-	-	-	-	-
Colorado	0.032	(0.078)	129	-	-	-	-	-	-	-	-	-
Florida	0.378***	(0.130)	1176	0.317***	(0.133)	1176	0.375**	(0.163)	1176	0.343**	(0.161)	1176
Indiana	0.452	(0.353)	224	-	-	-	-	-	-	-	-	-
Michigan	0.457*	(0.189)	727	0.117***	(0.071)	727	1.263	(0.597)	727	0.934	(0.519)	727
Minnesota	0.076**	(0.075)	299	-	-	-	-	-	-	-	-	-
New Jersey	0.034	(0.075)	209	-	-	-	-	-	-	-	-	-
New Mexico	0.019**	(0.032)	153	-	-	-	-	-	-	-	-	-
Ohio	0.516	(0.216)	721	0.329**	(0.168)	721	0.684	(0.403)	721	0.996	(0.635)	721
Pennsylvania	0.339*	(0.208)	372	-	-	-	-	-	-	-	-	-
Tennessee	0.092**	(0.105)	216	-	-	-	-	-	-	-	-	-
Texas	0.121***	(0.087)	526	-	-	-	-	-	-	-	-	-
Utah	0.088	(0.147)	210	-	-	-	-	-	-	-	-	-
Wisconsin	0.120**	(0.114)	296	-	-	-	-	-	-	-	-	-

**p<0.10, **p<0.05, ***p<0.01*
Coefficients reported as odds ratios.
Model with 'Has any charters' as the dependent variable uses all observations.
The other four models use observations only from states w/substantial enrollment in for-profit charters: AZ, FL, MI, & OH

Figures

Figure 3-1

Probability of Any Charter in a Tract, Fitted Values w/95% Cis, Model with Pct. Black Covariate

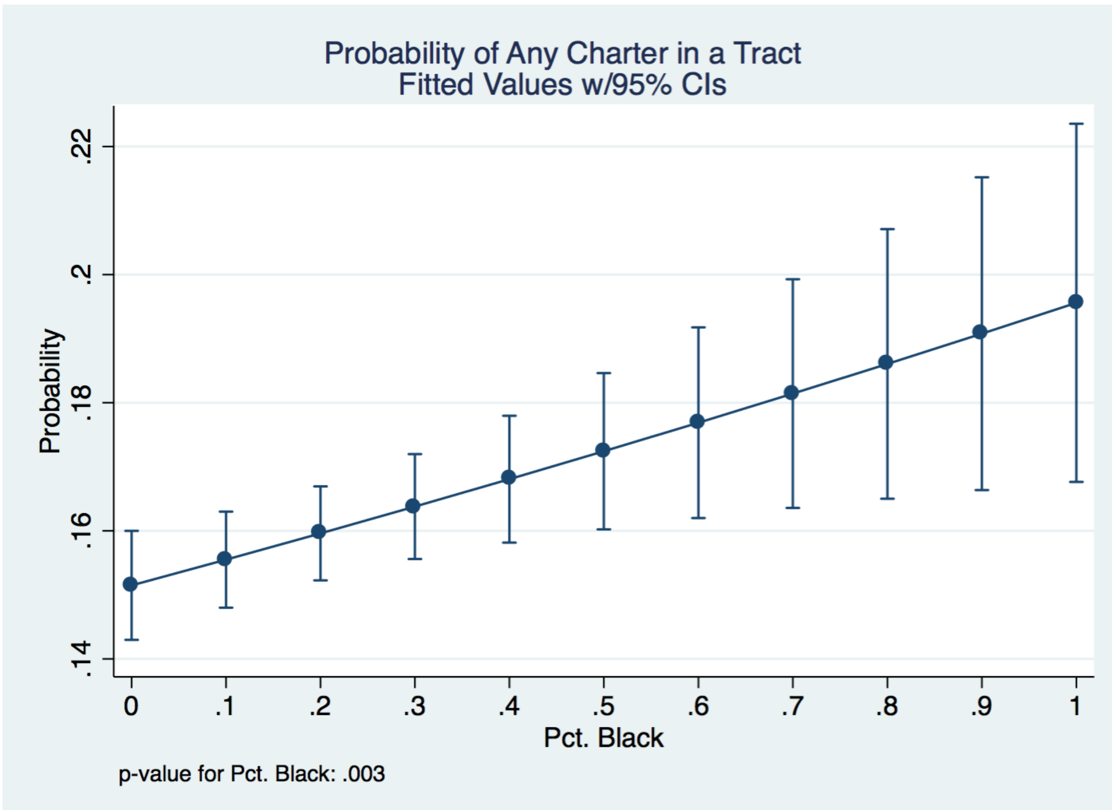


Figure 3-2

Probability of Any Charter in a Tract, Fitted Values w/95% Cis, Model with Pct. Hispanic Covariate

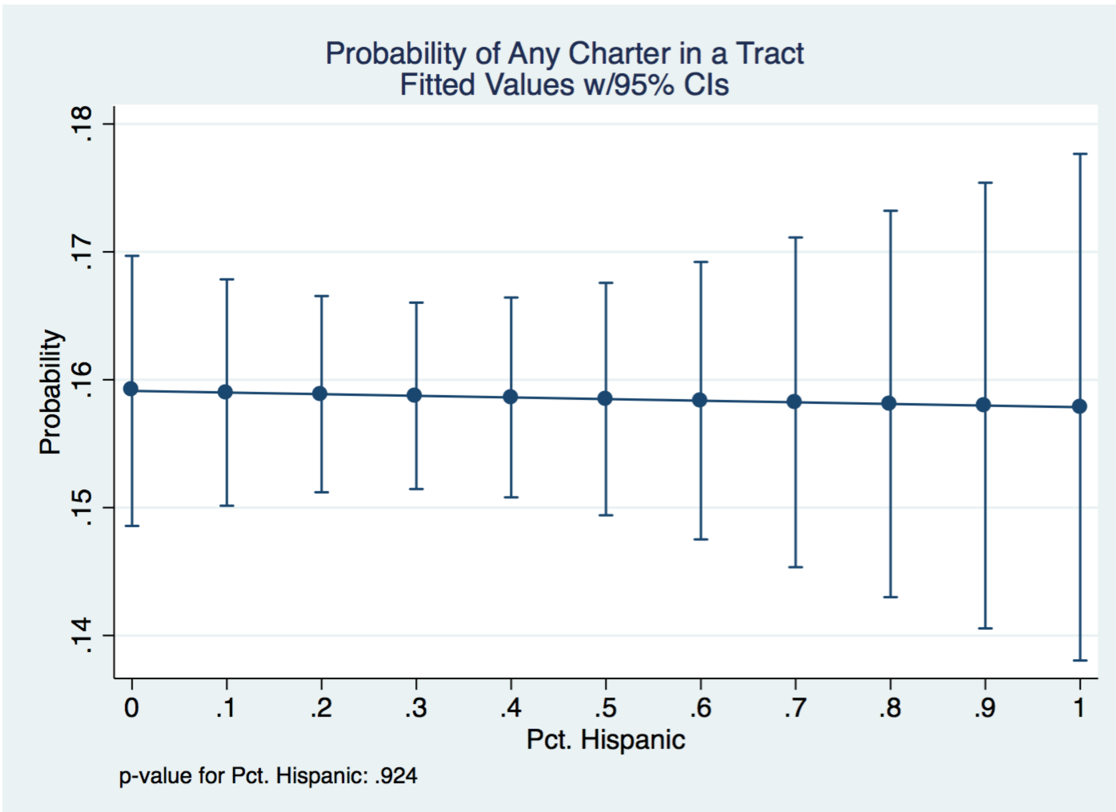
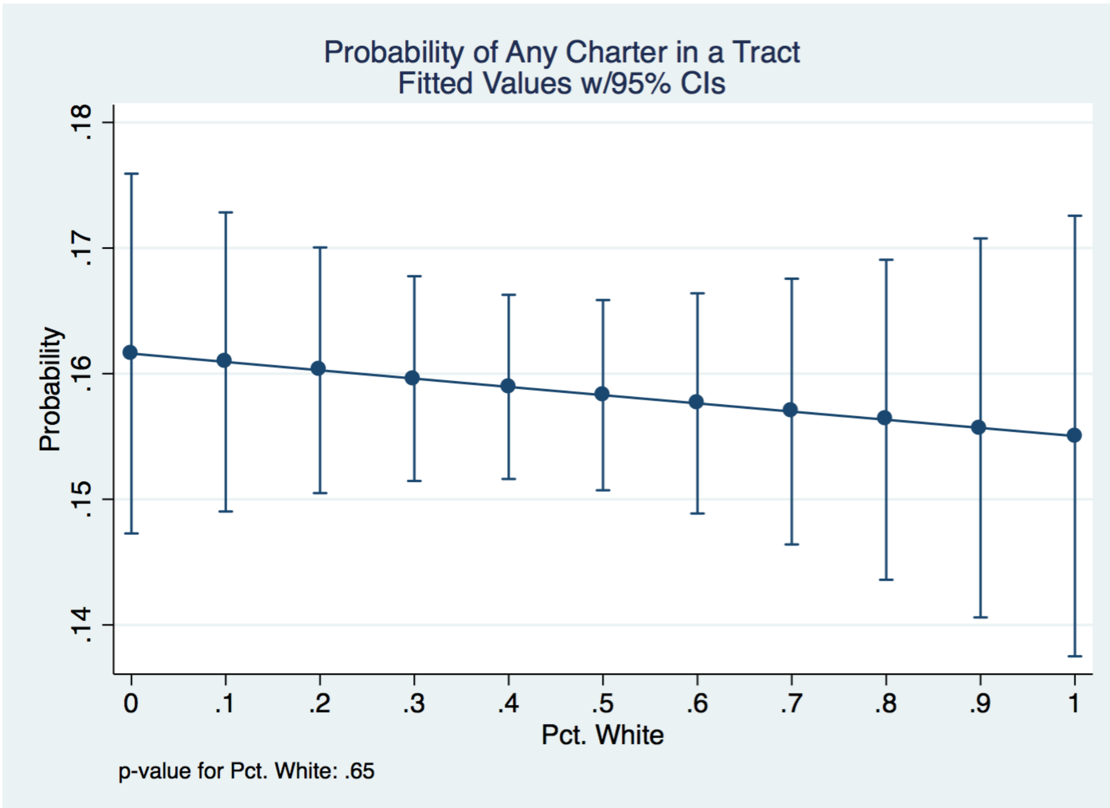


Figure 3-3 *Probability of Any Charter in a Tract, Fitted Values w/95% CIs Model with Pct. White Covariate*



Dissertation Conclusion

Before I synopsize the findings of this dissertation, I would like to address my process of conducting the research herein. Each of these papers started with my consideration of a dataset I had created for another research project. The first paper originates from my work on the School Funding Fairness Data System, the second paper originates from a panel of New Jersey staffing and spending data I had cultivated, and the third paper originates from a dataset that builds on previous work that classifies charter schools by profit motive and organizational type. In each paper, I began by asking: "What can this dataset – or an extension of this dataset – tell us about charter schools that we did not know before?" In this sense, the data themselves suggested the lines of inquiry for this dissertation.

It is also fair to say, however, that my knowledge of the research on charter schools guided my explorations of the datasets I created. In the first paper, the small body of literature that analyzes the fiscal effects of charter proliferation prompted the question: could a larger, national dataset apply spending model methods to a large number of jurisdictions to discern whether charter growth affects public school district finances? Ultimately, I discovered that the uniformity of the federal fiscal data is in dispute, which is, by itself, an important discovery. Finding a method to determine which states were reporting data that was valid for the purposes of this research was a challenge; however, that challenge ultimately led to comparisons of model estimates based on federal and state data, which I believe is the best approach for future study.

The conclusion – that analysis based on state data was the best approach for further research – led to the second paper. Knowing that I could use New Jersey data to test different elasticities of staffing led me to explore the literature to determine whether any theories existed as to how staffing would be affected by the loss of enrollments. Freeman and Hannan (1975) provided a framework for understanding changes in resources, but I likely would not have sought out their work, and the work of others on enrollment decline, were it not for the dataset I was using. The third paper came about in a similar way: knowing that I could join a dataset of the types of charter organizational structures to geographic data led me to seek out research on how charter locational decisions are made. The theory that the racial characteristics of neighborhoods would affect these decisions came from my reading of the research. But again: I would not have explored this research base had I not been prompted by the questions that arose from my consideration of the data.

This dissertation, then, was driven by the possibilities inherent within the datasets I had created. Critically, the construction of the theories herein came after my considerations of the potential of the data. While I believe this is a wholly valid means of approaching a research topic, I acknowledge here that there is a risk in the methodology: research questions may be constrained by the limits of the data itself. Quantitative research demands a frank and comprehensive discussion of those limits; one of my primary goals in this dissertation was to include such a discussion within each of its papers.

This dissertation asked two major research questions about the effects of charter school proliferation:

1. How does charter growth affect the finances of public school districts?

2. Are those effects distributed evenly across neighborhoods with different demographic characteristics?

The first two papers explore the first question. While there is substantial variation across different state and local contexts, this dissertation finds that there is sufficient evidence to conclude that, in many cases, public district spending rises as a consequence of charter school growth. The evidence also suggests that this rise is due to public school districts having fixed costs that are inelastic to enrollment decline due to charter proliferation.

This is an important, but preliminary, finding. It is important because there is now empirical evidence that contradicts the notion that charter proliferation is a fiscally neutral policy intervention; school choice comes at a cost. As I note in the second paper, some charter school advocates have argued that districts should simply become more flexible in their spending, matching their enrollment losses due to chartering perfectly with cuts in outlays. There is, however, no evidence that school districts are capable of making this adjustment. The fact that spending increases occur so frequently and in so many different contexts when charters proliferate suggests, instead, that there are structural characteristics of public school districts that make perfect elasticity to charter growth difficult, if not impossible.

I state this finding is preliminary because we do not yet have evidence that shows how the extra spending that is induced by charter proliferation might affect student outcomes. It may be that extra resources improve student achievement in public district schools that are affected by charter growth; alternatively, these schools may simply experience increases in inefficiency induced by enrollment declines from charters. The differences in changes in different types of school spending suggests this second scenario is the correct one – but it is not definitive proof. While I believe further research using spending function modeling on state and federal data should be conducted, it is also clear that the next major step for this area of inquiry is cost function modeling; in other words, we must take into account student outcomes, inefficiency, and endogeneity in future work on charter proliferation and public school district finances. This will be difficult work, requiring the development of theoretical and empirical models to explain the complexities of the relationship between charter school growth and public school district costs. This said, I contend this dissertation represents an important step toward a more complete understanding of this relationship.

The urgency of this work is heightened by the findings of this dissertation's third paper: charter school locations are sensitive to the socio-economic and racial characteristics of neighborhoods. Given the findings that both poverty and racial minority concentration predict a greater likelihood of an area having a charter school in its presence, there are serious equity concerns related to the effects of charter growth. If the extra spending charter school proliferation induces positively affects public school district outcomes, the greater presence of charters in disadvantaged neighborhoods may actually put more resources into the public schools that need them. More likely, however, is that this extra spending is the result of inelasticity to enrollment decline, inducing greater inefficiency in public school districts. How districts raise the funds to pay for these spending increases is still unknown, and an important area for future inquiry; this said, the possibility that inefficiencies are being introduced more often into disadvantaged neighborhoods is, by itself, a call for further study of the issue.

School choice advocates, going back to Milton Friedman, have often made the case that choice is its own reward. Schools need not improve in their effectiveness or their efficiency under a choice system to justify the establishment of that system, because allowing parents and students to choose their own schools is its own benefit. This is, of course, an ideological view; if one greatly values the ability to choose a school, the costs to the system as a whole or its uneven impact on resources will be a secondary concern. Public policy, however should always be made with a full accounting of the costs, as well as the benefits, of an intervention in mind. In the case of charter schools, this dissertation presents evidence that there is, indeed, a cost to charter growth, and that cost is more likely to fall on areas with greater levels of socio-economic disadvantage.

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