Charter School Expansion and Competitive Pressures on Traditional Public School's Financial Decision Making

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ABSTRACT

Charter schools impacts on traditional public schools (TPS) has been a long-standing topic of debate amongst education policymakers. However, little is known about how charter school competition alters the composition of expenditures in a TPS. This paper attempts to bolster previous literature on the issue by looking at Texas's charter school policies from 1996 to 2006. By utilizing a difference-in-difference approach that uses traditional public schools who faced competition past 2006 as controls I tackle two measurement challenges. First, this approach allows me to control for unobserved heterogeneity of being a TPS that faces charter competition. Second, it attenuates potential concerns that new difference-in-difference literature has identified. The results provide statistically significant evidence that charter competition does induce changes in instructional spending from anywhere between -1.3% (-1.24 percentage points) to 0.7% (0.5 percentage points). However, these results and fiscal reallocations after treatment are highly contingent on who the TPS serves, the distance between the charter and TPS, and on policy measures in place.

Keywords: School Finance, Charter Competition, Charter School Regulation, Difference-In-Differences, Charter Competition, School Resources

JEL Classifications: C18**,** H52**,** H75**,** I21**,** I22, I24**,** I28**,** J68

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I. Introduction

School choice policies, namely charter school expansion, has been at the center of educational policy reform for much of the past thirty years. While early charter policies were welcomed with bipartisan approval, recent support for further charter school policies are increasingly drawn down party lines. In many ways a charter is like the traditional public schools (TPS) it competes with, as they both offer open enrollment to students, charge no tuition, and adhere to many of the same state and federal educational statures. However, the differences between the two highlight the mixed support on the topic. Charters, free from state control, can innovate and specialize in educational programs offered. Proponents note this, along with its lean operational costs, is a more efficient use of government funds, promotes choice for families, and pressures TPS to improve educational outcomes to keep students from transferring. Detractors however argue this competition only serves to put further financial strain on TPS and destroys the economies of scale that public schools benefit from.

Theoretically, economists have argued increased competition in education could be the "tide that lifts all boats" (Hoxby 2003, Friedman 1955). Specifically, the entry of new schools creates a tension forcing traditional public schools to either address its competition or potentially lose government provided per-pupil funding. One major avenue in which a TPS can address such competition is to dedicate a greater proportion of resources into functions that generate improved educational outcomes or parental satisfaction. Empirically, only a few studies have tried to link the theoretical rationale of increased school choice to TPS financial decision making. Of those few studies, results have been mixed, with most contradicting previous works.

More generally, Ladd & Singleton (2018), Bifulco & Reback (2014), and Arsen & Ni (2012) all find that the increased incidence of school choice does carry negative fiscal impact for a TPS, but their research does little to nothing to measure if financial decisions were altered due to school choice.

The first notable quantitative work trying to measure resource allocation focused on the state of Michigan by Arsen and Ni (2012). Through the use of a two-way fixed effects model, they found null effects of any differential resource allocation in school districts due to charter competition, however their work was not free from confounding factors. Namely, Michigan's interdistrict choice programs, allowing for cross district enrollment and competition in public schools, ran concurrently with shifts in charter competition. More recent works have turned their focus to Ohio. Linick (2016), for example exploited differences in two charter expansion policies to identify changes in resource allocation. He found the initial policy, targeting the eight largest counties, increased instruction funding from traditional public-school districts up to 2.5%. However, the second policy, targeting the next eighteen largest countries, provided null results. Cook (2017) too used variation in policy timing as an instrument within Ohio, finding charter competition shifted funding allocations away from instruction and into capital outlay within school districts. Lastly, Ridley, et al. (2018) used both an instrumental variable and synthetic control approach in Massachusetts to find charter entry induces a greater proportion of funds towards instruction and salaries with school districts.

Policy context and methodology of previous works have played into the mixed findings seen above. Across all three states surveyed, previous choice policies, state refund schemes that repay TPS from charter competition, and restrictive policies on charter placement has provided less than perfect external validity. Moreover, the measure of "charter competition" has relied on district level resource measurements across legislative boundaries. While this method can account for large scale shifts in district decision making, it fails to understand competition in a more refined geospatial aspect. For example, a new elementary charter school might be legally able to recruit from a district, but the competing public school district's elementary school resides many miles away from the charter. Additionally, one charter might not induce statistically distinguishable changes in resource allocation if the observed public school district is large. These two factors are important to understanding charter competition, as 45% of students live less than two miles from their school, for an average of 3.6 miles for younger students and 6 miles for older students. These measurements are smaller for students in urban areas.[1]

This study attempts to bolster previous literature on the mechanisms behind TPS response to charter entry and to add precision to measures of resource allocation. I do this by looking at the state of Texas from 1996 to 2006 which saw its first charter schools in 1997.[2] I utilize a difference in difference approach, comparing schools that face any charter competition to schools that did not. To address the problem of endogenous entry of charter schools, I utilize new difference in difference methods from Cengiz et al. (2018) to create pure controls of public schools that face charter competition outside my window of time (post 2006). Additionally, I look at school level responses to charter entry by distance, not legislative boundaries. I do this by using Euclidean distance measures between a newly entered charter school and a TPS serving similar grade levels. My data allows me to not only look at proportions of funding spent on instruction, but at specific educational programs (like ESL, special, gifted, etc.) for added precision. Lastly, I disaggregate impacts following the evolution of Texas's charter policies to better understand how charter regulation induces differential competitive response from TPS.

What I find is that charter competition does induce changes in instructional spending from anywhere between -1.3% (-1.24 percentage points) to 0.7% (0.5 percentage points), contingent on the type of TPS and the students it serves. I also find that charter regulation strongly determines if financial reallocations occur. While my results are small in magnitude, they are similar to estimates found in previous research. Lastly, these results help further support previous quantitative and qualitative works on the topic and provide insight as to when changes in spending could occur and how those changes manifest.

II. Background

I. *History of Charters*

[1] NHTS Brief, Travel to School: The Distance Factor, https://nhts.ornl.gov/briefs/Travel%20To%20School.pdf
[2] Jones, Adam, and Amanda List. Time to Change Course: Reclaiming the Potential of Texas . www.texaspolicy.com/library/doclib/2018-06-Charter-Paper-CIE-ExcelInEd.pdf.

Texas first passed charter school legislation in 1995, making the state one of the earliest to adopt this form of school choice.[3] However, Texas's first steps into charter-school-like legislation began in 1991 with its "Partnership School Initiative." This initiative mimicked many similar privileges of a charter school, giving select TPS lower regulation and oversight from the Texas Education Agency (TEA).[4] The overwhelming popularity of the initiative gave fully fledged charter school legislation wide support once the 1995 biennial legislative session started.

Since the first charters open their doors in the 96/97 schoolyear, Texas's charter legislation has gone through substantial changes in charter opening and accountability procedures. From 1997 to 2000, Texas saw a 758% increase in charter operations mainly due to a loose approval process, accepting nearly all charter operators who applied.[5] This growth outpaced TEA's responsiveness in setting regulations for each new charter, leading to public outcry of newly vetted charters failing their students and owing large sums of money to the state.[6] Moreover, the initial legislation left out crucial measures to punish or close poorly preforming charters. Burned by the past mistakes, in 2001 lawmakers tighten regulations on charter opening, and added new statues to ensure accountability in charters. This effectively created a regulatory environment where only academically strong charters could stay open and created safeguards on which charter operators could get approved. Since the introduction of new legislation, roughly 70% of charters that did open under old charter policies have closed their doors.[7]

II. *Charter Operational Procedures*

Charter schools in Texas fall within four bins: Open enrollment charter, Campus charter, Home-rule charter, and University Charter. Campus program charters and Home-rule charters are formerly a TPS that turned into a charter school. These programs are still part of a public school district. For the sake of this study, I consider these programs like a TPS, I do this because inter-district competition does not siphon funds from a school, it just shifts funds to a new school within a district. This shift can easily be moved back to the original TPS by school district leadership and is not a threat. Open enrollment and University charters however are schools operated by a private entity, separate from the TPS and school district. Therefore, these schools do exert competitive pressure to a nearby TPS.

Typically charter schools must fill out a roughly hundred-page applicant, which must past approval of both external reviews, internal review, then approval from Texas's independent State Board of Education. Further, charters must specify the school districts it can recruit from, allowing only those students to enroll. By 2001, charter schools had to notify school districts of their intent to recruit students as well. This process takes one year, therefore charters who apply in fall 2000 can begin operation during the 2001/2002 school year.

[3] Ibid.
[4] Ibid.
[5] Ibid.
[6] Ibid.
[7] Ibid.

III. Charters in Operation: 1997 to 2011

As previously mentioned, Texas has cycled through charter booms and busts. Regardless, the overall size of charter schools has grown and has captured a sustainable number of K-12 students across the state. Figure 1 shows these changes, namely the massive growth and subsequent policy restrictions on charter openings post 2000. By the mid-2000's charters only made up a small percent of the state's enrollment, however by total enrollment, Texas was one of the largest charter states. It is also important to note that there a 50-50 split between charters that serve as "regular" or "alternative" schools. Regular schools aim to serve all students without a specific focus on one type of academic goal. Alternative schools, however, focus on one academic goal or demographic that a regular school would not (like focusing only on ESL students, vocational programs, at-risk populations, etc.). Alternatively, 80% of TPS are regular education schools.

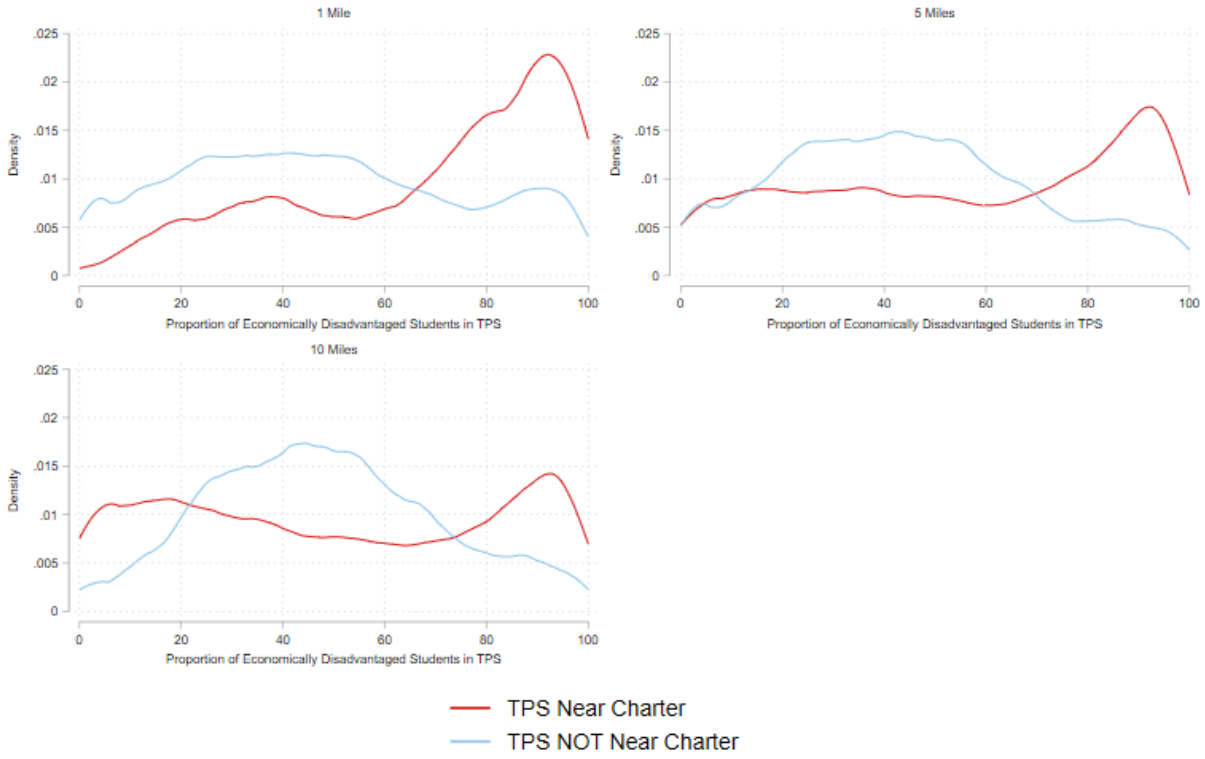
Table 1: Growth of Charter Schools and Students Enrolled

Year	# of Charters	Change	% Change	Total Students	% of Students in State
1997	12			1842	.000491
1998	16	4	.3333333	3016	.0007894
1999	50	34	2.125	9463	.0024321
2000	112	62	1.24	17840	.0045273
2001	136	24	.2142857	25776	.0064113
2002	171	35	.2573529	33504	.0081559
2003	191	20	.1169591	39596	.0094153
2004	205	14	.0732984	47445	.0110894
2005	241	36	.1756098	52161	.0119811
2006	248	7	.0290456	58245	.0130036
2007	283	35	.141129	69493	.0152637
2008	318	35	.1236749	78357	.0169327
2009	380	62	.1949686	89810	.0190941
2010	405	25	.0657895	104260	.02173
2011	432	27	.0666667	122020	.0249573

Charter schools also tend to congregate near urban areas, with 30% in a census designated city. TPS on the other hand are evenly dispersed, with just 15% of TPS in a census designated city. Along with this urban placement, charters tend to recruit higher proportions of Black and Hispanic students. Table 2A, as shown in the appendix, shows averages from 1996 to 20006 of both TPS and charter enrollment, spending, and salaries. Outside of enrollment, Texas charters spend less on instruction and more on school leadership and other costs. This is due to less funding provided by taxes or the government. Charters need to pick up additional costs where TPS do not. Further, charters pay all staff less than a TPS Lastly, as figure 1 shows,

TPS that face competition are typically at the tails of serving economically disadvantaged students.[8] This figure highlights two important details. First, many charter's urban locale leads to the enrollment poor students. Second, charters that do not serve poor students will typically specialize in educational programs that serve affluent students.[9]

Figure 1: Types of Schools a Charter Serves



Regular TPS from 1996-2006 (within treatment window)

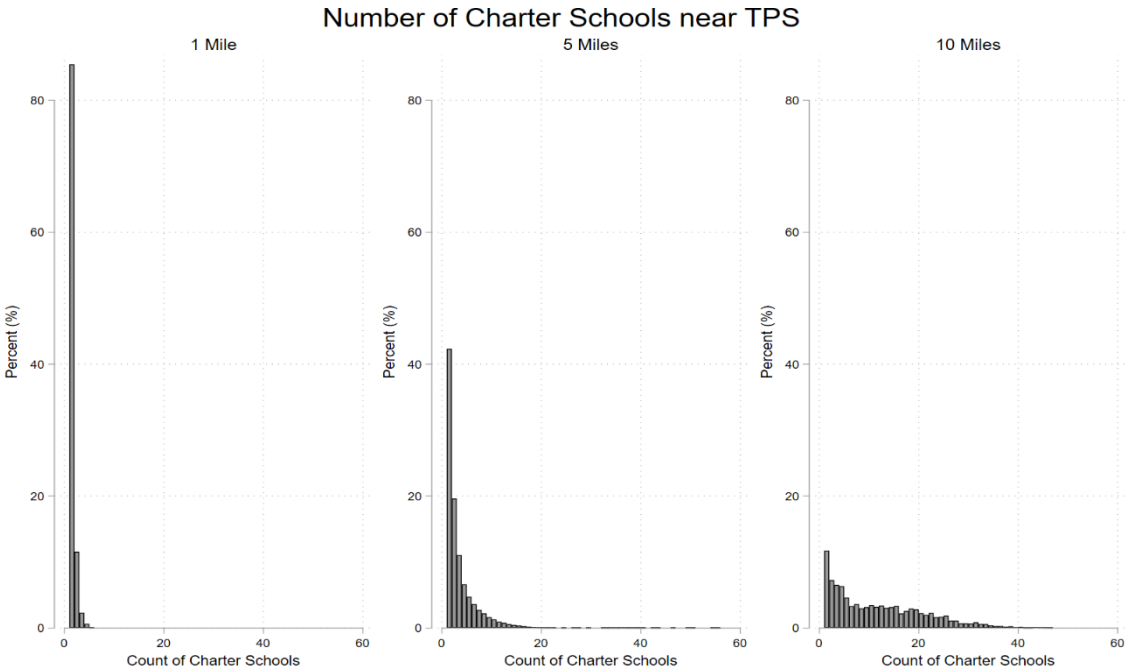
IV. Data

Data for school level observations was taken from TEA's Academic Excellence Indicator System (AEIS). The AEIS compiled school level metrics on performance, finances, and demographics until 2012. These publicly available datasets provided me information on financial decisions made by schools, salaries, whether a campus was a charter, and demographics in a school. Due to masking, or the act of hiding sensitive information, I was unable to reliably gather data on test scores. Additional information about school location, school type (regular or alternative), and coordinates were taken primarily from The Common Core of Data provided by the National Center for Education Statistics. Additional geographic information for added precision was taken from TEA, however TEA only provided geographic information for the 2009-2011 school years. To determine distance between new charter schools and a TPS I calculated the Euclidean distance between every school (TPS and charter) for a given year, this essentially created a matrix of distance values, with diagonal values of 0. From there I counted the number of charter schools at-most 1, 5, or 10 miles away that shared at least one similar grade with a TPS. Finally, I appended the data to create a panel dataset

[8] An Economically Disadvantaged Student is one who is eligible for Free or Reduced Price Lunch
[9] Popular charters could offer technology focused education, gifted education, etc.

containing financial, demographic, and year-by-year charter entry data. Figure21 below maps the number of charters relative to a TPS, conditional on having at least one charter nearby, i.e., $(\#\ of\ Charters \mid School = TPS, \#\ of\ Charters > 0)$. What we find is that charter competition within 1 mile is highly concentrated amongst one charter and a TPS. As we increase the distance, we lose this precision and at 10 miles competition amongst a TPS and charter is spread across many schools.

Figure 2: Number of Charters Near TPS



V. Methodology

To understand how charter school competition could affect public schools in both uniform and differential ways I specify multiple models and look at my models via different sample specifications. Before looking at each, there needs to be clarification on what the outcome variable entails and how I plan to measure it.

$Funding_{st}$ is the outcome variable that attempts to measure several things:

First, the proportional expenditures made on certain educational programs and school-wide functions for school s in year t. Total expenditures are composed of four functions: School Leadership (salaries of principals, recordkeepers, and fund for items they use), Instructional Leadership (funds for managing and supervising instructional staff), Instruction (funds for classroom materials, technologies, and educational programs), and Other (security, health services, professional development, etc.). As a note, all four function do not include any capital outlay or construction costs.

Within Instructional funds there are 6 educational programs: Regular, Special, Compensatory, Career & Technology, Bilingual/ESL, and Gifted education.

The idea behind measuring funding is that the movement of students serves as a mechanism for changes in school decision making. If a TPS is threatened by or has experienced a loss of students and subsequently funding, they might redirect expenditures to educational programs to keep students or parents satisfied. While other mechanisms such as staff or teacher movement could impact school decision making, those topics are outside the scope of this study but will be touched upon later in the discussion.

For sampling, I split my observations into treatment and controls groups. My treatment group are all campuses that face charter competition from 1996 to 2006, whereas my control group are campuses that face charter competition after 2006. Doing this, instead of a two-way fixed effect model across 1996 to 2011 helps attenuate several inference problems. First, using the full sample of TPS forces me to either compare late-treated TPS to early-treated TPS, or compare never-treated TPS to treated TPS. Both options present issues, the first suffers from what Bacon-Goodman and many new DiD papers have identified, namely these comparisons between early and late treated units can cause bias in coefficients. The latter option fails to account for unobserved endogeneity in trends, as a TPS with charter competition could potentially have different circumstances than a TPS that never faces charter competition. Instead, by using a control group of TPS that will be treated, but outside my window of time, I can address potential unobserved endogeneity and have a comparison group that will not later be treated in my regressions. To do this I followed methods used in Cengiz et al (2019). I duplicated my controls by the number of years any treatment occurred, therefore creating X individual DiD's within my data, where X is each year a treatment occurred multiplied by the number of controls I have. Doing this allows each treatment year to be compared to the full set of controls, helping attenuate bias in weighting of DiD coefficients.

Two other sampling specifications I utilize focus on changes in charter regulation and school type. First, due to the Texas's initial legislation letting waves of poor charters open during the late 90's and early 00's and subsequent tightening of regulations, I look at three samples. Pooled is the full sample, 1996 to 2006, encompassing both eras of regulation. Prior is the sample from 1996 to 2000, looking at only charters under poor regulation. Finally, post is from 2001 to 2006 looking at charter entry after tighter regulations. The idea is that after regulations TPS had a better idea of new charters operators applying which potentially increased the overall quality of competition. Second, I focus my analysis only on "Regular" TPS schools, i.e., schools that provide educational services to all students. I opted for this analysis for several reasons. "Alternative" TPS schools are typically juvenile or detention programs, where most enrollment is less than 10 students. Also, due to this low enrollment the most frequent financial expenditure data on instruction is either 100% or 0%. I keep Alternative charters as competition for regular TPS, because these charters could effectively enroll subsets of a TPS student body. For this reason, the results I do present can only speak to the local average treatment effect for "Regular" public schools that cater to all students.

With all this in mind, the first model I specify measures changes in school financial decision making via an event study where:

$$Funding_{st} = \alpha_s + \rho_{dt} + \sum_{\tau=-4;}^{5} \gamma_\tau Competition_{s(t+\tau)d} + \sum_{Q=2}^{5} \theta_Q Poor_{st_0} * Competition_{std} + \varepsilon_{st}$$

Where $Funding_{st}$ tracks either funding decisions of school functions or educational programs, α_s measure's school level fixed effects, which control for time invariant characteristics of the school, such as its location. ρ_{dt} measures district by year fixed effects which controls for both temporal changes and district linear trends. I do this because most financial decisions are made at the district level, therefore this fixed effect can address shifts in district level trends that could affect funding and educational decisions for school s in time t. ε_{st} is the error term, measuring unobserved differences in outcome.

γ_τ is the event study component, where competition is measured as the entry of a charter school, d miles (1, 5, or 10 miles) away from school s, in time t. As mentioned before, this event study covers 1996 to 2006, where the control group are treated TPS after 2006. I extend lags and leads out by 4 and 5 years, respectively. Lastly, θ_Q is an interaction between TPS with different proportions of economically disadvantaged students and charter competition. This proportion is divided into quartiles, measuring proportion of economically disadvantaged students in school s in their earliest pretrend year t_0. Because charter schools typically locate in urban areas, where both economically disadvantaged students live and where TPS face more academic and financial burdens, it could be that competition varies with previous TPS circumstances. For reference, an economically disadvantaged student is someone who is eligible for free or reduced priced lunch.

The second model follows the first, but only looks at before and after effects around treatment time:

$$Funding_{st} = \alpha_s + \delta_t + \rho_{dt} + \beta_1 * Treated_{std} + \sum_{Q=2}^{4} \theta_Q Poor_{st_0} * Competition_{std} + \varepsilon_{st}$$

Where the only difference is the event study component which is switched with a β_1 dummy that changes after charter entry begins.

VI. Results

I. Event Study & Difference – in – Difference Across all Groups

Because Texas's legislation on charter schools changed over time, which potentially altered the nature of competition between charters and TPS, I present my initial results with three samples. Pooled encompasses the full sample of treated TPS, from 1996 to 2006. Prior shows results of charter entry for treated TPS between 1997 to 2000, the years before tighter regulations. Post shows results for treated TPS between 2001 to 2006, the years after tighter regulations. Event study figures for each group are presented in the appendix. Generally, pretends for pooled and prior groups were relatively flat, however larger distance measures showed some endogenous trends in pre-treatment periods. Moreover, all three groups saw marginal, statistically significant (P<.05), negative shocks to proportions spent on instruction after the first year of treatment. The post estimate group however had flat pretrends, especially in the 1- and 5-mile bins.

Table 3 shows average treatment effects (ATE) of the simple Difference-in-Difference models. Overall, ATE show no statistically significant impacts on instructional spending in

close ranges. At ten miles, we see that treated TPS in the pooled and post groups show strongly significant results, with marginal decreases of .83 percentage points and 1.120 percentage points respectively. In absolute terms, a reduction this size would translate into roughly a $20,000 to $24,000 reduction on instructional spending. Lastly, it seems that the pooled and post groups share similar point estimates, but pooled estimates are always understated and underpowered relative to post group measures. This potentially could indicate that TPS treated in the prior period, 1997 – 2000 are pulling the pooled estimates upwards, meaning prior treated TPS might have reallocated more funds to instruction after charter entry. Regardless, it seems that post treated TPS shows the largest effects due to competition, coupled with steady event study trends, provide the most stable estimates. Because of this I continue my analysis looking at the post group exclusively.

Table 3: Simple DiD of Charter Entry, by Time Period & Distance

	1 Mile			**5 Miles**			**10 Miles**		
	Pooled	Prior	Post	Pooled	Prior	Post	Pooled	Prior	Post
	Dependent Variable: Proportion of Funds Spent on Instruction								
Treatment	0.0625	-0.242	0.265	-0.0927	-0.0864	-0.0974	-0.833**	-0.468	-1.120***
	(0.30)	(-0.81)	(1.09)	(-0.43)	(-0.30)	(-0.40)	(-2.53)	(-1.14)	(-2.72)
Constant	71.80***	71.99***	71.69***	71.99***	72.29***	71.75***	71.95***	72.35***	71.38***
	(4058.37)	(2104.03)	(4503.46)	(1687.13)	(867.42)	(2414.14)	(739.88)	(416.32)	(1122.48)
N	21809	8765	13044	65235	29390	35845	63677	33449	30228

Note: Regression contains school fixed effects, district by year fixed effects and clustered errors on the school level. Pooled contains all treated TPS from 1997 – 2006. Prior contains all treated TPS from 1997 – 2000. Post contains all treated TPS from 2001 – 2006.
Treatment is a dummy variable that switches from 0 to 1 and stays on 1 once a charter opens D miles away. Values are aggregated across 4 years of lags and 4 years of leads.
t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01

II. Heterogenous Effects

While ATE show statistically null effects for closer distance bins, my models also aim to understand heterogenous effects of competition between schools that serve a high proportion of economically disadvantaged students (high poverty) and low proportions (low poverty). Table 4 presents these estimates for the post group for each distance bin. These were made with pre-trend values of proportions of economically disadvantaged children in a treated TPS. "4th Quartile Poverty" is the quarter of treated TPS with the highest level of poor students in time t_0.

What we find is that while ATE were null, the heterogenous effects got essentially washed away by the countervailing spending changes done by the lowest and highest poverty schools. Overall, these heterogenous effects are strongest at shorter distances. Using the 1-mile

distance regression, low poverty schools reduce instructional spending by 1.2 percentage points after treatment, while high poverty schools above the 50th percentile increase spending roughly 1.8 percentage points more relative to low poverty schools, for a 0.6 percentage point total increase in spending from the mean value of 71.69%. This 0.6 increase translates to roughly $11,000 of more spending on instruction.

While the 10-mile regressions show significant results in both regressions presented I am doubtful of the causal relationship for several reasons. First, event study figures for 10-mile charter entry indicated some nonlinear trends in pre-treatment. This fact leads me to believe some omitted variable bias is motivating these estimates. Moreover, at 10-miles the number of observations nearly double from the 1-mile estimates, this increase in observations will necessarily deflate standard errors and provide a lower bar for significance. Second, when Texas TPS leadership was interviewed, only 65% of them knew a charter within their boundaries existed.[10] More importantly, the largest school districts in Texas only span 20 miles length wise (Like Houston and Dallas), therefore it is questionable if charter entry ten miles away would induce such strong reactions from TPS leadership.

Table 4: Heterogenous Effects of Charter Competition for High and Low Poverty Schools

	1 Mile	5 Miles	10 Miles
Dependent Variable: Proportion of Funds Spent on Instruction			
Treatment	-1.242**	-0.576**	-1.228***
	(-2.21)	(-2.14)	(-2.86)
Treatment*2nd Quartile Poverty	0.725	0.393	0.00815
	(1.13)	(1.41)	(0.03)
Treatment*3rd Quartile Poverty	1.799***	0.752**	0.198
	(2.87)	(2.49)	(0.59)
Treatment*4th Quartile Poverty	1.780***	1.211***	0.295
	(2.80)	(3.03)	(0.58)
Constant	71.69***	71.73***	71.38***
	(4601.52)	(2333.60)	(1107.50)
N	13044	35845	30228

Note: Regression contains school fixed effects, district by year fixed effects and clustered errors on the school
Regression presents only Post Group.
Post contains all treated TPS from 2001 – 2006.
Quartiles of Poverty were made in Earliest year for treated TPS.
t statistics in parentheses
** p<0.10, ** p<0.05, *** p<0.01*

[10] Texas open-enrollment charter Schools FIFTH-YEAR. (n.d.). https://tea.texas.gov/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=2147502657

iii. Decomposing Heterogenous Effects, Mechanisms of Funding Shifts

Important questions to these shifts in instructional spending are these: where do diverted instructional funds go to? And what educational programs – if any – lose funding? To answer the latter, I decompose instructional spending by types of instructional programs in my dataset, i.e., Regular, Gifted, Special, ESL, Vocational, and Compensatory Education. Table 5 presents results with respect to educational programs for TPS treated within a mile. These results present proportion of funding *within* instructional spending. For reference, the ATE regression is presented in the appendix, but all results are insignificant (just like in Table 3).

Table 5: Heterogenous Effects of Changes in Instructional Funding, at 1-Mile.

	Proportion of Instructional Funds Spent on:					
	Regular	Gifted	Special	ESL	Compensatory	Vocational
Treatment	7.010***	-0.249	0.221	-4.122*	-2.840***	0.00326
	(2.89)	(-0.80)	(0.24)	(-1.78)	(-3.08)	(0.01)
Treatment*2nd Quartile Poverty	-5.173*	-0.000317	1.458	4.180*	-0.273	-0.214
	(-1.89)	(-0.00)	(1.33)	(1.69)	(-0.21)	(-0.57)
Treatment*3rd Quartile Poverty	-8.174***	0.154	-0.624	5.791**	2.885**	-0.0129
	(-3.02)	(0.38)	(-0.63)	(2.29)	(2.34)	(-0.04)
Treatment*4th Quartile Poverty	-7.299***	0.852**	-0.248	2.878	3.618***	0.223
	(-2.88)	(2.02)	(-0.24)	(1.20)	(3.28)	(0.67)
Constant	65.91***	1.802***	12.06***	7.265***	10.18***	2.681***
	(1196.40)	(117.48)	(577.96)	(181.40)	(240.48)	(299.39)
N	13044	13038	13032	13044	13044	13044

Note: Regression contains school fixed effects, district by year fixed effects and clustered errors on the school Regression presents only Post Group.
Post contains all treated TPS from 2001 – 2006.
Quartiles of Poverty were made in Earliest year for treated TPS.
t statistics in parentheses
** p<0.10, ** p<0.05, *** p<0.01*

Surprisingly, the lowest poverty schools have a nearly equal shift of spending from ESL and Compensatory education to Regular education, resulting in a 7-percentage point (or 10% increase from the mean) increase after treatment. Inversely, high poverty schools above the 50th percentile shift funds in the opposite direction, spending less on regular education and shifting funds over to Compensatory, ESL, and Gifted education programs. One reason this might occur is due to the composition of students leaving for a nearby charter schools. For example, low poverty TPS might face competition to a charter that specializes in ESL courses or provide supplemental programs for at-risk students. Therefore, once the charter opens, the low poverty school loses students primarily using ESL or Compensatory educational funds,

which results in shifting more of the existing funds to bolster what students stayed. On the side of the coin, high poverty schools might attempt to keep their best students from leaving by spending on gifted programs or see more regular students leave for charters. To test this hypothesis, I measure student composition within treated TPS.

Table 6 presents these results. In sum, the table presents inconsistent evidence towards the hypothesis. While low poverty schools spend less on ESL or compensatory education and see students leave who would enroll in those courses (bilingual or limited English students), high poverty schools' spending and student shifts are not as consistent. Implications of this are further discussed in section VI.

Table 6: Heterogenous Effects of Student Compositions after, at 1-Mile

	Proportion of Students that Identify as:							
	Bilingual	Gifted	Econ. Disadv.	Hispanic	Limited English	Special	Vocational	Students per Teacher
Treatment	-5.381**	-1.213**	0.128	-2.475	-5.590**	-0.232	2.256*	0.0662
	(-2.36)	(-2.18)	(0.05)	(-1.06)	(-2.55)	(-0.32)	(1.88)	(0.13)
Treatment*2nd Quartile Poverty	2.771	-0.936	5.057*	1.613	2.992	1.708*	-1.483	0.560
	(1.11)	(-0.93)	(1.82)	(0.64)	(1.24)	(1.84)	(-0.93)	(0.83)
Treatment*3rd Quartile Poverty	8.109***	1.851**	1.480	5.183**	8.652***	0.245	-1.496	0.278
	(3.11)	(2.38)	(0.58)	(1.98)	(3.36)	(0.31)	(-0.94)	(0.41)
Treatment*4th Quartile Poverty	6.846***	2.210***	-3.349	3.555	7.515***	0.323	-3.034**	-0.0173
	(2.83)	(2.85)	(-1.34)	(1.44)	(3.21)	(0.41)	(-2.28)	(-0.03)
Constant	21.00***	9.527***	67.33***	56.40***	22.80***	10.72***	11.08***	15.57***
	(387.67)	(304.74)	(1520.61)	(1095.90)	(403.71)	(677.59)	(255.38)	(635.49)
N	13104	13104	13104	13104	13104	13104	13104	12974

Note: Regression contains school fixed effects, district by year fixed effects and clustered errors on the school
Regression presents only Post Group.
Post contains all treated TPS from 2001 – 2006.
Quartiles of Poverty were made in Earliest year for treated TPS.
t statistics in parentheses
** p<0.10, ** p<0.05, *** p<0.01*

The last measurement on charter competition aims to answer the first question asked in this subsection, where do diverted instructional funds go? To answer this, I look at the other three funding functions in my dataset: funding on school leadership, instructional leadership, and other functions. ATE regressions are presented in the appendix, however they are all insignificant. Table 7 presents these results below. Across the board, high poverty schools above the 50th percentile reduce funding towards all non-instructional costs, but with mixed statistical power. Furthermore, point estimates range anywhere from -0.132 percentage points (8% reduction from the mean) to -0.964 percentage point (5% reduction from the mean). In absolute terms these reductions are small. For example, the -.132-percentage point reduction in Instructional Leadership translates roughly to 57$. Meanwhile, low poverty schools do see a marginal increase in "Other" spending, however its difficult to pinpoint what this spending constitutes without detailed financial records. Implications of this and previous regressions are discussed below.

Table 7: Heterogeneous Effects of Funds Spent on Non-Instructional Function at 1-Mile

	Proportion of Funding Spent On:		
	Other	School Leadership	Instructional Leadership
Treatment	0.699**	0.440	0.0949
	(1.98)	(1.34)	(1.64)
Treatment*2nd Quartile Poverty	-0.633	-0.396	-0.0382
	(-0.93)	(-1.04)	(-0.49)
Treatment*3rd Quartile Poverty	-0.876**	-0.732*	-0.181**
	(-2.15)	(-1.96)	(-1.98)
Treatment*4th Quartile Poverty	-0.964**	-0.676*	-0.132*
	(-2.34)	(-1.87)	(-1.92)
Constant	18.75***	7.593***	1.549***
	(1399.05)	(820.13)	(704.43)
N	13045	13053	13053

Note: Regression contains school fixed effects, district by year fixed effects and clustered errors on the school
Regression presents only Post Group.
Post contains all treated TPS from 2001 – 2006.
Quartiles of Poverty were made in Earliest year for treated TPS.
t statistics in parentheses
** p<0.10, ** p<0.05, *** p<0.01*

VII. Discussion/Conclusion

Texas and its long history of charter school policies has created a unique case to study charter competition through different regulatory iterations. In general, my result focuses on competition extremely close to a TPS where competition is likely to be felt. While competition is shown to impact TPS financial decision making, those decisions are highly contingent on regulatory measures and who the TPS serves. This contingency is an important caveat to this study and to previous works that found null results, especially when measuring changes at the district level.

First and foremost, meaningful results could only be identified after new regulations were imposed on charter's post 2000. This implies that tighter control of charter openings and operations could push TPS to react to competition. While I lack specific data to understand the mechanisms underlying the new regulation's impact on TPS decision making, policy context and charter history helps shed light onto why I observe such results. There are several possible reasons I lack results in the prior (1997 to 2000) period. First, while some academically strong charters were opened in this era (like KIPP), too many poor performing charters concurrently opened, creating a large variation of charter quality in the analysis. Consequently, whatever financial reactions TPS made from competition is muddled by swaths of low-quality charter competition which required no reaction from a TPS. In Opposition, after regulations a large proportion of charters opening near TPS were already vetted through a long application process and stricter accountability policies which produced treatment effects that were easy to measure. Other reasons could be that in pre-regulation periods TPS were unsure of what action to take and would do nothing. After regulations, a TPS had more information on charter competition and could aptly react.

One way to address this high vs. low quality charter competition is to measure competition through a "share" variable, measuring how many students in an area or district attend the nearby charter. The issue with this however is that I lack a proper instrument, and my measurement would suffer from simultaneity bias. For example, when a charter takes a high share of students in t_1, the TPS could react accordingly by shifting funds, bringing students back to the TPS, and subsequently lowering the charter's share in t_2. The coefficient generated from this regression then would be biased, as high shares could correspond to overburdened TPS unable to adjust to competition and low shares would correspond to reactive TPS that shifted funding accordingly. Regardless, it seems that regulation breeds better charters which breeds actual responses from TPS, however such measurements are sensitive to distance and unit of observation.

This sensitivity helps display crucial gaps in previous literature that used measurements at the district level. While I only find strong results post regulation, with-in a mile for a single TPS, I am extremely doubtful that these results would carry over to school districts that run multiple schools across many miles of a city. For district level measurements to return statistically significant and unbiased results a combination of several things must happen. For example, many charters opening at the same time targeting an equal proportion of TPS within a single district would lead to an unbiased estimate, because competition would be felt evenly across the district. If competition is lopsided to one TPS then statistically significant results and its point estimates are severely underpowered. Imagine a school district with 10 TPS and

only 1 TPS facing competition. If point estimates indicate a 1% decrease in spending for a school district, then the 1 treated TPS is responsible for all the variation, moving the ATE down for all schools. Therefore, when I look at previous works from Linick (2016) and Ridley et al. (2018) I cannot help but expect their results to be powered by confounding factors. For Ridley et al. (2018), state refunding schemes can explain this difference. However, I am unsure how to interpret Linick's (2016) results without questioning causal inference.

Focusing on my results more broadly, a causal pathway presents itself. When high quality charters open near a TPS, the TPS will react different depending on who the TPS serves. If the TPS is a low poverty school, it will spend roughly 1.12 percentage points (~$22,000) less on instructional functions. Instead, the low poverty TPS will spend .7 percentage points (~ $3,000) more on other functions not related to instruction or leadership. Additionally, charter competition induces ESL and gifted students to transfer to the nearby charter, shifting instructional funds to regular education programs and away from ESL programs. For high poverty schools when a high-quality charter opens nearby, it increases spending on instruction by roughly 0.5 percentage points (~$10,000). To do this, the high poverty school spends less on all non-instructional functions (~$6,000). Additionally, after students leave for the charter school the high poverty school is left with greater proportions of ESL learners and gifted students, therefore shifting instructional funds to those students.

There are limitations to this narrative, especially with regards to spending on educational programs. Because this study looks strictly at proportion of funds used, I am unable to identify the difference among shifting funds between educational programs and siphoning funds away from educational programs. When students leave a TPS it necessarily lowers variable costs of schooling (one less student means one less lunch, one less desk, one less textbook). But fixed costs stay the same, such as payments on loans, repairs, or capital outlay. Therefore, when I see percentage point shifts from a specific educational program to another, I am unsure if TPS total funds are relatively level after students leave and there is a strategic shifting of funds to keep students in or if TPS lost total funds and must siphon what fund are left to keep educational programs afloat. To make matters worse, some point estimates are so small that in absolute terms we see spending changes of just $100. Hence, I am hesitant that the mechanisms provided are robust in inference, but this coupled with student movement analysis does provide interesting pathways to explorer in later works.

The last, and most important interpretation this paper presents is on the heterogenous effects of funding on instruction by who the TPS serves. As previously mentioned, low poverty schools spend less on instruction while high poverty schools will spend more. This heterogenous effect when compared to previous literature provides an interesting setting in which competition arises. Following Cook (2017) who found charter competition lowered instructional spending and increased capital outlay spending it seems that low poverty schools follow this mode of action. This potentially means low poverty schools do react to competition, but not through investments into education, but by siphoning funds into marketing and external indicators of quality. Low poverty schools did end up spending ~$3,000 more on "other" functions after competition. These funds could have gone to painting old buildings, sending flyers out to parents, or other marketing tactics. Moreover, what funding variable I do have do not measure construction and capital outlay costs. It could be that low poverty schools begin repairing or building new facilities to entice parents or students to stay. While I lack

quantitative evidence to support this, qualitative works help supports this notion. For example, Sullivan, et al. (2008) noted TPS leadership's frustration of the slow bureaucratic response to charter competition, and therefore tend to use more flexible marketing tactics instead of a systematic diversion of resources. Moreover, Lubienski (2005) found similar evidence and noted that marketing is not only a quick way to retain students but increases academic achievement, as branding can create sorting where the best students stay in the TPS.

What about high poverty schools? These TPS did not spend less on education, but more, while also reducing spending on other funding functions. Again, I lack specific data to address the mechanisms, however some clear interpretations arise. First, the median high poverty schools have slightly less per-pupil fund to spend than low poverty schools (~150$ less per students). It could be when competition arises, poor schools do not have the flexibility to make transfers to marketing and must maintain pre-treatment per-pupil funds on instruction to stay afloat. Second, it could be that low poverty schools were mismanaged and had inefficient allocations of funds spent on leadership or administrative positions, therefore competition did induce reallocation directed towards educational outcomes. Lastly, the differences we see could be based on poor management of TPS. Qualitative evidence has pointed to that fact that reactions can be dependent on TPS culture and leadership. Hess, et al (2001) found schools with uncooperative cultures reacted less frequently to competition. This point gets compounded as high poverty schools face a "revolving-door" of school level staff. The apathy found on the school level can transfer up to district leadership who cannot build strong working relationships with TPS leadership. Inversely, low poverty schools have the administration cohesion to react quickly and begin marketing shortly after charter entry.

In conclusion, I find that charter competition within 1-mile of a TPS does not induce a statistically significant average treatment effect. However, this competition does induce heterogenous responses from TPS that either serve high or low proportions of poor students. This effect found that low poverty schools lowered proportions of funding on instruction and instead spent more on "other" or unknown costs. Using previous research, I infer that transfers are spent on marketing and capital outlay to improve the external quality of the school. Inversely, high poverty schools spend marginally more on instruction and less on leadership and other costs. While the underlying mechanisms that induce changes in financial decision making are not always clear, this work helps explain where previous works failed or bridge different results between papers. Mainly, measuring financial decision making at the district level presents a trade off between precision and external validity. Further, what positive effects previous papers did find could be due to policy implementations (such as refunding a TPS) or by type of TPS affected. Regardless, this work presents new questions for researchers to inspect. Namely, where exactly are low poverty school funds going? What specific piece of Texas's 2001 regulation explains the change in significance of estimates? And how can this work help inform policy makers on new implementing new charter policies in their state?

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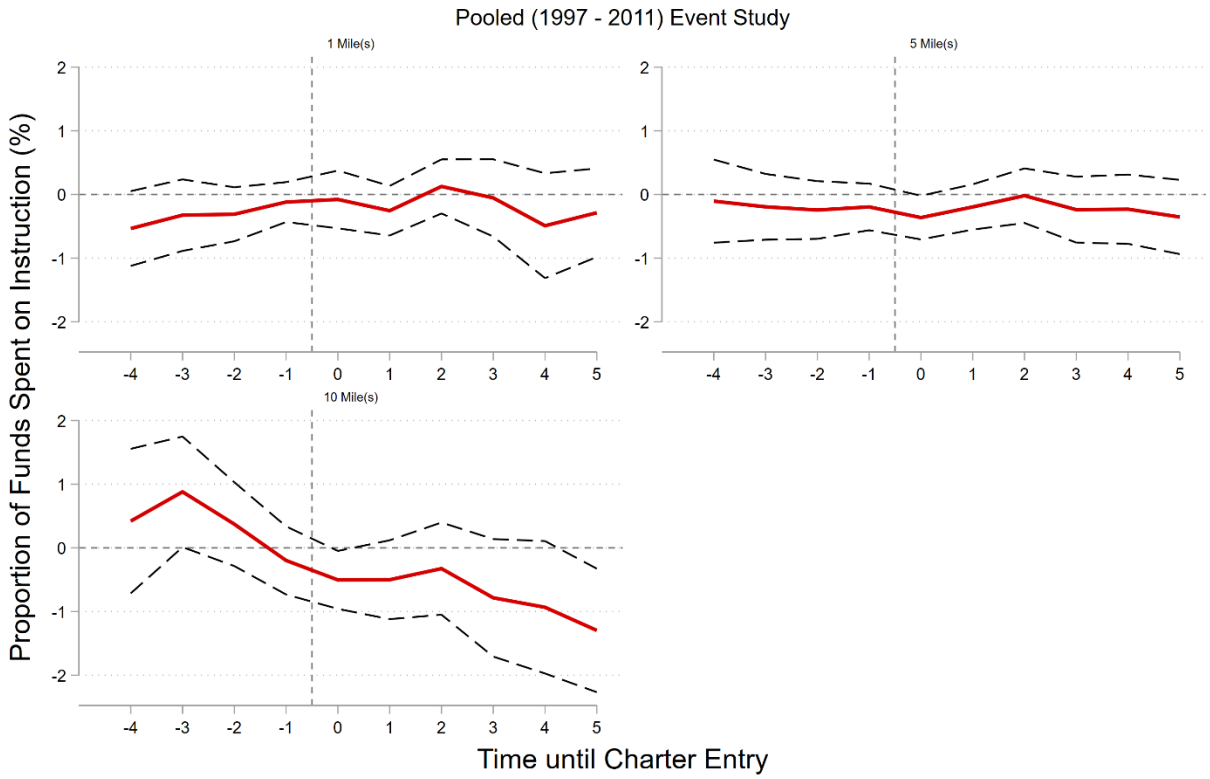
IX. Appendix

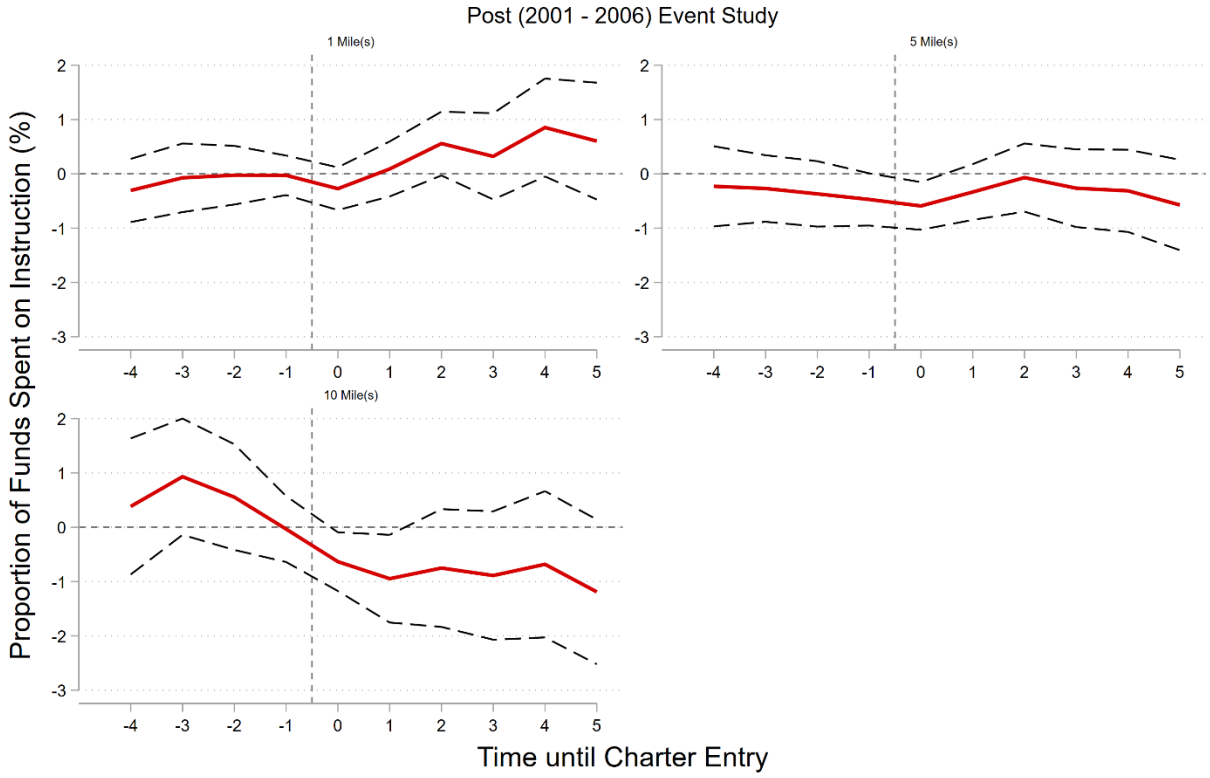
Table 2A: Growth of Charter Schools and Students Enrolled

	Student Proportions		Expenditures Proportions		Instructional Programs Expenditures		Salaries	
	TPS	Charter	TPS	Charter	TPS	Charter	TPS	Charter
White Students %	43	21						
Black Students %	13	33						
Hispanic Students %	41	42						
Asian Students %	2	4						
Expenditures on Instructional Leadership %			1	1				
Expenditures on School Leadership %			7	9				
Expenditures on Instruction %			72	68				
Expenditure on Function Other %			18	21				
Expenditures on Bilingual/ESL Education %					4	1		
Expenditures on Compensatory Education %					10	15		
Expenditures on Gifted & Talented Education %					1.5	0.17		
Expenditures on Regular Education %					70	74		
Expenditures on Program: Special Education %					13	8		
Expenditures on Program: Career & Technology Education %					3	0.76		
Average Salary of Campus Administration Staff							60254	53027
Average Salary of Professional Support Staff							44690	37185
Average Salary for Beginning Teachers							26179	25806
Average Salary for Teachers with 1 - 5 yr experience							33298	32230
Average Salary for Teachers with 6 10 yr experience							36629	28552
Average Salary for Teachers with 11 - 20 year experience							42454	25302
Average Salary for Teachers with > 20 Years Experience							48251	16660
Average Salary for Teachers							39929	35724

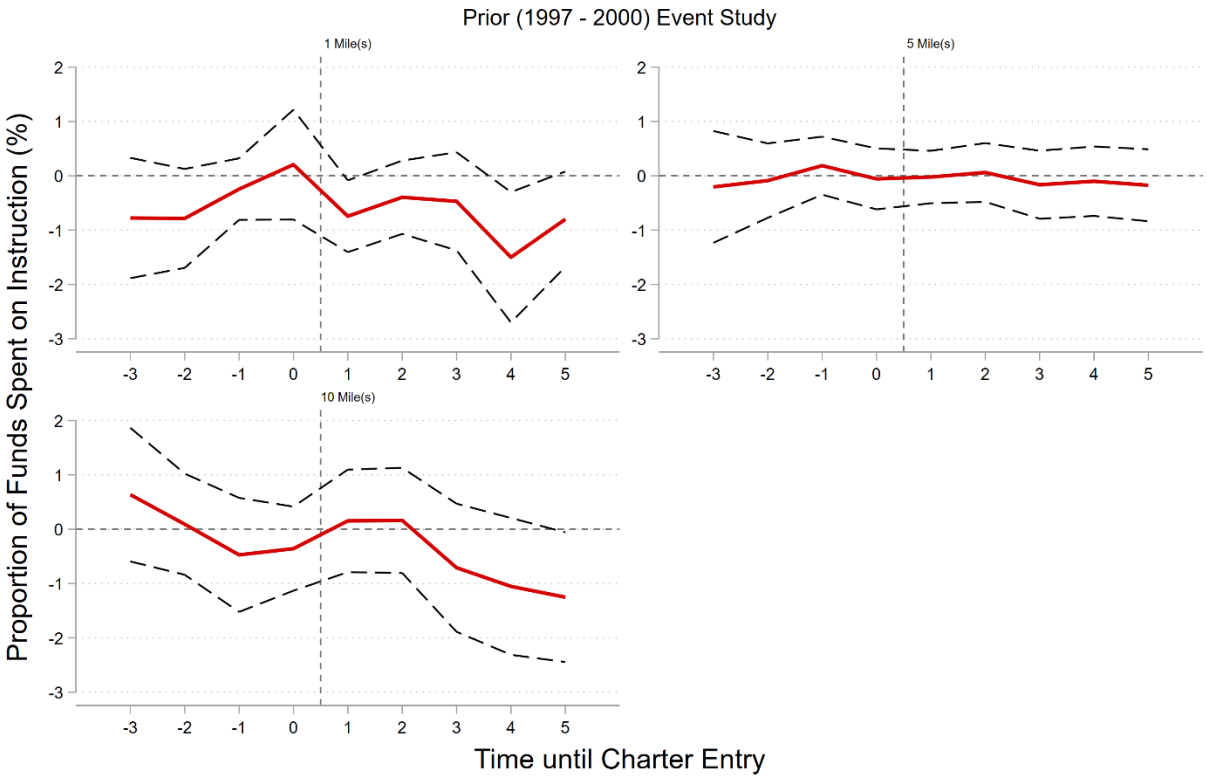
Note: Figures were made with data from 1996 to 2006. This includes only "Regular" charter and TPS. Numbers are rounded up by nearest integer unless values re in halves or less than one. Values of Educational programs are a subset of instructional funds. Some measurement error will occur so proportions might not add up to 1.



95% CI bands. TPS treated in years between 1997 to 2011.



95% CI bands. TPS treated in years between 2001 to 2006.



95% CI bands. TPS treated in years between 1997 to 2000.

Table 5A: Average Treatment Effect of Instructional Programs at 1-Mile

	Regular	Gifted	Special	ESL	Compensatory	Vocational
Treatment	0.270	0.204	0.120	-0.366	-0.265	0.0750
	(0.31)	(0.87)	(0.37)	(-0.58)	(-0.41)	(0.55)
_Constant	65.90***	1.802***	12.06***	7.270***	10.18***	2.681***
	(1175.58)	(116.82)	(569.50)	(177.37)	(238.89)	(299.25)
N	13044	13038	13032	13044	13044	13044

Note: Regression contains school fixed effects, district by year fixed effects and clustered errors on the school Regression presents only Post Group.
Post contains all treated TPS from 2001 – 2006.
t statistics in parentheses
** p<0.10, ** p<0.05, *** p<0.01*

Table 6a: Average Treatment Effect of Student Compositions

Gifted	Econ. Dis.	Hispanic
0.272	-0.295	1.033
(0.56)	(-0.41)	(1.31)
9.525***	67.34***	56.40***
(298.94)	(1425.16)	(1082.06)
13104	13104	13104

Note: Regression contains school fixed effects, district by year fixed effects and clustered errors on the school Regression presents only Post Group.
Post contains all treated TPS from 2001 – 2006.
t statistics in parentheses
** p<0.10, ** p<0.05, *** p<0.01*

Table 7a: Average Treatment Effect of Funds Spent on Non-Instructional Functions

	Other	School Leadership	Instructional Leadership
Treatment	-0.121	-0.165	-0.0296
	(-0.60)	(-1.16)	(-0.89)
_Constant	18.75***	7.592***	1.549***
	(1423.77)	(816.59)	(707.95)
N	13045	13053	13053

Note: Regression contains school fixed effects, district by year fixed effects and clustered errors on the school Regression presents only Post Group.
Post contains all treated TPS from 2001 – 2006.
t statistics in parentheses
** p<0.10, ** p<0.05, *** p<0.01*