PACE
Policy Analysis for California Education

WORKING PAPER

Charter Competition and District Finances: Evidence from California Students

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Charter schools enroll a growing share of public school students, leading to concerns about the financial implications of charter schools for traditional public schools (TPSs). Using detailed expenditure data for school districts in California, I exploit variation in charter school enrollment across time and between districts to evaluate how district spending and overall financial health change as nearby charter sectors expand. I find that larger charter enrollment shares are associated with lower levels of per-pupil spending and reduced fiscal health in TPSs. However, these relationships in some cases exhibit significant nonlinearities and are much smaller in magnitude than what has been observed in other states. Consequently, larger charter enrollment shares are not associated with differences in the proportion of expenditures allocated to various activities, goods, or services. Differences between these results and those from similar analyses in other states may be explicable in terms of California's economic and policy context, providing lessons for policymakers.

VERSION: May 2019

Acknowledgements

The author is grateful to Katharine Strunk, Morgan Polikoff, Edward Cremata, and attendees of the Rossier School of Education's Quantitative Working Group for valuable feedback on earlier versions of this paper. PACE working papers are circulated for discussion and comment purposes and have not undergone the peer-review process that accompanies official PACE publications. However, this paper is forthcoming in the June 2019 issue of the Journal of Education Finance.

Since the first charter school law in the United States was passed in Minnesota in 1991, the charter school sector has grown to enroll 5.4 percent of public school students nationwide as of the 2014-2015 school year (U.S. Department of Education 2015). This expansion has been controversial and has generated a great deal of public and scholarly interest in the effects of charter schools on the students who enroll in them. However, comparatively little research examines the effects of charter schools on nearby TPSs.

Most studies examining the effects of charter schools on TPSs focus on student outcomes such as achievement (e.g., Imberman 2011; Winters 2012). Also important, however, are the financial implications of charter school growth for TPSs. Critics worry that charter schools drain resources from local school districts, leaving TPSs under-funded (e.g., Blume 2016). Charter school advocates counter that with fewer students to serve districts should be able to adjust to lower revenues (e.g., Roza 2016). Given the large number of students in TPSs, the resolution to this debate is of considerable policy importance.

I address these financial questions by examining how school district expenditures change as local charter school enrollment grows in California. California is a useful context because it is understudied in the charter school literature, the size of the state provides the necessary statistical power for study, and the state's charter sector has expanded rapidly in recent years, providing the necessary variation in charter market share across years and districts to explore associations with district finances. Additionally, California's school funding rules, discussed in more detail below, may tend to mitigate the fiscal impacts of charter schools on TPSs, offering a useful contrast to other states.

Consistent with prior work elsewhere I find that TPSs in California spend less per pupil, allocate smaller shares of spending toward day-to-day operations, and experience greater levels of financial strain as the first charter schools open nearby. However, these relationships are much weaker than is observed in other states. Additionally, the large charter enrollment shares observed in California allow for the estimation of nonlinear relationships between charter competition and TPS operations. Observed nonlinearities suggest that these already-modest relationships attenuate further or even change direction at higher levels of charter school enrollment, perhaps because variable costs become increasingly fixed for districts when charter enrollment shares grow large, or because districts respond differently to competition over different time horizons.

The remainder of this paper proceeds as follows. First, I briefly summarize the theoretical and empirical literature on the competitive effects of charter schools on TPSs. I next discuss California's charter school context, with an emphasis on features of the state's policies that are distinctive and that are likely to have implications for TPS finances as the charter sector expands. I then describe the data and methods I employ, followed by a presentation of my results. I conclude by connecting my findings to previous research and with a discussion of potential implications for public policy.

I. Previous Literature and Theoretical Framework

There are two main mechanisms by which charter school competition might influence TPS finances: direct budgetary impacts and competitive effects. The direct budgetary impacts of charter schools on TPSs apply to both TPS revenues and expenditures. Charter schools shift funding away from TPSs mechanically because funding follows charter students to their charter schools rather than going to their neighborhood TPSs. At the same time, when a student enrolls in a charter school this will absolve the local TPSs of the marginal cost of educating that student. Thus, charter schools will tend to reduce overall TPS revenues and expenditures.

It is not obvious *a priori* what the net effect of these revenue and expenditure changes will be on the overall fiscal health of a TPS district. Bifulco and Reback (2013) conduct case studies of two large districts in New York experiencing significant charter school enrollment growth and highlight two dynamics that contribute to this ambiguity. First, charter schools can generate "excess costs" of education, some of which may be borne by local districts. For example, a TPS district may be unable to sell buildings or reduce other fixed costs in proportion to a drop in enrollment, resulting in financial strain (e.g., Ladd and Singleton 2017). Second, the financial impacts of charter schools on TPSs will be determined to a substantial degree by the policies that allocate funding and responsibilities among school systems. For example, the extent to which a district sheds costs as students enroll in charter schools depends on what services, such as transportation or administration, the district continues to be responsible for providing.

Additionally, because TPSs lose revenue or economies of scale when students enroll in charter schools, the presence of charter schools provides TPSs with an incentive to make themselves more attractive to students and their families. This may result in changes to the way any given level of expenditures is allocated within the TPS system as districts spend relatively more on activities that are deemed to make the school more attractive to prospective parents. Hoxby (2003) argues that an effect of this competitive pressure will be to make TPSs more efficient, at least if the revenue associated with the marginal student is significant and the magnitude of charter school competition is sufficiently large. Using data on Michigan's schools from 1992-2000 and a difference-in-differences approach, she finds evidence that schools in districts with at least six percent of students enrolled in charter schools increased both their level of achievement and their rate of academic improvement. Because these improvements were obtained without large changes to per-pupil spending levels, Hoxby argues that they constitute *bona fide* efficiency gains. However, using additional controls and years of data, Ni (2009) finds no evidence of efficiency gains in Michigan's TPS sector as a result of charter competition.

Some economic models also predict that competitive effects will result in product differentiation, whether through product design or advertising and marketing, because consumers have idiosyncratic preferences (e.g., Smith 1956). Consistent with this theory, in a qualitative study of 30 schools in New Orleans, Jabbar (2015) finds evidence that, in addition to attempting to improve operations, schools respond to competition by trying to distinguish

themselves from competitors. Specifically, she finds that schools attempt either substantive changes to the services they provide (e.g., extracurricular activities, curricular themes, or student services) or more sophisticated marketing and branding (e.g., revised logos or brochures).

While there are several potential mechanisms by which charter schools may affect local TPS finances, few studies bring evidence from many districts directly to bear on these questions. Arsen and Ni (2012) explore these issues in Michigan using statewide panel data from 1994-2006. Using district and year fixed effects they find that charter competition may slightly reduce the share of spending TPSs devote to instruction, but otherwise expenditure allocation does not significantly change. In addition, charter school enrollment appears to cause district revenues to fall faster than expenditures, reducing districts' fund balances, suggestive of decrements to districts' overall financial health.

Cook (2018) takes a similar approach using data from Ohio. He finds that a one percentage-point increase in the share of students transferring to charter schools reduces district revenues by 2.7 percent, due in part to a decline in local property values. Ohio districts facing greater charter competition employ fewer teachers but do not reduce (collectively bargained) salaries, and total expenditures fall. TPS expenditures also shift toward capital improvements.

These studies provide some support for the theory that charter schools may impose fiscal strain in the TPS sector. They also provide some support for the theory that TPSs will allocate expenditures differently as charter school enrollment grows, though TPSs do not obviously shift expenditures toward activities that might be expected to improve productivity (e.g., instruction). This is potentially concerning as it suggests that charter school competition may reduce the quantity or quality of educational services provided to TPS students, especially if districts reallocate resources away from instruction. Moreover, TPS districts that do not adjust to enrollment declines with spending cuts may suffer other disruptive or undesirable consequences as their fiscal health declines, including state intervention or credit rating downgrades (Arsen et al. 2015). However, because the effects of charter schools on TPSs may vary across policy contexts, it is difficult to predict whether similar results would be replicated in other states.

I contribute to this literature by exploring the association between TPS finances and charter school enrollment in districts in California. Specifically, I address three questions. First, how does the per-pupil *level* of TPS spending change (overall, and on specific categories of expenditure) as local charter school enrollment increases. Second, how does the *distribution* of TPS spending between different categories of expenditures change as local charter school enrollment increases? Finally, how does the *overall financial health* of districts change as local charter school enrollment increases?

II. The California Context

Several features of California's economic and policy context are worth highlighting for their potential implications for my questions of interest. First, California's charter school sector is relatively large in both absolute and proportional terms, and has grown substantially in recent years. In 1992, California become the second state in the nation to adopt a charter school law, and by the 2013-2014 school year 10.9 percent of California schools and 8.3 percent of California students were in the charter sector, compared to 6.6 percent of schools and 5.1 percent of students nationally (U.S. Department of Education 2015). This growth provides the variation of interest in the present study because, as described below, my predictor of interest will be the share of students in a district who are enrolled in charter schools.

Second, California's school funding system may make school districts less sensitive to enrollment loss than they would be under other states' systems. For example, Arsen and Ni (2012) find that charter schools in Michigan exert significant financial pressure on TPSs under a system in which school districts and charter schools are entitled to a mostly-flat minimum per-pupil funding grant from the state and localities are generally not allowed to raise local taxes to supplement school budgets. In California, by contrast, the state sets a per-pupil revenue target for districts that depends on several factors. For instance, school districts in California have generally been granted higher per-pupil funding targets when they have low enrollment (to account for economies of scale), or when they have declining enrollment year-over-year (Weston 2010). Localities may raise taxes to meet or exceed those funding targets, but if they are unable to do so state aid makes up the difference, at least for some kinds of revenue, further insulating districts from fiscal stress.[1]

In Ohio, Cook (2018) finds that some of the financial harm imposed on TPSs by charter schools results from depressed property values, and thus property tax revenues. Here again California's school funding rules may protect districts from such stress, as the large majority of districts already receive state aid because they are unable to meet their revenue targets locally (Weston 2013).[2] Additionally, it is not obvious that charter schools will have the same effects on property values across contexts, and some evidence suggests that California's housing market may be insensitive on average to the proliferation of charter schools (Brehm, Imberman, and Naretta 2016).

Third, other school finance regulations in California might be expected to mitigate the fiscal impacts of charter schools on TPSs. Charter schools in California are supervised by other education agencies, and often a charter school's supervising agency will be its local TPS district. Districts are entitled by law to charge charter schools up to three percent of the charter

[1] California has changed its school funding system in recent years but has maintained many of the general features discussed here, including the use of need-adjusted minimum funding guarantees for districts.

[2] Localities in California face rigid constraints on their ability to generate local tax revenue due primarily to the passage of a ballot initiative (Proposition 13) in 1978. It is still possible for localities to raise additional tax revenue (e.g., through flat per-parcel taxes on property rather than *ad valorem* property taxes), but it is difficult and in practice most districts do not do so.

school's revenue to cover the costs of this supervision. These fees may reduce, or even reverse, the fiscal strain districts might otherwise experience from charter school expansion.

The distinctive characteristics of the California context limit the generalizability of the present study. Nevertheless, these characteristics are important to understand for at least two reasons. First, articulating relevant features of a policy context is of theoretical importance, as it can illustrate the extent to which findings from any one study can be generalized. On the one hand, confirming in California findings from other states indicating that charter schools strain TPSs financially would provide powerful evidence that such effects obtain in a very general way, across diverse contexts. On the other hand, failure to replicate such results in a novel context would indicate that previous findings should be generalized only with extreme caution, if at all.

Second, if the details of a state's policy and economic context have significant implications for TPSs facing charter competition, this is likely to be of considerable practical importance for policymakers. Emulating successful education policy outcomes, or avoiding unsuccessful outcomes, requires understanding how those outcomes were obtained. Even if the findings of the present study do not generalize in a simple way to extant public school systems in other states, they may illustrate for policymakers factors worthy of consideration, and levers at their disposal, in the design of charter school and school finance policy.

III. Data

My financial data come primarily from the California Department of Education (CDE). Since the 2003-2004 school year, the CDE has required all of the state's local education agencies (LEAs) to report expenditure information using a standardized account code structure (SACS), which is then made available in unaudited form. SACS requires that expenditures not only identify the object on which they were spent (e.g., equipment replacement), but also be linked to general goals (e.g., adult education) and activities (e.g., instruction). This detail offers two advantages for my purposes. First, it allows for granular analyses of school district spending patterns. Second, because many charter schools report their spending through local districts using charter school-specific funds, it is possible to identify and exclude most charter school expenditures from my analysis. This is important because I am concerned with the financial implications of charter schools for TPSs in particular; charter schools reporting financial information through their affiliated LEAs therefore potentially contaminate my sample. I am ultimately able to exclude spending conducted by approximately 86 percent of charter schools from the TPS financial data, resulting in a relatively "pure" sample of TPSs.[3]

[3] The remaining charter schools are those that report financial data through the TPS district with which they are affiliated, and only at the district level, using funds shared with their TPS neighbors. This makes their financial data indistinguishable from those of other schools in the district when aggregating up to the district level. Thus, approximately 1.3 percent of what I describe as "TPSs" are, in fact, charter schools. In results available upon request I assess the extent to which these charter schools bias my estimates by allowing additional charter schools to "contaminate" my TPS sample, and any such bias appears quite small.

I supplement the SACS data with school-level administrative demographic data from the CDE. I also utilize three datasets from the Common Core of data, including the Public Elementary/Secondary School Universe and LEA Universe Surveys (for demographic data and to identify all-charter districts) as well as the LEA Finance Survey (for LEA debt levels). After excluding all-charter districts, the resulting dataset includes a panel of 977 school districts each observed at least once between the 2003-2004 and 2014-2015 school years. Table 1 presents summary statistics of my variables of interest.

Table 1. Summary Statistics

	N	Mean	SD	Min	Max
District enrollment	10832	6803	25062	3	748093
TPS enrollment	10832	6501	23143	3	727227
Charter enrollment (%)	10832	5	14	0	95
English learner (%)	10832	19	18	0	100
FRL (%)	10832	51	27	0	100
White (%)	10832	45	28	0	100
Special education (%)	10832	9	4	0	43
Grades K-3 (%)	10832	36	14	0	100
Grades 7-8 (%)	10832	17	8	0	70
Grades 9-12 (%)	10832	20	28	0	100
Staffing					
Student:teacher ratio	10804	20	4	3	65
Novice teachers[a] (%)	9848	10	10	0	100
Tenured teachers (%)	9849	69	25	0	100
Mean teacher experience (years)	9848	14	3	1	38
Student:admin ratio	8996	338	160	3	2050
Student:support staff ratio	7227	546	636	7	10109
Per-pupil expenditures					
Total	10832	13008	6358	6113	138164
Student	10832	10590	4615	5673	98632
Non-student	10832	2417	3696	0	125790
Capital	10832	1415	3108	0	69175
Debt service	10832	579	1400	0	101101
Retiree costs	10832	83	161	0	4688
Regular K-12 education	10832	5950	2623	2809	37006
Specialized secondary schools	10832	1	11	0	236
Vocational education	10832	9	48	0	1168
Regional occupation centers/programs	10832	15	72	0	2059
All salaries	10832	6322	2181	3265	33314
Teacher salaries	10832	3816	1123	1669	20946
Administrator salaries	10832	674	426	0	9429
Support staff salaries	10832	844	470	0	7148
All benefits	10832	1919	831	644	11369
Health and welfare	10832	950	547	0	6888
Other benefits	10832	46	120	0	6592
Books and supplies	10832	751	444	124	6376
Equipment replacement	10832	31	254	0	11566
Per-pupil fiscal health measures					
Ending fund balances	10832	7832	10823	-872	212850
Reserves	10832	3870	7821	-741	212850
Total debt	9992	6428	9685	0	190193

Note. Financial figures are presented in 2014 dollars.

[a] Novice teachers are those in their first two years of teaching.

IV. Methods

Previous studies have taken various approaches to quantify charter competition, including using the number of charter schools within a given radius of a TPS school (Bettinger 2005; Imberman 2011; Sass 2006) or the number of charter schools or share of charter school students within a county boundary (Bohte 2004). Neither approach is suitable for the present study because in California financial data are available only at the district level, students may cross county boundaries to enroll in charter schools, and California's counties are relatively few in number and vary substantially in size. An alternative, and perhaps more suitable approach, is to identify the share of a district's total potential enrollment that is enrolled in charter schools using student-level information about the particular TPS system a child leaves to enroll in a charter school. When feasible (Arsen and Ni 2012; Cook 2018; Ni 2009; Winters 2012), this method has the virtue of directly identifying the likely counterfactual TPS for each charter school student, and thus the TPS system directly impacted by that student's movement into the charter sector.

However, because such longitudinal student-level data are not available in California, my measure of charter school competition departs from this ideal. In particular, I make two simplifying assumptions about the district(s) with which any given charter school is competing. First, I assume that each charter school enrolls students exclusively from, and thus exerts competitive pressure exclusively on, the TPS district with which it is formally affiliated. While in California students may cross school district boundaries to enroll in a charter school, I am not concerned about substantial inaccuracy because previous literature suggests that students and families prioritize school proximity and attend nearby schools even when school choice is available or expanded (e.g., Glazerman and Dotter 2016; Harris and Larsen 2015). My measure should therefore offer a reasonable approximation of the extent to which a district is competing with nearby charter schools for enrollment.[4]

Second, I treat any charter school not formally affiliated with a TPS district as though it is affiliated with the nearest TPS district. In California a charter school may in some cases operate as its own LEA or be affiliated with a non-district LEA (e.g., a county office of education), but this reflects technicalities of oversight and administration, not differences of enrollment policy. I therefore assign each such charter school to the nearest TPS district serving the same grade levels, where a district's location is defined as the location of its central office.

I then estimate a series of models of the following form:

$$(1)\quad Y_{it} = \beta_1 C_{it} + \beta_2 C_{it}^2 + \beta_3 S_{it} + \gamma_t + \delta_i + \varepsilon_{it}$$

[4] Additionally, I exclude 82 charter schools representing 3.7 percent of all charter school observations that have a substantial online or distance component (e.g., virtual schools) that would allow them to easily enroll students who do not live nearby. I retain charter schools with a virtual component if the CDE categorizes them as "primarily" classroom-based. For example, some partially-online schools require students to attend in-person classes four days a week.

where subscripts indicate that an observation comes from district *i* in year t. Y_{it} are the outcomes of interest, most commonly per-pupil spending measures in districts' TPSs but in some cases per-pupil fund balances or debt levels, or staff characteristics. When financial in nature, and despite being measured on a per-pupil basis, these outcomes often exhibit considerable positive skew.[5] All financial outcomes measured in dollars (as opposed to percentages) are therefore subjected to an inverse hyperbolic sine (IHS) transformation.[6]

C_{it} is the predictor of interest, a measure of charter school competition defined (as described above) as the percentage of a district's total enrollment that is enrolled in charter schools. Because California districts vary widely in local charter school prevalence and district responses to additional competition may vary at different levels of competition, C_{it}^2 – the square of the share of students enrolled in charter schools – is included to allow for nonlinear relationships across the distribution of C. S_{it} is a set of TPS characteristics that may affect district expenditures. These include an IHS transformation of TPS enrollment to control for economies of scale enjoyed by larger districts, as well as the shares of TPS students enrolled in different grade levels (K-3, 7-8, or 9-12) as different grades are funded by the state at different levels and may have different cost levels or structures. Also included in S are student demographics, including the shares of students who are white, English language learners (ELLs), eligible for free- or reduced-price lunch (FRPL), or identified as having a disability.[7] γ_t is a set of school year dummy variables to control for any statewide trends over time and δ_i is a set of district fixed effects to capture time-invariant district characteristics. ε_{it} is an error term. Standard errors are clustered at the district level. [8]

V. Results

V.1 RQ1: The Level of Spending in TPS Districts

I begin by considering my first research question above, regarding the overall level of per-pupil expenditures in the TPS system. Table 2 presents estimated differences in total TPS

[5] Per-pupil, rather than aggregate, measures are used because they may be easier and more intuitive to interpret. Results when using aggregate figures, available upon request, are generally similar, especially for financial outcomes that represent large portions of typical district budgets. For smaller subcategories of aggregate expenditures estimates do differ somewhat in magnitude from per-pupil estimates, but are qualitatively similar and tend to be less precise.

[6] In an IHS transformation, $\sinh^{-1} y = \ln(y + \sqrt{y^2 + 1})$. This serves a similar purpose (and has a similar interpretation) as a natural log transformation, with the added advantage that $\sinh^{-1} y$ is defined at $y = 0$, allowing the retention of null observations (Burbidge, Magee, & Robb, 1988).

[7] These controls are measured at the school level when possible, and therefore include only those TPS schools in districts for which financial outcomes are measured. Student disability status is not readily available at the school level in many years, so LEA-level figures (which include both TPS and affiliated charter schools) are used instead.

[8] Because C is squared before estimation, $\hat{\beta}_2$ estimates a nonlinearity over the entire distribution of C (as is typically the case in a polynomial specification), rather than a nonlinearity with respect to deviations from a district mean (as might commonly be assumed in the presence of fixed effect; McIntosh and Schlenker 2006). This is appropriate for present purposes given the wide range of charter school enrollment shares observed in California. In results available upon request, I generate estimates allowing for both within-district and overall nonlinearities and show that the former appear not to matter.

spending associated with charter school enrollment. For illustrative purposes, models with and without potential nonlinear relationships are presented, and these specifications are qualitatively different in substantively important ways. Under a linear specification, a one percentage-point increase in charter school enrollment in a district is associated with approximately 0.2 percent higher total per-pupil expenditures in local TPS districts.

However, the inclusion of a quadratic term suggests a more complicated picture; charter school growth is associated with lower per-pupil TPS spending at low levels of charter school penetration, but that relationship shrinks in magnitude as the charter sector expands. In the nonlinear specification, the first percentage point of students in a district to enroll in charter schools is associated with lower total spending of approximately 0.2 percent on a per-pupil basis, with additional charter school enrollments associated with progressively smaller differences in spending.[9] This suggests that the financial implications for TPSs of additional charter school enrollment may be different for districts' with higher and lower levels of charter competition.

To illustrate the magnitude of these estimates, table 3 presents predicted per-pupil expenditures in a stylized California school district in the 2013-14 school year with characteristics similar to those of the state as a whole. Reading from left to right across the top row reveals how total per-pupil spending in the TPSs would be expected to differ at different levels of charter competition, for example being lower when the district is imagined to have five percentage points of its students in charter schools rather than none. The aggregate impact of these differences is modest. For this district moving from zero percent to 10 percent charter school enrollment (approximately the statewide average in recent years) would, *ceteris paribus,* be predicted to be accompanied by 1.4 percent lower total per-pupil spending ($10,355 vs. $10,210, a difference of $145) in the district's TPSs. An additional 10 percentage points of charter school competition, while the same in magnitude as the first increase, is associated with an additional decrement to per-pupil spending that is smaller still: just 0.3 percent, or $34.

This decline in total spending is essentially identical ($\hat{\beta}$= 0.002, p = .072) when aggregate rather than per-pupil expenditures are used as the outcome, and these estimates are considerably smaller than Cook's (2018) estimate in Ohio, where he finds that the enrollment of a percentage point of students in charter schools is associated with a decline in total district spending of 2.8 percent. Given that my estimates suggest that this relationship tends to attenuate as charter enrollment increases, this is consistent with the hypothesis that California's TPSs are to some extent insulated from the fiscal pressures associated with charter schools compared to their counterparts in other states.

[9] In fact, these estimates imply that the relationship changes signs (i.e., becomes positive) once the charter school sector enrolls approximately 18 percent of area students. Though that is an unusually large share of public school enrollment for charter schools, it is not unheard of in California. By the measure used here, approximately 12 percent of California districts, with a median enrollment of roughly 2,000 students, had charter sectors at least this large during the 2014-15 school year.

Table 2. Fixed Effect Regressions Predicting Student and Non-Student Spending (IHS per pupil)

					Non-Student Spending							
	Total Spending		Student Spending		All Non-Student		Capital		Debt Service		Retiree Benefits	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Charter (%)	0.0016**	-0.0020+	0.0013*	-0.0020**	0.0057*	0.0013	0.0025	-0.0112	0.0083+	0.0017	0.0005	0.0049
	(0.0006)	(0.0011)	(0.0005)	(0.0007)	(0.0023)	(0.0047)	(0.0048)	(0.0105)	(0.0047)	(0.0092)	(0.0037)	(0.0084)
Charter (%)^2		0.0001**		0.0001***		0.0001		0.0002		0.0001		-0.0001
		(0.0000)		(0.0000)		(0.0001)		(0.0001)		(0.0001)		(0.0001)
N	10832	10832	10832	10832	10832	10832	10832	10832	10832	10832	10832	10832
Districts	977	977	977	977	977	977	977	977	977	977	977	977
R-sq	0.76	0.76	0.91	0.91	0.56	0.56	0.46	0.46	0.82	0.82	0.72	0.72

Note. Standard errors clustered on districts in parentheses. Per-pupil expenditure figures have been subjected to an inverse hyperbolic sine (IHS) transformation, giving associated coefficients an interpretation similar to that of a natural log transformation. All models include district and year fixed effects and controls for TPS enrollment, grade level shares, and the share of students who are ELLs, eligible for FRPL, white, or who have a disability.
$^{+}p < .10$; $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

Table 3. Predicted Per-Pupil Financial Outcomes at Increasing Charter Enrollment Shares, 2014 dollars

	Charter (%)				
Outcome	0	5	10	20	40
Total spending	10,355	10,268	10,210	10,176	10,443
Non-student spending	1,225	1,235	1,249	1,392	1,438
Regular K-12 education	4,615	4,573	4,541	4,503	4,538
Teacher salary spending	3,378	3,343	3,317	3,286	3,311
Capital spending	316	300	288	274	277
Ending fund balances	3,998	3,871	3,766	3,618	3,543

Note. Figures are predicted for a hypothetical district with TPS enrollment of 6,000 students in 2014 with student demographics matching those of the California as a whole in that year. The district is assumed to have a district-specific fixed effect equal to the mean fixed effect of similarly-sized districts in the panel.

V.2 RQ2: The Distribution of TPS Spending

Next I consider distribution of expenditures across various types of objectives and objects in the TPS system. Both theory and prior empirical work suggest that district resource allocations may change in the face of competition because some costs in the TPS system are relatively fixed even as students exit for the charter sector, and districts will therefore allocate proportionally fewer resources toward those costs that decline with enrollment (i.e., variable costs). How best to distinguish fixed and variable costs is not obvious. As a starting point, I follow Loeb, Grissom, and Strunk (2007) in distinguishing "student" and "non-student" spending, with the former representing expenditures undertaken to provide day-to-day services directly to a district's own K-12 students and defined in a manner very similar to the CDE's measure of operational expenditures. Specifically, non-student spending includes spending on pre-K and adult education, capital (excluding equipment replacement costs), debt service, non-pension benefits for retirees, services to other agencies or to the community, and refunds to the state of savings on district contributions to the state's public employee retirement system (PERS). All other spending is classified as student spending, making the student and non-student categories mutually exclusive and collectively exhaustive of all expenditures.

If charter competition induces TPS districts to allocate resources away from variable costs and toward relatively fixed costs, and if my measure of student expenditures captures primarily variable costs, than the lower levels of per-pupil spending observed above should be driven primarily by lower levels of student spending. Because it includes costs that are unlikely to be sensitive in the short term to changes in K-12 enrollment, per-pupil non-student spending should remain unchanged or even increase as local charter sectors expand. This is precisely the pattern observed in table 2. The estimates for student spending are very similar to those observed for spending as a whole, being generally lower as charter sectors initially expand from a low baseline. Non-student expenditures exhibit a somewhat different pattern, appearing higher even at low levels of charter school penetration and if anything increasing more steeply at higher levels of charter competition.

That non-student spending would decrease more slowly (or increase more rapidly) on a per-pupil basis as local charter sectors expand is not surprising given that non-student spending represents many costs, such as retiree costs, that may not fall proportionally or immediately as students exit the TPS system. This is consistent with the previous literature discussed above, and suggests that fixed costs may constrain districts' abilities to respond to competitive pressure and may serve as a source of financial strain. However, the small magnitudes of these estimates imply that changes in the shares of spending devoted to non-student activities are small at typical levels of charter school competition; the representative district in table 3 going from zero to 10 percent charter school enrollment is predicted to see non-student spending consume only 0.4 percentage points more of the budget, having increased by $24 per pupil.

At the same time, the estimated (albeit statistically insignificant) nonlinearity implies that an additional 10 percentage points of students enrolling in charter schools will be

accompanied by higher per-pupil non-student expenditures in the TPSs amounting to an additional $143, with those expenditures consuming an additional 1.4 percentage points of the budget. Though few districts may have charter sectors enrolling 20 percent or more of local students, especially outside of California, those that do may nevertheless find these relatively fixed non-operational expenditures to be increasingly burdensome as local charter sectors expand further.

V.2.a. Fixed costs. To better understand which district costs are in fact fixed, table 2 includes estimates for spending on capital, debt service, and benefits (e.g., post-employment health insurance) for retired employees, which collectively represent approximately 85 percent of non-student expenditures.[10] Spending on these objects fluctuates substantially even within districts, making these estimates less precise, but the coefficients are similar to what is observed for non-student spending as a whole and as would be expected if these costs are fixed as enrollment declines. The estimates for these expenditure categories also do not exhibit significant nonlinearities, suggesting that these costs may be substantially fixed even when charter enrollment is proportionally high. However, recall that, except at very high levels of charter school penetration, larger local charter school sectors are associated with differences in total nonstudent spending that are small in absolute terms. The burden imposed on districts by these rising per-pupil fixed costs is therefore likely to be small unless local charter sectors become large.

A notable exception to the pattern described above is capital expenditures.[11] As shown in table 2, overall capital expenditures, while imprecisely estimated, fall with charter school enrollment when that enrollment is low; a district experiencing its first 10 percentage point growth in charter school enrollment would be predicted to see nine percent lower capital outlays, or approximately $90 less per pupil for the mean district in 2014-15.[12] While that relationship attenuates at higher levels of charter competition, even an additional 10 percentage point growth in charter school enrollment would be associated with per-pupil capital outlays that are lower by an additional 1.3 percent. While TPS district capital requirements should be expected to fall as students exit for the charter sector, these results nevertheless run contrary to the conventional wisdom that capital expenses are substantially fixed for districts. It is possible that districts are able to cut capital costs in anticipation of charter school openings, or that charter schools help to relieve capital-related capacity

[10] These retiree benefit costs do not include pension costs, which are not directly funded by districts for their former employees. Districts' pension contributions for active employees are included in student spending.
[11] Perhaps more so than with other categories of spending, it is not obvious how long districts' capital expenditures should be expected to take to respond to charter school competition. Estimates presented here are for capital expenditures measured in the same year as charter school enrollment. Coefficients shrink in magnitude and become less precise when predicting capital expenditures in year t+1 or t+2, though these differences are difficult to interpret given that in subsequent years districts also have larger charter enrollment shares on average.
[12] However, capital outlays per pupil can vary substantially across districts; as illustrated in table 3, a plausible hypothetical district might see much smaller (or larger) declines in dollar terms.

constraints for districts, though capital-related spending cuts may be increasingly difficult as the local charter sector expands.

V.2.b. Variable costs. Because they may be unlikely to affect the day-to-day experiences of district's own TPS students, spending differences concentrated on non-student goods and services do not directly illuminate how resources available for TPS students are expected to differ as local charter school sectors expand. It is therefore worth considering districts' expenditures on their own students, and the extent to which those costs are in fact variable as students exit for the charter sector.

V.2.b.i. Staffing costs. Of the SACS-defined objects (i.e., goods or services) on which districts spend money, a substantial majority is devoted to staff compensation (i.e., salaries and benefits). Across all districts and years in this sample compensation accounts for 66 percent of expenditures on average, more than three-quarters of which (51 percent of all spending) consists of salaries. How such costs might change in TPSs as charter schools expand is not obvious *a priori*. On the one hand, TPSs may dedicate more resources to staff compensation to compete with charter schools, or because reducing staffing levels is difficult in the short term. On the other hand, staff salaries may be easier to shed than other expenses (e.g., capital or retiree obligations), prompting districts to make cuts to compensation, however painful, to cover other rising per-pupil fixed costs.

Table 4 presents results predicting staff-related outcomes in districts using local charter school enrollment shares. Per-pupil spending on salaries is generally lower in districts when local charter sectors are larger, and these differences are driven to a substantial extent by declines in teacher salary spending (models 1 and 2). Given that TPSs tend to employ more veteran teachers compared to charter schools (U.S. Department of Education 2013), one might expect that new charter schools would tend to attract relatively novice teachers, leaving TPSs with relatively experienced staff who receive higher salaries. Schools reducing staff may also do so on a reverse seniority basis, laying off the most novice (and lowest-paid) teachers first, raising average salaries (e.g., Boyd et al. 2011). This is not obviously evident in California. Teacher experience indicators are not significantly related to districts' charter enrollment shares (models 8–10); rather, lower spending on teacher salaries is explained to a large extent by higher student:teacher ratios.[13] It may be that districts balance novice teacher layoffs (or reduced hiring) with early retirement incentives for more senior employees.

Per-pupil spending on administrator salaries is also lower in TPSs when local charter sectors are larger, and this is again partially explicable by higher (albeit imprecisely estimated) student:administrator ratios (models 3 and 12). Spending on support staff (e.g., librarians and counselors) salaries is unrelated to charter enrollment shares (model 4),[14] though higher

[13] Arsen and Ni (2012) also find no change in average teacher salaries, which is perhaps consistent with the finding here that teacher experience indicators (a primary determinant of teachers' salaries) do not change.

[14] Even when statistically significant these estimated changes in per-pupil teacher, administrator, and support staff salary spending are insufficiently large or different from other spending outcomes to substantially change the share of all expenditures dedicated to these costs.

charter school enrollment shares are associated with lower student:support staff ratios (model 13). Administrator and support staffing levels may be subject to the same considerations as teacher staffing levels described above. However, support staff expenditures may represent relatively fixed costs if support staff levels are already low, as they are in many California districts.[15]

Local charter sector expansions are associated with benefit spending that is only slightly, if at all, lower, perhaps because benefit costs are more difficult to shed than are salaries, or are more valued by employees. These expansions are also accompanied by higher (but imprecisely estimated) spending on "other benefits", such as tax-sheltered annuities or incentives for early retirement. The composition of these other benefits is not discernable in SACS, but to the extent that they represent spending on early retirement incentives, these results are again consistent with districts responding to enrollment declines by incentivizing retirement among veteran teachers.

While these estimated coefficients are small, they may nevertheless represent non-trivial absolute differences in spending because compensation accounts for such a large portion of the typical district's budget. For example, during the 2013-2014 school year the median district in this sample spent approximately $7,200 per pupil on staff compensation (salaries plus benefits) in its TPSs. These estimates imply that if a district moves from 0 percent to 10 percent of students enrolled in charter schools, local TPSs would spend approximately $100 (1.4 percent) less per pupil on compensation, or $2,200 less for a classroom of 22 students (a typical size for self-contained classrooms in California).

In many cases the relationships between charter competition and these outcomes exhibit nonlinearities suggesting that staffing costs for districts may become increasingly fixed as local charter sectors expand. For instance, the positive coefficients on the square of charter enrollment share indicate that while per-pupil spending on teacher salaries, administrator salaries, and health and welfare benefits are all lower when charter school enrollment shares are larger, those differences become smaller or even change direction at higher levels of charter competition. Thus, while the hypothetical district in table 3 is predicted to spend $61 (1.8 percent) less per pupil on teacher salaries in its TPSs when going from zero to 10 percent charter enrollment, going from 10 to 20 percent charter enrollment is associated with an additional decline of only $31 (1.0 percent). This might be the case, for example, if per-pupil staffing levels are more difficult to reduce when they are low, if the per-pupil cost of providing benefits to staff increases as the number of participating staff decreases, or if there is a finite number of veteran staff who can be induced to retire early. The distinction between fixed and variable costs may thus blur for districts as spending flexibility is exhausted in the face of rising charter school enrollment.

[15] For example, California's public schools employed just one librarian for every 7,783 students and one guidance counselor for every 235 secondary students in the fall of 2014. Comparable figures nationwide were 1,127 and 143, respectively (U.S. Department of Education 2016).

V.2.b.ii. Competitive improvements and programmatic differentiation. If charter schools exert competitive pressure, TPSs may respond by attempting to make their instructional programs more attractive. I consider two mechanisms by which such a process might proceed. First, districts may respond to competitive pressure by buying more – or more costly – materials for their existing instructional programs. Second, TPSs may respond by attempting to make their instructional programs not only more effective, but also more diverse. Table 5 shows the relationship between charter school enrollment and TPS expenditures that are classified as material acquisition or as pertaining to various instructional goals.

Districts with larger charter school enrollment shares do not appear to spend more per-pupil on either books and supplies or equipment replacement, and may if anything spend less, consistent with these costs being variable for districts but inconsistent with the hypothesis that districts will tend to invest in them in response to competitive pressure. Districts with larger charter sectors also do not appear to spend more on instruction in general, and in fact the relationship with per-pupil expenditures on regular (i.e., non-vocational, non-alternative) K-12 instruction is negative at low levels of charter competition and roughly similar to that of student spending as a whole. However, this relationship is modest and attenuates somewhat at higher levels of charter school competition. As can be seen in table 3, a district experiencing its first 10 percentage point growth in charter school enrollment is predicted to have per-pupil spending on regular K-12 instruction fall by 1.6 percent. It may be that districts do not consider these to be productive investments or that, being relatively insulated from the fiscal pressures associated with charter school enrollment, TPS districts feel little competitive pressure in the first place.

However, most school districts in California are elementary districts, serving mostly students in kindergarten through eighth grade. Such districts may have less ability or fewer incentives to alter or protect their instructional spending than districts serving substantial numbers of secondary students. Indeed, when elementary districts are excluded, the relationship between charter school enrollment and regular K-12 instructional expenditures disappears, suggesting that competitive incentives or cost structures vary across different kinds of districts. Additionally, unified and high school districts appear to spend more on high schools specializing in technology or arts education, vocational education, and regional occupational centers & programs (another type of vocational program) when local charter sectors are larger. This is consistent with the theory that TPSs may attempt to diversify their instructional programs in the face of competition. Again, these changes may be modest in practical terms because districts spend little on these types of activities on average (approximately $50 per pupil on average on all three categories combined, excluding elementary districts) and, consistent with Arsen and Ni (2012), these changes are sufficiently small that they do not substantially alter the shares of spending dedicated to instructional activities in the district.

V.3 RQ3: District Fiscal Health

Because districts may not be able or willing to reduce expenditures even when enrollment falls, it is also instructive to look at measures of district financial sustainability.

Table 4. Fixed Effect Regressions Predicting Staffing Outcomes

	Salary Spending (IHS per pupil)				Benefit Spending (IHS per pupil)			Teacher Characteristics			Student:Staff Ratios		
	All	Teacher Salaries	Admin. Salaries	Pupil Support Salaries	All	Health & Welfare	Other	Novice Teachers[a] (%)	Tenured Teachers (%)	Mean Exp. (years)	Students: Teacher	Students:Admin	Students: Support Staff
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Charter (%)	-0.0024**	-0.0023**	-0.0058*	-0.0006	-0.0013	-0.0021	0.0233+	0.0464	-0.0571	0.0017	0.0369*	0.9616	-7.8815*
	(0.0008)	(0.0007)	(0.0026)	(0.0011)	(0.0009)	(0.0014)	(0.0120)	(0.0595)	(0.0792)	(0.0172)	(0.0151)	(0.7071)	(3.9493)
Charter (%)^2	0.0001**	0.0000**	0.0001*	0.0000+	0.0000**	0.0001***	-0.0003	-0.0003	-0.0005	-0.0002	-0.0006*	-0.0092	0.0730
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0002)	(0.0009)	(0.0011)	(0.0003)	(0.0002)	(0.0085)	(0.0507)
N	10832	10832	10832	10832	10832	10832	10832	9848	9849	9848	10804	8996	7227
Districts	977	977	977	977	977	977	977	971	971	971	977	960	825
R-sq	0.91	0.85	0.70	0.92	0.89	0.83	0.65	0.37	0.78	0.66	0.84	0.75	0.53

Note. Standard errors clustered on districts in parentheses. Per-pupil expenditure figures have been subjected to an inverse hyperbolic sine (IHS) transformation. District covariates include TPS enrollment, grade level shares, and the share of students who are ELLs, eligible for FRPL, white, or who have a disability.

[a]Novice teachers are those in their first two years teaching.

$^+p < .10$; $^*p < .05$; $^{**}p < .01$; $^{***}p < .001$

Table 5. Fixed Effect Regressions Predicting Competitive Differentiation and Fiscal Strain (IHS per pupil)

				Unified & High School Districts Only				Fiscal Strain Measures		
	Books & supplies	Equipment Replacement	Regular K-12 Instruction	Regular K-12 Instruction	Specialized Secondary Schools	Vocational Education	ROC/Ps[a]	Ending Fund Balances	Reserves	Total Debt
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Charter (%)	-0.0003	-0.0060	-0.0020**	0.0002	0.0038*	0.0057	0.0321+	-0.0070**	-0.0072	-0.0162
	(0.0012)	(0.0073)	(0.0008)	(0.0012)	(0.0018)	(0.0116)	(0.0184)	(0.0025)	(0.0048)	(0.0171)
Charter (%)^2	0.0000*	0.0001	0.0000***	0.0000	-0.0001*	0.0000	-0.0001	0.0001*	0.0000	0.0003
	(0.0000)	(0.0001)	(0.0000)	(0.0000)	(0.0000)	(0.0002)	(0.0003)	(0.0000)	(0.0001)	(0.0003)
N	10832	10832	10832	4924	4924	4924	4924	10832	10832	9992
Districts	977	977	977	435	435	435	435	977	977	972
R-sq	0.81	0.36	0.92	0.93	0.85	0.81	0.76	0.71	0.73	0.88

Note. Standard errors clustered on districts in parentheses. Per-pupil expenditure figures have been subjected to an inverse hyperbolic sine (IHS) transformation. District covariates include TPS enrollment, grade level shares, and the share of students who are ELLs, eligible for FRPL, white, or who have a disability.

[a]ROC/Ps denote regional occupational centers and programs, another type of vocational education. $^+p < .10$; $^*p < .05$; $^{**}p < .01$; $^{***}p < .001$

Results for three measures of fiscal health are presented in last columns of table 5. Under SACS guidelines districts set up funds for accounting purposes to document resources and expenditures intended to advance particular objectives or as required by law. Associated fund balances represent the difference between the assets and liabilities available to a district in a particular fund. Lower fund balances may therefore serve as a sign of fiscal stress. As shown in table 5 (and illustrated for a hypothetical district in table 3), per-pupil aggregate fund balances at the end of the fiscal year are significantly negatively associated with local charter school enrollment shares. This suggests that even when California districts are able to reduce their expenditures in the face of charter school competition this may be insufficient to completely offset contemporaneous declines in revenue. Results are very similar when predicting districts' general fund reserves (defined by the state as certain kinds of flexible fund balances; Taylor 2015).

However, I do not find evidence that districts facing charter competition are financing their expenditures with debt; total per-pupil debt levels appear if anything to be negatively related to charter sector size. This suggests that any strain indicated by districts' declining fund balances is not so severe as to force districts to take on additional debt. This may be due to existing fund balance "cushions" – as shown in table 3, districts tend to maintain large aggregate fund balances – or statutory or regulatory limits on the outstanding debt districts can carry. In any case, these results are consistent with my final hypothesis above: that school districts in California, being relatively insulated from the financial pressures associated with charter schools, experience relatively little financial strain as local charter sectors expand.

V.4 Robustness Checks and Limitations

As a check on several of my modeling assumptions, in results available upon request I perform a series of sensitivity analyses to examine the extent to which results vary if those assumptions are changed. Estimates change slightly if very small districts are excluded, suggesting some heterogeneity across district types or if analysis is limited to pre-Great Recession years, though these restrictions substantially reduce the size of my sample. However, results are insensitive to alternative treatments of charter schools in the competition or outcome measures and to the inclusion of district-specific linear time trends and in no case are general conclusions substantially altered.

Though findings are generally robust to a range of sample and model specifications, at least four caveats are in order. First, while offering several advantages in terms of detail, public SACS data are unaudited and may therefore inaccurately or inconsistently reflect expenditures made by districts. Non-random inaccuracies in the data – whether due to errors or to idiosyncrasies in how districts classify and report expenditures – may bias my results. Second, because SACS does not allow me to exclude all charter schools from the TPS district financial data, my estimates may reflect in part expenditure shifts in charter schools. The charter schools that remain in the data are relatively few in number, so any resulting bias is likely to be small, but cannot be estimated precisely.

Third, my measure of charter school competition is likely imperfect for the reasons described above. If charter schools are enrolling large numbers of students from across district boundaries or from multiple districts simultaneously, my coefficients of interest will not accurately capture the pressure such charter schools are exerting on local districts. Finally, I cannot rule out bias from unobserved, time-varying district characteristics associated with both expenditures and charter school enrollment, though the insensitivity of most estimates to the inclusion of district-specific linear time trends should mitigate this concern.

VI. Discussion and Conclusion

Using administrative data from California, and qualitatively consistent with prior work, I I find that charter school enrollment is associated with slightly lower levels of per-pupil spending in nearby TPS districts, particularly spending on day-to-day operations and when charter school enrollment rates are low. Most kinds of other expenditure are, if anything, higher in such cases, perhaps because they reflect relatively fixed costs for districts. Moreover, there is some evidence that these changes are a sign of strain in the TPS sector as districts' available fund balances appear to decline along with expenditures.

Because California includes many districts that vary widely in the size of their charter sectors, I am also able to show that the relationships between charter school enrollment and TPS finances often exhibit nonlinearities. Assumptions of linearity in the existing work to date may therefore mask important heterogeneities as charter schools concentrate in or around TPS districts. These nonlinearities may reflect heterogeneous responses by districts facing different degrees of competition, for example because districts may be more able and willing to respond to charter school competition across longer time horizons, or when competition reaches a certain threshold (e.g., because it is noticeable, or enrollment losses are sufficient to allow previously fixed costs to be shed). Future work should consider the extent to which, and attempt to understand why, the financial implications of charter school schools may differ at higher and lower levels of charters school enrollment.

Additionally, the stresses I observe in TPSs appear to be less severe than those experienced by TPSs in other states, indicating that California's policy context shields districts to a large degree from fiscal strain. Policymakers elsewhere may therefore consider borrowing elements of California's school funding apparatus, such as minimum, funding guarantees for districts or supplemental funding for districts experiencing enrollment declines, for their own jurisdictions. However, the extent to which it is desirable to insulate TPSs from the competitive pressures of charter schools is not obvious. Insulating TPSs financially from competitive pressure is costly, and may prevent improvements in TPS operations that would otherwise be competitively induced by charter schools. Indeed, if a district is no longer responsible for educating a student who leaves for the charter sector, a policy that compensates a district for that student's departure may create perverse incentives in the TPS system.

Of course, whether the expansion of charter schools is a worthwhile policy objective depends on many considerations above and beyond the financial implications for TPSs.

Nevertheless, whether and how charter schools grow in number is a policy choice that should be made with a full understanding of the implications for affected communities and the financial health of TPSs will continue to be important so long as they enroll large numbers of students. There are both theoretical and empirical reasons to believe that charter schools may pose a financial threat to nearby TPSs, but my findings suggest that conclusions about the fiscal impacts of charter schools on TPSs should be generalized only with caution.

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