the performance

of california charter schools

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Executive Summary

CREDO, a policy research and evaluation group at the Hoover Institution of Stanford University, studied the impact of charter schools in California. Using data on school API scores and associated school characteristics from the California Department of Education, the analysis built an extensive econometric comparison of charter schools and their traditional counterparts, modeled separately for elementary schools, middle schools and high schools. The principal results of the study are presented below.

Profile Summary

- Charter schools overall are smaller in size than conventional public schools.

- Looking at academic achievement as measured by API scores by grade-level since 1999, the average charter API score is lower than the average conventional public school API, but with isolated exceptions, the difference is not significant. This finding is noteworthy because of the unequal distribution of charters across districts. The conventional school average includes schools in high performing districts that have no charter schools.

- The trend in API scores for charters since 1999 is equivalent to that of conventional schools for elementary schools. The lower absolute scores are offset by the rate of growth from 1999 – 2001, which is slightly higher for charter than for conventional elementary schools. When the comparison is restricted to schools that are in districts that have charter schools, the rate of growth is even higher.

- Middle school charters show increases in the average API score from 1999 to 2002, but the average growth from year to year is significantly lower than for conventional schools.

- Charter high schools have API scores on average that are just enough lower than conventional high schools that they teeter back and forth being statistically significant or not from year to year. The striking finding, however, is that their average improvement since 1999 is more than twice than of conventional high schools, a statistically significant difference.

- Across all elementary and secondary schools, charters were found to serve equivalent proportions of minorities from 1999 to 2002. However, the two most recent school years showed elementary-level charters served a lower proportion of minorities than in earlier years, a difference that was significantly different from conventional public schools.

- Because many charters have only recently opened, it is not surprising that overall charter schools have a higher mobility rate over the past four years than

conventional schools. This pattern holds for schools at the elementary, middle and high school level.

Modeling Summary

For each year 1999 to 2002 the API scores of elementary, middle and high schools in California were analyzed to determine the effects of a variety of student and school factors as they relate to the scores for each school. This analysis included both charter schools and conventional schools; elementary, middle and high schools were analyzed separately. With this approach it is possible to identify the independent contributions of each factor and to determine if they are significant.

- Poverty has the largest influence on school API performance, followed by lack of parental regard for education, student mobility, proportions of minority students, and proportions of English language learners.

- After controlling for all other influences, the API scores for elementary charter schools and middle charter schools are not different from conventional schools.

- The analysis shows that elementary charters on average work with lower performing students than the typical conventional school, while middle school charters draw slightly higher performing students. The influence of student selection in high schools varies from year to year, so no pattern is possible.

- After controlling for all other influences, the API scores for high school charters are positively different from conventional schools.

Looking at API scores each year makes it difficult to separate the effects of schools from the effect of factors outside the school's control. API growth over time yields a better – but still imperfect – picture of how schools are doing. The change in API scores from 1999–2001 were analyzed against the student and school factors.

- Against all other California schools, the changes in charter schools' API scores at the elementary and middle school levels are not statistically different, despite being slightly lower.

- Compared to other California high schools, California charter high schools on average have growth in API scores that is positive and statistically significant.

- The proportion of fully credentialed teachers in schools was found to contribute positively to change in API scores, and was statistically significant for elementary and high schools, but not for middle schools. The magnitude of the effect, however, was very small: by increasing the proportion of fully credentialed teachers in a school by ten percent, a school could be expect to add only about 2 points to their API gains.

- The final analysis compared charter schools against the schools in the districts where they are located. This analysis attempts to create a level field of comparison – how are charters doing compared to schools that serve the same populations.

- Charter elementary schools and charter middle schools were found to create equivalent gains for students as their conventional peer schools.

- Charter high schools produced significantly more positive changes in API scores than conventional high schools in their area.

- In this pool of schools, the concentration of credentialed teachers was significant only in elementary schools.

- With the understanding that many charter schools are still in infancy, and experiencing the typical disruptions of starting an enterprise, the findings of equivalent performance or better is noteworthy, and the strong rates of gains hold out the possibility of even greater results in the future. The results point to positive effects both from charters and the schools they impact through competition, suggesting that the policy of supporting charter schools in California is worth continuing.

Introduction

Charter schools are an important innovation in K-12 public education. Intended to provide a choice in education for public school students, charter schools are relieved of many regulations faced by traditional schools in order to give charters flexibility to create new models for instruction or organization. The overarching aim of charters is to spur innovation and success in educating students.

In California, the Charter Schools Act of 1992 legislated that charter schools could be authorized. Since that time over 450 charters have been granted, with 412 operating in early 2003. Over the ten-year history of the legislation, a wide range of concepts for charter schools have been proposed. Differences among charters in their target student profile, curricular focus, instructional method organizational structure and overarching educational goals highlight the creative response on the part of charter sponsors. There is no dispute that charters have brought innovation to public education as the legislation intended. With it, the policy goal of educational choice is advanced.

Less is known about the success of California charter schools in fulfilling their ultimate mission of improving outcomes for California students. This study examines three key policy issues:

1. How do the student populations of charter schools compare to traditional schools?
2. How do charter schools perform academically compared to traditional schools?
3. How is the performance of charters affected by the populations they serve or by the characteristics of the schools themselves?

Few states have as long a history with charters as California and even fewer have the longitudinal data on student and school performance to support such an analysis. Even where analysis is available nationally or for other states, the singularities of each state's enabling legislation make generalization difficult. Lessons from states such as Texas may be more relevant to California than to other states, but the funding, testing and operational parameters are sufficiently different to suggest barriers to extrapolation.[i] National studies such as Fuller et al. are constrained to qualitative and survey-based analysis and thus unable to relate differences in inputs between charters and traditional schools to student outcomes.[ii] Thus, even where differences in resources or teacher credentials are identified, it is unclear how much they affect the academic performance of students. Slovacek et al. examined California charter schools with high concentrations of racial/ethnic minorities or poverty and found that they were making positive academic gains.[iii] The study is important because it presented measures of student outcomes for the first time. However, neither the Fuller nor Slovacek studies attempt to compare their findings about charters to any control group of schools, and lack any meaningful context from which to understand the results.

A more extensive analysis of the performance of charter schools is vital to help inform future decisions concerning chartering, accountability and choice in California public education. An upcoming study by RAND on the effect of the charter school law in

California will provide many needed enhancements to the existing body of research on California Charter schools. At the same time, the quantity and quality of available data on charters limits the kinds of questions that can be answered. Specifically, since the California Department of Education does not track students over time and across schools, it is not possible to identify completely the effect that charter school attendance has on student performance. Instead, we can only make more general inferences about groups of charters and their levels of performance. We cannot wait, however, until more complete information is available.

The Current Research

This research brief builds on earlier work in two ways. We introduce a comparative dimension to the study of charter schools in California by comparing them to their traditional peers. Against the statewide average of traditional public schools --which includes schools in high performing districts without charters -- the analysis shows that charter schools have lower school API scores than their peers, but that the difference is not significant. Charters also show rates of progress that are higher than the state averages for primary and high schools. The findings also offer preliminary evidence that the lower scores of charters reflect the fact that the lower scores are a function of the self-selection by students and parents into the school rather than low performance of the school.

The second enhancement to the existing research comes from the use of multivariate analysis to relate differences in student background and school resources to both absolute performance levels and to school progress measures. This analytic approach allows us to study the effect of charter schools after removing potentially confounding influences that may differ across schools. The analyses show that against similar populations, charters and traditional schools perform about the same in elementary and middle schools, but outperform their peers in high schools.

Two related findings emerge from the analysis. The conventional wisdom that size of school matters finds support in these findings. After controlling for other possible influences, the analysis reveals a significant association between smaller schools and higher achievement across all grade levels. Teacher credentials, however were found to not be a strong driver of student results: while the proportion of fully credentialed teachers correlates to higher performing schools, once the attributes and talents of students was controlled for, fully credentialed teachers did not factor significantly as expected in changes in a school's API scores over time. Similarly, the proportion of emergency credentialed teachers was not as serious a deterrent to achievement gains as others have suggested.

Methodology

This study used data from the California Department of Education to perform a statistical analysis of the performance of charter schools in California. Annually since 1999, the Department has calculated the Academic Performance Index (API) for schools based on their students' scores from the Standardized Testing and Reporting (STAR) examinations.[iv] The Department also has made available over the Internet their dataset of all public schools in California. This resource includes information about whether a school is chartered, its years of operation, and the grades that are served by the school. These two sources were used to create a record of characteristics and academic performance for each school in the state.

The record for each school includes the API scores for any year between 1999 and 2002 that the school operated. Cross-sectional models for 2000 through 2002 were able to use prior year scores to control for starting performance. Changes in school scores over time were developed using 1999 as the base. Changes in the construction of the API in the 2001 – 2002 school prevented their use in change scores. The change models begin to distinguish between the initial draw of students into a school and the contribution that the school makes independent of the initial educational endowments of the students.

The analysis focuses on 316 elementary, middle and high school charter schools in California and their non-charter equivalents. Even though 87 charters in the state serve other populations (consolidated K-12, alternative schools, juvenile center schools, etc.) they were excluded from the study. Schools were excluded on two grounds. First, they were excluded because they lacked a sufficient number of comparison schools (as in the case of the 63 K-12 consolidated schools). Second, schools were excluded from the change models because they lacked adequate performance data, such as excluding from the progress analysis any school that started in 2002 because it had no history.

Multivariate regression models were constructed for each year of API scores from 1999 to 2002, regressing school scores on student body characteristics, family educational characteristics and school attributes.

Profile of California Charter Schools

The true number of charter schools in California has been a matter of some debate. The number changes frequently because the state of charter schools in California is highly dynamic – new schools are authorized frequently and each fall a new cohort begins operations. As well, some schools that have operated as charters have closed. So, depending on the measure being used -- Charters Granted, Active Charters, Operating Charters – the figures will differ.

Adding to the uncertainty is the fact that a few charters do not appear in the California Department of Education school files. Based on multiple sources, a total of 403 active charter schools were identified for the 2002-2003 school year, as displayed in the table below.

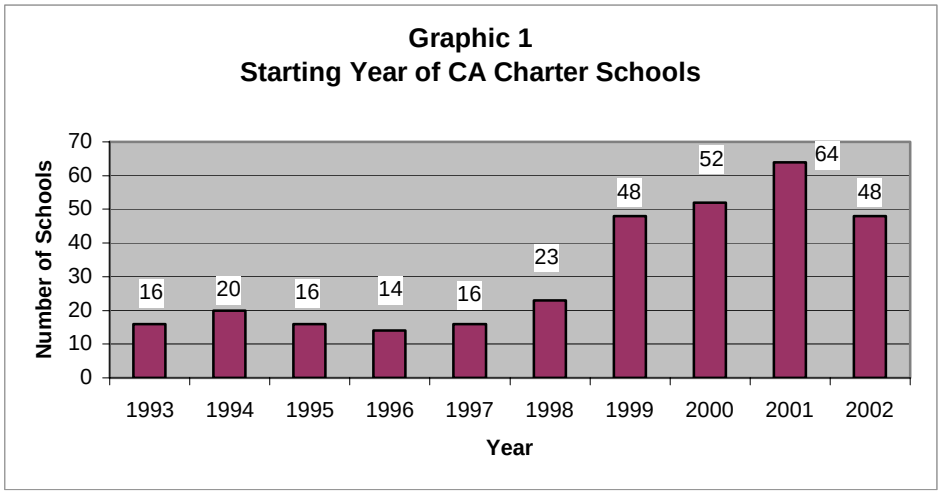
Table 1
Charter Schools In California as of Spring 2003

Operating Schools – known to CDE		403
Elementary	179	
Middle School	32	
High School	105	
K-12 Consolidated	63	
Alternative/Other	24	
Operating, no data at CDE		9
Charter Schools in Development		33
Chartered but Not Operating		39
Total		**484**

Source: "Profiles of California Charter Schools," California Network of Educational Charters (CANEC) available at: http://www.canec.org.

The majority of schools operating as charters in California are structured along tradition grade spans of elementary, middle and high schools. The significant number of consolidated schools includes regional schools in sparsely populated areas of the state and statewide non-classroom based schools. The numbers of schools in development and currently not operating illustrate the difficulty in capturing a precise number in the highly dynamic environment in which charter schools operate.

The population of charter schools in California over the ten-year period has been highly dynamic, as displayed in Graphic 1.



In the first five years after legislative enactment, the rate of start-ups was slow but steady. In 1999, however, the rate doubled in a single year and has remained high ever since. More than half the charter schools in the state have been in existence three years or less. The rapid growth rate of charters in recent years has introduced special challenges into this analysis of charter school performance. With the currently available data, it is difficult to separate the inevitable difficulties in starting up a school from decisions by the school about which types of students they seek to attract from the actual performance of the school. Based on the 2002 reports from the California Department of Education, enrollment figures were developed for the grade levels used in this study. The figures are presented in Table 2 on the following page.

Table 2
Enrollment for California Schools by Grades

	Charter Schools		Traditional Schools		Charter as a Percent of Traditional
	Total	Average	Total	Average	
K – 6	80,138	292	3,400,276	425	2.4
7 – 8	22,980	550	973,691	974	2.4
9- 12	51,897	524	1,807,054	1330	2.9
Ungraded	1,681	233	63,382	65	2.7
TOTAL	156,696		6,244,403		2.5

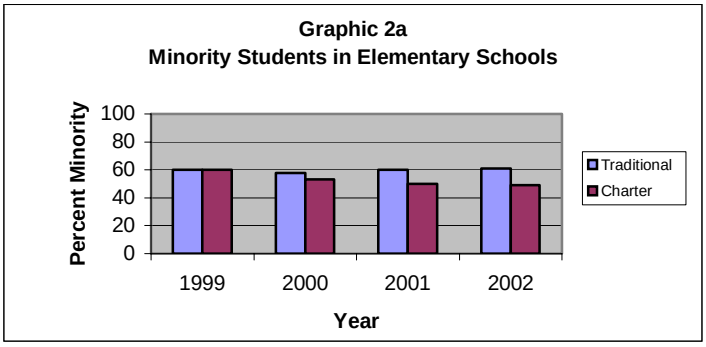
Source: California Department of Education; Charter School Website and DataQuest Website.

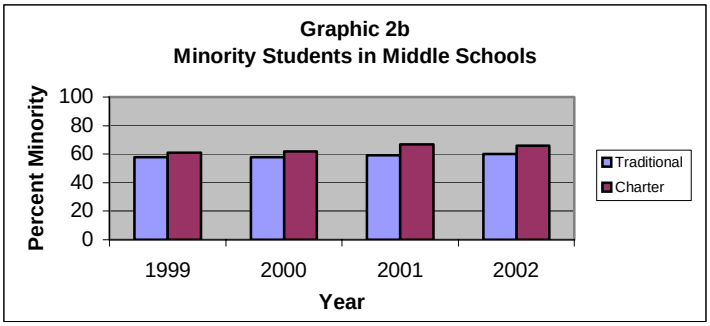
Since the legislation was passed, charter schools have enrolled about 2.5 percent of all primary and secondary students in California. The proportion is consistent across all grade levels and types of schools. By way of comparison, after an equivalent period of open entrance in the local distance telecommunications markets, the new providers had 9.8 percent of the market.[v]

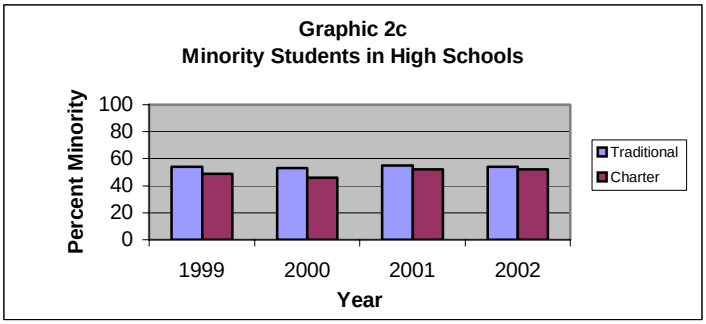
Comparison of School Characteristics

The Charter School Act of 1992 raised the expectation that charter schools would address the needs of California's most educationally challenged students in ways that traditional public schools had not. At the same time, charters were encouraged to find innovative approaches to raising the educational performance of all their students, regardless of background. Aside from other political and operating constraints, these conflicting pressures suggest that charters may differ from their traditional counterparts in two potentially opposing directions. They may elect to target a more disadvantaged segment of the student population – a decision that would be revealed in the student characteristics of those enrolled. Alternatively, as critics have suggested, they may seek to attract the most successful students (the practice known as cream-skimming); this too would be revealed in the profiles of the students enrolled. Or, as a maximizing strategy they may choose not to target or innovate, thereby hoping to present a close resemblance to the traditional schools with which they compete. Comparing the school and student characteristics of charters to traditional schools provides a preliminary look at these possibilities.

Compared to traditional student profiles, charter schools have similar proportions of minority students as shown in Graphic 2. Only in elementary schools in 2001 and 2002 were the differences found to be statistically significant (at $p<.01$). These differences are displayed in Graphic 2a.

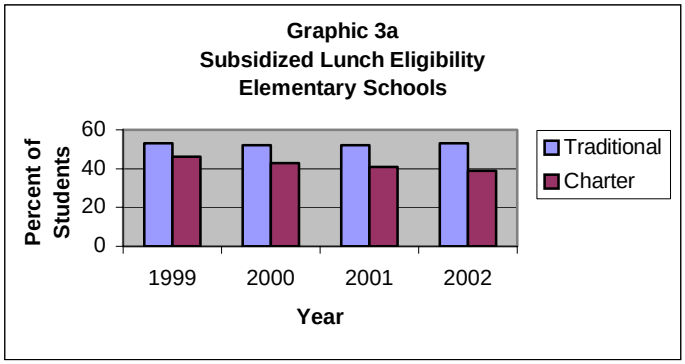


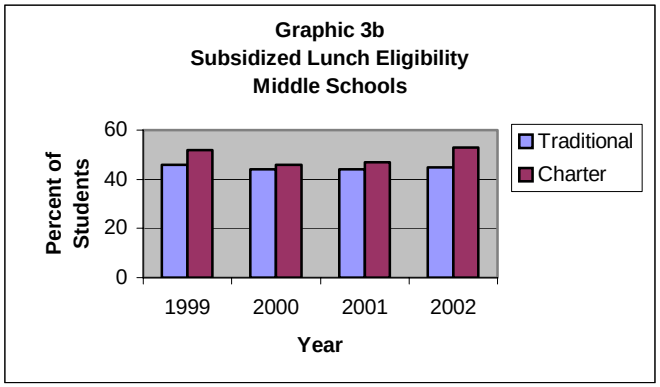


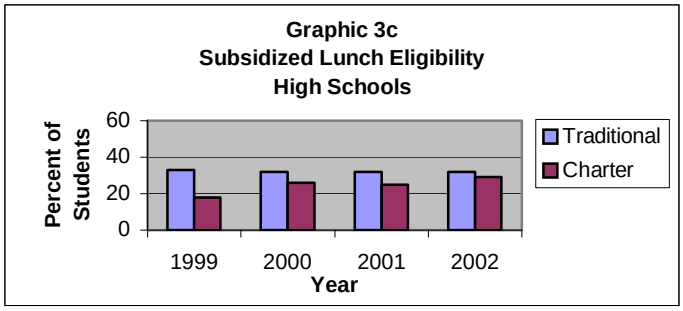


Both charter schools and traditional high schools show smaller proportions of minorities than are reported for elementary and middle school, suggesting that charters may face the same pressures to retain minority students as their conventional counterparts.

However, as Graphic 3 on the next page reveals, charters serve lower proportions of poor students, as measured by eligibility for free or reduced price lunch. The differences are significant for elementary schools in recent years ($p<.05$) but not for middle schools or for high schools.

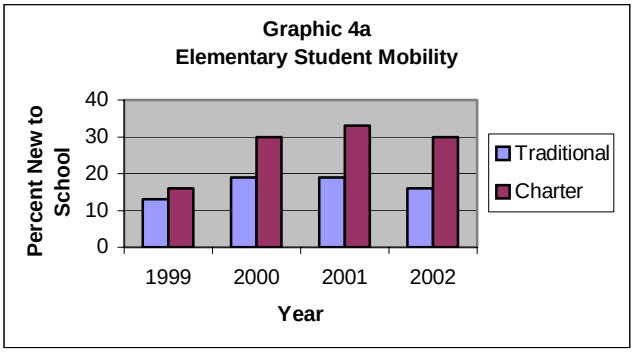


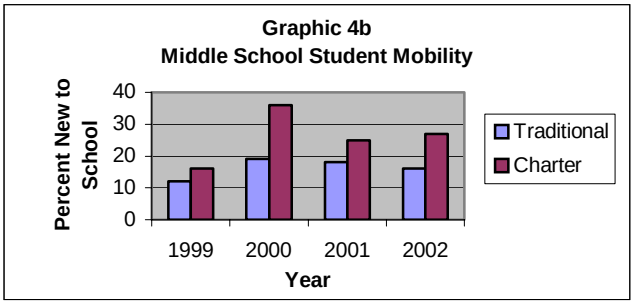


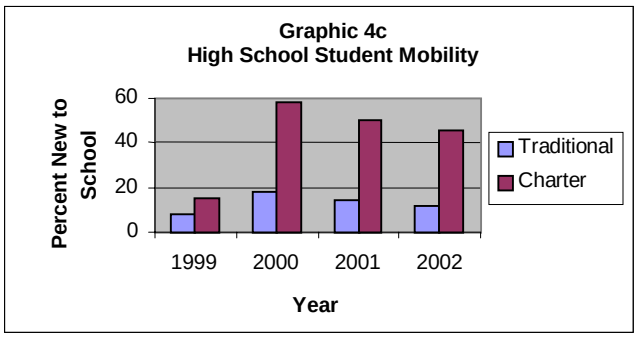


Some charter advocates explain the discrepancy as a decision by charters to avoid the monitoring and reporting that participation in Title I meal subsidy and other enrichment programs entails. The data suggest that some 163 schools did not report their student eligibility, a number that equates to 40 percent of the charters in the state in 2002. An additional 44 (or 18 percent) reported having no eligible students. So nearly 60 percent of the charter schools do not participate in this Title I program. However, the reluctance of older students to be identified as eligible has been well documented elsewhere, so the lower percentages for all schools at these grade levels may under-report the degree of poverty in the student body in secondary schools.

The rapid growth in the numbers of charter schools is reflected in the significantly higher student mobility rates for charter school students. Graphic 4 illustrates these comparisons, which are significant for all school types at the $p < .01$ level. This makes sense, since as charter schools open or expand the number of grades, students must change schools to enroll. Changing schools is associated with a temporary lapse in academic progress as students adjust to new environments.[vi] This raises the question of whether charter school performance in the early years of operation blends together the effects of school changing and the schools' own contribution to academic achievement.







Recently, the topic of school size has received considerable attention. The debate centers on whether there is an optimal range of enrollment that, if exceeded, damages the sense of community and cohesion among students and teachers. The association between school size and academic performance remains largely untested, however.[vii] Despite this fact, the United State Department of Education has initiated a major funding program to

encourage the creation or re-creation of small public high schools, often schools-within-schools.[viii] As displayed in Table 2, at all grade levels, California charter schools are on average two-thirds the size of their traditional peers. This finding is statistically significant at the $p<.01$ level. Moreover, the schools joining the ranks in recent years are having a strong trend towards lower enrollments. These schools provide an excellent opportunity to examine the effect of size on student achievement, which is done in the following section.

Comparison of API Performance and API Growth

In 1999, the California state legislature adopted the Academic Performance Index as a common measure of school performance. Calculated annually for each school, the API is a weighted average of the scores earned by students on the Standardized Testing and Reporting examinations for grades 3 through 11. This cross-sectional snapshot of absolute levels of performance is used as a stand-alone measure of the effectiveness of schools. The API scores for a school are also compared over time to determine if the school is making appropriate gains in its performance.

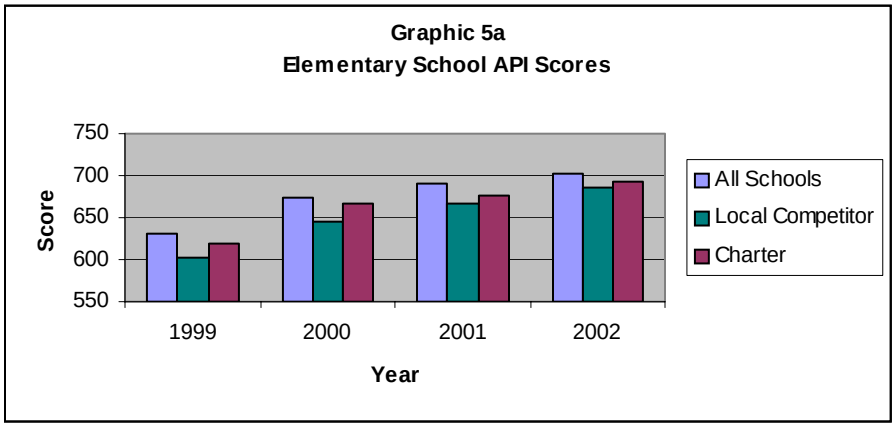
The shortcomings of the API as a measure of school effectiveness have been common knowledge among policy makers for some time.[ix] Until it is revised, the API continues to be the standard by which schools are judged, both relative to each other in a given year and against themselves over time. Accordingly, it is the metric used here to examine the performance of California Charter Schools. Thus, scores from 1999 through 2002 can be used to compare charters to traditional schools at various points in time. As well the change in school scores can be examined to gauge gains in school scores, and by extension, gains in student learning. The scores from 2002 cannot be used for longitudinal analysis due to changes in the underlying tests on which the API is based; both the structure of the tests and the weights assigned to them in the final index score were changed.

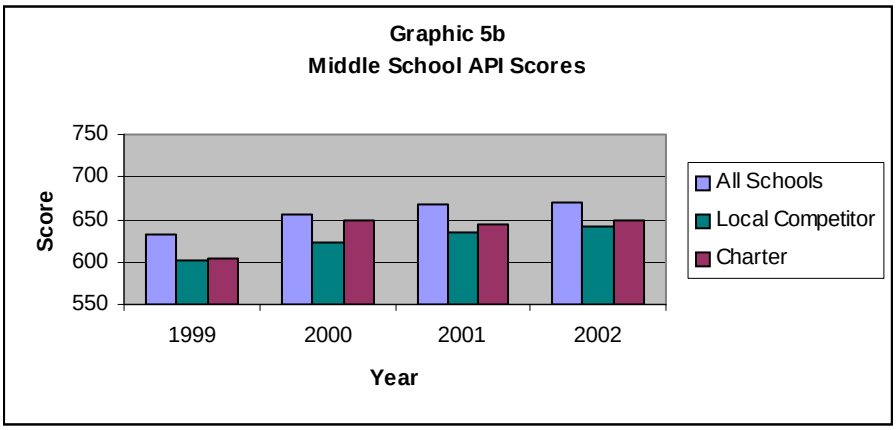
Different policy questions require the use of different comparison groups. If the question is "Do charter schools in California offer improvements to the quality of education in California?" then the appropriate comparison is against all schools in the state. However, if the question to be addressed concerns the effect of introducing competition in geographically-limited areas, then the best comparison group would be schools in the immediate vicinity. The rationale is that where districts have agreed to grant charters, schools face immediate pressure to create a sufficiently attractive alternative to avoid losing students to the charter.

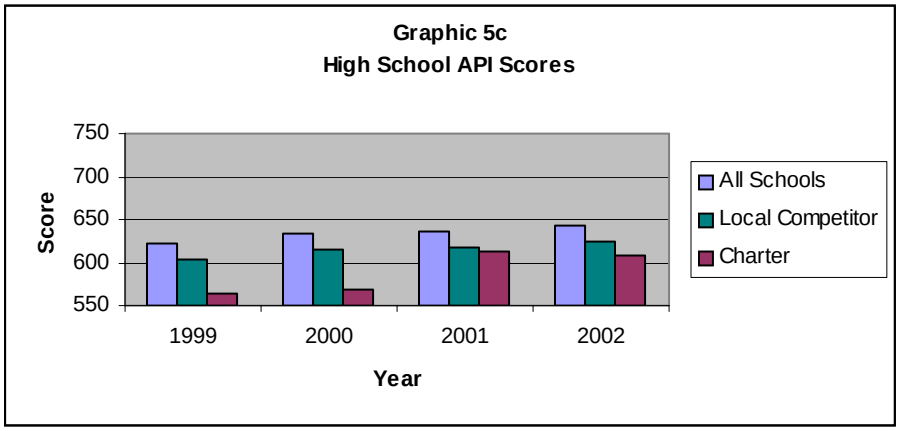
For this part of the study, two comparison groups were developed. The first consists of all the traditional public elementary, middle and high schools in California that received an API score for any year between 1999 and 2002. The second comparison group consists of the elementary, middle and high schools that are operating in districts where at least one charter operates. Schools were classified as facing competition even if the charter was granted for a different school type than theirs, on the assumption that the district was a contestable market.

Annual Achievement of Schools

The average API scores for each year from 1999 to 2002 were compared for charter schools and traditional schools. The results of the comparison are presented by school type in Graphic 5 (see next page). Both comparison groups are included alongside the charter school results.







The analysis revealed sharp differences by school type. For elementary schools, no significant differences exist between the average API performance of charter schools and the statewide average for traditional public elementary schools. This finding is striking since the statewide average includes results of high performing schools in districts that have no charters. The charter school performance takes on an even sharper relief in comparison to the performance of the elementary schools with which they compete. In each year, their competitor peers performed worse overall, though the difference was not

statistically significant. However, the difference between the state average scores and the average competitor scores were significant for elementary schools.
The situation for middle schools was similar to that of elementary schools. The differences between charters and either of the two comparison groups were not statistically significant, but charters performed better than the peer schools in their districts.

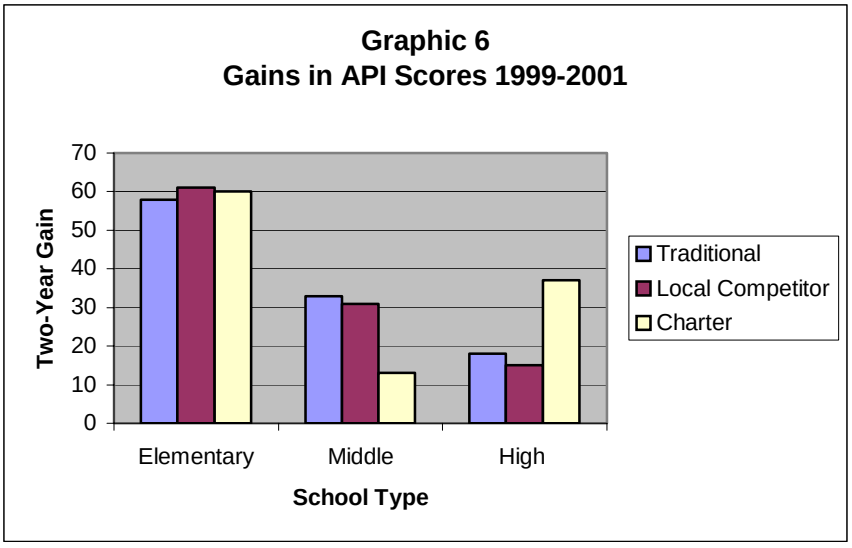
Charter high schools lagged considerably behind their comparison schools. In 1999 and 2000, the few charter high schools that existed had dramatically lower API scores than wither of their comparison groups, both statistically significant at the $p<.05$ level. The gap narrowed to become insignificant in 2001 but then increased slightly in 2002, when the differences between charter high schools and the statewide high school average once again were statistically relevant.

In all cases, the typical charter schools lags behind the average California school in the API scores it earns. For elementary and middle schools, charters perform better than their local competitors, but this is not the case for high schools. Just looking at the API results, it is difficult to explain the differences. We do not know, for example, if the differences between charters and their local competitors is due to charters attracting a different segment of the student population (either higher or lower performing), whether differences in scores are due to differences in resources or whether the new charters each year are starting at a higher level of performance in their first year than the earlier charters. The econometric analysis presented in the following section examines these influences.

Academic Gains

A more equitable way of comparing schools is to look at their ability to produce improvements in the academic performance of their students regardless of their nominal level of achievement. Gain scores as they are known assume that individual differences in student makeup and prior schooling will be reflected in the base score for an individual student, and any advancement will be due to the contributions of the school. Since there is no way to connect students with their individual prior histories, it is not possible to aggregate from individual student learning gains to arrive at a school-level score. Instead, differences in a school's API score over time serves as a crude proxy.

As mentioned earlier, the 2002 API scores cannot be used to compare with earlier years due to changes in the underlying tests and the way in which those scores are factored into a school score. Consequently, the measures of academic progress are based on changes between 1999 and 2001. This obviously limits the analysis to those schools that had scores in both years. The results appear in Graphic 6 (see next page).



Elementary schools showed far greater gains in scores over the period than either middle schools or high schools, regardless of school type. Compared to the average elementary school, charters produced greater gains over the period. However, the gain scores across the various groups of elementary schools were within three points of each other, with no significant difference among the groups. Middle schools present a different picture: while middle schools in districts that competed with charters showed equivalent gains as the statewide average for middle schools, charter middle schools lagged considerably behind. This difference is significant at $p < .05$. This finding is in part due to the fact that only 13 charter middle schools were included in the gain score analysis, so that low performance of any single school carries a far greater impact than in a group of hundreds.

Charter high schools were found to have dramatically higher gain scores than either the average high school in the state or their local competitor high schools. Increasing their API scores on average by nearly 20 points a year, charter high schools produce more than double the improvement than either comparison group, significant at $p<.01$.

As with the annual analyses of API scores, it is not easy to explain the differences based on the available data. In the three-year period, a school could have significantly different cohorts of students enrolling; the later API scores would capture the dual effects of different student quality for the new students and academic growth for the students who enrolled earlier. These results are explored further in the following section.

Econometric Analysis

Since the field of charter schools is so dynamic, it is influenced simultaneously by a number of factors. Some are unique to charter schools, such as the sharp increase in enrollment that comes with a grade-by-grade growth plan. Others affect traditional schools as well, such as student mobility or high concentrations of educationally disadvantaged students. In order to make fair comparisons between charters and traditional schools, each of these factors must be considered and given an appropriate weight in explaining the performance of schools.

Such a procedure is possible with econometric analysis, which isolates the contributions of multiple factors simultaneously. The technique looks across large numbers of schools and calculates the weight of each single factor holding all other factors constant. Each model generates coefficients for each explanatory factor that quantify its contribution to the API scores of schools. Since the number of charter schools is a small fraction of all California public schools, the results are driven by traditional schools. Essentially, the models explain the performance of a typical public school. Thus if two schools are identical save that one is a charter, the model would expect them to perform identically except to the extent that the charter school factor contributes meaningfully to performance. In this way, it is possible to see how charter schools on average perform.

The models include a binary variable that takes the value of "1" if a school operates as a charter, and "0" otherwise. Including this variable produces a comparison that equates charters and traditional schools on equal footing. The binary variable allows a model to discern features of a charter school that are different than a traditional school but for which no specific data exists. For example, charters might be organized around curricular themes or have integrated community service into their program or placed special emphasis on older students tutoring early elementary students. These "special" attributes differentiate charters from traditional schools, as intended by the legislation. However, consistent information on every characteristic of a school's operations is not available across charters or for their traditional peers. As binary variables are typically used, the models will be able to discern *if* charter schools contribute uniquely to overall academic performance, and by how much, but will not discern *how* those contributions are made.

In the current analysis, we make an important deviation from the typical use of binary variables. Because earlier discussion of charter schools has in part focused on the professional credentials of their teachers, we have separated out the teaching resource from the remainder of the elements that would be captured by the charter school binary variable. We model school performance with an explicit factor for teacher credentials to test whether the concentration of fully credentialed teachers (or conversely the concentration of emergency credentialed teachers) is a significant determinant of school performance. The results were tested against models excluding teacher credentials, and the results were almost identical. We can therefore be confident that the isolation of the teacher credential influence does not materially affect the interpretation of the charter school effect.

The models were run separately for elementary, middle schools and high schools. The variation within elementary, middle or high schools was far smaller than the across-group variation, making separate models desirable. The separation makes sense because of the different operating structures and student characteristics in each type of school. Keeping the school types separate allows for the possibility that charter schools may differ in how they are organized in each of these grade levels.

The following variables were used to explain the differences in API scores across schools:

- The percent of students in the school who were tested
- The percentage of minorities in the student population
- The percentage of students eligible for free/reduced price lunch
- The percentage of students that are English language learners
- The percentage of students with parents who did not finish high school
- The percentage of students with a parent with college or graduate school degree
- The percentage of teachers who are fully credentialed
- The percentage of teachers who hold emergency credentials
- The prior year API score
- School size, as measured by enrollment
- The charter status of the school (coded "1" if operating as a charter, "0" otherwise)

There were other factors of interest, such as the number of years a school has been in operation or the number of grades taught in the school, but the data was missing in so many cases that the overall strength of the models was compromised, so these factors were omitted from analysis.

The analysis is structured in four parts. Each part uses the same set of explanatory factors. Their form, however, is adapted to the functional form of the model. For example, mobility rates are annual when the model is a one-year analysis, but averaged over a multi-year period when the analysis is longitudinal. Each part of the analysis is described below.

Level Analysis.

We present the results of a cross sectional analysis of a single year of API performance for all California elementary, middle and high schools. The models use data for 1999. Available data on school characteristics is used explain differences in the API scores across schools as a function of their different attributes. This approach, called a level or nominal analysis, is the approach most often used to assess the impacts of new education programs. The general idea is that if a program is successful, it should show materially higher test scores than the comparison program. It is included here specifically so that its shortcomings can be illustrated.

Annual API Change–All Schools.

This model used the same variables as the level analysis but the dependent variable was configured to reflect changes in scores instead of level scores. The annual API growth for the years 2000 - 2002 is examined for the entire population of elementary, middle and high schools in California. The sample of schools changes from year to year as schools open or close. The purpose of this view is to study how the charter school influence changes over time. One possibility is that charter schools perform better over time. Another is that a lifecycle exists for charter start-ups in such a way that API scores for new cohorts of charters are different than those of experienced charters.

Longitudinal API Change–All Schools.

This analysis looks at a longer period of change between the 1999 and 2001 API scores for a constant sample of schools. A total of 6770 schools in California had scores for both years; their score changes range from -111 to 274. Restricting the sample to those schools that had at least three years of experience eliminates the churn that is captured in the preceding analysis. This analysis was run first without and then with a factor for the size of school, since this population is the most appropriate for gauging the role that school size plays in the degree of learning that occurs for students.

Longitudinal Analysis–Competitor Schools.

This analysis restricts the sample of comparison schools even further. The comparison group consists only of those schools that operate in districts that have charters operating there. This view considers the performance of charters relative to the specific schools that provide them students, and represents the minimum competitive standard that charters must best.

Model Results

The estimated models present the opportunity to examine the way each of the factors affects performance holding all other factors constant. The models help put charter schools on an even footing with traditional schools by factoring out differences in the characteristics of students and their families and school resources. The full results are included in the appendices. In the full tables, factor weights that appear in bold are statistically significant at the $p>.05$ level. Here, the results are given in summary fashion.

Level Analysis.

The profile comparisons showed that API scores are lower for charter schools than for the average traditional school in every grade level. As shown in Appendix A, the level models explain the performance of schools in terms of the mix of students they enroll and the resources they bring to bear to teaching. As well, the model tries to gauge the effectiveness of charter schools. If the model results are taken at face value, it would appear that elementary and high school provide inferior education compared to tradition schools. That inference, however, would be wrong.

Since the API was new in 1999, the model for that year cannot control for prior school performance. Consequently, it is not possible in this model to ascertain how much of the weight attributed to charter schools comes from current performance and how much is due to the academic background of the particular draw of students. The distinction is critically important. Charter schools are being compared in this model to the "average" school in the state – yet charter schools generally target a very atypical segment of the student population. If charters attract students who are committed to a better education than they have received to date, then it would stand to reason that the initial educational endowments of those students would be lower than for the state traditional school average. The level analysis cannot distinguish these selection effects from the impact a school has on the students it serves. For this reason, a more sophisticated approach is needed.

The model also reveals little about the relationship of teachers to schools. The models show that the proportion of fully credentialed teachers positively and significantly affects API scores. But interpreting the results is problematic. Since the 1999 model is a snapshot at one point in time, it reflects the distribution pattern in place at that moment. Across almost all the models, higher proportions of fully certified teachers are found in schools with higher API scores. The opposite is observed for emergency credentialed teachers: higher concentrations are found in lower performing schools in most of the models. It is important to note that the models cannot account for dynamic trends that may account for the observed pattern. When examining teacher effects, this limitation is important: these results cannot tell if teachers gravitate to schools where students perform better or whether they improve the performance of the students they have. The associations tell us something about the way teachers sort themselves across schools, but not whether they contribute significantly to learning over time. We will return to that more important question in the analysis of score changes below.

Annual API Change Models–All Schools.

The preceding section explained how factors largely outside a school's control affect the API scores that a school receives at any one point in time. A more important question is what change in achievement a school can produce given the student and teacher talent it has. Progress models explain the factors that contribute to the gains or losses in API scores that a school experiences over time. By incorporating prior achievement as a variable, the models are self-weighted, capturing both selection and performance effects, so the focus can shift to the change a school creates beyond its own starting point. To examine this question, the analysis created a measure of change in school performance by including its prior year score. Separate models were analyzed for 2000, 2001 and 2002. The results are presented in Appendix B.

It may seem confusing initially to examine each year separately, but as Graphic 1 displayed earlier, large numbers of charter schools join the ranks each year. Annual models let us see if charter schools as a group are changing over time. The weight on charter schools in each year reflects the addition of each prior cohort of charters.[x] So in each annual model we are looking at the current pool of charters, but the changing weight from year to year is partly a function of the addition of new charters to the mix. Two

noteworthy finding emerge from these results. First, once prior achievement is controlled (i.e. the selection effect is removed), most of the models show no statistically different performance between charter schools and traditional schools. The only times the charter school coefficient becomes significant, the impact is positive. Among high schools in 2001 and among middle schools in 2002, charters averaged higher API scores than their traditional counterparts.

The second finding of interest is that the impact of charter schools vacillates from year to year in each school type. This result reflects the addition of each new wave of charters. Even with the enhancements over the level models, these models cannot distinguish the impact of experience on older charters from the impact of new charters coming on line. Regardless, the finding of "no statistically different performance" should not be dismissed lightly. It is notable that the group of charters, weighted heavily by start-ups, is able to perform at the same level as established schools after such a short period of time.

The swings also illustrate how different analyses of charter schools found in the literature could yield such different results, driven purely by which time period is used. Such a demonstration signals the need for caution in comparing evidence on charter schools across different studies.

The models are not as clear about the individual contributions of some of the other factors. As a group, the variables for the percentage of minority students in the school, the percentage of students eligible for subsidized lunch, the percentage of students who are English language learners and the percentage of students with a parent who did not complete high school are so highly correlated that it is difficult to get precise and stable estimates of their individual contributions to API gains. As a set of variables, however, they account for a substantial weight in explaining API scores. Since their role here is to help isolate the effects of school-controlled factors, they are retained as a group, even if little can be said about how they perform independently.

Longitudinal API Change–All Schools.

Limiting the focus to schools that have three years of API scores offers a better opportunity to see the results of school effort given existing student and teacher resources. To the extent that the students in a given school are equivalent over time, changes in API scores reveal how schools are able to create learning in their students regardless of their starting point. The full results appear in Appendix B.

This analysis studied the full set of California elementary, middle and high schools that recorded API scores in 1999, 2000 and 2001. Compared on an equal basis to the full population of traditional schools, elementary and middle school charters were found to perform no differently in creating learning gains over time. Thus the difference in overall progress between traditional middle schools and charters stems from differences in the populations being served and the segment of the performance distribution in which charters operate. Against all traditional high schools, however, charters showed

significantly more positive gains – about 15 API points over a two-year span. This finding was significant at p>.05.

The models also provided deeper insight into the effect of teacher qualifications on student learning. Recall that Fuller et al. reported that charter schools differ from each other in their proportions of teachers with full teaching certification. That finding raises two obvious questions: how do these patterns compare with traditional schools and what difference do these variations have on school achievement? A simple t-test on the proportion of fully credentialed teachers reveals that for every year studied, charter schools have lower proportions of fully credentialed teachers, a finding that is significant at the p>.05 level.

When the model analyzed all elementary, middle or high schools in the state, the proportion of fully credentialed teachers in a school was found to be positively related to learning for elementary and high schools, both at the p>.05 level of significance. However, the magnitude of influence was small. A ten percent increase in the proportion of fully credentialed teachers produced a one-point shift in API gains for elementary schools and a 2.5 point gain in API change for high schools. No effect was shown for the roughly 1000 middle schools that were studied.

These progress models also tested the effect of school size on changes in student performance. Recent attention by policy makers on the potential benefits of enrollment in smaller schools yields the opportunity to test the proposition under the same rigorous controls as for charter schools. The point is relevant for the charter analysis as well, since the profiles revealed that charters had significantly smaller enrollments than traditional schools. For this analysis, the appropriate comparison group is the full population of elementary, middle and high schools. As shown in Appendix C, the results support the value of smaller schools. For each type of school, an inverse and significant relationship was found between size and progress: the smaller the school the greater the progress, all other factors being equal.

Longitudinal Analysis–Competitor Schools.

The fourth analysis examined the performance of charter schools compared to the local schools in the districts where they are located. The full results appear in Appendix D. The findings paralleled the results from the larger sample of schools. Elementary charters and middle school charters produced progress in their students that was equivalent to the local schools. The charter high schools outperformed their local traditional peers in a statistically positive manner.

The models examined the role other factors play in creating learning for students. Within this narrowest sample, student mobility rates were significant in explaining progress only in the elementary schools. There, schools with more mobile student populations had significantly lower gains, a finding that is consistent with the literature on mobility effects. In the remaining comparisons, the effect was not meaningful.

Fully credentialed teachers were found to meaningfully influence student progress only in elementary schools, but the effect was negative instead of the expected positive sign. It is difficult to explain this result given current information. One possible explanation is that even though fully credentialed, many teachers in these competition schools may be new to the field (a time of well documented variance in performance); the fact that difficult schools experience higher turnover suggests that these schools may be where new teachers get their start.

Discussion and Recommendations

The analytic results presented in the previous sections show that for charter schools have lower API scores on average than the average school in California, and this holds for elementary schools, middle schools and high schools. The gains in charter schools, however, outpace their traditional counterparts for elementary school and high school, and the difference is statistically significant for charter high schools. Thus, even though they enroll students who are farther behind in achievement, charter elementary and high school charters take their students farther each year than other traditional schools.

When these trends are examined across schools to determine the significant drivers of school achievement scores, the analysis shows that the differences are largely due to differences in student characteristics, parental levels of education and to a lesser degree the qualifications of teachers. Charter schools in elementary and middle grades produce about the same as their traditional peers, after these effects are held constant. At the high school level, charter schools produce significantly higher progress in their students.

In all levels, the pool of charters consists of many new schools experiencing all the disruption of starting a new enterprise. That they could achieve comparable or better results in spite of these challenges raises interesting questions about their longer run performance. While the numbers included in the analysis are still a meager fraction of all schools in the state, their early results suggest that the policy of charter schools in California is worth continuing.

ENDNOTES

[i] Hanushek, Eric, John F. Kain, and Steven G. Rivkin. "The Impact of Charter Schools on Academic Achievement ", December 2002 (pending publication: available at http://www.hanushek.net).

[ii] Fuller, Bruce, Marytza Gawlik, Emlei Kunoyama Gonzales, Sandra Park. "Charter Schools and Inequality: National Disparities in Funding, Teacher Quality and Student Support." Policy Analysis for California Education, Working Paper Series 03-2, April 2003.

[iii] Slovacek, Simeon P, Antony J. Kunnan and Hae-Jin Kim. "California Charter Schools Serving Low-SES Students: An Analysis of the Academic Performance Index." Program Evaluation and Research Collaborative. Los Angeles, CA: California State University, Los Angeles, March 2002.

[iv] The structure and utility of the Academic Performance Index are discussed in an earlier CREDO report: *The Future of the California Academic Performance Index*, CREDO, April 2002.

[v] Trends in Telephone Service, 2002. Industry Analysis Division, Federal Communications Commission, 2002. (Found at http://www.fcc.gov/Bureaus/Common_Carrier/Reports/FCC-State_Link/IAD/trend502.pdf)

[vi] Hanushek, Eric A., John F. Kain, and Steven G. Rivkin. "Disruption versus Tiebout Improvement: The Costs and Benefits of Switching Schools" forthcoming in *Journal of Public Economics*

[vii] The latest contribution to the debate was an attitudinal survey of students in large urban high schools. No attempt was made to associate their response or their enrollment to their academic performance. "Students: Small Schools Challenging" *Education Week* April 23, 2003.

[viii] Office of Vocational and Adult Education--Smaller Learning Communities Program Grant Announcement *Federal Register*: March 20, 2003 (Volume 68, Number 54), Pages 13690-13696.

[ix] Fletcher, Stephen H. and Margaret E. Raymond. *The Future of the California Academic Performance Index.* Report to the California Secretary for Education. CREDO, April 2002.

[x] The lag of one year is due to the fact that prior API scores are needed in order for a school to be included in the model. So for 2000 through 2002, the annual models gauge the impact of charters in their second year of operation.

Appendices

Appendix A

1999 API Scores - Level Analysis

Source	Elementary	Middle School	High School
Percent Tested	0.131	**1.699**	**1.230**
Percent Minority	**-0.421**	**-0.528**	**-0.605**
Student Mobility within School	-0.022	-0.163	**-0.315**
Percent Free/Reduced Price Lunch	**-2.519**	**-1.810**	**-0.270**
Percent English Learners	-0.142	0.029	**-0.704**
Percent of Students with a Parent Not a HS Graduate	**-1.091**	**-1.899**	0.085
Percent of Students with a Parent College Graduate or More	**0.551**	**0.945**	**3.879**
Percent Full Credentialed Teachers	**0.872**	**1.855**	**0.753**
Charter School	**-39.575**	**34.244**	**-31.333**
Last Year's API			
Constant	**710.060**	420.674	**346.592**
Number of Observations	2316	678	776
F	(9, 2306) = 906.95	F(9, 668) = 398.64	F(10, 765) = 1255.43
Prob > F	0	0	0
R-squared	0.7797	0.843	0.8758
Adj. R-squared	0.7789	0.8409	0.8743
Root MSE	61.695	48.86	38.614

Note: Values in **Bold** Face are significant at p> .05.

Appendix B

Annual API Change Models -- All Schools **Elementary**

Source	API 2000	API 2001	API 2002
Percent Tested	**0.354**	0.161	**-25.127**
Percent Minority	0.018	**-0.084**	**0.128**
Student Mobility within School	**-0.103**	**-0.163**	**-0.330**
Percent Free/Reduced Price Lunch	**-0.280**	**-0.244**	**-0.103**
Percent English Learners	**-0.113**	0.055	-0.330
Percent of Students with a Parent Not a HS Graduate	**-0.135**	-0.022	**-0.089**
Percent of Students with a Parent College Graduate or More	**-0.043**	**0.160**	**0.454**
Percent Full Credentialed Teachers	**0.217**	**-0.103**	**-0.085**
Charter School	2.841	-3.827	-3.066
Last Year's API	**0.848**	**0.793**	**0.763**
Constant	**102.550**	**166.182**	175.367
Number of Observations	4534	4775	4862
F	F(10, 4523) = 10183.33	F(10, 4523) = 10183.33	F(10, 4896) = 9745
Prob > F	0	0	0
R-squared	0.9575	0.9524	0.9471
Adj. R-squared	0.9574	0.9523	0.947
Root MSE	27.055	25.454	23.756

Note: Values in **Bold** Face are significant at p> .05.

Appendix B (Continued)

Annual API Change Models -- All Schools

Middle Schools

Source	API 2000	API 2001	API 2002
Percent Tested	0.621	**1.797**	16.917
Percent Minority	-0.060	**-0.187**	0.060
Student Mobility within School	0.010	-0.044	-0.078
Percent Free/Reduced Price Lunch	**-0.319**	-0.030	**-0.119**
Percent English Learners	-0.023	0.125	0.050
Percent of Students with a Parent Not a HS Graduate	-0.015	-0.075	-0.036
Percent of Students with a Parent College Graduate or More	**0.124**	0.058	**0.507**
Percent Full Credentialed Teachers	**0.313**	-0.045	-0.052
Charter School	-7.737	-0.833	**10.115**
Last Year's API	**0.860**	**0.868**	**0.792**
Constant	35.820	-64.915	130.904
Number of Observations	1094	1105	1127
F	F(10, 1083) = 363.43	F(10, 1094) = 1356.36	F(10,1117) = 4106
Prob > F	0	0	0
R-squared	0.9688	0.9684	0.9700
Adj. R-squared	0.9685	0.9681	0.9698
Root MSE	22.041	20.549	18.230

Note: Values in **Bold** Face are significant at p> .05.

Appendix B (Continued)

Annual API Change Models -- All Schools

High Schools

Source	API 2000	API 2001	API 2002
Percent Tested	**0.864**	**1.074**	-7.36
Percent Minority	**-0.138**	**-0.095**	**0.2593**
Student Mobility within School	**0.109**	-0.102	-0.020
Percent Free/Reduced Price Lunch	0.020	-0.086	**0.118**
Percent English Learners	-0.147	-0.121	-0.021
Percent of Students with a Parent Not a HS Graduate	0.071	0.129	**-0.346**
Percent of Students with a Parent College Graduate or More	**0.572**	**0.383**	**0.381**
Percent Full Credentialed Teachers	**0.226**	**0.177**	-0.028
Charter School	-3.012	**14.459**	-0.373
Last Year's API	**0.827**	**0.822**	**0.842**
Constant	3.701	-9.500	**79.874**
Number of Observations	851	902	878
F	F(10, 840) = 1138.73	F(10, 891) = 1109.22	F(10, 868) = 1638.28
Prob > F	0	0	0
R-squared	0.9622	0.9595	0.9444
Adj. R-squared	0.9618	0.959	0.9438
Root MSE	20.829	21.001	21.635

Note: Values in **Bold** Face are significant at p> .05.

Appendix C

Longitudinal Analysis - All Schools

Source	Elementary Change 1999 - 2001	Middle School Change 1999 - 2001	High School Change 1999 - 2001
Average Percent Minority	**-0.067**	**-0.169**	**-0.115**
Average Percent Mobility	-0.053	-0.067	-0.065
Percent of Students with a Parent Not a HS Graduate	**-0.970**	-0.120	0.067
Percent of Students with a Parent College Graduate or More	**0.102**	0.128	**0.417**
Percent Free/Reduced Price Lunch	**-0.378**	**-0.159**	-0.037
Last Year's API	**-0.290**	**-0.208**	**-0.188**
Percent Full Credentialed Teachers	0.078	0.116	**0.243**
Charter School	0.462	-14.610	**14.992**
School Size	**-0.009**	**-0.005**	**-0.003**
Constant	**262.216**	**176.740**	**108.898**
Number of Observations	4495	1080	836
F	F(9, 4485) = 326.26	F(9, 1070) = 38.86	F(9, 826) = 20.28
Prob > F	0	0	0
R-squared	0.3957	0.2463	0.181
Adj. R-squared	0.3945	0.24	0.1721
Root MSE	30.126	25.564	23.33

Note: Values in **Bold** Face are significant at p> .05.

Appendix D

Longitudinal Analysis - Competition Schools

Source	Elementary Change 1999 -2001	Middle School Change 1999-2001	High School Change 1999-2001
Average Percent Minority	**-0.177**	**-0.432**	**-0.185**
Average Percent Mobility	**-0.222**	0.008	0.021
Percent of Students with a Parent Not a HS Graduate	-0.110	0.065	-0.180
Percent of Students with a Parent College Graduate or More	0.003	0.277	0.298
Percent Free/Reduced Price Lunch	**-0.193**	-0.043	**0.194**
Last Year's API	**-0.242**	**-0.194**	**-0.132**
Percent Full Credentialed Teachers	**-0.191**	0.064	0.056
Charter School	-0.299	-4.834	**13.691**
Constant	**254.332**	162.110	87.324
Number of Observations	1578	356	843
F	F(8,1569) = 113.36	F(8, 347) = 9.68	F(8, 326) = 7.48
Prob > F	0	0	0
R-squared	0.3663	0.1824	0.1551
Adj. R-squared	0.3631	0.1636	0.1343
Root MSE	31.777	25.998	22.50

Note: Values in **Bold** Face are significant at p> .05.