A Further Examination of Student Progress in Charter Schools
Using the California API

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1. Introduction and Summary

   In their March 2002 report "California Charter Schools Serving Low-SES
Students: An Analysis of the Academic Performance Index" Simeon P.
Slovacek, Antony J. Kunnan, and Hae-Jin Kim (hereafter SKK) raise and
pursue an important issue: in their words to "compare student achievement
between California charter schools and California non-charter schools while
taking students' socioeconomic status ("SES") into consideration" (SKK,
p.1). SKK deserve commendation for attempting a longitudinal analysis
using three years of API data. However, mistakes in the identification of
schools and in the assembly of school data, plus flaws in their data
analysis approaches, render the SKK conclusions incorrect. Even if the SKK
data and data analyses had been sound, the strong conclusions expressed
in their report (and also in the press coverage of the report) were
unwarranted.

To start off, especially recognizing that different readers will have
different appetites for details, I'll present some bottom-line summaries of
results. Further description and justification for these numbers are
developed at length in the body of the report.

	Improvement of all Students	
	Charter Students	Non-charter students
1999 API	597.28	621.13
2000 API	626.7	649.13
2001 API	633.98	661.89
'99-01 improvement	36.7	40.76

	Improvement of Socioeconomically Disadvantaged (SD) Students	
	Charter Students	Non-charter students
1999 API	485.02	503.56
2000 API	517.36	538.31
2001 API	533.95	557.23
'99-01 improvement	48.92	53.67

	Improvement of Socioeconomically Disadvantaged (SD) Students in High SD Schools	
	Charter Students	Non-charter students
1999 API	457.77	482.48
2000 API	493.68	517.92
2001 API	511.14	540.28
'99-01 improvement	53.37	57.81

These summary results indicate that the improvement of students in non-charter California schools exceeds the improvement of students in California charter schools by about 4 points. An appropriate interpretation of a 4 API point difference is: every other student getting an additional item correct on each Stanford 9 test (refer to the original "Interpretive Notes" report, cited below). Thus, in educational terms 4 API points is not that large an amount. Unfortunately, SKK created headlines out of differences smaller than 4 points (sometimes 2 points), and although one wants to be careful not to make a fuss about these rather small differences, it is also important to counter the false conclusions put forth in SKK. Even though I'm writing this report while watching the Kentucky Derby, my inclination is not to focus on the "horse race" aspects of the charter vs non-charter comparisons. However the horse race is what SKK feature.

The body of this report contains three main sections. Section 2 "Repairing the SKK Data Set" describes the necessary corrections to the SKK data before the analyses can be conducted. Section 3, "Results from Improved Analyses," describes aggregate student progress by grade-level and subgroups. Section 4, "Reconsidering the SKK Analyses and Results", presents the results of a corrected version of the SKK analyses, and describes the flaws in the SKK analysis strategy that motivated the further analyses in Section 3. The final section, Discussion, contains a point-by-point refutation for the SKK "Summary of Findings" and a recapitulation of the results from the preferred analyses.

API Resources
Previously, I've released on the CDE web-site a series of data analysis reports describing the properties of the API and the progress of California schools. Some portions of those reports are relevant to the topics in SKK and this rebuttal. These reports are located at the page:
    http://www.cde.ca.gov/psaa/apiresearch.htm
Rogosa, D.R. Interpretive Notes for the Academic Performance Index. California Department of Education, November 2000.
Rogosa, D.R. Year 2000 Update: Interpretive Notes for the Academic Performance Index. California Department of Education, October 2001.
Rogosa, D.R. Year 2001 Growth Update: Interpretive Notes for the Academic Performance Index. California Department of Education, December 2001.

SKK report
"California Charter Schools Serving Low-SES Students: An Analysis of the Academic Performance Index" Simeon P. Slovacek, Antony J. Kunnan, and Hae-Jin Kim. March 2002. SKK report available at:
http://www.calstatela.edu/academic/ccoe/c_perc/rpt1.pdf

2. Repairing the SKK Data Set

As a statistician (and most definitely not an expert on Charter schools) my motivation for looking closely at the SKK analysis was to formulate and illustrate some improved strategies for answering the interesting empirical questions posed by SKK. I have no bias for trying to overturn the SKK conclusions; instead I was looking to shore up the analysis. To my surprise a main methodological lesson here is the most basic: the primacy of scrutiny of the quality and consistency of the data set (perhaps bordering on obsessive).

A. Charter School Data

The starting point is the list of 93 California charter schools supplied by SKK upon request (and SKK should be commended for their cooperation); ideally, such critical information would be included in the report. The Housecleaning Notes on the following page details the deletions and changes that needed to be made to the SKK data set. Readers who found the SKK results credible should go through these Housecleaning Notes. The careful (but perhaps imperfect) scrutiny of this data led to deletion of 5 schools, plus assorted corrections to both the API and demographic data of the surviving 88 charter schools from the SKK roster (SKK88).

In addition, 5 California charter schools having API data for the 1999-2001 period were identified (and vetted with CDE). These 5 schools are:

37683386061956   San Diego City Unified, Memorial Junior High
38684786040935   San Franciso Unified, Edison Charter Academy
19647336019939   Los Angeles Unified, Westwood Elementary
37683386039457   San Diego City Unified, Darnall E-Campus (Elem Char)
37681063731023   Escondido Union High, Escondido Charter High

Thus the complete set of charter schools for the analyses is the corrected SKK88 plus these 5 schools. The listing of the 93 CDS codes plus school-type indicators is given in the Appendix.

B. Non-Charter School Data

Start with the set of 7075 California Schools having some API data in the 1999-2001 period. From the CDE California School Directory (located at www.cde.ca.gov/schooldir) obtain (in March 2002) a list of CDS codes for 372 active charter schools plus 21 charter schools listed as merged/closed. Remove these 393 CDS codes from the set of 7075 California Schools and select from the remaining schools those having API scores for the 1999-2001 period. This process produces a set of 6592 non-charter schools having API data in both 1999 and 2001.

C. Designation of High SD (Socioeconomically Disadvantaged) Schools.

In California's accountability program a student is classified as Socioeconomically Disadvantaged (SD) if either:
1) Neither of the pupil's parents has received a high school diploma OR
2) The pupil participates in the free or reduced price lunch program.

The High SD subset of schools is composed of schools having at least 50%
of students designated as SD in at least 2 years in the 1999-2001 period.
As seen from Housecleaning Notes, a multiple year requirement is helpful
in avoiding the effects of data errors or anomalies. SKK use a portion
of the SD designation, participation in free or reduced price lunch
program, at single point in time, 2001, to obtain their low-SES schools.
The Housecleaning Notes also include the corrections to this "Meals"
variable that affect SKK designations into their subset of low-SES schools.

Housecleaning Notes

1. delete Soledad Enrichment Action (CDS 19101991996008) because the school
   has no 2001 data. As Soledad is a very low scoring school (API_99 = 297)
   inclusion in the 1999 but not 2001 mean-of-school-means distorts the
   overall comparison of charter improvement by about 3 points.

2. delete Elk Grove Charter (CDS 34673146112254) as no 1999 data available.
   In the SKK report 1999 data actually was taken from a different school--
   Elk Grove Elementary (CDS 34673146033047) and then combined with 2000
   and 2001 data from Elk Grove Charter to produce the very odd 3-year
   score listing: 745 531 546. (Elk Grove Elementary CDS 34673146033047 had
   year 2000 and 2001 scores 806, 829.)

3. delete Mare Island Technology Academy (CDS 48705816116255 grades 6-8).
   Scores used by SKK actually are data from Mare Island Elementary
   (CDS 48705816051510 grades 2-5)

4. delete New Hope Charter (CDS 39686193930435) which does not have 1999
   data. SKK use 1999 score from New Hope Elementary (CDS 39686196042428)
   combined with 2000 and 2001 scores from New Hope Charter.
   New Hope Elementary has scores (573 564 574); New Hope Charter has
   2000 and 2001 scores (666 662).

5. correct the 1999 API score for Westside Elementary (Char)
   (CDS 34674056112643). Transcription error for 1999 score in SKK; correct
   1999 score is 748. SKK use a 1999 score of 648 which is the 1999 score
   for Westside Elementary (CDS 34674056033633, not charter).

6. correct the demographic "Meals" designation for Charter Learning
   (CDS 41690216112213). Charter Learning has API above 800 all three
   years, with over 2/3 parents listed as college grads, has 80% of
   students white and has by CDE reports percent Meals equal 0 in 1999
   and 2000. Because the CDE report did have percent Meals 99 for 2001,
   SKK classified the school as disadvantaged. These facts appeared so
   incongruous to me that I asked CDE to check the demographic data and
   subsequently the school reported percent Meals is actually 1, not 99.
   Thus this school should not be included in the disadvantaged collection.
   This sort of problem argues for using multiple years of data for any
   labeling of schools on demographics.

7. correct the demographic "Meals" designation Edison-McNair Academy
   in East Palo Alto (CDS 41689996044333). McNair Meals was 100% in year
   2000 and 82% in 1999 but CDE database reported only 9% in 2001, which is
   the value used by SKK in designating this school as non-disadvantaged.
   Followup from CDE indicated that the Meals measure should be changed
   from 9% to 75% in '01; thus Edison-McNair Academy is properly included
   in the disadvantaged grouping. Another example of the importance of
   using multiple years for designating/classifying schools.

8. delete Hickman Elementary (CDS 50711006052559). For 2001 API growth
   reporting this school has flag 11 (significant demographic change) and
   thus no official API score. Therefore I chose to delete it from the
   analysis. The three years of API scores-- 654 720 695-- used by SKK
   are numerically correct.

9. Year 2000 data is missing in four of the SKK charter schools. SKK, in
   reporting year 2000 mean-of-school-means, imputed the missing data by
   filling in the 1999 scores instead of simply treating those scores as
   missing. As year 2000 means are primarily used only for display in SKK
   this anomaly in the presentation is of cosmetic import. My tables treat
   missing as missing.

3. Results from Improved Analyses: Description of Student Improvement in Charter and non-Charter Schools

The main results of the analyses are displayed in Exhibits 1-4 and
Figure 1. Each Exhibit displays results for different groups of students:
  Exhibit 1:
  all students (in 93 charter schools and 6592 non-charter schools)
  Exhibit 2:
  Socioeconomically Disadvantaged (SD) students (in 93 charter schools
     and 6592 non-charter schools)
  Exhibit 3:
  Socioeconomically Disadvantaged (SD) students in the subset of High SD
     schools (41 charter schools and 3189 non-charter schools)
  Exhibit 4:
  all students in the subset of High SD schools (41 charter schools and
               3189 non-charter schools)
As noted before, a student is classified as SD by CDE if neither of the
pupil's parents has received a high school diploma or the pupil
participates in the free-or-reduced-price lunch program. In this report
a school is classified as High SD if at least half of it's students are SD
in at least 2 years of the 1999-2001 period.

Exhibits 1-3 reflect a logical progression of conditioning: start with
all students in Exhibit 1, then refine to SD students in Exhibit 2,
then refine further to SD students in the subset of schools that are
classified as High SD in Exhibit 3. Exhibit 4 provides only an indirect
look at the progress of low-SES students, as High SD schools may contain
up to 50% non-disadvantaged students. Exhibit 4 is included because it
corresponds to the SES breakdown attempted by in SKK.

Each Exhibit contains 3 tables. The bottom table "Complete Grade-by-Grade
Display" displays an API score at each grade level and at each year for
students in charter and non-charter schools. Also, the right-hand columns
show the number of students at each grade level for each year. For example,
the "Complete Grade-by-Grade Display" in Exhibit 1 shows a Charter Student
Grade 2 1999 API score of 585 (computed using the data from the 5319 Grade
2 charter school students as one large school). The top table
"Grade-by-Grade Improvement" is derived from the "Complete Grade-by-Grade
Display" by taking the difference between the 2001 and 1999 API scores.
The middle table "Create One Large School Table" is my best attempt at
summary. The grade-by-grade displays are aggregated to the stated grade
interval: e.g., all students with grades 2-11, or some version of
Elementary School students using grade intervals of 2-6 or 2-8.

Why display grade-by-grade results or collections of grades (as in the
Create One Large School tables)? Two interrelated reasons: (i) that charter
schools often have an unconventional grade span or distribution, and so
breaking out grade levels allows clearer comparisons with non-charter
schools; (ii) analyses in the Interpretive Notes series have shown much
larger API improvement for the lower grade levels (see Year 2000 Update
and Year 2001 Growth reports). The collections of grades (as in the Create
One Large School tables) are useful (even necessary) to smooth uneven
results in the Charter Schools over grade levels. But the grade-by-grade

numbers are interesting, especially if one is careful not to overinterpret results based on relatively small amounts of data. In particular, it's important to note that for the subset of charter schools classified as High SD (Exhibits 3 and 4) only 2 schools contribute grade 10 and 11 students (98% of grade 11 from one school), 3 schools contribute grade 9 students, and although 11 schools contribute grade 8 students nearly 90% of those grade 8 students are from three schools. Therefore, the combinations over grade levels in the Create One Large School tables are more useful summaries.

Summary of results, Exhibits 1-3.
Grade-by-Grade Improvement is strong in the lower grades, but for charter students improvement is uneven across upper grades in each of the breakdowns. The non-charter students show greater improvement in 7 of the 10 grades in each exhibit. The Create One Large School Comparisons in Exhibits 1 and 2 show greater improvement for non-Charter students than for Charter students in all configurations except for the grade 9-11 big school. In Exhibit 3, SD students in High SD schools, the grade 2-8 and grade 2-11 (all students) configurations show greater improvement for non-charter students by the 4-to-5 point margin seen in the other breakdowns.

Figure 1 attempts to provide some perspective by showing the considerable improvement over the 3 years by both charter and non-charter students, especially in comparison to the differential in improvement (the SKK horse race). The API scores for the three groups--All Students, SD Students, SD Students in High SD Schools--conform in descending order to the order of listing. And within each grouping of students, charter school students (in red) have lower scores than non-charter students (in black). A visual challenge in Figure 1 is produced because the scores for SD students in charter schools are nearly identical to SD students in High SD non-charter schools.

Comparing Cohorts.
Exhibits 1-4 provide comparisons of repeated cross sections (e.g. 3rd graders in 1999 compared with 3rd graders in 2001). It's also fun to augment those comparisons by tracing (rough) cohorts over time. Cohorts (and their sizes) can be traced by following diagonals in the Complete Grade-by-Grade Display at the bottom of each Exhibit. Table 1 organizes the grade-by-year results into cohort summaries. The upper half shows results for all students and the lower half for SD students. The "grade-by-grade cohort improvement" displays the difference between 2001 API and 1999 API scores for the cohort beginning in 1999 in the designated grade. For example, charter students in grade 2 in 1999 are in grade 4 in 2001, and the table value for all charter students of 46.5 for 1999 Grade 2 is obtained from Exhibit 1 as 631.5 - 585. As with Exhibits 1-4 the charter students show irregular improvement in the upper grades, and it's important to keep in mind that a small number of schools are contributing those students.

Perhaps of most use are the "create one large cohort" comparisons; these include students in grades 2-6 in 1999 and grades 4-8 in 2001. The improvement horse race yields the pattern of results seen previously. For all students, the charter cohort improvement of 41.7 is less than the non-charter improvement of 45.02, and for the SD students the charter cohort

improvement of 44.83 is less than non-charter improvement of 49.57. But as I cautioned previously, a 3 or 5 point differential is not that large (even though SKK made strong assertions based on smaller differentials).

Exhibit 1 All Students in Charter and Non-charter Schools

Grade-by-Grade 1999-2001 Improvement Table

Grade	Charter Students	Non-charter students
2	64.75	57.75
3	67.88	69.25
4	58.62	62.62
5	41.62	50.62
6	27.5	42.12
7	-2.38	33.5
8	-5.	25.62
9	19.75	23.38
10	32.75	14.12
11	14.	12.88

Create One Large School Table

Grades Included		1999 API	2001 API	'99-01 improvement
2-6	Charter Students	587.92	641.28	53.36
	Non-charter students	620.27	676.71	56.44
2-8	Charter Students	597.42	637.42	40.
	Non-charter students	622.41	671.52	49.11
9-11	Charter Students	596.63	618.93	22.3
	Non-charter students	617.32	634.48	17.16
2-11	Charter Students	597.28	633.98	36.7
	Non-charter students	621.13	661.89	40.76

Complete Grade-by-Grade Display

Charter Students: API Grade-by-Grade   Number of Students

Grade	API_99	API_2k	API_01	N_99	N_2k	N_01
2	585	645	649.75	5319	4788	5271
3	590.75	624.625	658.625	5482	5091	5198
4	572.875	612	631.5	5224	5250	5382
5	577.75	609.875	619.375	5065	4828	5207
6	621.5	641.75	649	3877	3876	4125
7	629.75	643.75	627.375	3850	3139	3891
8	627.375	642.125	622.375	3762	3194	3864
9	592.625	631.5	612.375	2655	2358	3041
10	575.5	584.875	608.25	2672	2365	2517
11	628.625	630.625	642.625	2098	1955	1976

Non-Charter Students: API Grade-by-Grade   Number of Students

Grade	API_99	API_2k	API_01	N_99	N_2k	N_01
2	627	673.25	684.75	390590	368007	381878
3	619.625	665.625	688.875	404587	381499	380280
4	606.125	646.25	668.75	385580	385589	388245
5	609.375	639	660	381846	370207	394822
6	640	666.375	682.125	367052	358948	367726
7	625.125	646.625	658.625	355534	349187	362952
8	631.125	650	656.75	363705	347953	355187
9	618.375	637.875	641.75	298473	321195	335108
10	594.125	605.125	608.25	320822	310990	318280
11	643.375	654.25	656.25	273481	269394	271594

Exhibit 2 SD Students in Charter and Non-charter Schools

Grade-by-Grade 1999-2001 Improvement Table

Grade	Charter Students	Non-charter students
2	81.38	73.5
3	74.88	85.69
4	74.69	77.62
5	57.12	62.06
6	30.5	51.
7	-1.12	40.75
8	-23.25	32.06
9	24.06	24.5
10	38.	13.5
11	18.62	12.62

Create One Large School Table

Grades Included		1999 API	2001 API	'99-01 improvement
2-6	Charter Students	479.12	545.14	66.02
	Non-charter students	506.14	576.43	70.3
2-8	Charter Students	484.92	537.17	52.25
	Non-charter students	505.73	567.94	62.21
9-11	Charter Students	485.69	512.38	26.69
	Non-charter students	494.4	512.57	18.17
2-11	Charter Students	485.02	533.95	48.92
	Non-charter students	503.56	557.23	53.67

Complete Grade-by-Grade Display

SD Charter Students: API Grade-by-Grade   Number of SD Students

Grade	API_99	API_2k	API_01	N_99	N_2k	N_01
2	480	546.875	561.375	2775	2817	3261
3	487.5	520.875	562.375	2813	3051	3015
4	454.563	501.5	529.25	2608	3138	3125
5	466.125	489.375	523.25	2532	2769	3068
6	520.25	535.5	550.75	1724	1972	2120
7	510.563	530.375	509.438	1341	1369	1810
8	519	517.625	495.75	1111	1210	1593
9	486.188	527.375	510.25	970	955	1367
10	458.625	473.563	496.625	787	719	800
11	523.25	519.875	541.875	554	538	526

SD Non-Charter Students: API Grade-by-Grade   Number of SD Students

Grade	API_99	API_2k	API_01	N_99	N_2k	N_01
2	521	574.25	594.5	191365	212006	225818
3	508.813	565.5	594.5	195846	218405	217706
4	487	534.25	564.625	183265	214564	219795
5	490.813	524.5	552.875	178866	200340	216382
6	523.75	552.875	574.75	163475	186470	190954
7	501.5	526.375	542.25	144698	170407	175821
8	507.438	529.5	539.5	138461	157050	161084
9	505.75	527.25	530.25	105026	132388	134546
10	462.813	474.5	476.313	100232	113797	113905
11	519.625	532.75	532.25	78228	89274	89002

Exhibit 3 SD Students in High SD Charter and Non-charter Schools

Grade-by-Grade 1999-2001 Improvement Table

Grade	Charter Students	Non-charter students
2	82.12	75.75
3	83.12	89.12
4	83.5	80.06
5	63.25	63.25
6	45.81	49.88
7	-5.12	40.25
8	-40.69	31.44
9	3.62	24.5
10	-0.56	14.94
11	-29.56	13.19

Create One Large School Table

Grades Included		1999 API	2001 API	'99-01 improvement
2-6	Charter Students	452.97	526.67	73.69
	Non-charter students	484.58	556.9	72.31
2-8	Charter Students	458.27	517.37	59.1
	Non-charter students	483.67	548.08	64.4
9-11	Charter Students	453.36	450.78	-2.58
	Non-charter students	475.5	494.25	18.75
2-11	Charter Students	457.77	511.14	53.37
	Non-charter students	482.48	540.28	57.81

Complete Grade-by-Grade Display
SD Charter Students in High SD schools

Grade	API_99	API_2k	API_01	N_99	N_2k	N_01
2	459.875	527.25	542	2355	2423	2795
3	463.625	505	546.75	2338	2630	2596
4	431.5	479.625	515	2151	2562	2643
5	439	474.188	502.25	2054	2272	2558
6	479.813	507.375	525.625	1257	1421	1612
7	482.125	501.375	477	934	855	1300
8	502.563	488.563	461.875	712	702	1098
9	459.938	463.875	463.563	637	585	854
10	413.875	428.125	413.313	418	415	389
11	494.125	465.875	464.563	302	308	265

SD Non-Charter Students in High SD schools

Grade	API_99	API_2k	API_01	N_99	N_2k	N_01
2	502.375	554.875	578.125	158764	174449	188239
3	488.125	545.375	577.25	162226	178742	178927
4	463.813	511.25	543.875	150265	174966	180185
5	469.25	502	532.5	146826	162233	176746
6	500.25	527.75	550.125	125908	141190	144723
7	476.375	498.688	516.625	102984	120236	125079
8	484.438	504.5	515.875	99355	111274	115709
9	484.625	505.75	509.125	62033	74248	76229
10	443.188	451.438	458.125	56681	62333	62930
11	504.438	515	517.625	43732	47811	48761

Exhibit 4 All Students in High SD Charter and Non-charter Schools

Grade-by-Grade 1999-2001 Improvement Table

Grade	Charter Students	Non-charter students
2	80.81	68.12
3	85.75	82.
4	79.69	74.
5	63.	57.5
6	31.	46.88
7	-17.69	38.12
8	-32.12	27.5
9	-9.19	24.69
10	-0.25	15.31
11	-27.44	11.88

Create One Large School Table

Grades Included		1999 API	2001 API	'99-01 improvement
2-6	Charter Students	478.97	549.3	70.33
	Non-charter students	521.17	587.26	66.09
2-8	Charter Students	486.91	540.28	53.36
	Non-charter students	520.77	579.07	58.31
9-11	Charter Students	459.87	449.83	-10.04
	Non-charter students	505.08	523.23	18.15
2-11	Charter Students	483.88	531.03	47.14
	Non-charter students	518.31	570.2	51.88

Complete Grade-by-Grade Display
Charter Students in High SD schools

Grade	API_99	API_2k	API_01	N_99	N_2k	N_01
2	478.688	548.625	559.5	3132	2860	3170
3	483.625	524.25	569.375	3127	3057	3044
4	456.688	503.75	536.375	2887	2996	3095
5	462.625	503.188	525.625	2794	2700	3033
6	527	548.75	558	2006	1995	2116
7	520.125	531.125	502.438	1507	1260	1721
8	531.875	530.875	499.75	1350	1191	1614
9	470.563	459.75	461.375	969	741	1031
10	413	421.375	412.75	637	606	562
11	497.875	464.375	470.438	513	462	434

Non-Charter Students in High SD schools

| Grade	API_99	API_2k	API_01	N_99	N_2k	N_01
2	536.75	586	604.875	226063	213110	226841
3	523.875	576.375	605.875	231727	218744	218728
4	501.75	546	575.75	216061	216739	221143
5	507.75	538.25	565.25	212194	204129	220055
6	536.75	563.75	583.625	186026	180892	185646
7	513.75	536.625	551.875	159056	159069	166561
8	525	543	552.5	161030	154269	160052
9	509.063	532	533.75	94763	100939	103900
10	474.813	483.25	490.125	90642	88329	89421
11	537.625	548	549.5	72725	70467	71079
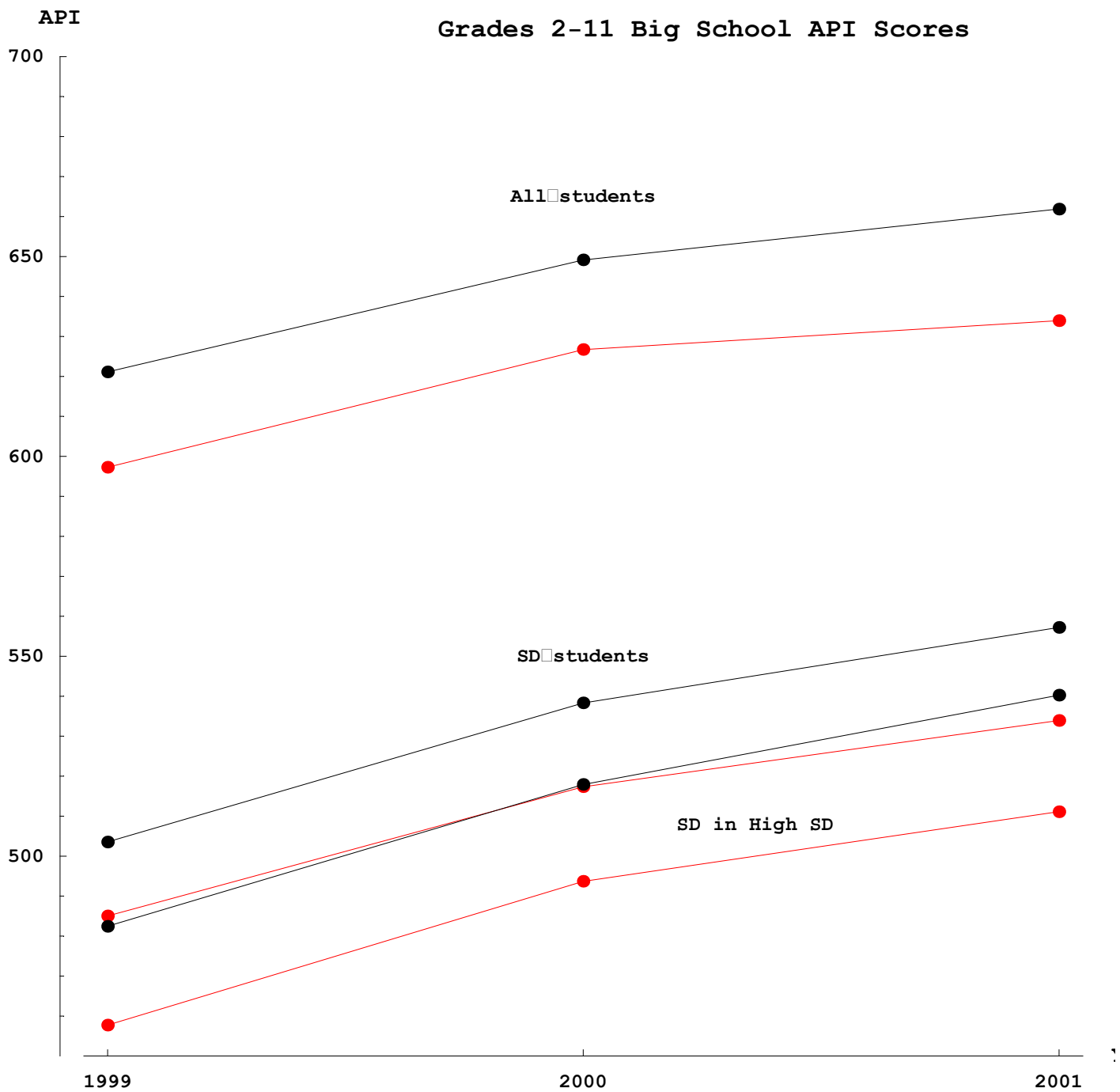
Figure 1. Charter (red) and non-Charter (black) API scores for All Students, SD Students, and SD Students in High SD Schools

Table 1: Cohort Summaries

Students from Exhibit 1 (all students)
Grade-by-Grade 1999-2001 Cohort Improvement Table

1999 Grade	Charter Students	Non-charter students
2	46.5	57.75
3	28.62	69.25
4	76.12	62.62
5	49.62	50.62
6	0.88	42.12
7	-17.38	33.5
8	-19.12	25.62
9	50.	23.38

Create One Large School Cohort, 1999 Grades 2-6

Year	Charter Students	Non-charter students
1999	587.92	620.27
2000	624.13	652.79
2001	629.62	665.29

Students from Exhibit 2 (SD students)
Grade-by-Grade 1999-2001 Cohort Improvement Table

1999 Grade	Charter Students	Non-charter students
2	49.25	73.5
3	35.75	85.69
4	96.19	77.62
5	43.31	62.06
6	-24.5	51.
7	-0.31	40.75
8	-22.38	32.06
9	55.69	24.5

Create One Large School Cohort, 1999 Grades 2-6

Year	Charter Students	Non-charter students
1999	479.12	506.14
2000	512.24	541.32
2001	523.95	555.71

4. Reconsidering the SKK Analyses and Results

In their Charts A and B and Tables 1 and 2 SKK present their results of
their analysis strategy:
for the entire listing of schools SKK find that improvement of charter
    schools is 2 points greater than the improvement for non-charters
    (53.4 vs 51.4 API points)
and for the low-SES subset of schools-- "Meals" in 2001 at least 50%--
    SKK find that improvement of charter schools is 2.8 points greater
    than the improvement for non-charters
    (67.0 vs 64.2 API points)

Why not accept the SKK results and assertions?
Remember that the results in the SKK report incorporate all the errors
in school identification and data values described in Housecleaning Notes.
In addition are the various deficiencies and distortions of the SKK
analysis strategy described in this section.

Table 2 displays corrected results for the SKK analysis strategy.
The SKK analysis strategy can be summarized as
1. Obtain three years of API scores for a list of charter schools.
1a. Compute the mean of the school scores at each of the three years
    (the "Mean-of-School-Means" for charter schools)
2. Obtain three years of API scores for a list of non-charter schools.
2a. Compute the mean of the school scores at each of the three years
    (the "Mean-of-School-Means" for non-charter schools)
3. Compare improvement of charter and non-charter schools by subtracting
    the 1999 mean-of-school-means from the year 2001 mean-of-school-means.

Construct a low-SES subset of charter and non-charter schools by selecting
those schools reporting "Meals" in 2001 at least 50%. The Meals variable
indicates the percentage of students in the schools participating in the
Free or Reduced Lunch Program (NSLP).

4. Repeat steps 1-3 for this low-SES subset of schools.

Table 2   SKK-style Mean-of-School-Means Tables

All Schools

	SKK88 API (n)	non-Charter API (n)	DRR93 API (n)
1999	610.3 (88)	631.17 (6592)	609.9 (93)
2000	643.2 (84)	665.1 (6515)	644.0 (88)
2001	661.6 (88)	681.07 (6592)	658.9 (93)
1999-2001 Increase in Mean-of-School-Means	51.3	49.9	49.0

Schools with Meals in 2001 at least 50%

	SKK88 API (n)	non-Charter API (n)	DRR93 API (n)
1999	493.6 (42)	530.67 (3131)	494.5 (45)
2000	537.6 (41)	570.50 (3070)	538.4 (43)
2001	560.3 (42)	592.40 (3131)	556.4 (45)
1999-2001 Increase in Mean-of-School-Means	66.70	61.73	61.90

Table 2 notes
n is number of non-missing schools
SKK88 is the corrected list of charter schools used by SKK
     deleting inappropriate data and correcting mistakes
DRR93 is our best charter list (the corrected SKK88 plus the 5
     additional charters subsequently identified)

The mean-of-school-means analysis for the complete set of charter schools is basically a draw for the corrected data--improvement for the non-Charter schools is within a point of the DRR93 set of charter schools.

Table 2 corrects the following problems with the SKK analysis and report.

1. Data errors etc for the Charter School data from Housecleaning Notes.

2. Identification of non-charter schools in 2001. For their 2001 non-Charter mean-of-school-means, SKK include a number of schools not included in the 1999 mean-of-school-means. Consistency would dictate that the requirements for the Charter schools of having data for the 1999-2001 period also be imposed to the non-charter group. The Table 2 mean-of-school-means includes only schools having data for the 1999-2001 period. This peculiar action by SKK, which results in about a 3 point inflation of their year 2001 non-charter mean-of-school means is "justified" by a footnote following their Table 1 which seems to indicate that SKK were unable to merge data files over the 3-year period, instead using piecewise 2-year links.

3. Exaggerated interpretation of small differences and distortions of "percent growth". SKK go further astray in reexpressing the charter vs non-charter improvement horse race in terms of "percent growth", computed as $100*(API\_01 - API\_99)/API\_99$. The SKK rationale appears to be that charter schools have a lower mean-of-school-means than non-charter. But, SKK misunderstand or overlook one of the most important features of California API data--that improvement is greatest for the lower-scoring schools. Refer to the Year 2000 or to Year 2001 Growth Interpretive Notes reports to see this pattern is ubiquitous. In part, this pattern is a (deliberate) result of the construction of the API index. Thus a lower-scoring collection of schools (chosen at random) would be expected to achieve larger improvement. Consequently the SKK percent growth further distorts (rather than improves) the comparison by moving the numbers in the wrong direction. (One cannot resist noting the exaggerated nature of SKK graphical displays, as in their Chart B; never has the difference between 11.9 and 13.1 loomed so large.)

But, and it is a big "but", my Table 2 still does not represent a good analysis, mainly because of the mean-of-school-means strategy and the inadequate school-level SES breakdown using Meals in 2001. Among the deficiencies not mended in Table 2:
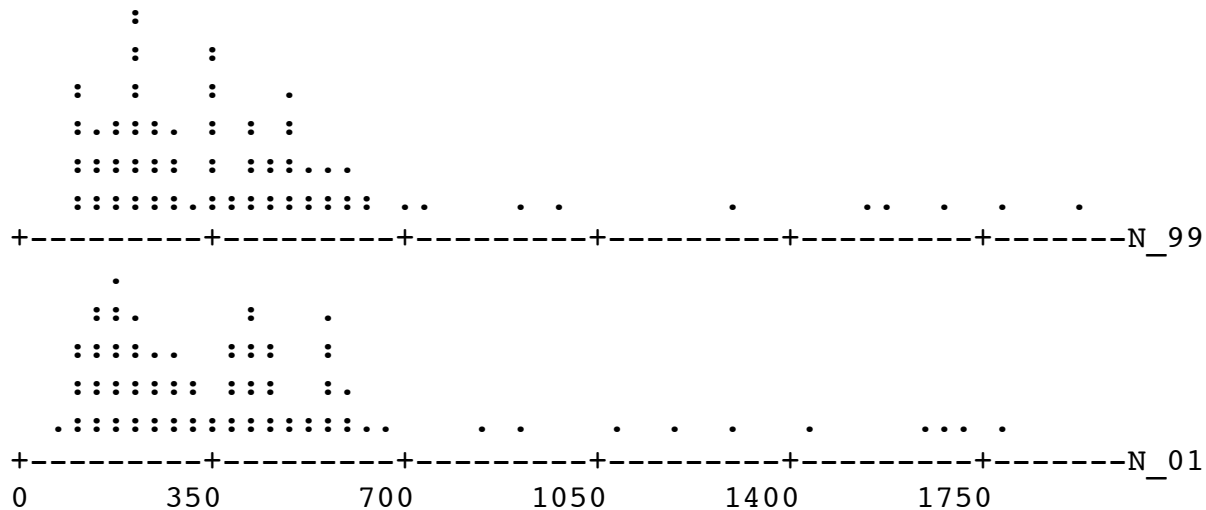
1. Differences in School Sizes.
In a mean-of-school-means analysis students in smaller schools contribute more to the result than students in larger schools. For the collection of Charter Schools, the displays of school size below indicates the range of school sizes are a factor of 20 or more. Consequently, one student in the smallest schools contributes as much to the mean-of-school-means result as a classroom of students in the largest schools.

```
-----------------------------------------------------------------
Descriptive Statistics: N_99, N_01 for 93 Charter Schools
   Variable    N    Median        Q1         Q3      Minimum      Maximum
   N_99        93    351.0      205.0      488.0       100.0      1920.0
   N_01        93    361.0      190.5      527.5        58.0      1799.0
-----------------------------------------------------------------
Dotplot: N_99, N_01 for 93 Charter Schools in DRR93
        :
        :    :
      :  :    :    .
      :.::.. : : :
      :::::: : ::::...
      ::::::.::::::::: ..     . .       .      .. .  .   .
   +---------+---------+---------+---------+---------+-------N_99

        .
      ::.        :    .
      ::::.. ::: :
      ::::::: ::: :.
     .::::::::::::::..   . .    . .  .   .      ... .
   +---------+---------+---------+---------+---------+-------N_01
   0       350       700      1050      1400      1750
-----------------------------------------------------------------
```

2. School type and grade level distribution.

A related distortion of results from using intact schools in the mean-of-
school-means analysis results from a larger API improvement for the lower
grade levels (see Interpretive Notes series Year 2000 Update and Year 2001
Growth reports). Thus a sample of schools with the lower grades over
represented will tend to show more improvement than a statewide census.
That's one reason to break student data down into grade levels as in done
in my Exhibits 1-4 or to compare equivalent collections of grade levels (as
in the Create One Large School tables). To illustrate that this concern is
relevant in these data, refer to the display below. For this collection of
Charter schools, their students are over-represented in the lower grades
and under- represented in the upper-grades relative to the (large) non-
Charter students.

| Grade | Proportion of Students at Each Grade Level | | | |
	Charter 1999	Charter 2001	Non-Charter 1999	Non-Charter 2001
2	0.133	0.130	0.110	0.107
3	0.137	0.128	0.114	0.107
4	0.131	0.133	0.109	0.109
5	0.127	0.129	0.108	0.111
6	0.097	0.101	0.104	0.103
7	0.096	0.096	0.100	0.102
8	0.094	0.095	0.103	0.010
9	0.066	0.075	0.084	0.094
10	0.067	0.062	0.091	0.089
11	0.052	0.049	0.077	0.076

This difference between the grade distributions will also affect a summary
such as my grade 2-11 big school, and this motivates the narrower
collections of grades, such as the grades 2-6 or grades 2-8 summaries shown

in Exhibits 1-3.

3. Inadequate conditioning on low-SES.
The attempt to look at low-SES students is commendable but the SKK strategy
is indirect at best. There is a certain futility of high-Meals subset of
schools. Specifically, in this "low-SES sample" lots of (relatively) high
SES students (up to 50%) are contributing to the school mean. Recognition
of this problem likely motivated the SKK attempt to further constrain the
school classification by moving the Meals cut-off to 75%, where SKK
basically run out of data. Two additional side issues: the need to use
multiple years for good classification into low-SES (clearly shown in the
Housecleaning Notes) and the drawback of only using part of the CDE SD
designation. But the main point is: if you want to learn about the
performance or improvement of low-SES students it is necessary, as is done
in Exhibits 2 and 3, to study the low-SES students (e.g., SD designated
students) directly.

                        5. Discussion

Over the past few years my mantra has been that the California testing
programs (i.e., STAR) and the consequent API reporting should be valued as
an information system, as opposed to the focus on the rewards programs
(GPA, AB1114). In that light I was pleased when I saw the press reports in
March on the SKK report, using the API data to address interesting
educational policy questions. However, with the use of these valuable data
comes an obligation to do the best job possible in data analysis.

Why do the results in Section 3 (e.g., Exhibits 1-3) contradict the
numerical results and assertions in SKK? Multiple reasons that can be
divided into two categories: the series of mistakes in the SKK data
detailed in the Housecleaning Notes, and poor choices in the strategies and
details of their mean-of-school-means data analysis discussed in Section 4.
Methodological lessons focus on why the SKK analysis strategy is not very
wise. But a primary methodological lesson is how important it is to be
careful about the data used. The "Response to SKK Summary Of Findings"
below reiterates the empirical findings and takes up additional issues
and assertions put forth by SKK.

The DRR93 list of Charter Schools represents the best I could do, sitting
here in my basement in Palo Alto, to identify charter schools over the
1999-2001 period. I put forth the list for scrutiny; any needed alteration
will be accommodated. With probability near 1, some improvement on this
data set is possible.

                  Response to SKK Summary Of Findings
    "The findings were as follows" (SKK, page ii):

1. "California charter schools are doing a better job of improving the
academic performance (as measured by API) of California's most at-risk
students, those who are low-income, than non-charter California public
schools."

    This lead conclusion is incorrect on so many levels that coherent
    enumeration is difficult. First and most important, the relevant
    empirical evidence refutes the SKK conclusion. Starting with Exhibit
    2--"SD Students in Charter and Non-charter Schools", whether the
    comparisons are made grade-by-grade or in collections of grades,
    SD students in non-charter schools show the greater improvement.
    For example, a cross-sectional comparison of Grades 2-6 indicates 4
    points greater improvement for SD students in non-charter schools;
    for all SD students (grades 2-11) SD students in non-charter schools
    show greater improvement by 3.4 API points. Furthermore, from Table 1,
    using (rough) cohorts of students starting in grades 2-6 in 1999, the
    SD students in non-charter schools show greater improvement by almost
    5 API points. More furthermore, the subset of SD students who reside
    in "High SD" schools (roughly 75% of SD students are in this subset)
    examined in Exhibit 3 show the same result--the SD students in High
    SD non-charter schools show greater improvement than the SD students
    in High SD charter schools by almost 5 API points.

The main methodological message in this context is that in order
to make assertions about the progress of SD students (as is done in
SKK #1) it's necessary to do an analysis of SD students. SKK only have
indirect evidence on SD students through their selection of all
students in high Meals schools. Plus the SKK analyses suffer from the
distortion of the mean-of-school-means data analysis and the flaws in
the SKK data set.

Thirdly, as indicated previously, it's important too keep in
perspective the educational (practical) significance of the observed
differences between charter and non-charter. I reiterate my cautions
about making too much of a fuss about a 4-point differential
(roughly equivalent to every other student obtaining one additional
item correct on each Stanford 9 test). But in order to counter the
SKK assertions, as in "charter schools are doing a better job", it's
necessary to shout a bit that the SKK horse race between charter and
non-charter is actually won by the non-charter schools.

2. "Student achievement (as measured by API) in California's low-income
charter schools is, on average, improving at a faster rate than in similar
non-charter schools."

This assertion (#2) differs from #1 above in referring to all students
(SD or non-SD) who attend a school classified by SKK as disadvantaged
(using the Meals variable in 2001). The analysis most closely
corresponding to this indirect SKK attempt to "adjust for SES" is
summarized in Exhibit 4. Exhibit 4 shows results for students in High
SD schools (at least half of students SD in two or more years). Overall
(students in grades 2-11), once again the result is that students in
High SD non-charter schools show greater improvement than the students
in High SD charter schools by a margin of almost 5 API points. However,
Exhibit 4 also shows stronger improvement for charter students in the
lower grades (an effect not seen with all students or with the SD
students in Exhibits 1 and 2).

This may be a good spot to try to establish some balance in the
discussion. As part of their Assertion #2 SKK comment that "It appears
that charter schools are doing an effective job of improving the
academic performance of low-income students." That statement is also
consistent with the empirical evidence presented here. In fact SKK, by
making a fuss about rather small differences in scores based on flawed
data and poor analyses, may well harm the image of charter schools, as
the reversal of their results may create an overreaction by interested
parties. Succinctly stated, don't confuse bad research with bad
schools.

3. "Charter schools are serving a greater concentration of low-income
students."

This is an interesting small descriptive item. The empirical evidence
is obtained from Exhibits 1 and 2--simply compute the proportion of SD
students in the charter and non-charter schools. Over grades 2-11 the

proportion of students in charter schools classified as SD is .511 and
the proportion of students in non-charter schools classified as SD is
.491. Not a large difference, amounting to approximately 800 students
out of the charter group of 40472 students in the 2001 data. Broken
down by grade, the proportion of SD students is:

```
-------------------------------------------
   Proportion SD Students
   Grade    Charter 2001      Non-Charter 2001
     2          0.619               0.591
     3          0.580               0.572
     4          0.581               0.566
     5          0.589               0.548
     6          0.514               0.519
     7          0.465               0.484
     8          0.412               0.454
     9          0.450               0.402
    10          0.318               0.358
    11          0.266               0.328

   -------------------------------------------
```

"Concentration" can be interpreted in various ways. and SKK offer
different empirical evidence, based on their flawed school-level data.
Actually, making the SKK-style comparison produces the opposite
result; with the corrected data a greater proportion of non-charter
schools (.484) are classified as High SD than charter schools (.441).

4. "Smaller schools tend to outperform larger schools in terms of student
achievement growth. In other words, size matters."

This Assertion #4 provides an opportunity to make a number of comments
about school size and API performance. In the "Year 2000 Update:
Interpretive Notes for the Academic Performance Index" Section 3A
carefully examines the supposed relation between school size and API
scores, using the Year 2000 API scores. (Here school size is the number
of students included in the API, which is less than total enrollment.)
Table 18 of that document gives descriptive statistics for school size
at each state decile. For example, California High Schools scoring in
the ninth decile (rather high) have median size 1083 whereas the High
Schools scoring in the second decile (rather low) have median size
1061. Elementary Schools scoring in the tenth decile (top) have median
size 348, whereas Elementary Schools scoring in the fourth decile have
median size 350. This Section 3A also presents the scatterplots--API
plotted against school size for each school type, Elementary, Middle,
and High. From those plots one wouldn't conclude a notable relationship
between school size and API. What can be seen in each plot is that a
few very large schools (10 or less) are very low scoring schools with
the remaining schools showing little dependence of API on school size.

So why do SKK make claims for a strong constant effect of school size?
The basic blunder--combining across school types--is not unique to
SKK. Another example of a poor analysis which received considerable
press attention was from the California Budget Project ("What do the
2000 API results tell us about California's schools?" CPB, March 2001).
The CBP assertion "school size increases API scores decrease" is
discussed in the Year 2000 Interpretive Notes. In California, Middle

Schools have about twice the number of API students as Elementary
Schools and High Schools have about three times the number as
Elementary Schools.   Also Elementary Schools have the highest scores
and High Schools the lowest. For reference the table below, excerpted
from "Year 2001 Growth Update: Interpretive Notes for the Academic
Performance Index", shows that for year 2001 (used by SKK) the median
score of Elementary Schools is 25 points higher than for Middle Schools
which in turn is 30 points higher than High Schools. But these score
differences are due to a number of factors such as grade level of
students, curricular match of the Stanford 9 tests etc, etc.

Median School API Scores 1999-2001

	Elementary	Middle	High School
API_99	631.75	633.25	620.375
API_2k	674.125	655.062	638.375
API_01	693.5	668.375	635.75

Combining school types will induce a (false) relation between API
scores and school size. In technical talk, size serves as a proxy for
school type (omitted variable) and distortions ensue. Moreover, the
use of the multiple regression coefficients by SKK to form their
assertions about school size is without merit; I believe that most
elementary statistics students are forcefully taught not to interpret
fit coefficients in this manner. One additional note: even though the
SKK Assertion #4 is phrased in terms of "student growth" all their
analyses and discussion appear to be in terms of the static year 2001
API score, so that's the focus here.

Also, it's useful to look at API and school size for the set of 93
charter schools; here we have 68 Elementary Schools, 11 Middle
Schools, 10 High Schools (plus 4 schools with a "small" designation).
The plot of API versus school size on the next page uses the RGB color
coding (Red = Elementary, Green = Middle, Blue = High). It's very hard
to discern the effect of school size claimed by SKK, especially when
school type is properly distinguished.

Bottom line is that size doesn't matter much at all, but it is easy to
fool a regression equation into pronouncing that size matters by
combining across school types.

5. "Socioeconomic status continues to influence student performance on
standardized tests."

This is perhaps the most vexing and unfortunate item in the entire SKK
report. SKK attempt to establish that charter schools do a better job
with SD students than non-charter schools; in reality, there is no
such evidence. Based on totally inappropriate interpretations of
school-level regression coefficients (p.8, especially the comparison
of coefficients on p.10) SKK assert (p.10): "the finding in this study
that charter schools are doing a better job of serving low-SES
students". Exhibit 2 shows that SD students are making (slightly)
larger improvement in non-charter schools. And Exhibit 3 confirms that
differential in favor of non-charter schools for SD students in the
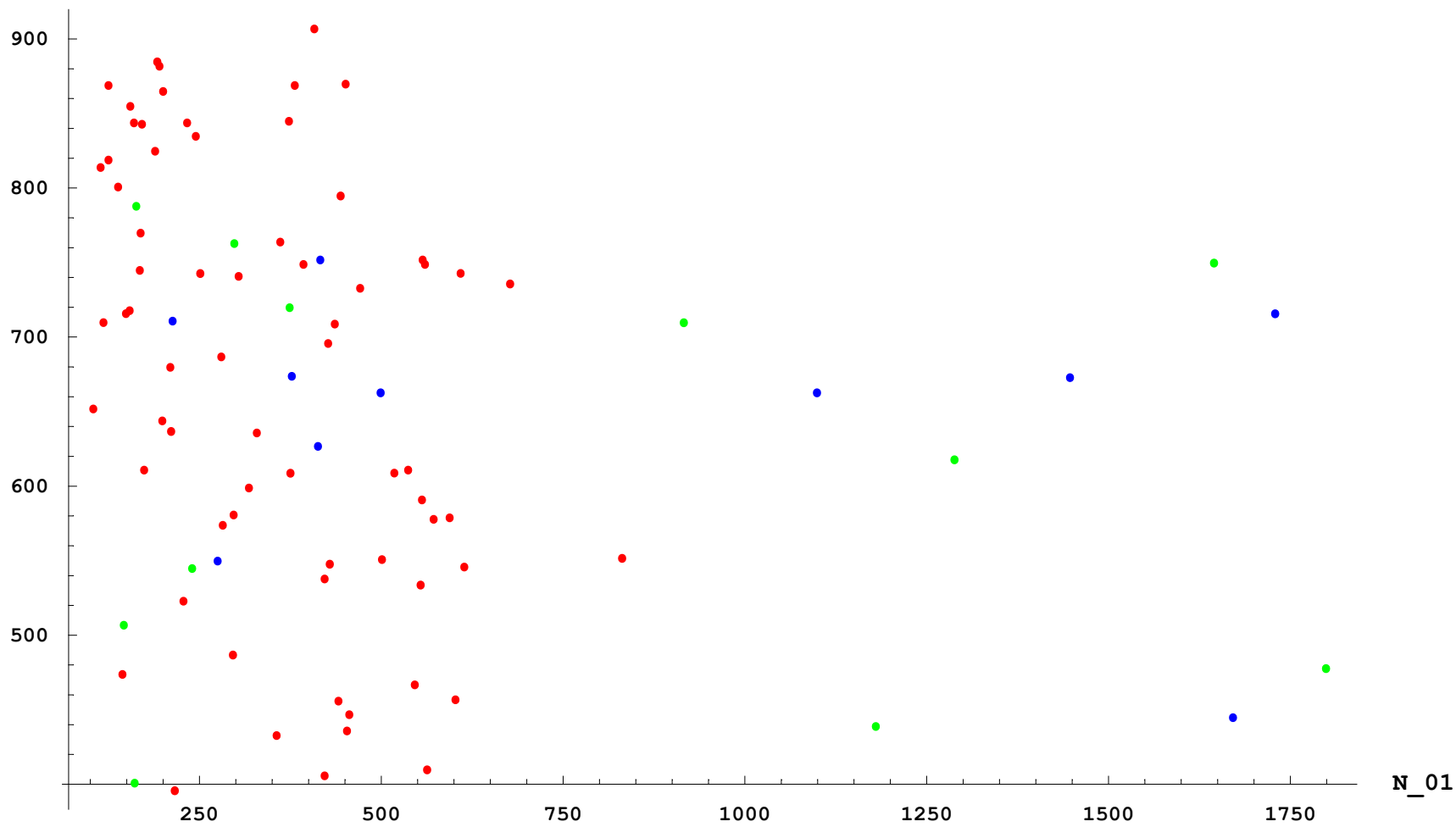subset of schools designated as High SD. Again, nothing here

Figure 2. Plot of API versus school size (Red = Elementary, Green = Middle, Blue = High)

indicates that charter schools are doing a poor job; please don't
confuse poor research with poor schools.

The relationship between demographic factors and student performance
is an important and controversial issue. Section 3 of the
"Interpretive Notes for the Academic Performance Index" and Section 3
of the "Year 2001 Growth Update: Interpretive Notes for the Academic
Performance Index" present data analyses for the API which demonstrate
that demographics are far from deterministic, and that "schools with
similar demographics have wide ranges of performance, even when
compared to the differences in performance between the most
demographically advantaged and disadvantaged schools" (p.43, Year 2001
Growth Update). Certainly, schools considered to be advantaged rarely
score poorly and schools considered to be disadvantaged very rarely
exceed the scores of the advantaged schools. Therefore, one can detect
a trend. But the important feature of the API data is the wide range
of scores for schools of similar demographics. And this feature is not
subtle. Visual inspection of the scatterplots of school API scores and
the SCI (the "School Characteristics Index", "a composite of the
school's demographic characteristics" computed by CDE) shown in the
"Interpretive Notes" reports will suffice. Also, for what it's worth,
the school-level correlation between API and SCI is essentially the
same for these charter schools as it is for the entire state.

To provide some quantification, consider the "Range of Similar Schools
API" for year 2000 API data. The table shown below indicates that half
the Elementary Schools show a range of their Similar Schools API scores
of at least 257 points, and 75 percent of elementary schools have a
range of their Similar Schools API scores of at least 222 points.
A good way to calibrate these numbers is to note that for elementary
schools the statewide decile categories typically span 45 API points.
Thus 223 points represents a span of about 5 statewide deciles, and the
median range 257 represents a span of 6 statewide deciles. For the group
of charter schools in this report the corresponding numbers are shown
below the statewide numbers.

```
-----------------------------------------------------------------------
                Range Similar School API, All California
Variable      N      Mean    Median        Q1        Q3      Minimum       Maximum
Elem       4775    268.88    257.00    222.00    308.00       125.00        435.00
Middle     1125    224.26    212.00    178.00    238.00       131.00        414.00
High        853    258.77    255.00    227.00    314.00       121.00        398.00
-----------------------------------------------------------------------
                Range Similar School API, 93 charter schools
Year          N      Mean    Median        Q1        Q3      Minimum       Maximum
1999         86    277.59    262.00    223.25    303.50       182.00        522.00
2000         83    277.72    257.00    228.00    328.00       138.00        426.00
-----------------------------------------------------------------------
```

Acknowledgements

Appendix A Listing of the 93 Charter Schools

CDS	SType01	SType99
34674476034508	E	E
36750773630837	E	H
33670586031959	E	E
34674396033799	E	E
37680236037956	E	E
37680236111322	E	E
37683386039457	E	E
37680236037980	E	E
37680236109771	E	E
31669516085252	E	E
28662666026900	E	E
28662666026934	E	E
21654176113229	E	E
24657716025654	E	E
28662666026983	E	E
30103063030632	E	H
30736356030183	E	E
29664156111413	E	E
29664156113138	E	E
37683386040018	E	E
44697996049829	E	E
49709536111678	E	E
42692786045918	E	E
44697996049720	E	E
49753586052369	E	E
50711346113286	E	E
50712176052922	E	E
50710926112965	E	E
50711006112627	E	E
41690216112213	E	E
41689996044333	E	M
41689996114953	E	E
37683386114961	E	E
38684786040935	E	E
41690056044473	E	E
41690216044754	E	E
41690216044788	E	E
41690216044721	E	E
41690216044739	E	E
19650946023527	E	E
19647336018063	E	E
19647336017701	E	E
19647336017677	E	E
19647336015929	E	E
19647336019145	E	E
19647336018634	E	E
19647336018204	E	E
19647336017040	E	E
19647336017016	E	E
19647336016810	E	E
19647336016570	E	E
19647336017156	E	E

19647336017057	E	E
19647336016323	E	E
19647336019236	E	E
19647336019905	E	E
19647336019939	E	E
19647336019715	E	E
19647336019806	E	E
19647336097927	E	E
19647336112536	E	E
10621666088942	E	E
10101086085112	E	E
10622406006712	E	M
16639336010466	E	E
16639906010557	E	E
19647336019525	E	E
10622406006704	E	E
38684783830411	H	H
19647331995836	H	H
48705734830113	H	E
19647331932128	H	H
34752833430659	H	H
36679343630761	H	H
31669513134657	H	H
31669513130168	H	H
37681303732732	H	H
37681063731023	H	H
10622406108328	M	M
19647336058267	M	M
19647336061394	M	M
30666216085328	M	M
01612596111660	M	M
34674056112643	M	M
37683386061956	M	M
37683386061964	M	M
16639906110233	M	M
19647256113146	M	M
19647331931070	M	H
10619946005730	S	E
31669516031363	S	E
31669443130226	S	E
10621661030642	S	H