Equal Resources, Equal Outcomes? The Distribution of School Resources and Student Achievement in California

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Foreword

This report on the distribution of school resources and student achievement in California represents PPIC's first contribution to the debate on this most challenging of public policy issues. We entered into this arena fully aware of the substantial body of research findings and recommendations already published by respected scholars and policy research institutes throughout the country. To make a contribution to the debate in California, we knew at least three conditions had to be met. First, findings would have to be at the level of individual schools and, wherever possible, the student. This would require, in most cases, the use of administrative records maintained by the California Department of Education. This report draws extensively on data collected and maintained by that department and, in particular, on data from the California Basic Education Data System, which includes detailed district, school, and teacher information. In future studies, we will begin working with student-level records commonly collected by school districts.

Second, we had to recruit a research team leader with a proven track record in the area of school resources and student outcomes. Julian Betts was just the person. He joined PPIC in 1998 as a Visiting Fellow, designed a research agenda on K–12 education, and focused his research team on the allocation of school resources in California. This report is the first in what promises to be a substantial body of PPIC work focused on teachers, curriculum, class size, and student outcomes.

A third condition necessary for contributing to the debate was that our assessment of K–12 education be placed in the context of over 25 years of education finance reform. *For Better or For Worse? School Finance Reform in California*, by Jon Sonstelie, Eric Brunner, and Kenneth Ardon, is a companion study that examines in depth how the transfer of control over school finance from local to state government has affected the distribution of revenues, average spending per pupil, class sizes, teachers' salaries, and statewide student achievement. Together, these two studies make a major contribution to our collective knowledge about the financing and resources of California schools and their relationship to student performance.

In *Equal Resources, Equal Outcomes?* the authors conclude that schools with larger populations of economically disadvantaged students have fewer teaching resources, as measured by teacher education, experience, and credentials and the availability of Advanced Placement courses. Even more troubling, the authors find that differences in the socioeconomic background of students explain most of the variation in student achievement. Whether students have experienced, well-credentialed teachers or not, the main explanatory variable in their academic achievement is their family socioeconomic status—measured in this study by participation in the state's free or reduced-price school lunch program.

Regardless of this effect, the extreme variation in school resources remains troubling, and the authors suggest a number of practical steps that can be taken to place higher-quality resources with the students who need them most. The authors offer a series of recommendations concerning the supply and distribution of teachers, high school curriculum, and school accountability that have direct policy implications for the current policy debate.

Finally, it should be noted that the Policy Summary of this report is written for a lay audience and read alone is sufficient to understand the study's major findings. The body of the report is more technical and is designed to provide the policy specialist and researcher with a detailed description of the databases and methodology involved in the analysis. Together, they provide a unique and thorough assessment of the allocation of school resources in California.

David W. Lyon
President and CEO
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Policy Summary

Whether measured by the proportion of the population served, the significance for the future of society, or the cost to taxpayers, public education ranks as one of the most important services that government supplies. In California, the public clearly understands the importance of its public schools and believes that they need reform. In surveys conducted by the Public Policy Institute of California (PPIC) in 1998 and throughout 1999, California respondents listed schools and education as the most pressing issue facing the state. In these surveys, respondents cited schools more often than the next three most commonly cited issues combined.

In step with public opinion, California's state government has put public education at the forefront of the legislative agenda. In early 1999, Governor Gray Davis called an emergency session of the legislature to develop a number of sweeping reforms to the public school system.

Several pivotal issues have emerged from the public debate. First, the public seems concerned about the overall level of funding given to public schools.[1] Second, both the public and the state government express concern about the overall performance of California's students on achievement tests. Third, public concern focuses not only on the *level* of school resources and test scores but on inequality in both measures. Perhaps in recognition of the latter, a key piece of legislation emerging from the 1999 emergency session of the state legislature was the Public Schools Accountability Act. This act aims to identify and assist schools that lag the furthest behind national norms in student achievement.

In light of these ongoing public concerns, this report seeks to answer three crucial questions:

1. How do school resources, measured in terms of class size, curriculum, and teachers' education, credentials, and experience, vary among schools?
2. Do schools serving relatively disadvantaged populations tend to receive less of these specific resources?
3. Do existing inequalities in school resources contribute to unequal student outcomes?

The report addresses these questions in detail. It also examines the extent to which school resources and student achievement vary among regions of California.

Rather than focusing on spending per pupil, a figure commonly cited in the education debate, the report focuses on very detailed measures of resources at the school and classroom levels. Our purpose is to better capture the specifics of students' educational experiences within the classroom. In our study, we use data from the 1997–1998 census of

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[1]Beyond overall funding, the public expresses concern about teacher preparation, teacher education, and facilities. In PPIC's December 1998 survey, the foremost reason cited by the public for troubles in the state's school system was teacher preparation.

teachers, schools, and districts conducted by the state government to develop precise measures of class size, teacher preparation, and curriculum, based on an analysis of each class offered in California schools at that time. The report presents separate analyses for schools in three grade spans: kindergarten through grade 6, grades 6–8, and grades 9–12, which correspond to elementary, middle, and high schools. It also examines student achievement as captured by the first statewide administration of the Stanford 9 achievement test in spring 1998.

Do California's Schools Receive Equal Resources?

There are differences in the level of equality in class size, teacher preparation, and (at the high school level) curriculum among schools. There is large variation in average teacher background, as measured by teacher education and experience, and in the percentage of teachers without full credentials.

In sharp contrast, average class size varies very little among schools. A notable exception to this pattern is class size in kindergarten and grade 3. One might think that the state-mandated incentive to reduce class size to 20 students in kindergarten through grade 3 should have resulted in quite equal class sizes in all these grades. In fact, class size variation is quite small for grade 1 and 2 classes, but in elementary schools, the largest inequalities in class size occurred in kindergarten and grade 3. This could reflect a short-term imbalance created because some schools have been unable to fully implement class size reduction as a result of teacher or classroom shortages. Ironically, we find larger variations in average class sizes across elementary schools than across middle or high schools. Our review of teachers' collective bargaining contracts from selected school districts suggests that it is likely that class size stipulations in collective bargaining agreements between districts and teachers' unions help to prevent average class size from varying significantly among schools.

To illustrate how large the inequalities in teacher preparation are and how small the variations in average class size are among schools, we ranked schools in California according to specific measures of school inputs and identified the levels of the given resource at the 75th percentile and 25th percentile schools. (The 75th percentile school has a larger value of the given measure than schools attended by 75 percent of all students in California, whereas the 25th percentile school has a larger value than schools attended by 25 percent of all students.) Figure S.1 shows class size in the 75th and 25th percentile schools within the kindergarten through grade 6 (K–6) grade span. Some variation occurs,

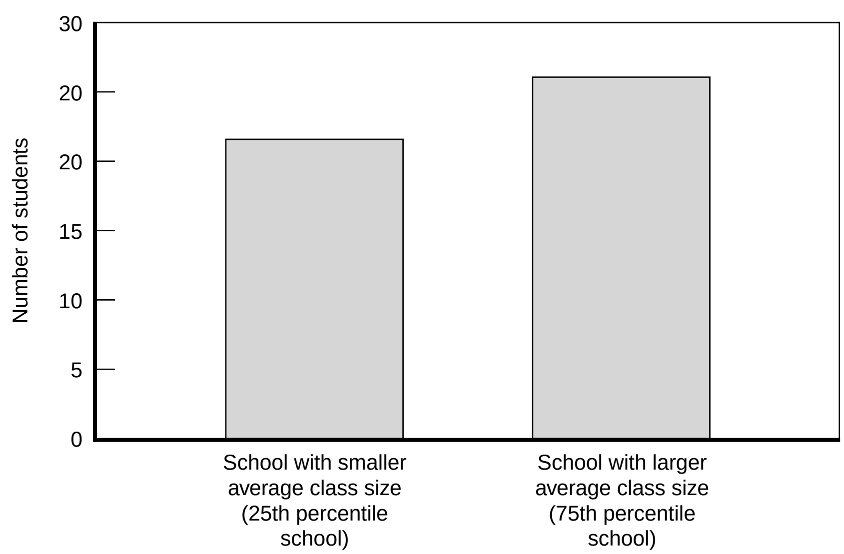

Figure S.1—Class Size Differs Little Among K–6 Schools but it is not large. Furthermore, some of the variation likely reflects the fact that some schools in this grade span do not include grades 4, 5, and 6, which tend to have larger classes. Smaller variations emerge if we exclude special-education classes. Similarly, the variation in overall class size is smaller in middle and high schools relative to the variation in elementary schools that is shown in the figure.

Figure S.2 shows the 25th and 75th percentile values in K–6 schools of three distinct measures of teacher characteristics: the percentages of teachers with 0–2 years of experience, with a bachelor's degree or less, and with less than full certification. In each case, large variations on the order of 15 to 24 percentage points emerge. The results for the share of teachers without full certification are particularly striking—at the 25th percentile school, 0 percent of teachers lack a full credential compared to 19.1 percent of teachers at the 75th percentile school. Variations in

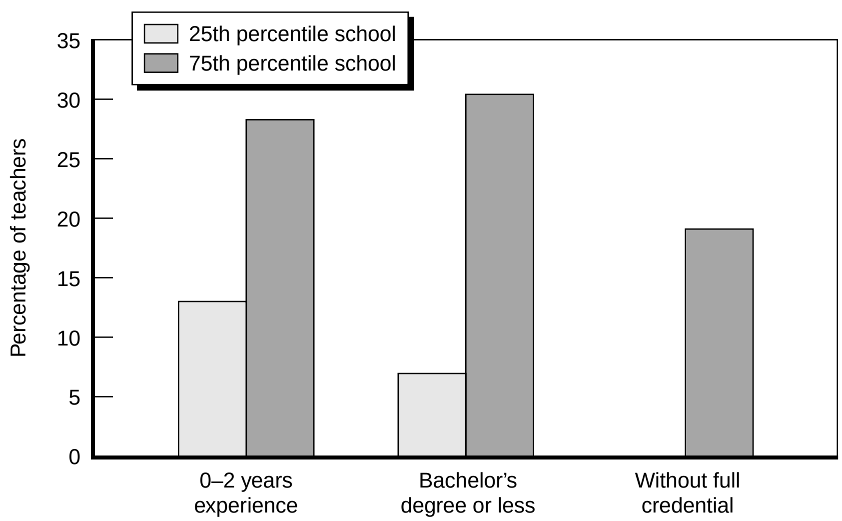

Figure S.2—Teacher Characteristics Differ Considerably Across K–6 Schools teacher preparation among middle schools and high schools are similar but slightly smaller.

Like teacher preparation, high school curriculum varies greatly among schools. Specifically, we focus on the percentages of courses that satisfy entrance requirements at the University of California (the “a–f” courses) or similar requirements at California State University campuses. The “interquartile” range, that is, the range between the 25th and 75th percentile high schools, is 46 to 61 percent. Advanced Placement (AP) offerings also vary substantially, with an interquartile range in the percentage of classes that are AP of 1.4 to 3.4 percent. In science, for example, this translates into twice the number of AP science courses offered in some schools than in others.

Why do these inequalities exist? Do schools intentionally tailor their spending toward the needs of the local student population? For example, do some schools or districts spend more to hire highly educated teachers, at the expense of teacher experience and perhaps class size, whereas administrators in other areas do the opposite? An alternative explanation that would raise more severe policy concerns is that there may be “have-not” schools with less of all of these measures of school resources. For the most part, the explanation of “have” and “have-not” schools fits the data better. For example, in all three grade spans, the percentage of teachers with a master’s degree or higher is positively linked to mean teacher experience, negatively linked to the percentage of teachers without a full credential, and in high schools is positively related to the percentage of classes that are “a–f” and to the number of AP classes offered.

In sum, the state’s schools exhibit considerable inequality in teacher preparation and curriculum offered and relatively little inequality in average class size. Schools that have less of one resource tend to have less of many other resources as well.

How Equally Are School Resources Distributed Regionally?

One way to investigate which students receive fewer resources is to examine regional patterns. As was the case among schools, average class size variations are quite small among regions (urban, suburban and rural), but there are large variations in the other resources.

Figure S.3 shows the same three measures of teacher preparation in elementary schools, this time calculated separately for urban, suburban, and rural schools. By most measures, urban schools have a far higher percentage of teachers with low preparation levels. Perhaps the most striking finding in the figure is that over a quarter of teachers in urban

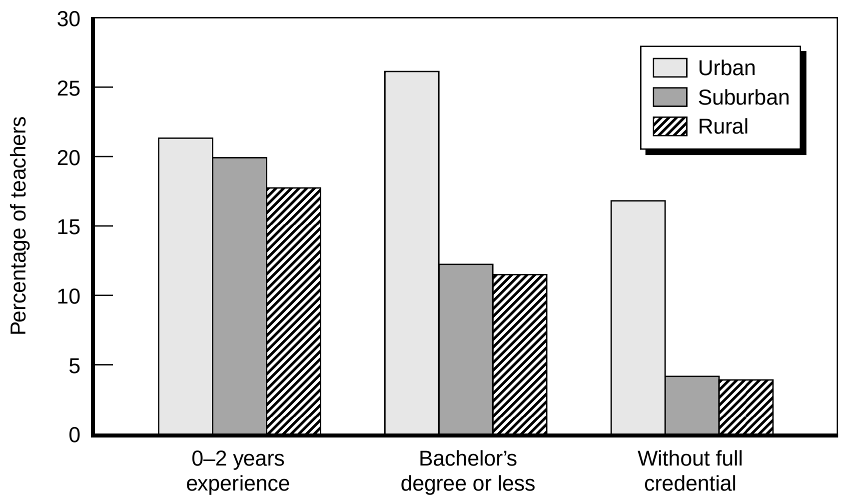

Figure S.3—Urban K–6 Schools Have a Higher Percentage of Less-Prepared Teachers elementary schools hold only a bachelor's degree or less, compared to 12 percent and 11 percent in suburban and rural schools, respectively. Similar disparities emerge in middle schools and high schools, although in these higher grade spans smaller percentages of teachers have only 0–2 years of experience.

One important exception emerges to the general pattern that suburban and rural schools have similar levels of resources. The percentage of teachers holding a master's degree or higher is lowest in rural schools, and highest in suburban schools, with urban schools in between.

At the high school level, rural schools tend to offer considerably smaller percentages of courses that are either "a-f" or AP than do schools in the other two regions. Similarly, urban schools lag behind suburban schools in this regard.

An analysis of resources by county confirms the above results in that counties with large suburban areas tend to have more resources than counties with heavy urban or rural populations. For example, the largely rural counties of the Central Valley typically receive fewer resources than other counties. Similarly, highly urbanized Los Angeles County tends to lag behind other similar coastal counties with large metropolitan areas.

Do Schools Serving Relatively Disadvantaged Populations Receive Fewer Resources?

Given these inequalities—especially in teacher preparation and high school curriculum—and the variations among rural, urban, and suburban schools, a natural question is whether disadvantaged children get less of the school resource pie. The answer is a resounding "yes."

Our study divided schools into five socioeconomic status (SES) groups based on the proportion of students receiving free or reduced-price lunches.[2] Table S.1 presents the levels of different school attributes across elementary schools for schools with the most-disadvantaged students and those with the least-disadvantaged students. There are systematic differences between the level of experience and education of teachers in these different groups of schools. For example, the median percentages of teachers without a full credential are 21.7 percent and 2.0 percent in the bottom- and top-SES groups of schools, respectively. The corresponding figures for the percentage of elementary teachers with two or fewer years of experience are 23.8 percent and 17.2 percent.

Table S.1

K–6 Schools with More-Disadvantaged Students Have Lower Levels of Resources

Characteristic	Lowest-SES Schools	Highest-SES Schools
Average class size	23.1	23.5
Average teacher experience, years	10.8	12.9
% with 0–2 years	23.8	17.2
% with 10 or more years	43.3	53.3
% with bachelor's or less	32.6	8.8
% with master's or more	21.7	27.0
% not fully certified	21.7	2.0

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[2]We use the proportion of students at a school who receive lunch assistance as our primary measure of SES. Other measures of interest include the proportion of children in families receiving Aid to Families with Dependent Children (AFDC), the percentage of limited English proficient (LEP) students at a school, and the percentage of students in different ethnic or racial groups. We use the percentage of students participating in the lunch program rather than the proportion receiving AFDC benefits because the latter is a measure for all children in the school's *attendance area*, whereas the former measures the socioeconomic status of children who actually attend the school. We find similar results to those discussed above when we examine the distribution of school resources across schools containing different percentages of nonwhite students. These results can be found in the report and accompanying appendices. We use the terms low/high-SES and more/less-disadvantaged student populations interchangeably.

There are also strong positive correlations between student SES and measures of AP and “a–f” course availability in high schools. Figures S.4 and S.5 show the median percentage of courses that are “a–f” (college-preparatory) and Advanced Placement in high schools for schools in each of the five SES categories. It is unclear whether differences in course offerings reflect differences in schools’ capacity to offer advanced courses or variations in the demand for these courses by students.

To disentangle the separate influences of region, student SES, and district characteristics on the level of school resources, the study used regression analysis. Regression analysis allows us to examine how multiple factors are jointly related to school resources. We can estimate models and then predict how each factor will influence our measures of school resources holding everything else constant.

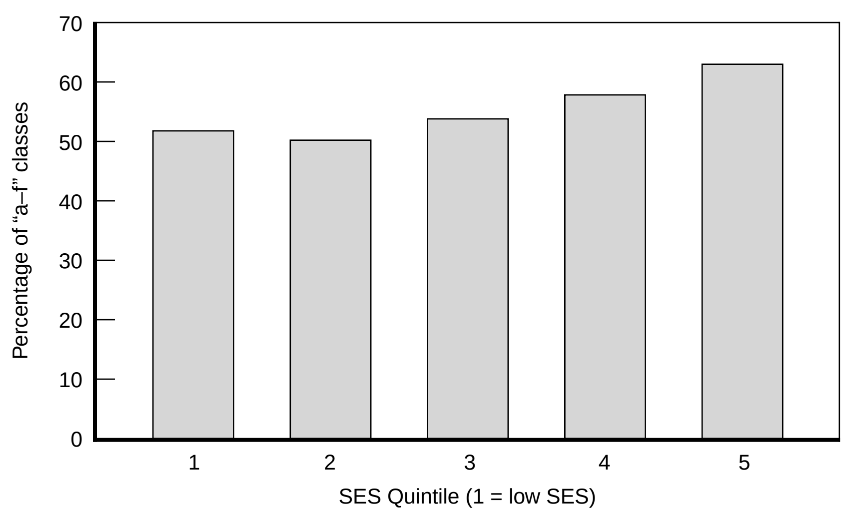

Figure S.4—Median Percentage of “a–f” Courses Increases As Student SES Rises (based on percentage receiving lunch assistance)

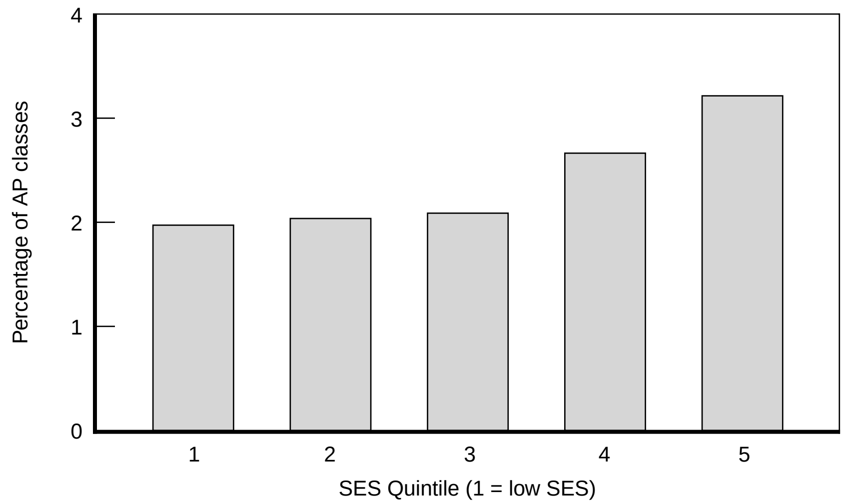

Figure S.5—Median Percentage of AP Courses Increases As Student SES Rises (based on percentage receiving lunch assistance)

For example, some of the variations in school resources among urban, suburban, and rural schools appear to derive from variations in student SES among these types of schools. Student SES and school resources, especially teacher characteristics and AP course offerings, are strongly related. Notably, teachers' level of preparation can "explain" a significant portion of the variation in course offerings in high schools. Not surprisingly, smaller schools offer fewer AP courses than other schools.

Schools with more-disadvantaged students also offer fewer AP courses. It is unclear whether this is related to a school's willingness to supply AP courses or to students' demand for these courses. If demand for AP classes were high in these schools, one would expect to find larger enrollments in the AP courses that were offered. However, regression analysis revealed that at two schools with identical resources but a 50 percent difference in the percentages of students receiving free or reduced-price lunches, the school with more-disadvantaged students would have math and science AP classes that on average had five fewer students. The absence of overcrowding in AP classrooms in schools in disadvantaged areas suggests that variations in student demand for AP classes, perhaps due to variations in curriculum before high school, play a role in the lower provision of AP classes in these areas.

One of the study's most important findings is that inequities in school resources apparent in the statewide data replicate themselves to some extent within districts. In other words, *within* a given district, schools with particularly disadvantaged students are likely to have less highly educated and less highly experienced teachers and to offer fewer advanced classes at the high school level. Evidence from a sampling of districts' collective bargaining agreements suggests that in part these inequalities may result because the most experienced teachers typically have first right of transfer to other schools when vacancies appear. The upshot may be that the most highly qualified teachers gradually migrate to the least-disadvantaged schools within districts.

How Much Variation Is There in Student Achievement?

The substantial variations in school inputs, especially related to teacher preparation and high school curriculum, raise the question of whether school "outputs," as measured by student achievement, exhibit similar inequalities. Test score data[3] reveal several important facts. First,

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[3]The report examines student achievement using the first round of the Stanford 9 tests conducted in spring 1998, conducted as part of the Standardized Testing and Reporting (STAR) program.

overall California's students perform poorly relative to those in the nation as a whole. Second, the limited English proficient (LEP) status of students and students' SES both bear a relationship with test scores that can only be described as stark.

California's students lag behind national norms on these tests by substantial margins. However, the unusually high proportion of LEP students in California can account for at least two-thirds of the gaps in math and reading performance. Figure S.6 shows this difference, using the percentage of students scoring above the national median in the math component of the Stanford 9 test, by grade. In a typical grade, only about 40 to 45 percent of the state's students score at or above the national median. (If California's students had the same distribution of

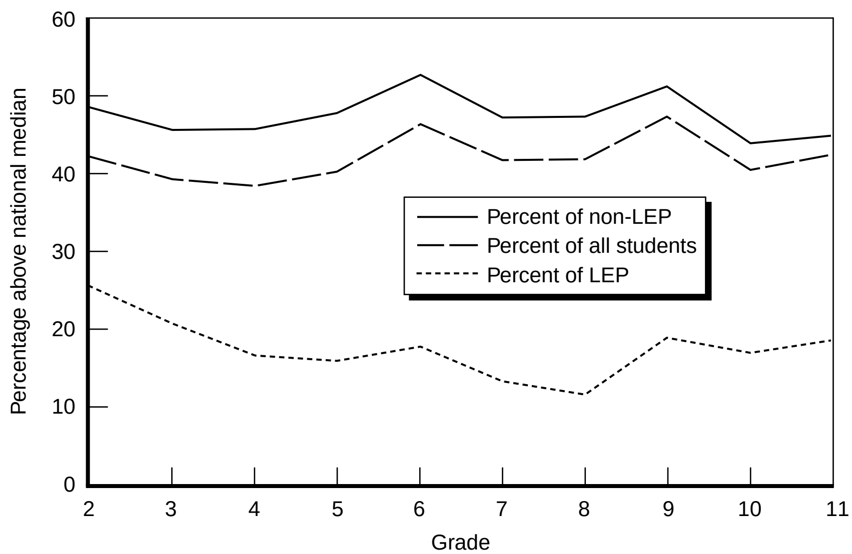

Figure S.6—Performance of LEP Students Strongly Affects Percentage of California Students Scoring Above National Median (1998 Stanford 9 Math Test) achievement levels as elsewhere, then 50 percent of students should score above the national median.) The figure shows that after separating LEP from non-LEP students, from 44 to 53 percent of non-LEP students in California perform at or above national norms in math. That is, the state's English-proficient students score just below national norms.

Because a smaller fraction of LEP students than other students took the Stanford 9 test, and because the low performance of LEP students may largely reflect language barriers, we subsequently focus only on the achievement of non-LEP students.

There is substantial variation across schools within California in student achievement, even when LEP students are excluded from our measures. These variations closely mirror the inequality in student achievement observed nationally.

Student SES as measured by the share of students receiving free or reduced-price lunches bears an astonishingly high correlation with student achievement at the school level. Figure S.7 illustrates this, showing the overall percentage of non-LEP students in California scoring above national norms for their grade for low-SES through high-SES schools. For both reading and math, a strong correlation between SES and test scores emerges. When examining test scores based on urbanicity or by county, we find patterns that mirror geographic variations in student SES.

Does Inequality in School Resources Contribute to Inequality in Student Achievement?

What does the dramatic positive relation between student SES and test scores shown in Figure S.7 imply? Does higher student socioeconomic status directly contribute to more learning, perhaps at

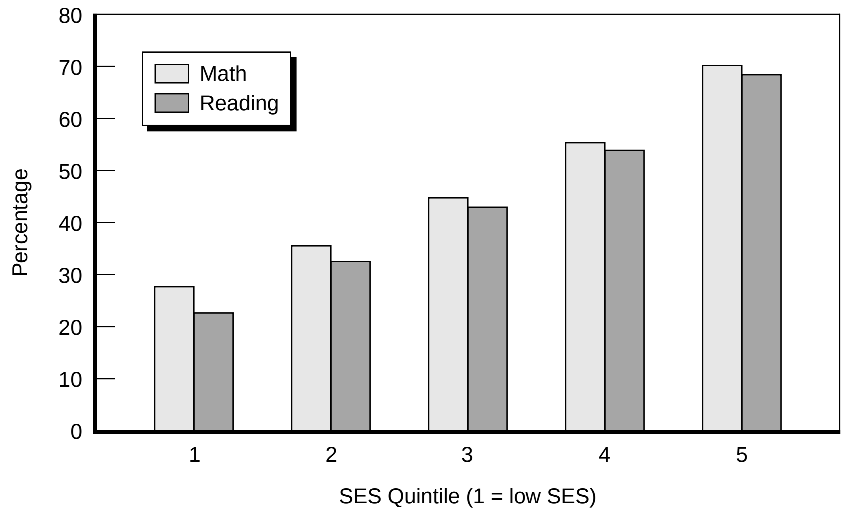

Figure S.7—Percentage of Students Scoring At or Above
National Medians Increases with Student SES
(based on percentage receiving lunch assistance)

home? Alternatively, do disadvantaged students perform more poorly because of the lack of resources, especially the lack of highly qualified teachers in schools serving disadvantaged populations? This question is the most important but most difficult issue addressed by our study. California test score data are not ideal for answering this question because the state does not yet have a student-level database that follows individual students over time. Instead, we opted to model the level of test scores in selected grades as a function of student SES, school resources, and characteristics of the district. A weakness in this approach is that it cannot capture unobservable factors such as the past history of school inputs or current and past peer group and family influences on a given student's achievement.

In the regression analysis that controls for a wide variety of school and student characteristics, by far the most important factor related to student achievement in both math and reading was our measure of SES—the percentage of students receiving lunch assistance. Among the school resource measures, the level of teacher experience and a related measure—the percentage of teachers without a full credential—are the variables most strongly related to student achievement. Teachers' level of education, measured by the percentage of teachers with a master's degree or higher, in some cases is positively and significantly related to test scores but not nearly as uniformly as the measures of teacher experience. Similarly, a higher percentage of teachers with only a bachelor's degree within a given grade is negatively related to student achievement. Class size at the given school bears little systematic relation to student achievement. However, the small variations in average class size among California's schools may account for our inability to detect a strong link between class size and student test scores. Notably, in the test score equations, indicators for suburban and rural schools are rarely significant, suggesting that much of the variations in test scores among urban, suburban, and rural schools that appear in the raw data can be accounted for by variations in student SES and school resources.

To drive home the relative importance of student SES and various measures of schools and school characteristics more generally, Figure S.8 shows the changes in the percentage of students scoring at or above national norms in reading in grade 5 that are predicted to result from moving from a school at the 25th percentile to the median level and then to the 75th percentile in the given school resource or attribute. The first set of bars at the left of the figure shows the predicted levels of student performance in three schools that are identical except in student SES.

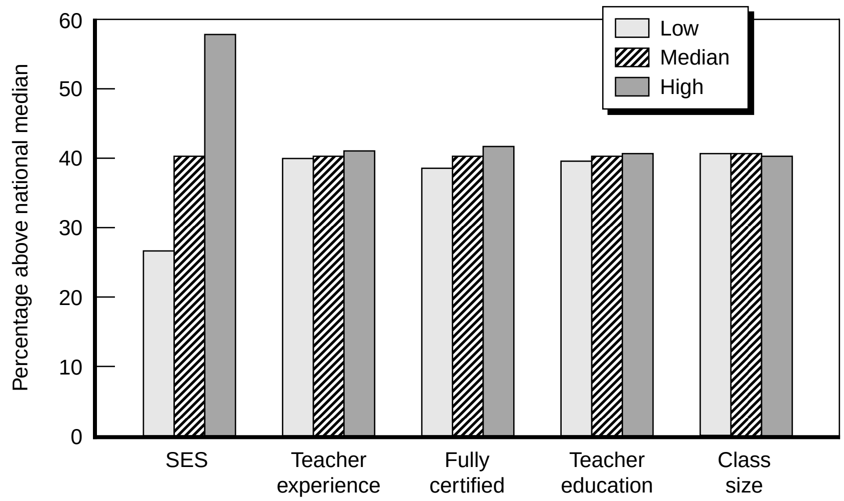

Figure S.8—Differences in SES Explain Most Variation in Student Achievement in Reading in Grade 5

The different heights of the bars show the predicted effect of changing from a "low-SES" school to a "median-SES" school to a "high-SES" school. The other sets of bars toward the right of the graph show the predicted percentage of students scoring at or above national norms in schools with the 25th, median, or 75th percentile of the stated resource. In spite of the large variations in teacher preparation among schools, teacher preparation and other school resources appear to have only modest effects on student achievement. In contrast, student SES appears to play a dominant role in determining student achievement.

Policy Implications

The findings concerning inequality in school resources and student achievement have strong implications for a number of current policy issues in California.

Improving the Supply and Distribution of Highly Trained Teachers

Figure S.8 suggests that teacher preparation influences student achievement. However, policymakers must be realistic in understanding that variations in student SES appear to play a far more important role than variations in teacher preparation in determining student achievement.

Bearing this qualification in mind, what reforms to the labor market for teachers might help students the most? The evidence that teacher experience, certification, and teacher education are linked to student achievement suggests that expanding the supply of highly trained and fully certified teachers in California is in order. However, additional, more-subtle reforms are required. Shortages of qualified teachers are highly concentrated geographically and in addition are concentrated in schools serving the most disadvantaged populations. Simply expanding the supply of teachers cannot eliminate either of these inequalities. In addition, Figure S.8 suggests that the effect of variations in teacher preparation on student achievement is rather limited relative to the effect of variations in student SES.

What further solutions could the state enact? Teacher shortages in the most heavily affected areas might be partially reduced through differential cost-of-living adjustments across school districts, a reform discussed in a recent report by the Legislative Analyst's Office (LAO). We discuss this in further detail below.

Finding a workable solution to the clustering of less-qualified teachers in schools serving disadvantaged populations could prove more difficult. This clustering occurs both among districts and *within* districts. The question becomes: What can the state and districts do to encourage more of the most highly qualified teachers to work in low-SES schools? One obvious solution involves offering salary incentives to highly qualified teachers who choose schools in disadvantaged areas. Such a system would represent a fundamental change in teacher pay policy in California, where rigid formulas typically set teachers' salary throughout a district as a function of teachers' seniority and education. In addition, such a system might require renegotiation of "first right of transfer" clauses in collective bargaining agreements.

Finally, it seems highly likely that the recent initiative to reduce class size in kindergarten through grade 3 has played a major role in the rise in the percentage of elementary school teachers lacking adequate preparation. Schools in disadvantaged areas seem particularly hard pressed to recruit teachers who have a full credential, several years of experience, and a high level of education.

Evidently, policy changes that on the surface do not directly involve teachers can ripple through the teacher labor market for many years. Thus, a general policy prescription would be for the state to postpone any further major reforms to public education until it has conducted a thorough analysis of the likely consequences of a proposed reform for the market for teachers. Indeed, policymakers must constantly bear in mind that highly prepared teachers do not "grow on trees."

School Accountability, Student Disadvantage, and the Market for Teachers and Principals

In 1999, California began to implement the Public Schools Accountability Act. The complex and ambitious reform plan involves a carrot-and-stick approach to accountability. The act rewards schools that meet or make adequate progress toward meeting state standards, but at the same time it threatens schools at the bottom end of the state rankings with tough sanctions should they fail to improve adequately.

Although we believe that it is important to hold schools accountable, a likely side-effect of the new drive for accountability will be a shortage of qualified teachers and principals in schools serving disadvantaged populations. The reason is simple: Because of possible sanctions, personnel will avoid working in the schools most likely to be identified as failing to meet state standards.

To reduce this risk, rewards and punishments must be based in part on a comparison of performance relative to other schools serving similar student populations. We would also encourage the state to base measures of performance on *changes* in student performance rather than just on the *levels* of achievement across schools.

The 1999 version of the accountability system partially implemented both of these suggestions. Nevertheless, the gap in achievement between low-SES and high-SES schools is so stark that most schools subject to sanctions are likely to be low-SES schools. Therefore, a dangerous side-effect of the accountability reforms could indeed be to dissuade principals and teachers from choosing to work in schools serving disadvantaged populations.

The solution to this dilemma might lie in funneling considerable additional resources into schools in disadvantaged areas, while gradually phasing in sanctions to give the affected schools a reasonable opportunity to improve outcomes.

Likely Consequences of Increased Devolution of Authority to School Districts

A recent LAO study calls for further devolution of control to local school districts. The present report cannot speak directly to the merits of this proposal. However, the report does reveal inequalities in resource allocations *within* districts. For this reason, devolution of control to the district or school level is unlikely to equalize resources among schools and in fact could work in the opposite direction. The state may want to require or at least encourage districts to reduce within-district inequalities in allocation of resources, especially those related to teachers, in return for greater local control over teaching methods and curriculum.

The Question of Inequalities in High School Curriculum

California's high schools vary substantially in the proportion of college preparatory "a–f" and AP classes that they offer. Two recent lawsuits contend that these inequalities represent a systematic bias against disadvantaged students, and minority students in particular, in their quest to attend university after graduation.

What can be done to reduce existing variations in the rigor of the high school curriculum? The study delivers three conclusions.

First, smaller schools and districts offer markedly fewer AP courses as a percentage of total classes. Innovative solutions in which smaller schools use a combination of course-sharing with other schools, or "distance learning" via the Internet or other means could do much to narrow the observed gaps in AP course-taking patterns. Indeed the most cost-effective solution, given differences in teacher attributes across different schools, might be for more high schools to encourage promising students to take courses at nearby community colleges.

Second, it seems clear that variations in teacher education, and to a lesser extent teacher experience and certification, account in part for variations in AP offerings. Again, we come back to one of the core findings of the study: Inequalities in teacher preparation among schools are large, and they matter for student outcomes, whether measured in terms of test scores or course-taking patterns. In light of this result, it seems naïve to believe that a simple edict that all schools statewide offer identical sets of AP courses can succeed, unless inequalities in teacher preparation are removed first.

Third, a simple statewide requirement that all high schools must offer the same percentage of AP classes is likely to fail to equalize the proportion of students taking such courses without curriculum reform in earlier grades. Weaknesses in curriculum in middle schools and even elementary schools may limit students' ability to enroll in advanced courses once they reach high school. In short, curriculum reform cannot begin in grade 12; it must begin much earlier.

The Need for a Differential Cost-of-Living Adjustment or a More-Targeted Policy of Reducing Resource Inequalities Across Districts

As mentioned above, a recent LAO study discussed the possibility of using differential cost-of-living adjustments to reduce interdistrict inequalities in funding per pupil. Such a proposal has merit given the evidence of variations in school resources among regions that this study presents. In addition, equalization policies should do more than alter growth in overall budget levels. We believe they should target the area of greatest inequality: teacher preparation.

The Need for More-Detailed Data on California's Schools

The report makes detailed recommendations for changes in data collection that we believe would help the state better understand what policies or types of teacher preparation are most effective in boosting student achievement. Although we do find that teacher experience and being fully credentialed matter for student achievement, we find less evidence that teacher education matters. We think this result is partially due to a lack of information about teacher education and does not necessarily mean that differences in teacher training do not matter. More information on the subjects a teacher has taken in college would be helpful in evaluating teachers. Nevertheless, any expansion of the existing statewide survey of teachers, schools, and districts should take care to maintain existing questions, in order to preserve the fairly high degree of consistency in questions that has been achieved in the past. Similarly, California is likely to amend the statewide testing system over the next few years as the new curriculum standards are implemented. The need to tailor the statewide test to the state's new curriculum standards is obvious; however, it is important to continue with the basic Stanford 9 test components for several years in order to establish at least one measure of student achievement in California that is consistent over time.

The Bottom Line

Considerable inequality still exists in the level of resources that California's schools receive. The greatest variations among schools relate to teacher preparation and curriculum offered; inequalities in class size are much smaller. At the same time, there are large variations in student achievement. Student SES bears a strong positive relationship to both school resources and student achievement.

Traditional redistributive policies aimed at reducing variations in revenues per pupil across districts are unlikely to equalize student achievement across all schools, for three reasons: First, resource inequality is restricted primarily to teacher training and curriculum, so that redistribution must focus on these specific characteristics of schools rather than on revenues per pupil alone. Second, much of the variation in school resources occurs *within* districts; such disparities cannot be removed by reallocation of dollars among districts. Third, school resources appear to play only a modest role in determining student achievement. Instead, student SES plays a dominant role. For this reason, equalization of student achievement across schools is likely to require a much more radical reallocation of resources than implied by mere equalization of spending.

What then can be done?

One part of the solution may be to spend *differently*. Improved on-the-job training among inexperienced teachers probably can make a contribution to improving overall student achievement. Similarly, the finding in the report that teacher education does not bear a particularly strong relationship to student achievement suggests that finding new ways to teach teachers might be in order. However, we note that the very limited information available at present about teachers' education may have concealed aspects of teacher education programs that are in fact effective.

If the first part of the solution is to spend differently, a second part of the solution may be to spend considerably more on schools in disadvantaged areas than on schools in high-SES areas. For example, bold new policies to encourage experienced teachers to work in low-achieving schools should be sought and implemented. One example, which would represent a radical departure from past practice, is to pay bonuses to highly qualified teachers who agree to teach in schools serving disadvantaged populations.

It is far from clear that the political will exists to implement such a major redistribution of resources. However, the Public Schools Accountability Act may provide the policy levers necessary to initiate such redistribution. The act seeks to improve the incentives for all participants in public education, while funneling additional aid to the schools that lag furthest behind. In addition, the publicity surrounding the annual release of state rankings of schools, and the identification by the state of failing schools in voters' backyards, may sear existing inequalities in student achievement indelibly into the public's consciousness.

As the public becomes increasingly aware of the large disparities in achievement among schools, one of two things must happen. One possibility is that support for the state's tough new accountability system will crumble. A second possibility is that support for accountability will remain strong, and at the same time public backing will galvanize for the implementation of spending increases and other reforms necessary to raise student outcomes in those schools that lag furthest behind. Only time and the strength of the economy will tell which of these two scenarios will prevail.

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Acknowledgments

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1. Inequality in School Resources and Student Achievement: Overview of the Central Issues

Introduction

California's public school system is currently under intense scrutiny. The Governor and the public have appropriately named education as a top policy priority. By any measure—the proportion of the population served, the total amount of state funding, or the overall importance of education as a social program—public schooling represents one of the most important services that a government can provide to society. As such, it is essential that policymakers have rigorous and comprehensive analyses to help them make education policy decisions in California. The intent of this report is to provide such an analysis.

Despite three decades of court battles and legislation aimed at reducing inequality in funding among California school districts,[1] considerable inequities in overall funding remain. This report documents inequality in resource levels among California's public schools. The report also documents disparities in academic achievement among the state's public school students and then assesses the relative importance of student socioeconomic status (SES) and school resources as factors that influence variations in student achievement. The research examines how districts allocate resources *within* district boundaries—a subject about which relatively little is known. In other words, the report addresses the question: "Are inequities in school resources related to inequalities in students' test scores or do other factors, such as the level of disadvantage among the student body, have a stronger relationship with student achievement?"

The continued lack of equalization in revenues per pupil within districts, combined with the possibilities of substituting one type of spending for another between and within districts, suggests that it is important to understand how California's schools differ in their level of specific types of "resources." This report assesses the extent to which California's schools vary in key teacher-qualification resources—as measured by such variables as teacher experience, education, and credentials—and other resources such as class size, pupil-teacher ratio, and curriculum. The report includes detailed analyses of how variations

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[1]Evans, Murray, and Schwab (1997) summarize how court decisions have affected school finance in the United States. Sonstelie, Brunner, and Ardon (2000) analyze school finance reform in California between 1970 and 1990. Chapter 3 of Elmore and McLaughlin (1982) explains the political compromises that inspired Senate Bill (SB) 90. Elmore and McLaughlin provide a similarly detailed analysis of the other major political and legal disputes surrounding school finance reform up to 1980.

in these types of resources are correlated with students' socioeconomic status and the location of schools. Finally, the report analyzes the extent to which academic achievement in California's public schools varies, focusing on the relative importance of student SES and school resources in explaining these differences.

Policy Relevance

This analysis is relevant to five current policy discussions. The first policy area concerns teacher training. There appears to be a growing sentiment in California that the state needs to find ways to help teachers improve their skills. Recent public opinion polls reveal a widespread belief among the public that K–12 schools need a radical overhaul. A survey conducted by the Public Policy Institute of California (PPIC) in December 1998 asked respondents the following open-ended question: Which one issue facing California today do you think is most important for the Governor and the State Legislature to work on in 1999? Thirty-six percent of respondents listed schools. The next two most frequent responses were "don't know" (18 percent) and "crime" (7 percent). Little variation in these responses occurred across regions (Baldassare, 1999). This survey also asked adult respondents whether they favored or opposed "increasing teachers' pay based on merit, to attract and retain more and better teachers." Statewide, 84 percent of respondents favored the idea. Similarly, 85 percent favored "requiring that teachers be given more training and have tougher credential standards before they teach in the classroom."

The public's concern about a lack of resources for public schools appears to lie at the heart of these survey results. In the same survey, respondents were asked the following question: "People have different ideas about what they think is wrong with California's K–12 public schools. What is the one reason you think is most responsible for public schools not performing as well as they could?" The most frequent response, cited by 22 percent of respondents, was "teachers." The second and third most frequently cited reasons were "lack of state funds" (12 percent) and "overcrowded classrooms, school buildings need repair" (11 percent). Undoubtedly, parents disagree about the type of resources, such as physical facilities, class size, curriculum, or teacher training, that most need improvement. But taken together, all of these responses suggest that Californians worry that school quality is not as high as it should be and that the level of resources in public schools is insufficient to educate the state's children properly.[2] In another PPIC statewide survey conducted in September 1999, education continued to rank as the public's number one concern (Baldassare, 1999).

The recent class size reduction (CSR) initiative appears to have resulted in a shortage of fully credentialed teachers in grades K–3. In an initial analysis of the effect of the CSR initiative, the CSR Research Consortium (1999) found that the proportion of grade K–3 teachers without full credentials skyrocketed over the period 1995–1997—from 1 percent to 12 percent.

Given the recent shock to the market for teachers produced by the CSR initiative, and public concerns about teacher quality, we devote particular attention to "teachers as a school resource," examining

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[2]The final 1999–2000 budget signed into law by Governor Davis appears to have responded to perceptions that additional support and training are required for teachers. The budget allotted $125 million for teacher peer review and assistance, $50 million for teacher performance bonuses, and $12 million for professional development in reading for teachers (Asimov, 1999).

teachers' education levels, credentials, and teaching experience. We address such questions as:

1. How well educated are teachers?
2. Is there a critical shortage of certified teachers?
3. Which types of students, subject areas, and geographic areas are most affected by shortages of highly educated teachers, of highly experienced teachers, and of fully credentialed teachers?
4. In what grades and subject areas is there the greatest need for expanded teacher training?
5. Which teacher characteristics are most strongly related to student achievement?

A second policy issue is the rapidly evolving system of state curriculum standards, state tests, and school accountability. In a special session in early 1999, the state legislature passed several bills designed to increase school standards. Perhaps most notably, SB 1X, the "Public Schools Accountability Act of 1999," creates a state accountability system that incorporates three key elements. First, it calls for an Academic Performance Index (API) that will measure the progress of individual schools beginning in June 2000. This index will be based on several factors, which include currently reported data such as the Stanford 9 test results that are gathered as part of the Standardized Testing and Reporting (STAR) system, as well as graduation rates and attendance rates. In the future, the API will include an applied academic skills matrix and the planned high school exit examination. Other factors, such as student mobility, special-education status, English language proficiency, socioeconomic status, gender, and ethnic group will also be incorporated into a school's assessment.[3] The API will rank schools annually into ten deciles based on the above criteria, and it will be used to assign schools to either the High Achieving/Improving Schools (HA/IS) program or the Immediate Intervention/Underperforming Schools Program (II/USP).[4]

Beginning in fall 2000, schools at all deciles that meet growth targets in student performance (HA/IS schools) will receive financial awards. Schools that do not meet their performance targets may be assigned to the II/USP. Initially, some schools that fail to meet performance targets (based primarily on both 1998 and 1999 STAR results) will be able to apply for additional funding to implement a school reform plan, subject to the approval of the State Superintendent.[5]

Schools may volunteer or may be randomly selected by the California Department of Education (CDE) for these II/USP planning grants. However, any school that does not meet its growth target in the 2000–2001 academic year must hold a public hearing and is subject to intervention by the local district board. If, after two years, the school still shows few signs of improvement, the State Superintendent can take over the school. Its principal will likely be reassigned. The State Superintendent can take a number of additional actions, including allowing parents to send their children to other schools or to create a

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[3]In summer 1999, a list of underperforming schools was released that was based on 1998 and 1999 STAR test results alone.

[4]Schools with fewer than 100 students, as well as certain other categories of schools, were granted exemptions for 1999.

[5]As of this writing, approximately 330 schools will receive $50,000 planning grants, and approximately 100 schools will receive implementation grants of at least $50,000, with a maximum of $200 per student. http://www.cde.ca.gov/iiusp/ (8/25/99).

charter school, reassigning certified administrators or teachers, or even closing the school.

The initiatives in SB 1X share one common theme: Students, teachers, and schools all over the state should work toward a common set of educational goals and standards enunciated by the state. Uniformity in outcomes—as measured by the curriculum undertaken and more directly by test scores and graduation rates—is the ultimate goal.

It seems crucial, at the dawn of this new era of state standards, high-stakes tests, and school accountability, to understand the degree to which "the playing field is level" between schools. SB 1X stipulates that schools be judged on the basis of the achievement of "all numerically significant ethnic and socioeconomically disadvantaged subgroups within schools," so that equal improvement will be expected for students of different groups. What is less clear is whether SB 1X will improve or weaken incentives for teachers and principals to work in schools serving disadvantaged populations. It remains to be seen whether the planned API will fully account for variations in student performance related to demographic factors. If student SES is strongly correlated with schools' test score rankings, schools in disadvantaged areas are particularly likely to end up on the state's list of failing schools. Given the prospects for state-mandated school reorganization and involuntary personnel transfers at these schools, the legislation might indeed make it less desirable, especially for principals, to work in schools in disadvantaged areas.

Similarly, it is unclear whether it is fair to compare two schools with different class sizes, course offerings, and teacher preparation. Our work develops a detailed portrait of the existing inequities in these school resources and the role, if any, that these resource inequities play in determining student achievement. If the playing field is not level to start with, either school rankings in the API should take into account disparities in school inputs or further financial reforms should be enacted to reduce disparities.

The report is relevant to a third and very recent policy debate, related to the proposal by the Legislative Analyst's Office to create a K–12 Master Plan (Legislative Analyst's Office, 1999b). The proposed Master Plan is far-reaching, but it essentially focuses on the need for increased financial flexibility within districts. The proposal for increasing school district control over state assistance raises an important question: Would increased local control affect the distribution of school resources? Although it is impossible to predict exactly how increased district flexibility would play out, it seems safe to conclude that variations in the level of school resources across California's schools would only increase. Our analysis partially answers how different districts would be likely to respond by examining current patterns of resources within and across districts.

The fourth policy area the report addresses is curriculum. Ever since the release of *A Nation at Risk* by the National Commission on Excellence in Education in 1983, national attention has focused on public schools' curriculum. High school curriculum has recently received heightened attention in California because of the confluence of two events. First, in 1995 the Regents of the University of California (UC) passed SP-1. The most important provision of SP-1 was: "Effective January 1, 1997, the University of California shall not use race, religion, sex, color, ethnicity, or national origin as criteria for admission to the University or to any program of study" (University of California, 1995). Then, in 1996, California voters passed Proposition

209, which created a similar ban on affirmative action related to race, religion, or gender in "public employment, public education, or public contracting," including admissions to UC and the California State University (CSU).

This ban on affirmative action in the state's two public university systems has increased concerns about the extent of variation in the curriculum offered across high schools. Students seeking undergraduate admission to UC are required to complete a prescribed set of coursework, the so-called "a–f" courses. CSU has a similar set of course requirements. If some high schools offer only a few sections of such courses, it could seriously limit the ability of some students to obtain admission to UC or CSU.

Similarly, UC has a policy of adding one grade point to any high school courses that are undertaken in the Advanced Placement (AP) series. In other words, a grade of B in an AP math course is treated by UC as a grade of A. Thus, students at schools offering few AP courses may be at a disadvantage when applying to UC, because their overall grade point average (GPA) is likely to be lower than that of a student who had more access to AP classes.

These concerns have culminated in a lawsuit against UC Berkeley, launched in February 1999 by minority students backed by a coalition of civil rights groups. The lawsuit charges that current UC Berkeley admissions policy violates federal civil rights laws. Reporting on the lawsuit, the American Civil Liberties Union (ACLU) quotes Kimberly West-Faulcon, Western Regional Counsel for the National Association for the Advancement of Colored People (NAACP) as summarizing the lawsuit as follows:

> UC Berkeley's current process places too much weight on insignificant differences in SAT scores and gives enormous preferences to students to take Advanced Placement, or AP, courses. The first problem is that an SAT score tells you very little about what an applicant will ultimately contribute to Berkeley. The second problem is that many schools with high concentrations of African Americans, Latinos and Filipino Americans have no AP courses at all. Rewarding applicants with slightly higher SAT scores who had access to AP courses simply because of where they attended high school doesn't reward merit, it rewards privilege (ACLU, 1999).

A similar, but broader, class-action lawsuit was brought against the State of California and Inglewood Unified School District in July 1999 by the ACLU. The lawsuit specifically focuses on inequality in access to AP courses by California's public school students (Sahagun, 1999).

This report assesses these issues in some detail. First, it examines the level of inequality in the proportion of courses offered by California's high schools that are college-preparatory—that is, required for UC/CSU admission. Second, it tests for variations in the number of AP classes offered across schools, in the size of the classes, and in the training of the teachers who teach the classes. The analysis thus deals directly with the contention that many high schools in California do not provide the courses students need for admission to top public universities.

The fifth policy area is the equalization of resources across schools. This issue has regained relevance in California given the recent analysis by the Legislative Analyst's Office (1999a) of the need for differential cost-of-living adjustments to reduce inequities in funding across districts. The centralization of funding of school districts that resulted from Proposition 13 and related court judgments has not fully equalized resources across districts and schools, making it important to understand the specific nature of the remaining variations in school resources. The report answers the following questions in addressing this policy issue: (1) Has past equalization policy springing from the Serrano I and II court cases and Proposition 13 truly equalized resources among schools? (2) Are the district cost-of-living adjustments proposed by the Legislative Analyst's Office (1999a) needed? One way to answer both questions is to analyze the extent of current inequities in specific measures of school resources.

Outline of the Report

Using data collected by the CDE for the 1997–1998 academic year, we analyze the distribution of characteristics of students and the schools that they attend. We study inequality in these resources, where by *resources* we mean the characteristics of teachers, class size, and the curriculum offered in California's K–12 schools. Our unit of observation is the individual school. However, we use information about the characteristics of every class in the state, as detailed in the Professional Assignment Information Form (PAIF) filled out by all teachers, or by administrators on behalf of all teachers, near the beginning of the school year. We combine this information with other databases maintained by CDE, including the School Information Form (SIF), the Language Census (LC), Aid to Families with Dependent Children (AFDC), and the Stanford 9 Achievement Test administered as a part of STAR. Appendix A provides a more detailed description of these databases.

The next chapter depicts California's public schools as of the 1997–1998 school year. Chapter 3 assesses the degree of inequality between schools in class size, teacher characteristics, and curriculum. Chapter 4 examines whether observed variations in school resources are correlated with the socioeconomic status of students. Chapter 5 examines the regional variations in school inputs, as well as variations between suburban, urban, and rural schools. Chapter 6 summarizes the results of detailed regression analyses that test for a link between the level of student resources and the SES of the student body. By using regression analysis, we can examine the relationship between a specific school characteristic and resources while controlling for other differences across schools. The chapter also uses a district “fixed-effect” approach to examine how, within districts, school resources are distributed.

Chapter 7 turns from school resources, or “inputs,” to school outputs in the form of student achievement—the STAR math and reading tests. We look at the overall level and extent of equality in test scores, and the extent to which student SES accounts for variations among schools in test scores. We also examine regional variations in California test scores. Chapter 8 follows through on this theme by using regression analysis to model test scores at each school as a function of student SES and a host of school and district characteristics such as teacher experience and education, class size, and school and district size. This chapter brings together the two strands of the report by asking whether the inequality in school resources examined in early chapters plays a role in creating the unequal outcomes in student achievement documented in Chapter 7. Chapter 9 discusses the policy implications of our findings.

2. A Portrait of Average Resources in California Schools

Introduction

There are various ways to look at school resources—per-pupil spending is one of the most common. Yet, two students who attend schools with identical funding could have very different experiences because each school could spend its money on different things. Therefore, we are interested in examining a broader definition of resources. The datasets maintained by the CDE allow us to examine multiple measures that we believe are more representative of the learning experience (i.e., the result of the interaction between pupil and teacher) than any single measure could be. This chapter provides an overall portrait of schools, students, teachers, and classes and calculates averages for several measures—class size, curriculum, and selected teacher characteristics—which we refer to as *resources* throughout the rest of the report.

Characteristics of California's Schools

In 1997, the California public school system included 8,179 schools, 307,010 certified personnel, and over 5.7 million students. Using the SIF, we identified different types of schools and then focused on schools with "regular" academic programs. Thus, our analysis excludes special-education schools, juvenile halls, continuation schools, and adult schools, which means that we dropped 773 schools accounting for 2.3 percent of total enrollment. The sample also excludes schools for which AFDC and PAIF information was missing, as well as some charter schools for which data were missing. This led to another 85 deletions. Our study sample finally consisted of 7,321 regular schools in California's K–12 public school system, which included 97.7 percent of all public school students and over 92 percent of "teaching teachers."[1] We grouped the selected schools into four grade-span categories, based on similar characteristics of the schools, which will be discussed in more detail below. Each of the K–6, 6–8, and 9–12 groups included all schools where the enrollment fell entirely within one of these grade spans.[2] Schools where the enrollment crossed the boundaries described above were placed into an "other" category. Table 2.1 presents the number and percentage of schools, students, and teachers in each grade span used in this analysis.

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[1] Of the 307,010 certified personnel in 1997, 36,500 held nonteaching positions.

[2] Some grade 6 students are in elementary schools and some are in middle schools. Because approximately half of elementary schools are K–5, approximately half are K–6, and the rest constitute some combination of grades between kindergarten and grade 6, our elementary school category comprises grades K–6. The majority of middle schools are 6–8, whereas others are 7–8, and a few are single-grade. Grade-6-only schools were included in K–6 schools rather than in 6–8 schools.

Table 2.1

Number and Percentage of Schools, Students, and Teachers in Our Sample of California's Public Schools, by Grade Span, Fall 1997

Grade Span	No. of Schools	% of Schools	No. of Students	% of Students	FTE[a] Teachers	% of FTE Teachers
K–6	4,574	62.5	2,817,596	50.6	134,322.3	53.7
6–8	1,016	13.9	920,031	16.5	39,269.2	15.7
9–12	866	11.8	1,432,837	25.8	58,670.2	23.5
Other[b]	865	11.8	392,993	7.1	17,678.3	7.1
Total	7,321	100.0	5,563,457	100.0	249,940.0	100.0

[a]Full-time equivalent.

[b]"Other" includes 12 percent of schools but only 7 percent of students and teachers. It includes K–12 schools, K–8 schools, and schools where the grade spans did not fit entirely within any of our three defined categories (see footnote 2). The "other" category is not included in most of our analyses.

The three grade-span categories are distinctive in several ways, including the average number of students and teachers in each type of school. Elementary schools (grades K–6) account for the majority of schools. They have smaller average enrollment, fewer teachers, and smaller pupil-teacher ratios than schools with grades 6–8 and 9–12. Table 2.2 shows the enrollment and teaching force differences among the three grade spans.

Table 2.2

Average Number of Students and Teachers per School, by Grade Span, Fall 1997

Grade Span	No. of Students	No. of Teachers	Pupil-Teacher Ratio
K–6	616	29	21
6–8	906	39	24
9–12	1,655	68	25

Characteristics of California's Students

California's public school population is the largest in the nation. In 1997, the state's K–12 enrollment exceeded the entire population of 36 of the 50 states (taken individually). California's students also represent a broad range of socioeconomic levels and a diverse range of ethnic groups and languages. Our sample includes over 80 percent of the total enrollment in every grade and over 90 percent in grades K–5. Figure 2.1 shows the number of students in each grade of our sample schools.

The student population in California reflects the state's ethnic diversity. Nonwhite students constitute the majority of the enrollment in all three grade spans (see Figure 2.2). K–6 schools have the highest percentage of nonwhite students (63.7 percent), followed by 6–8 schools (60.8 percent), and 9–12 schools (58.2 percent). Latino students are the largest nonwhite racial/ethnic group in all three grade spans—44 percent

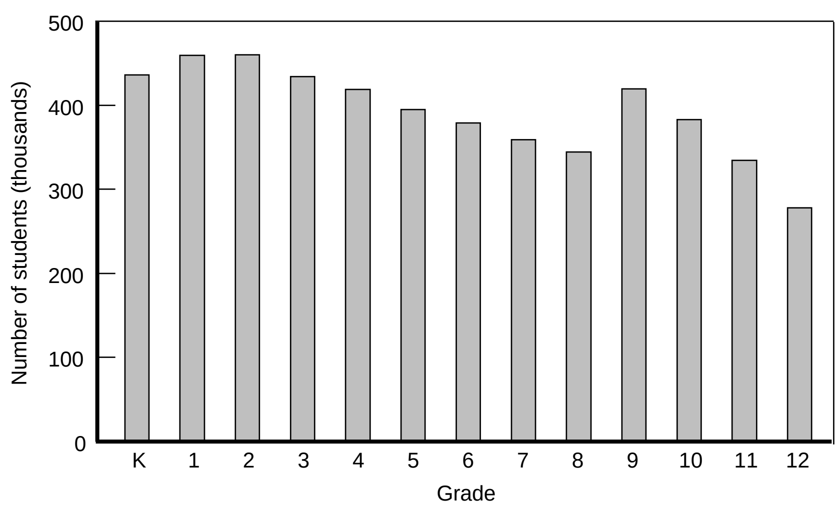
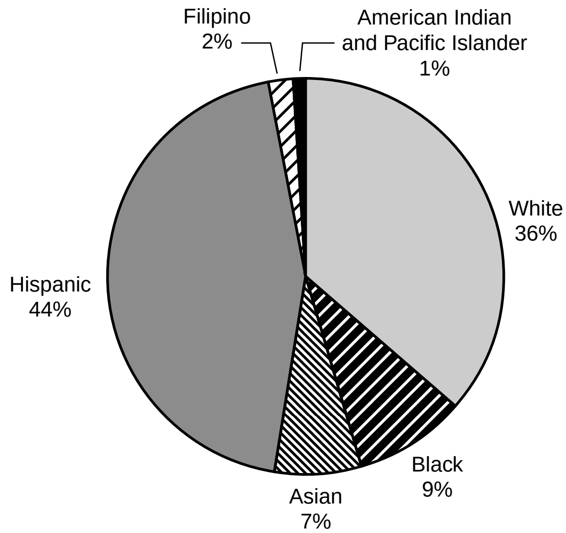


Figure 2.1—Number of Public School Students in Our Study Sample, by Grade, Fall 1997



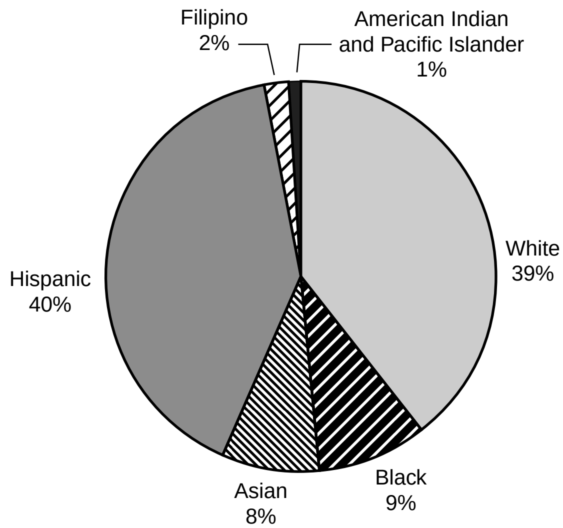
NOTE: Percentages do not sum to 100 because of rounding.

Figure 2.2a—Ethnic Composition of Students in K–6 Schools, Fall 1997

in K–6 schools, 40 percent in 6–8 schools, and 36 percent in 9–12 schools.

Other descriptive student data collected by CDE include SES measures and English language proficiency levels. Schools also report the percentage of children who receive free or reduced-price lunches at the school and the percentage of children who receive AFDC benefits in a school's attendance area.

We use both participation in the lunch program and AFDC as proxy measures of the SES of the school's student population. However, we focus primarily on the free or reduced-price lunch variable for two reasons. First, participation in the lunch program and AFDC are positively and highly correlated (0.71). Second, the lunch program



NOTE: Percentages do not sum to 100 because of rounding.

Figure 2.2b—Ethnic Composition of Students in Grade 6–8 Schools, Fall 1997

enables us to measure the SES of the students attending a given school,whereas the AFDC measure is less useful because it is based on all children living in the school's attendance area.

Limited English proficiency (LEP) students are those whose native language is not English and who do not speak English well. They are identified by native language, and summary counts are reported by schools on the Language Census (LC), which is collected each year. For all three of the above statistics, elementary schools have the highest percentages of students in each category, whereas 9–12 schools have the lowest percentages (see Table 2.3).

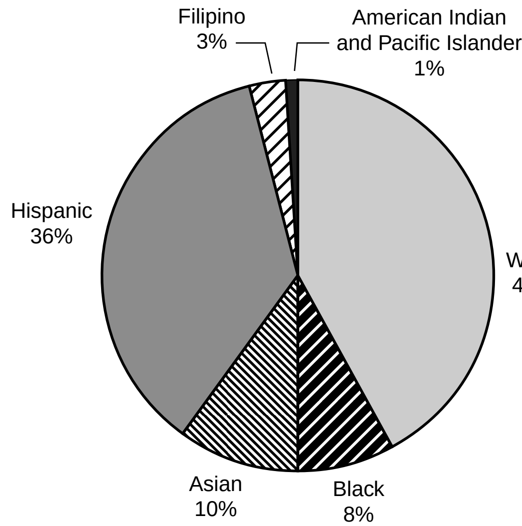


Figure 2.2c—Ethnic Composition of Students in Grade 9–12 Schools, Fall 1997

Table 2.3

Percentage of Students in Lunch, AFDC, and LEP Programs, by Grade Span, Fall 1997

Grade Span	Lunch Program	AFDC	LEP
K–6	56.7	21.4	31.7
6–8	47.8	17.2	21.7
9–12	30.8	14.3	16.0

Characteristics of California's Teachers

California's public school teachers are required to submit a Professional Assignment Information Form each year. This questionnaire includes information on the teacher's age, gender, ethnicity, education, experience, credentials, employment status, and teaching assignments. We used this information to produce school-level percentages and averages for our analysis. The final subset of schools used throughout most of our analysis includes over 80 percent of the total certified staff, and approximately 85 percent of teaching teachers (i.e., teachers who were in the classroom rather than engaged in administrative activities in the fall of 1997).

The teaching force in California's schools is for the most part well qualified, in terms of education, experience, and credentials. The majority of teachers have at least one year of coursework beyond a bachelor's degree, at least five years of teaching experience, and a full teaching credential. Teachers with higher education levels and more teaching experience tend to be in grade 9–12 schools, where subjects are more specialized.

Ethnicity

Although the student population in California reflects the state's ethnic diversity, California's teachers do not. White teachers constitute 74 percent of the teaching force in K–6 schools and almost 80 percent in 6–8 and 9–12 schools (see Table 2.4).

Table 2.4

Ethnic Composition of Teachers in California Public Schools, by Grade Span, Fall 1997
(in percent)

Grade Span	White	Black	Asian	Latino	Filipino	American Indian and Pacific Islander	Missing Data
K–6	74.0	5.1	4.4	14.1	1.0	0.8	0.6
6–8	79.5	6.2	3.3	8.5	0.7	1.0	0.8
9–12	79.6	4.7	3.4	9.9	0.7	1.2	0.6

Education

The teacher questionnaire asks for information on academic credentials, offering six education-level choices: (1) less than a bachelor’s degree, (2) bachelor’s degree, (3) bachelor’s degree plus 30 semester units of coursework, (4) master’s degree, (5) master’s degree plus 30 semester units of coursework, and (6) doctoral degree. The majority of respondents have at least a bachelor’s degree plus 30 semester units, which corresponds to about one additional year of coursework beyond the bachelor’s degree—a requirement for obtaining a full teaching credential. Figure 2.3 shows teachers’ education levels for the three grade spans.[3]

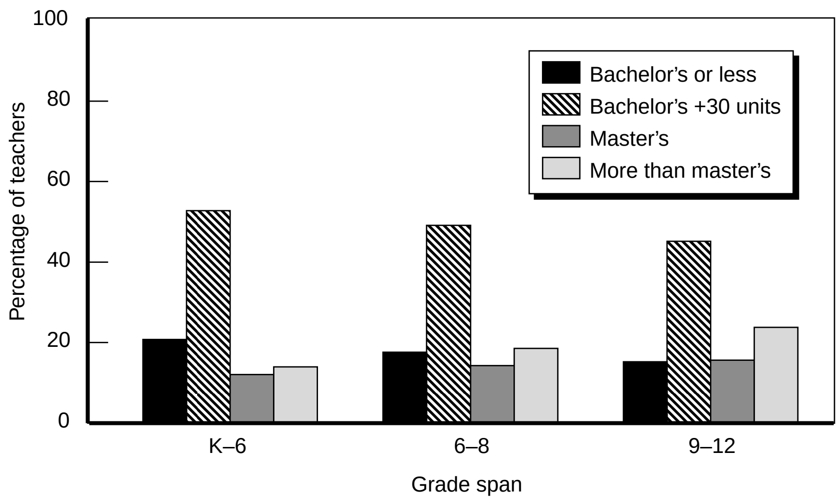


Figure 2.3—Education Levels of Teachers, by Grade Span, Fall 1997

[3]The percentage of teachers with less than a bachelor’s degree is so low (less than 1 percent) in all grade spans that this category has been combined with the bachelor's degree category.

Experience

The PAIF also asks teachers to provide information on their total years of teaching experience and their years in the current district. In our sample, grade K–6 teachers had an average of 12.3 years of experience, grade 6–8 teachers had an average of 13.7 years, and grade 9–12 teachers had an average of 15.3 years. Figure 2.4 shows teacher experience in four experience ranges. The figure clearly shows that K–6 schools have the largest share of novice teachers, with approximately 20 percent having 0–2 years of experience. We suspect that, as reported by the CSR Research Consortium (1999), the relatively large number of inexperienced teachers in elementary schools reflects to some degree the spate of teacher recruitment induced by the K–3 class size reduction initiative.

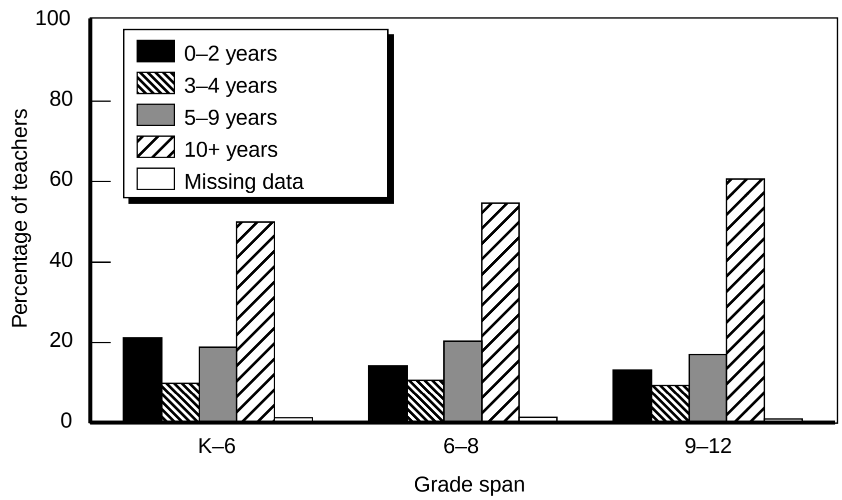


Figure 2.4—Experience of Teachers, by Grade Span, Fall 1997

Credentials

Given the recent controversy over the extent to which California's teaching force lacks proper training and credentials, it is important to distinguish among the requirements for each type of credential the state issues. The California Commission on Teacher Credentialing[4] maintains detailed information on the credentialing process.[5] California teachers may possess more than one type of teaching credential. There are five main credential types: full, university intern, district intern, emergency, and waiver. The full credential is the one most commonly cited as the minimum credential level required for teaching in California's public schools. Because the PAIF questionnaire does not distinguish between a

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[4]California Commission on Teaching Credentialing, http://www.ctc.ca.gov (5/99), and personal communication with James Alford, CTC, 8/26/99.

[5]All applicants for *any* type of teaching credential except in some extraordinary cases must qualify in the following three areas. First, the applicant must possess a bachelor's degree from an accredited college or university; second, all applicants, unless exempted by statute or regulation, must take the California Basic Educational Skills Test (CBEST); third, all applicants must obtain fingerprint clearance from the CTC. Thirty semester units beyond a bachelor's degree are required to obtain a full credential. Internships allow the intern to take coursework toward the full credential while simultaneously working in the classroom. Emergency credentials and waivers must be requested by the employer rather than the prospective teacher and must be accompanied by a Declaration of Need for Fully Qualified Educators. The prospective teacher must file a notice of intent to complete the requirements for a full credential and must actively pursue this goal to maintain or renew the emergency or waiver credential. In the case of a waiver, which is the credential of last resort, the employer must show evidence of serious recruitment efforts before resorting to the waiver. Emergency permits are valid for one year and are renewable a maximum of four times, conditional upon progress being made toward the full credential. This process allows a teacher on emergency credential to teach up to five years before obtaining a full credential. An exception to the emergency credential process described above is the Emergency 30-Day Substitute Teaching Permit, which is valid for one year, but which does not allow the teacher to substitute for more than 30 days for any one teacher. Applicants may apply directly to the CTC or through the employing agency for this permit. Finally, waivers are of two types—the short-term and the variable-term. The former is a temporary credential issued when a teacher already has a credential and is being assigned to teach in a new subject area. The latter is one that may be issued to an applicant without a bachelor's degree or who has not successfully completed the CBEST examination.

full preliminary credential and a full clear credential, we include both types in our discussions of full credentials. Substitute teachers, whether long-term or short-term, are not counted as part of the teaching force on the PAIF. Thus, we have no accurate data on the number of *substitute teachers* holding emergency credentials who may be teaching in California's schools. The number of teachers holding waivers is extremely small and has been included with emergency credentials in our analysis.

As noted above, a person may hold a full credential and an emergency credential simultaneously. For example, in K–6 schools, 12.1 percent of teachers report holding an emergency credential, but approximately 2 percent of this 12 percent already hold a full credential. We believe that a distinction needs to be drawn between a new recruit holding emergency credentials and a teacher who already has a full credential but who also holds an emergency credential. Such a situation can arise if an experienced and fully credentialed teacher is assigned to teach in a new subject area. Thus, it is misleading to look *only* at the percentage of teachers holding an emergency credential or waiver. Accordingly, in Table 2.5, we list as fully credentialed those holding a

Table 2.5

Credentials Held by Teachers, by Grade Span, Fall 1997
(in percent)

	Grade Span		
Credential	K–6	6–8	9–12
At least a full credential	86.0	88.0	89.8
Emergency credential or waiver *only*	10.1	8.4	7.1
Internship only	1.6	0.8	0.6
Missing data	2.3	2.8	2.5
Total	100	100	100

full credential *and* an emergency credential or waiver. Over 86 percent of California's teachers have at least a full credential, whereas fewer than 10.2 percent possess *only* an emergency credential or a waiver.

Experience, Education, and Authorizations, by Subject Area, for Teachers in Grade Span 6–8 and 9–12

We selected four core academic subjects for our analysis, based on common education curriculum standards. These core subjects are English, mathematics (including computer science), science (including life and physical science), and social science. These are the four subject areas that the National Commission on Excellence in Education (1983) recommended as "New Basics" that all schools require of their students.[6] Additionally, we studied the characteristics of teachers of AP courses in these subject areas in grade span 9–12. Advanced Placement courses provide students with college-level curriculum and credit.

In almost every core subject in the two grade spans, average teacher experience exceeded 13 years. Over 50 percent of teachers had at least ten years of experience. Thus, the average middle or high school teacher in California is highly experienced. With respect to educational attainment, just over 30 percent of teachers in middle schools had at least a master's degree, compared to just under 40 percent in high schools.[7]

Slightly over half of the core subject teachers in middle schools held the correct subject authorizations.[8] In grade 9–12 schools, the

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[6]The commission also recommended that schools require the study of foreign languages, but only for college-bound students and for a shorter period than the other four key subjects in the New Basics.

[7]An exception was grade span 6–8 science teachers, who had slightly less experience and less education than other middle school teachers.

[8]Because most middle schools are either grades 6–8 or 7–8, they are considered by the CDE to be part of the elementary school (K–8) category. As such, middle school

percentages with the correct authorization were higher than in middle schools. For instance, at least 80 percent of teachers in grade span 9–12 had a subject authorization for the core subject they taught, and over 90 percent of AP math teachers had a math authorization. Table 2.6 presents detailed statistics on the teacher characteristics for each subject in the two grade spans and for AP classes.

Table 2.6

Teacher Characteristics, by Subject Area and Grade Span, Fall 1997
(in percent)

	English	Math	Science	Social Science
	Grade Span 6–8			
Average experience	13.5	13.4	11.8	14.6
0–2 years	13.6	15.2	18.5	12.7
At least 10 years	53.9	50.7	46.1	56.4
At least a master's degree	33.6	31.7	29.6	32.7
	Grade Span 9–12			
Average experience	14.4	14.6	13.7	16.4
0–2 years	14.6	13.8	15.2	11.9
At least 10 years	56.7	56.7	55.3	62.6
At least a master's degree	38.7	38.3	39.3	41.5
Subject authorization	83.7	81.7	85.4	81.5
	Grade Span 9–12 AP Teachers			
Average experience	20.4	18.3	16.0	19.3
0–2 years	1.7	3.6	4.6	4.8
At least 10 years	81.7	75.2	65.6	74.1
At least a master's degree	56.9	50.4	51.5	50.0
Subject authorization	88.8	91.6	86.5	85.1

teachers are not required to hold subject authorizations and may hold multisubject elementary authorizations instead. We did not calculate the percentage of middle school core subject teachers with an elementary rather than a subject authorization. Thus, although the number holding specific subject authorizations is lower, it does not necessarily mean that more middle school teachers are teaching classes out of their field of expertise.

Characteristics of California's Classes

Pupil-Teacher Ratios and Average Class Sizes

By combining student enrollment counts from the SIF and teachers' FTE information from the PAIF, we calculated a pupil-teacher ratio for each school. (See Appendix A for details on pupil-FTE ratio calculations.) The PAIF also collects information from teachers on the class sections they teach. This information includes the specific grade or subject taught[9] and the number of students in the section. We used this information to produce average class sizes for several different types of classes. These measures include overall average class sizes at a school for each grade from kindergarten through grade 6 in K–6 schools, for subject area classes in 6–8 and 9–12 schools, and for AP classes in 9–12 schools. (See Appendix A for detailed information on the method used to calculate average class sizes.)

Pupil-teacher ratios are generally lower than average class sizes because the pupil-teacher ratio measures the number of students per teacher in a school, whereas the average class size is a measure of the actual contact between students and teachers in a classroom. For instance, a teacher who spends two periods of the day in a preparation period will not see students during that time, even though he or she is at the school for part of the students' day. Thus, pupil-FTE ratios include all teachers in the denominator, whereas the average class size measure includes only those teachers involved in the classroom setting. Figure 2.5 contains pupil-FTE ratios and overall average class sizes for the three

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[9]The assignment code for grades K–5 explicitly indicates the grade level. For higher grades, the code generally indicates the subject taught. In grade 6, codes for schools included in the K–6 category are the former, whereas codes for schools included in the 6–8 category are the latter.

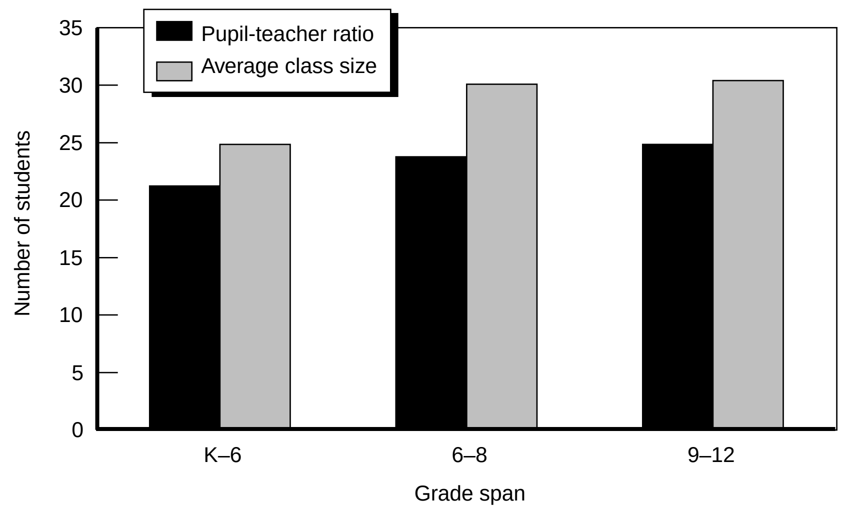

Figure 2.5—Pupil-Teacher Ratios and Average Class Sizes, by Grade Span, Fall 1997

grade spans. The figure makes clear that by either of these measures, classes are considerably larger in middle schools and high schools than in elementary schools.

Of course, one important reason why class sizes were smaller in elementary schools in 1997–1998 was the CSR initiative, implemented in grades 1 and 2 in 1996 and in kindergarten and grade 3 the following year. The question naturally arises: Are class sizes small in all elementary grades or only in grades K–3?

K–6 Average Class Size

Figure 2.6 shows the average class sizes for K–6 schools. Average class sizes in grades 1 and 2 meet the target K–3 CSR limit of 20.4 students per classroom, but average class sizes in kindergarten and grade

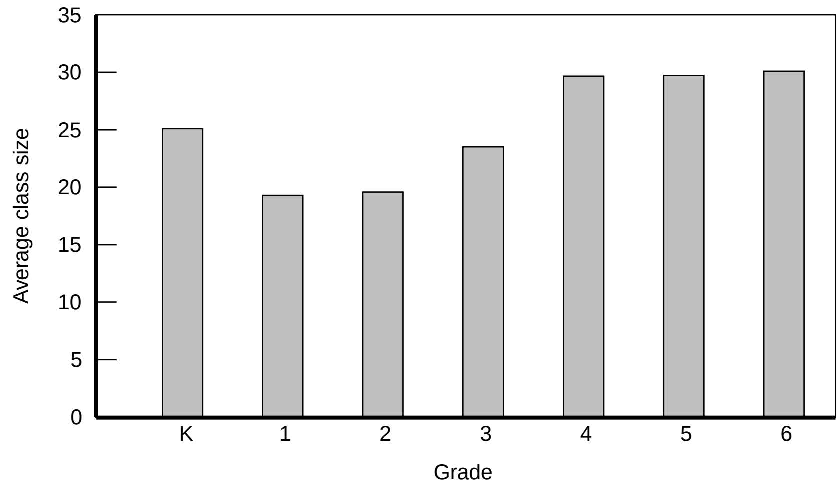

Figure 2.6—Average Class Sizes, Grade K–6 Schools, Fall 1997

3 do not. This is probably because the CSR legislation requires that schools first reduce class size to 20.4 in grade 1, followed by grade 2 and then by either kindergarten or grade 3 (SB 1777).[10] Finally, grades 4–6 have much larger average class sizes than grades K–3, ranging between 29.6 and 30.0 students. This is very close to the averages observed in middle schools and high schools (30.1 and 30.4, respectively).

Subject-Specific Average Class Size in 6–8 and 9–12 Schools

Figure 2.7 presents class sizes for four core subjects. In both grade span 6–8 and 9–12 schools, on average, English and math classes are smaller than social science and science classes. However, science classes

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[10]The CSR initiative applies only to grades K–3 and provides financial incentives for schools to reduce their class sizes in these grades. Schools must fulfill these class size requirements to qualify for the CSR funds, but there is no legal requirement for CSR compliance.

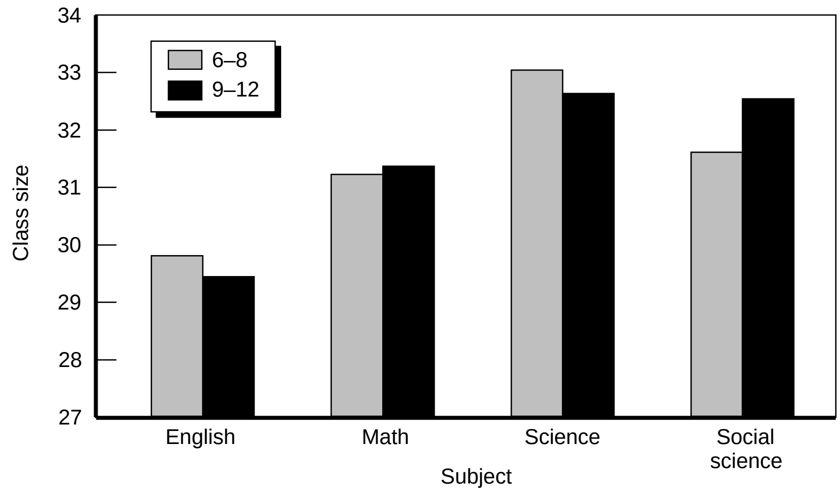

Figure 2.7—Core-Subject Average Class Sizes, Grade 6–8 and 9–12 Schools, Fall 1997

include lab sections, which may be larger than other science sections, thus affecting the mean.

Numbers of Course Sections in "a–f" and AP Subjects: 9–12 Schools

Another component of a quality education is access to courses designed to prepare students for college, such as the "a–f" series (UC/CSU prerequisites) and AP series. Table 2.7 provides a detailed breakdown of the average numbers and percentages of these classes by core subject. Most 9–12 schools offer some of these classes; the average number of "a–f" classes across schools is 229 (53 percent) and over 65 percent of the core subject classes are "a–f" offerings. The average number of AP classes is twelve (3 percent) and at least 2.3 percent of core subject classes are AP offerings. Table 2.8 presents the numbers and

Table 2.7

Average Number and Percentage of "a–f" and AP Course Offerings in Grade Span 9–12, by Subject, Fall 1997

	English		Math		Science		Social Science		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
"a–f" classes	60.6	74.9	41.7	67.6	36.4	74.8	44.6	80.2	228.6	53.5
AP classes	2.2	2.9	1.5	2.3	1.9	3.9	3.2	5.7	11.5	2.7

Table 2.8

Number and Percentage of Schools Offering AP Classes in Grade Span 9–12, Fall 1997

No. of AP Classes	No. of Schools	% of Schools
0	138	16
1–2	97	11
3–5	146	17
6–10	222	26
11–20	199	23
21–30	43	5
More than 30	21	2
Total	866	100

percentages of schools offering different numbers of AP classes. Note that 138 high schools (16 percent) offer no AP courses at all, whereas 97 schools (11 percent) offer only one or two sections of AP courses. In contrast, 64 schools (7 percent) offer more than 20 AP classes.

Comparison of California to the Nation

It is instructive to compare the overall characteristics of California's teachers and classrooms to national averages. These comparisons tend to confirm our finding that California's teachers have considerable amounts of experience, on average, but often lack educational credentials. Data from the Schools and Staffing Survey, 1993–94 (National Center for Education Statistics, 1999) suggest that at the national level about 65 percent of public school teachers had ten or more years of experience in 1993–1994. Our data suggest that in California in 1997–98, about 50–60 percent of the state's teachers had ten or more years of experience, depending on the grade span studied. The same national dataset suggests a much larger gap in level of education between California's teachers and those in the nation as a whole. In 1993–1994, 44 percent of elementary teachers and 51 percent of secondary teachers in the nation held a master's degree or higher. The corresponding figures for California's teachers in 1997 are much lower: 26 percent for elementary schools, 33 percent for middle schools, and 39 percent for high schools.

A comparison with national data also suggests that California lags the nation in its bid to reduce pupil-teacher ratios. In 1996, the national pupil-teacher ratio was 17.1, compared to 22.9 in California (National Center for Education Statistics, 1999).

Summary

In California, average class sizes range from approximately 20 students in K–6 schools to 30 students in 6–8 and 9–12 schools. Almost all high schools offer "a–f" courses and the majority of high schools offer at least a few AP courses. The majority of California teachers meet the state's minimum qualification standards, in the sense that most have a full credential and appropriate subject authorizations. They appear to be highly experienced, but their education levels are quite often below the master's level. What is unclear from measuring average resource levels is the degree to which there is an unequal *distribution* of these resources across the state's schools. That is the subject of the next chapter.

3. The Distribution of Students and Resources

Introduction

Despite three decades of legal battles that have focused on spending per pupil at the district level, it appears that some resources may still be unequally distributed across schools.[1] This chapter begins to explore that proposition in some detail. Whereas Chapter 2 focused on the characteristics of California's schools, students, teachers, and classes, this chapter focuses on *variations* in the level of these variables across schools.

We will rank students according to the level of resources they receive at their school. This allows us to calculate disparities across students. The measure of variation we use in this chapter is the interquartile ratio, which equals the ratio of the given school resource at the 25th percentile

[1]This report focuses on characteristics found in schools rather than on per-pupil spending. For a discussion of spending equalization across districts, see Sonstelie, Brunner, and Arden (2000).

(p25) to the resource at the 75th percentile (p75) of the distribution of the resource, and indicates the degree to which inequality exists (Reed, 1999). The closer the ratio is to 1, the less inequality there is, whereas the closer this number is to 0, the greater the inequality it represents.[2] For instance, if mean teacher experience for the 25th and 75th percentile students were 4 and 20 years respectively, then the interquartile ratio would be 4/20 = 0.2, indicating strong variations in teacher experience.[3] Although we use the interquartile ratio to describe the degree of disparity between schools, we also refer to appendices containing the various percentiles for each school characteristic discussed in the chapter.[4] In some instances, we will refer to the interquartile range, or difference between p25 and p75, rather than to the ratio. In cases where the interquartile ratio is 0, we will often discuss the interquartile range or the value of the 75th percentile to give a fuller description of the amount of inequality present. This is done because an interquartile ratio of 0 gives no information about the size of the 75th percentile.

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[2]There are various measures of dispersion, each of which has its limitations. Although we considered using the p10/p90 ratio, this dataset has many more 0 values at the 10th percentile than at the 25th percentile. Thus, we use the interquartile ratios and ranges extensively in this chapter and the next.

[3]We will occasionally refer to the interquartile ratio as the p25/p75 ratio to remind the reader how it is constructed.

[4]For a more complete picture of the resource distribution, we calculate the 10th, 25th, 50th (median), 75th and 90th percentiles of each variable across schools, weighting schools by total enrollment, to illustrate the interpretation of resource levels across these distributions. For example, imagine a teacher at the 25th percentile of teacher experience: This statistic indicates that 75 percent of students attend schools with average teacher experience *greater than* the 25th percentile experience level. Occasionally, we focus on measures of resource shortages, such as the percentage of teachers who are not fully certified. In these cases, when we rank, a higher percentile student will have *more* of the given resource *shortage* than will a lower percentile student.

Distribution of Students

Although students' socioeconomic characteristics may not be resources in the same sense as class size or teacher inputs, they are an important consideration because past research has suggested that a student's peer group (Henderson, Mieszkowski, and Sauvageau, 1978) and family background (Hauser, Sewell, and Alwin, 1976) can affect his or her achievement.

Figure 3.1 shows the interquartile (p25/p75) ratios for a number of measures of students' SES.[5] As we showed in Chapter 2, the ethnic composition of students in California reflects the state's ethnic diversity. However, the distribution of California's percentage white (39 percent)

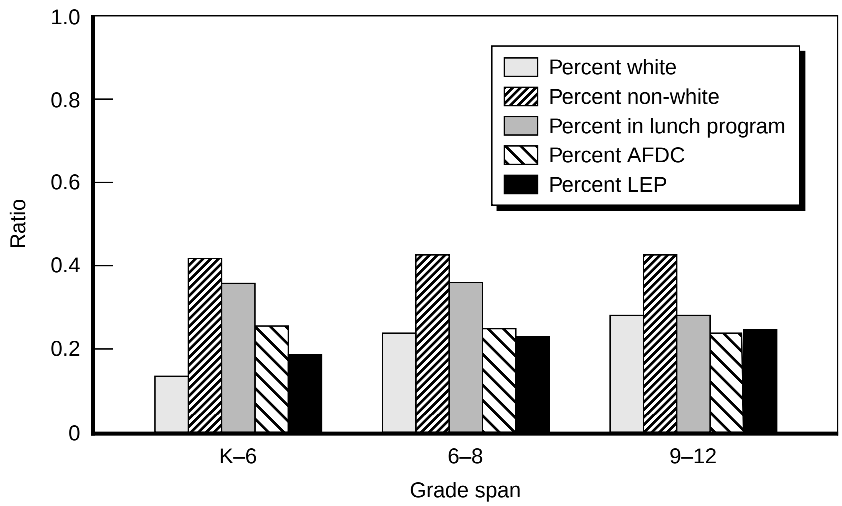

Figure 3.1—Interquartile Ratios for Student Characteristics, by Grade Span, Fall 1997

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[5]Appendix Table A.2 shows the underlying percentiles, interquartile ratios, and interquartile ranges.

and nonwhite (61 percent) students across schools exhibits much disparity. Strikingly, white students are even more highly concentrated in some schools than nonwhite students, as the low interquartile ratio (0.13) for percentage white students in K–6 schools clearly demonstrates. Similarly, we see unequal distribution patterns, which suggest some concentration, or clustering, when we look at three other student-measure variables: (1) percentage receiving free or reduced-price lunches, (2) percentage in the school's attendance area receiving AFDC benefits, and (3) percentage with limited English proficiency (LEP). Because the correlation between any two of the four variables above is positive and relatively strong (ranging from 0.45 to 0.76), their distributions are presented together in Figure 3.1.

No clear patterns in these five student characteristics emerge when comparing the interquartile ratios among *grade spans*; however, there are some differences. We can see that of the three grade spans, white students (0.13) and LEP students (0.19) are less equally distributed across K–6 schools than across 6–8 schools (0.24 and 0.23, respectively) and 9–12 schools (0.28 and 0.24, respectively). In contrast, of the three grade spans, grade 9–12 schools have more inequality (0.28) in the distribution of those in the free or reduced-price lunch program than K–6 (0.36) or 6–8 schools (0.36). This measure suggests that regardless of race/ethnicity or English proficiency, higher concentrations of low-SES high school students may be clustered in particular schools rather than evenly distributed across schools.[6]

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[6]In later chapters, we will focus primarily on the proportion of students receiving free or reduced-price lunches rather than the AFDC measure, because the latter is measured for all children in the school's attendance area (including students attending private schools or out-of-area charter schools) and does not provide quite as accurate a measure of the socioeconomic status of children in attendance at any given school.

In a way, the results in grade K–6 schools for the percentage white and the percentage LEP are unsurprising, because elementary schools are more local in nature. As such, they pick up variations in socioeconomic characteristics across neighborhoods more strongly than do high schools, which typically enroll students who have graduated from a number of elementary and middle schools over a wider area.

Thus, the unequal distribution of student characteristics across California schools may contribute to variations in educational outcomes, if peer groups and student background influence student achievement. In addition, variation in the socioeconomic makeup of the student body across schools also leads us to hypothesize that any inequities we find in school resources are likely to create inequities between socioeconomic groups.

School Resources

We examined the distribution of our key measures for class and teacher characteristics across schools. To address the question of whether large, mainly urban school districts might affect the distributions, we also did our analysis excluding the five largest school districts in the state—Los Angeles Unified, San Diego Unified, San Francisco Unified, Long Beach Unified, and Fresno Unified. These districts account for approximately 18 percent of our sample enrollment. We found virtually no difference for most of our resource measures between distributions across all schools and distributions across the subsample that excludes schools in the five largest districts.[7] Thus, our sample throughout this report includes schools from all districts in the state.

Classes

Class Size. As noted above, class size represents a measure of interaction between students and their teachers; presumably, on average, a student will get more attention from a teacher if there are fewer students in a given class. Recently, class size has received much attention, resulting from the K–3 CSR initiative in 1996, which has initially had the most effect on class sizes in grades 1 and 2. We begin by examining the distribution of overall class size, which includes special-education classes and all non-special-education classes, which we refer to as "regular" classes.

Overall class size tends to be smaller than regular class size in all grade spans, because special-education classes tend to be smaller than regular classes and both types are included in the overall average class size calculation. Average class sizes for grade 6–8 and 9–12 schools are very similar and are larger than K–6 average class sizes. For example, the median overall class size for K–6 schools is 23 students, compared to 28 and 29 students in 6–8 and 9–12 schools, respectively. (Appendix A tables contain the 10th through 90th percentiles of various measures of class size by grade span and, for the sake of comparison, the pupil-teacher ratio as well.)

As Figure 3.2 shows, the interquartile (p25/p75) ratios are quite large—over 0.8 in all cases. In other words, there is little variation in the

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[7]For most variables, the difference for each of the percentiles p10, p25, p50, p75, and p90 was less than 1 percent. See Appendix Table A.3 for the median levels of selected variables.

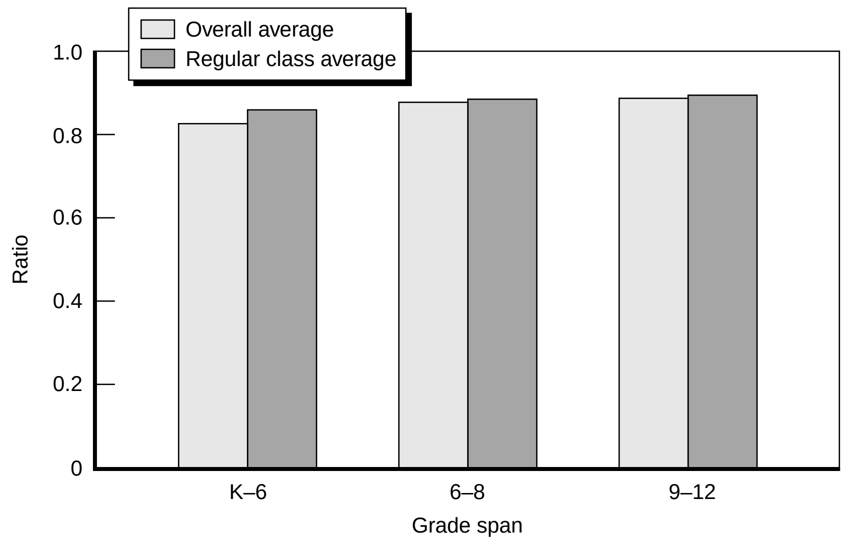

Figure 3.2—Interquartile Ratios for Average Class Size, by Grade Span, Fall 1997

distribution of average overall and regular class sizes across schools for the three grade spans. Interestingly, the K–6 schools exhibit considerably more variation in class size than do the higher grades.[8]

To understand why elementary schools have more variation in class size than other grade spans, we calculated the interquartile ratios for grades 1 through 6. Figure 3.3 makes it clear that the CSR legislation has much to do with variations in class size across the K–6 grade span.

[8]The mean average class sizes range from 11 to 16 students in special-education classes across the three grade spans; in regular classes, mean average class sizes range from 23 to 31. However, the range for special-education class size is much broader than that for regular classes. For example, differences between p75 and p25 for special-education class sizes are 11.1 in K–6, 6.3 in 6–8, and 6.1 in 9–12. For regular classes, these interquartile ranges are only 3.6, 3.6, and 3.3, respectively. The dispersion in special-education class sizes accounts for most of the difference in the interquartile ratios between overall class size and regular class size.

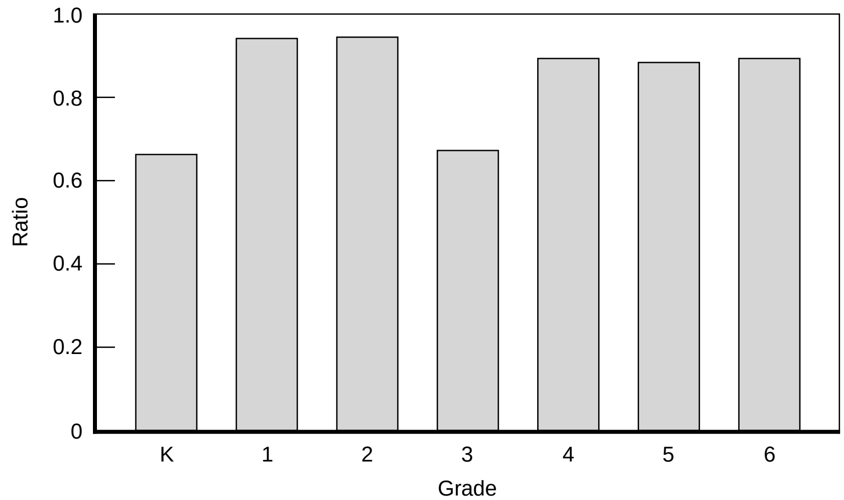

Figure 3.3—Interquartile Ratios for Average Class Size, by Grade, Fall 1997

However, when we look at the distribution of K–6 class sizes grade by grade, we find little class size variation across schools in most grades. Almost all class sizes in grades 1 and 2 (over 90 percent) are under the 20.4 students required by CSR, leading to a very high interquartile ratio. In contrast, kindergarten and grade 3 have both larger average class sizes and lower interquartile ratios (indicating higher inequality across schools) than do grades 1 and 2. The higher levels of inequality in kindergarten and grade 3 compared to grades 1 and 2 probably reflect the dynamics of schools' responses to the CSR legislation. As mentioned in Chapter 2, the CSR legislation requires that participating schools reduce class size to 20.4 students in grade 1 first, followed by grade 2, and then either kindergarten or grade 3. It may be that some schools are complying with CSR for grades 1 and 2 but doing so at the expense of kindergarten and grade 3. Ironically, the CSR legislation has temporarily *increased* disparities across schools because some schools have implemented the legislated changes in kindergarten and grade 3, whereas others have yet to do so and still have class sizes hovering at 25 or 30 in these grades. For grades 4–6, class sizes are larger than in lower grades, but there is little variation across schools.[9]

To assess class resources for grade spans 6–8 and 9–12, we took a slightly different approach. Rather than measuring the class size differences by grade, we looked at average class sizes for core academic subjects, because students may be following a curriculum based on criteria other than age-grade level.

Figure 3.4 presents the interquartile ratios for subject-specific class sizes in grade spans 6–8 and 9–12 and for AP classes in 9–12 schools. There is not much variation in class size across subjects or schools in either the 6–8 or 9–12 grade spans. Clearly, the CSR initiative for grades K–3 cannot account for the consistency of class size in these higher grades. The lack of variation in these cases may be driven by class size standards set forth in teaching contracts rather than through legislation. For example, three of the state's largest school districts—Los Angeles Unified, San Diego Unified, and San Francisco Unified—have specified class size guidelines in their contracts with teachers' unions. Sections 2.2 and 2.3 in the Los Angeles Unified School District (LAUSD) 1995–1998 contract address regular program class averages. The contract states, "Middle schools (including 6th grade middle school

[9]Another explanation for stronger variation in class size in the K–6 grade span is the varying composition of the K–6 category. Although 90 percent of schools and 93 percent of K–6 students in our sample attend K–5 or K–6 schools, this category contains a wider range of included grade spans, such as schools that have *only* grades K–2. In addition, K–6 schools vary in the number of classes they have in each grade, which can affect average class size in these schools.

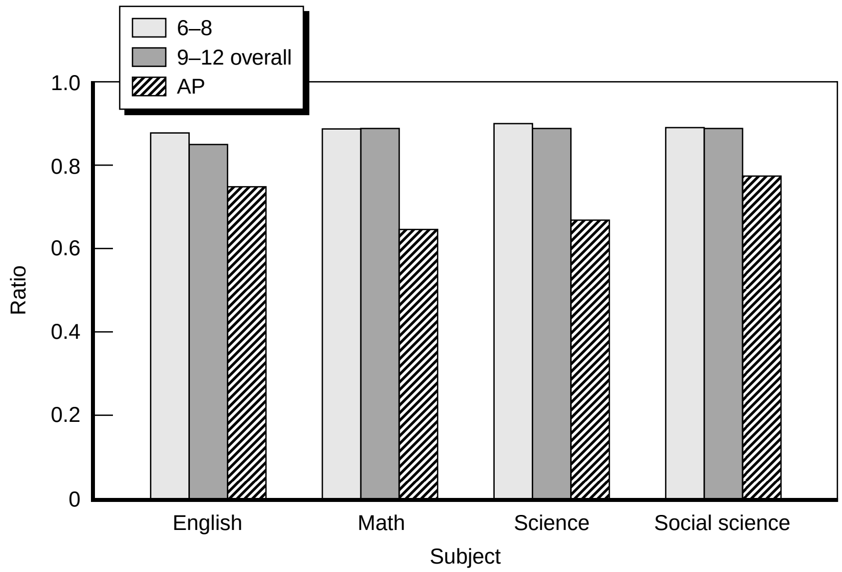

Figure 3.4—Interquartile Ratios for Average Class Size in Grade 6–8 and 9–12 Schools, by Subject, Fall 1997

students): all classes at a school are to average 36.25 students. . . . Senior high schools (including grade 9 senior high school students): all classes at a school are to average 35.5 students." Similarly, the San Diego Unified School District (SDUSD, 1998–2001) specifies a maximum class size and overall average class size for each grade range. Sections 9.5.2 through 9.5.4.1 of the San Francisco Unified School District (SFUSD, 1995–1998) contract provide specific class size "goals" for various subjects in middle and high schools. Class size specifications for most subjects range from 25–30 students, whereas the target size of physical education classes is 37 students. Although the language in each of these three districts' contracts describes the class size requirements in a slightly different manner, it is evident that teachers' contracts influence class sizes in higher grades. Given these examples, it is not surprising that we found little class size variation in the 6–8 and 9–12 grade spans (see Appendix Table A.2 for the detailed distributions).

When we analyze AP class sizes, a different picture emerges. Mean AP class sizes (27 English, 25 math, 24 science, and 28 social science) tend to be smaller than overall core subject class sizes (29, 31, 33, and 33, respectively) or "a–f" core subject class sizes (30, 32, 33, and 33, respectively). There is also more variation in core AP subject class sizes (interquartile ratios of 0.75, 0.64, 0.67, and 0.77, respectively) than in either overall core subject class sizes (interquartile ratios of 0.86, 0.89, 0.88, and 0.89, respectively) or "a–f" class sizes (interquartile ratios of 0.85, 0.88, 0.89, and 0.89, respectively).

English and social science AP classes are larger than math and science AP classes (as shown above and in Chapter 2), yet they exhibit little class size variation across schools. In contrast, math and science AP classes have smaller average class sizes but show more class size variation across schools than English and social science AP classes.[10] (See Appendix Table A.2.)

As these figures show, there is some evidence of unequal distribution in class sizes across California schools in all grade spans. Kindergarten, grade 3, and high school AP classes in math and science exhibit the greatest degree of inequality, with interquartile ratios of about 0.6. Most of the other grades in elementary schools, as well as subject areas in higher grade spans, exhibit interquartile ranges of about 0.8. In other words, the 25th percentile school has an average class size about 80

[10]Note that we calculate AP class size using the subsample of schools that offer AP courses in the given subject.

percent as large as the 75th percentile school. These inequalities are moderate but are cause for concern.[11]

Supply of "a–f" and AP Courses. In the preceding section, we discussed participation in AP classes in terms of class size. But a more basic question—the subject of part of the lawsuits mentioned in Chapter 1—is whether some high schools provide any AP classes whatsoever. In this section, we look at the percentage of classes in high school that are either AP or that satisfy college admission requirements ("a–f" courses). When analyzed in this light, we find some evidence of unequal distribution of resources across schools.

A lack of advanced classes at a school could reflect either supply or demand. The school may be failing to provide these classes, and in so doing fails to supply an adequate education to its students. Alternatively, students may not be demanding AP courses. There could be a number of reasons for this, such as poor student preparation from kindergarten forward that makes it unlikely that students, by the time they reach high school, will be ready for advanced courses. This lack of preparation might result from inadequate elementary and middle schools or the general level of disadvantage in the school's neighborhood. Alternatively, a lack of demand for "a–f" or AP courses might reflect a lack of information in the local community about the academic preparation that is needed for college.

Figure 3.5 shows the variation in the percentages of "a–f" and AP classes (1) among overall classes, (2) among regular classes, and (3)

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[11]Although our main interest is the degree of inequality *across* schools, it is also interesting to study the degree of inequality *within* schools. Chapter 2 shows that the median class size in high school AP courses is slightly lower than the median class size of all classes in the corresponding subjects. The implication is that in high schools, the most advanced students enjoy lower-than-average class sizes.

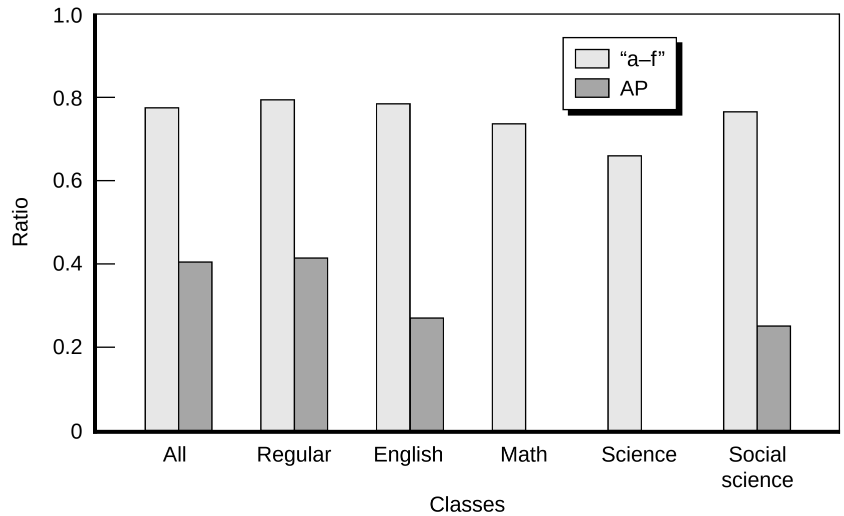

Figure 3.5—Interquartile Ratios for "a–f" and AP Core Subjects Class Offerings in 9–12 Schools, Fall 1997

among individual subject offerings. On average, approximately 53 percent of classes are college-preparatory, or "a–f" courses. However, there is more variation in the percentage of "a–f" math and especially science classes than "a–f" English and social science classes. More dramatic is the inequality in the distribution of AP classes: Both numbers and percentages of classes offered show unequal distribution. Not only is there inequality in the percentage of classes offered within a given subject that are AP, but perhaps more important, there is inequality in terms of *which* AP subjects are offered at all. For instance, the interquartile ratios of AP offerings for math and science are 0, meaning that the 25th percentile school offers no AP classes at all in these subjects. Because the percentage of AP classes is small compared with the percentage of "a–f" classes, it is also useful to look at the interquartile range to assess the magnitude of inequality when the interquartile ratio is 0. For AP math and science classes, 75th percentile schools have two (3.5 percent) and three (5.7 percent) more classes, respectively, than 25th percentile schools.

Even more striking, the AP courses that some schools offer are not in one of the four *core* academic subjects. For core academic subjects, 21.5 percent of students are enrolled in schools without AP English, 31.8 percent are in schools without AP math, 33.8 percent are in schools without AP science, and 18.9 percent are in schools without AP social science classes.[12] Furthermore, across California, 4.9 percent of 9–12 students are enrolled in 138 schools that offer *no* AP courses at all.

In sum, the data do provide evidence that California's students may not be playing on a level playing field, in the sense that their access to college-preparatory classes varies. However, as noted above, a second interpretation of the results is not that schools vary in the supply of college prep classes that they offer, but that students vary in their *demand* for such courses. Despite the evidence presented above, our results do not prove unequivocally that some schools lag behind in their ability to supply the level of these courses that students demand.

Teacher Characteristics

In this section, we focus on the distribution of teacher characteristics—teacher experience, education, credentials, and ethnicity. Given that most of the students in California's public schools are nonwhite and most of the teachers are white, we believe that ethnicity cannot be excluded from our analysis.

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[12]Appendix A contains the underlying 10th through 90th percentiles of the numbers and percentages of classes that are "a–f" and the corresponding numbers and percentages for AP classes by subject.

Experience. To assess the degree to which the distribution of teacher experience is equal across California schools, we focus on the two ends of the experience spectrum—those teachers who are inexperienced (0–2 years of experience) and those who are highly experienced (at least ten years of experience).

Figure 3.6 presents the interquartile ratios for low and high teacher experience in California. The detailed distribution of this and many other teacher characteristics by grade span are shown in Appendix A. As noted in Chapter 2, inexperienced teachers constitute a lower percentage (15 percent) of California's teaching force than highly experienced teachers (55 percent). The interquartile ratios (p25/p75) show large inequities in the distribution of teacher experience by either measure. The ratios are particularly low for the percentage of inexperienced teachers by school—on the order of 0.45. In other words, the 25th

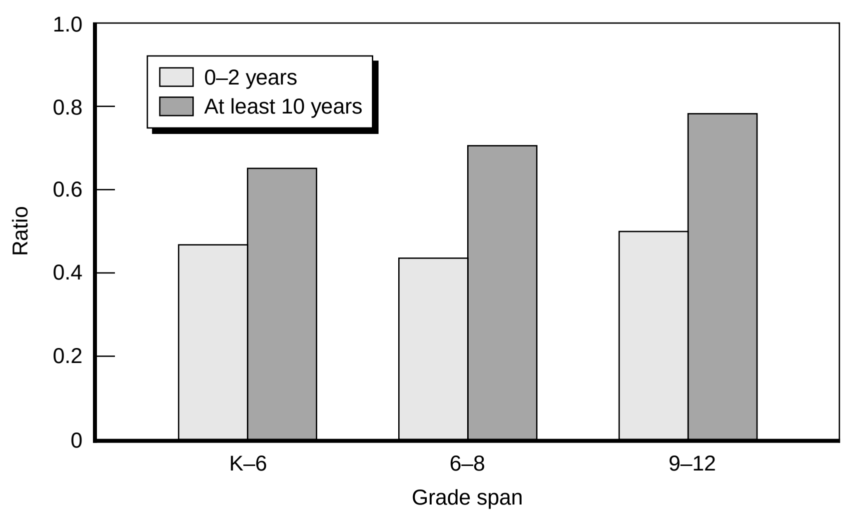

Figure 3.6—Interquartile Ratios for Low and High Teacher Experience Levels, by Grade Span, Fall 1997

percentile school has slightly less than half as large a percentage of inexperienced teachers as the 75th percentile school.

Teacher Education. We focus on the distribution of low education level (at most a bachelor's degree) and high education level (at least a master's degree) to assess any distribution disparity that may exist. In Figure 3.7, a pattern similar to the one seen for experience level emerges for education level. Fewer teachers possess low levels of education, but there is more inequality in the distribution of such teachers across California schools. The level of inequality between schools is remarkably large. The 25th percentile school has approximately 20–25 percent as large a share of teachers with a maximum of a bachelor's degree as does the 75th percentile school. The variations in teacher education are much more extreme when comparing the 10th and 90th percentiles. For instance, at the 10th percentile of K–6 schools (weighted by enrollment),

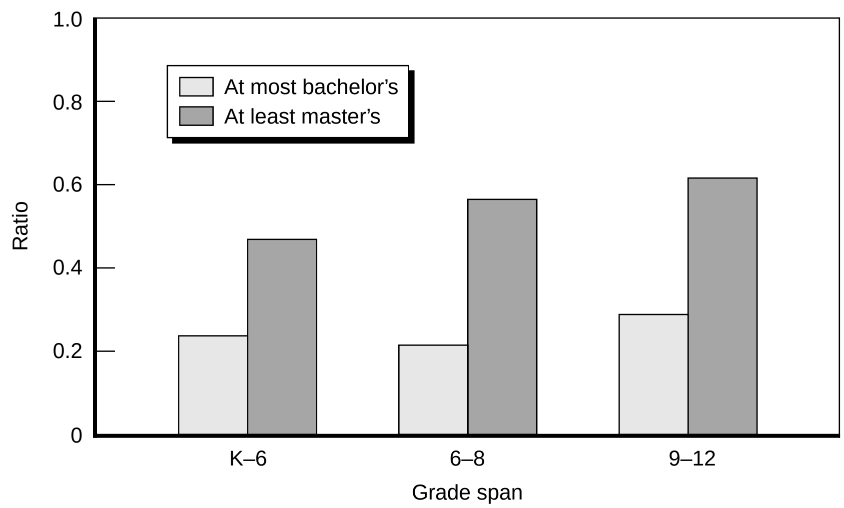

Figure 3.7—Interquartile Ratios for Low and High Teacher Education Levels, by Grade Span, Fall 1997

about 2 percent of teachers hold a bachelor's degree or less, compared to 50 percent of teachers at the 90th percentile. Slightly smaller ranges emerge for the other grade spans.

Credentials. The third teacher resource that we examine is credentials. For this measure, we focus on the distribution of teachers who lack a full credential and also on teachers who lack a full credential and who *also* have low experience. There is much disparity in the distribution across schools of both of these measures. Figure 3.8 shows the p25/p75 ratios for both measures. In the 9–12 grade span, the ratios are about 0.17, indicating a high degree of inequality across schools in the proportion of teachers who are not fully credentialed. In most cases for K–6 and 6–8 schools, the interquartile ratios are 0, because the 25th

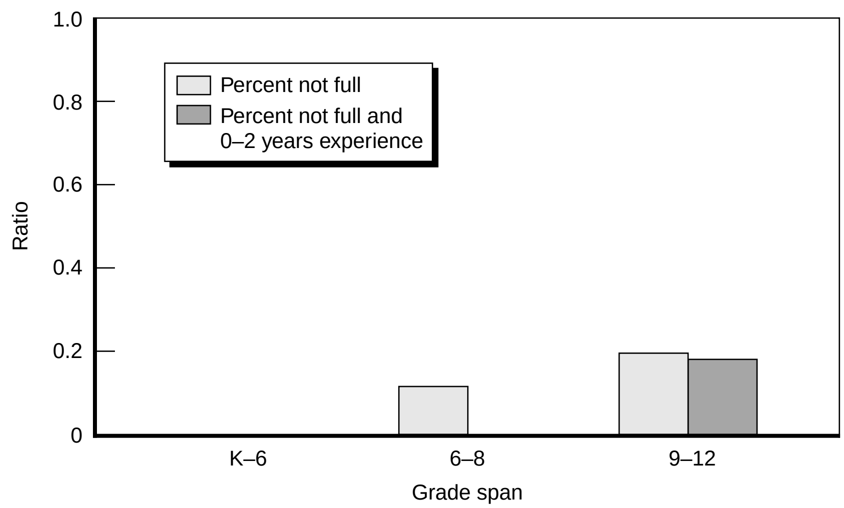

Figure 3.8—Interquartile Ratios for Teachers Without Full Credential and Teachers Without Full Credential and with Low Experience, by Grade Span, Fall 1997

percentile schools have teachers who are all fully certified.[13] At the 90th percentile, the percentage of teachers without a full credential ranges from 17.6 percent in high schools to an alarming 30.9 percent in elementary schools. At the other extreme, the 10th percentile, all teachers at a given school are fully certified. This is true for all grade spans. Our second measure—the percentage of teachers who are not fully credentialed, and who have 0–2 years of experience—shows a similar but slightly smaller range across the 10th through 90th percentiles. It seems clear that teachers who are not fully credentialed are distributed across schools in a highly skewed fashion.

Teacher Ethnicity. Although our research does not focus on teacher ethnicity as a resource, we do acknowledge that teachers serve as role models for students (Matute-Bianchi, 1986, 1991; Romo and Falbo, 1996) and may facilitate student access to institutional resources (Stanton-Salazar and Dornbusch, 1995). As such, their ethnicity may be thought of as part of the overall set of characteristics that affects how well teachers educate students. Note, however, that Ehrenberg, Goldhaber, and Brewer (1995) find no relation between gains in students' test scores between grades 8 and 10 and the race, gender, or ethnicity of the students' teachers.

The previous chapter noted that there is a larger percentage of nonwhite teachers in K–6 schools than in 6–8 and 9–12 schools (26 percent compared to 20 percent in each of the other grade spans). Figure

[13]Again, because the interquartile ratios are 0, it is useful to examine the interquartile range for these measures. Students attending K–6 schools at the 75th percentile have 19 percent more uncertified teachers and 14 percent more uncertified teachers who *also* have low experience than students attending schools at the 25th percentile. Grade 6–8 schools have 9 percent more uncertified teachers in 75th percentile schools than 25th percentile schools.

3.9 shows the interquartile ratios for nonwhite teachers in the three grade spans. We can see that nonwhite teachers are unequally distributed across all groups. However, the percentage of nonwhite teachers is positively and highly correlated with the percentage of nonwhite students in all grade spans, with a correlation exceeding 0.7. Chapters 4 and 6 will explore this relationship in more detail.

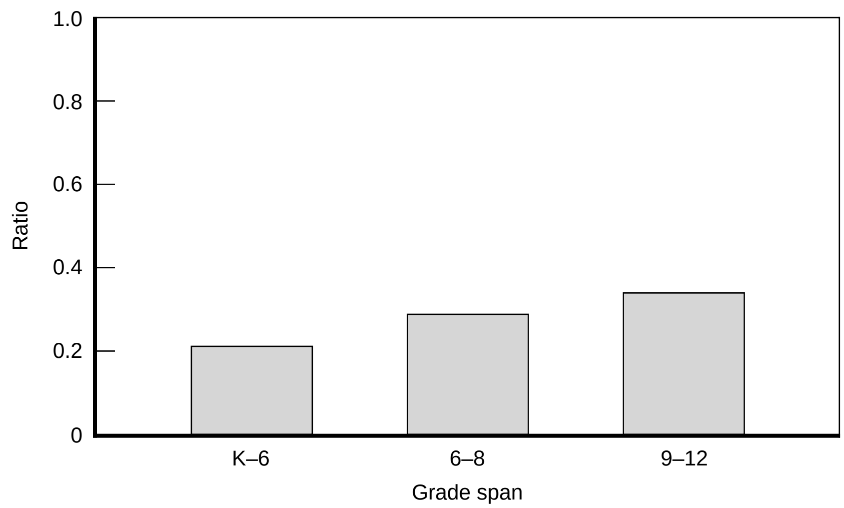

Figure 3.9—Interquartile Ratios for Nonwhite Teachers, by Grade Span, Fall 1997

Teacher Characteristics in 9–12 Schools, by Subject Area. In this section we examine the distribution of levels of experience, education, and authorization for teachers assigned to teach the core subjects in grade span 9–12. We focus on total experience, low experience (0–2 years), high experience (at least ten years), high education (at least a master's degree), and correct subject authorization[14] as our measures of teacher resources across subjects in 9–12 schools. We analyzed the distribution of these variables for all classes, including AP classes, in the four core subjects in grades 9–12. We then analyzed AP teacher characteristics for the four core subjects separately.

Figure 3.10 shows the distribution of a number of teacher characteristics in high schools, calculated separately by subject area. Teachers with low experience are the least equally distributed across 9–12 schools in California for all four core subjects. (Again, because we weight schools by enrollment, the more accurate statement is that these teachers are the least equally distributed across California's *students*.) Teachers

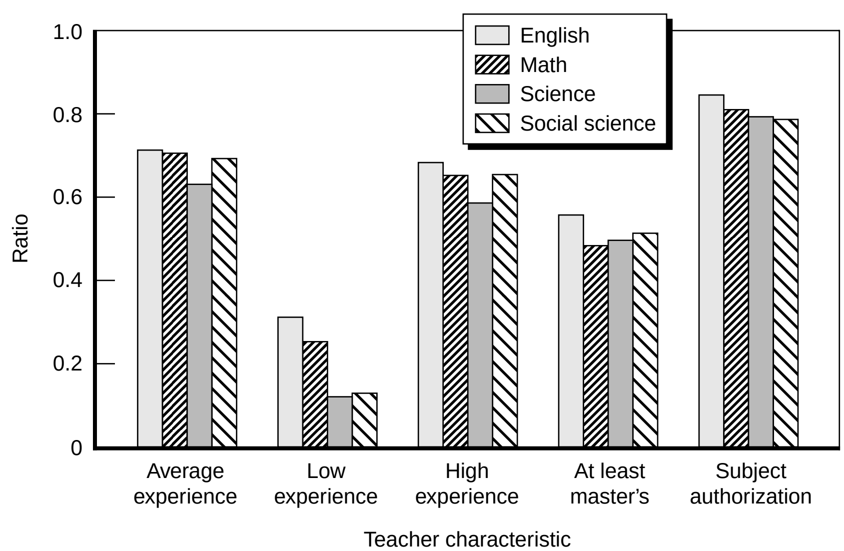

Figure 3.10—Interquartile Ratios for Teacher Characteristics in 9–12 Schools, by Subject, Fall 1997

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[14]Teachers teaching in specific subject areas in grades 9–12 are required to have an authorization to teach the subject.

with the correct authorization are the most equally distributed across schools for all four subjects. There is also some disparity in the distribution of average experience, high experience, and high education across subject areas. In general, English classes show the fewest disparities in teacher characteristics.

Because virtually all teachers who teach AP courses have more than two years of experience and at least a bachelor's degree, we excluded these categories from our analysis of the distribution of AP teachers' qualifications. Virtually all teachers teaching AP courses also hold the appropriate subject authorization, and the distribution of authorizations shows little inequality across schools. However, for the other teacher resources such as high experience and high education level, the pattern of inequality seen above for subject teachers is much more dramatic for teachers who teach in AP classes (see Appendix A).

Does Resource Inequality Reflect Overall Inequality in Funding or Variations in a School's Choices?

There are at least two interpretations of our findings of considerable inequality in resources by schools (weighted by enrollment). The first is that some "have-not" schools have fewer financial resources, which leads to larger classes and less-educated, less-credentialed, and less-experienced teachers. A second interpretation is that most of the inequality results because different schools *choose* to spend in different ways. For instance, one school may opt for small class sizes, which it finances by lowering the teacher wage bill by hiring less-qualified teachers. A second school, with similar overall financial resources, may choose to do the opposite. Clearly, our finding of inequality in school inputs is more disturbing if certain schools seem to lag behind by a variety of measures of resources.

To test which of these interpretations is the more accurate, we calculated the correlations in key resources across schools, weighting by school enrollment. The results appear in Appendix Table A.4. For most pairs of correlations and most grade spans, the correlations support the first hypothesis above—that California possesses both "have" and "have-not" schools. For example, in all three grade spans, the percentage of teachers with a master's degree or higher is positively linked to mean teacher experience, negatively linked to the percentage of teachers without a full credential, and in high schools is positively related to the percentage of classes that are "a–f" and to the number of AP classes offered. One important exception is the correlation between our measure of teacher education and class size: In middle and high schools, but not in elementary schools, there is a positive correlation between teacher education and class size. One interpretation is that the administration in high schools and middle schools sees a tradeoff between class size and teacher education (the latter influences teachers' salaries). In this interpretation, a teacher with a higher education level is presumed to be more effective at teaching a larger class. Class size, however, exhibits low correlations with the other variables we examined. In addition, recall that there was little variation in average class sizes across schools. Although schools with less-educated teachers seem to have smaller classes, these differences in class size will be small.

Teacher experience for the most part shows similarly signed correlations to the other variables listed above for teacher education, again suggesting that in general if a school has more experienced teachers, it is likely to have more of other resources. Not surprisingly, the measure of teacher credentials, again, tells a similar story.

Overall, some schools seem to have more-educated, more-experienced, and better-credentialed teachers—and some high schools a greater percentage of college-preparatory classes—than other schools. The lone exception to the positive correlations between resources seems to be that in middle and high schools, larger class sizes are weakly associated with more-educated and slightly more-experienced teaching staffs. These correlations provide further evidence that some California public schools have more resources than others.[15]

Summary

Inequality in resources, as measured by class size, courses, and teacher inputs, does exist across schools in California, despite various attempts (such as Serrano and the CSR initiative) to equalize school resources statewide. Class size and the overall pupil-teacher ratios in general exhibit little variation. This appears to be least true in elementary schools, where some schools have lagged behind in implementing class size reduction in kindergarten and grade 3. This phenomenon leads to higher inequality in class sizes in these grades than in other elementary grades, and higher inequality in elementary schools overall than in middle or high schools. A much more important source of resource inequality across California's students than class size is teachers, who vary substantially in level of education, experience, and credentials. By and large, if students at a given school have relatively little of one resource, they are likely to have relatively little of other resources as well.

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[15]Because of the limitations of our dataset, other teacher attributes that may contribute to overall teacher quality are not included in our analysis. If these unobserved attributes are negatively correlated with our observed teacher characteristics, school resources might be more equally distributed throughout the state than the above text suggests. However, we have no reason to believe that this is the case.

In the next chapter, we begin to analyze *which* schools receive different levels of these resources. We focus primarily on teachers in that chapter, given the evidence presented above that, for the most part, it is measures of teacher preparation, not class size, that are distributed inequitably across schools.

4. Do California's Disadvantaged Students Receive Equal Resources?

Introduction

This chapter focuses on whether socioeconomic status affects the level of resources that children at a given school receive. In Chapter 3, we hypothesized that variations in the socioeconomic composition of the student body across schools might imply that the inequities we found in school resources were likely to be associated with inequities among socioeconomic groups. This chapter explores that proposition in detail, using the proportion of students at the school who participate in the free or reduced-price lunch program as our primary measure of SES. We use this measure rather than the proportion receiving AFDC benefits because the latter is a measure for all children in the school's *attendance area*, whereas the former measures the socioeconomic status of children attending the school. We use the terms low or high SES and more- or less-disadvantaged student populations interchangeably.[1]

We also examine differences in school resources for students of various racial/ethnic minority groups. There is a positive and high correlation (0.73) between lower student SES and a higher percentage of nonwhite students across schools in our sample. Given this correlation, we focus principally on the free or reduced-price lunch measure of SES, but we also look at minority groups and provide evidence on the link between school characteristics and the percentage of nonwhite students, including students of specific racial/ethnic groups. To address concerns about the experience of particular racial/ethnic groups, we examined the median level of our key resources weighted by specific ethnic group enrollment for whites, Latinos, blacks, and Asians. These results are discussed later in the chapter.

We grouped schools into five categories, or quintiles, depending on the students' level of disadvantage at a school.[2] Table 4.1 displays the SES quintile percentage ranges for each grade span.[3] We analyzed the distributions of various student, class, and teacher characteristics weighted by enrollment across the SES quintiles of schools to determine whether inequalities exist across the dimension of a school population's socioeconomic status and its minority student level. However, we are

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[1]When we refer to "more or less disadvantaged," we refer to the school's proportion of students receiving free or reduced-price lunches rather than to the relative level of disadvantage for individual students. Because our proxy for SES—the percentage of students receiving lunch assistance—is a school-level measure and is based on a dichotomous variable, we cannot know the income range of individuals in the school's population.

[2]See Appendix B for a more detailed description of how we calculated the quintiles of schools.

[3]When we conducted an analysis across nonwhite quintiles, we found patterns similar to those for SES. Nonwhite quintile ranges are in Appendix Table B.2.

Table 4.1

Percentage of Students Receiving Free or Reduced-Price Lunches, by SES Quintile and Grade Span, Fall 1997

	SES Quintile (Q1 = Low SES)				
Grade Span	1	2	3	4	5
K–6	84.8–100	65.9–84.7	44.2–65.8	20.5–44.1	0–20.4
6–8	71.4–100	53.0–71.3	35.5–52.9	18.2–35.4	0–18.1
9–12	48.7–100	30.8–48.6	18.2–30.7	9.0–18.1	0–8.9

also interested in the variation of a given resource, such as class size, *within* SES school groups and in how these within-group differences vary across SES groups. As in Chapter 3, we use the interquartile ratios (p25/p75) of each variable's distribution to assess the magnitude of resource inequality within each SES group. We also use the interquartile range (p75–p25) and graphical analysis where warranted.

To further explore concerns raised in Chapter 3 about the effects that large and mainly urban districts may have on the distributions, we repeated the analyses in this chapter after excluding the five largest districts—Los Angeles Unified, San Diego Unified, San Francisco Unified, Long Beach Unified, and Fresno Unified—and compared the results with those for all districts. We found little difference in the medians for the majority of our key variables. In higher-SES quintiles, there was virtually no difference between medians with and without the five largest districts, whereas in lower-SES quintiles some of the medians were quite different. The most notable examples of this pattern were low teacher education (at most a bachelor's degree) and teachers lacking full certification. We will discuss these two variables in more detail below.[4]

[4]Appendix Table B.5 contains median resource levels for selected variables in all schools and excluding the five largest districts.

Analytic Framework

Three Central Questions

The three questions we address in this chapter are:

1. Do the levels of resources at a school vary with the SES of the student body?
2. Does the SES of the student body capture or explain most of the variations in the level of resources across schools?
3. Does the degree of dispersion or inequality of resources *within* SES groups vary with the socioeconomic status of the student body?

Hypothetical Examples

Figures 4.1 through 4.3 illustrate the analytical approach that we adopt in this chapter. These figures show hypothetical distributions of resources for each of five school groups, with Quintile 1 referring to the fifth of schools with the lowest SES, and Quintile 5 referring to the fifth of schools with the highest SES. For each group of schools, the 10th, 25th, 50th (median), 75th and 90th percentiles of the school resource, when schools are weighted by enrollment, are shown.[5]

To answer the first question, we examine the slope of the lines in each of these examples. The positive slopes suggest that there is a positive relation between the level of the resource and the SES of the students attending a particular school. In other words, students from high-income families receive more of the resource than do students from low-income families.

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[5]Although we rely primarily on the median levels and interquartile ratios for many of our measures, in some cases we present the p10 to p90 range in graphical analyses. Thus, our hypothetical examples provide interpretations based on p10 to p90.

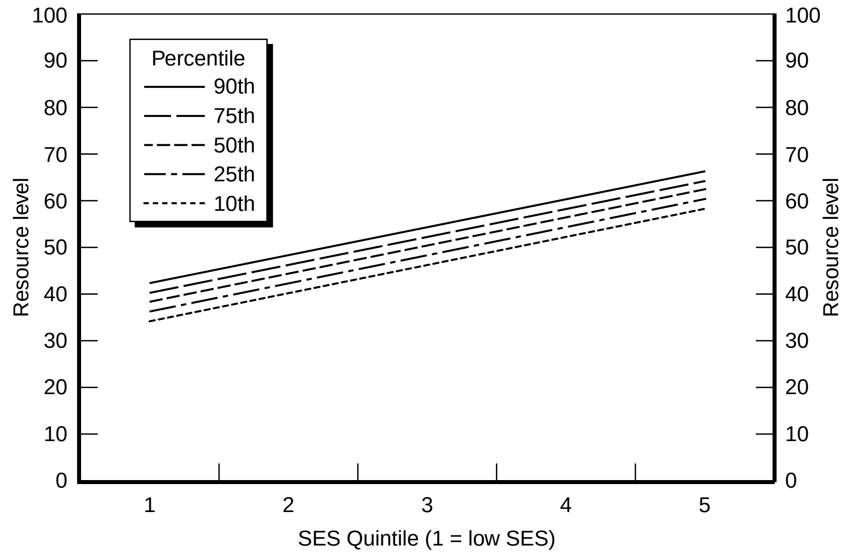

Figure 4.1—Hypothetical Resource Distribution, by SES Quintile: High-Equality Levels

The second question we ask is whether variations in SES explain most of the variations in the resource. To answer this question, we look at the size of the gap between the top (90th percentile) and bottom (10th percentile) lines. In general, the answer depends on the variation in the resource level within SES groups relative to the variation across SES groups, as we move to the right in the figure. In Figure 4.1, we see that the difference in the resource at the median level between the first and fifth SES groups is 24 (62 – 38), which is three times as large as the gap between the 90th and 10th percentiles *within* each SES group. In our example, this p90 – p10 gap is only eight units. Thus, SES groups capture most but not all of the overall variation in the resource.

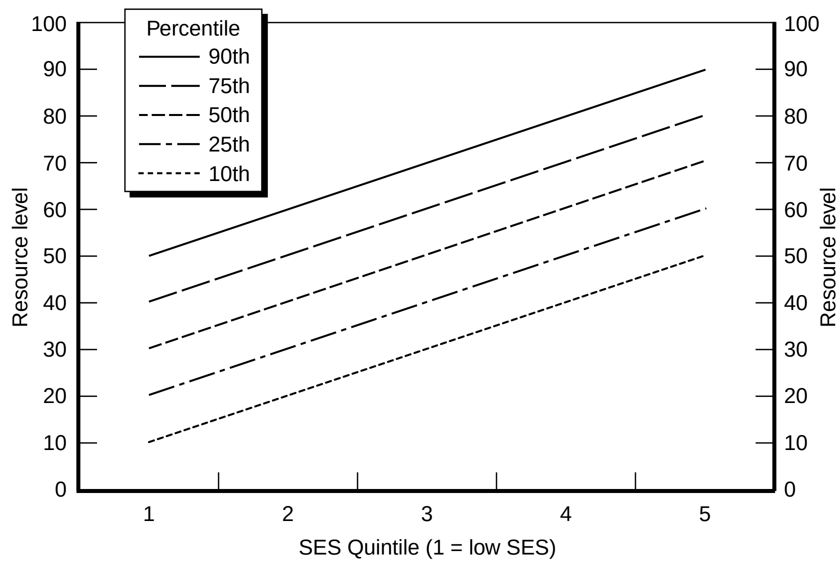

Figure 4.2—Hypothetical Resource Distribution, by SES Quintile:
Low-Equality Levels

The hypothetical example in Figure 4.2 is quite different, showing a much stronger variation in the resource level across SES groups than in Figure 4.1. Here, for the median student in each group, the gap in the resource level between the top and bottom quintile schools is 70 – 30 = 40 units of the resource. At the same time, far more variation in the resource level exists *within* groups (p90 – p10 = 40 in each quintile of schools). For this example, we also conclude that the resource level is strongly positively related to the SES level in the school. However, the wider gap between the top (90th percentile) and bottom (10th percentile) lines in this figure and the lines in Figure 4.1 shows that there is as much variation *within* SES groups as there is among SES groups. Thus, in the example illustrated by Figure 4.2, we cannot say that SES explains most of the variation of a given resource across schools.

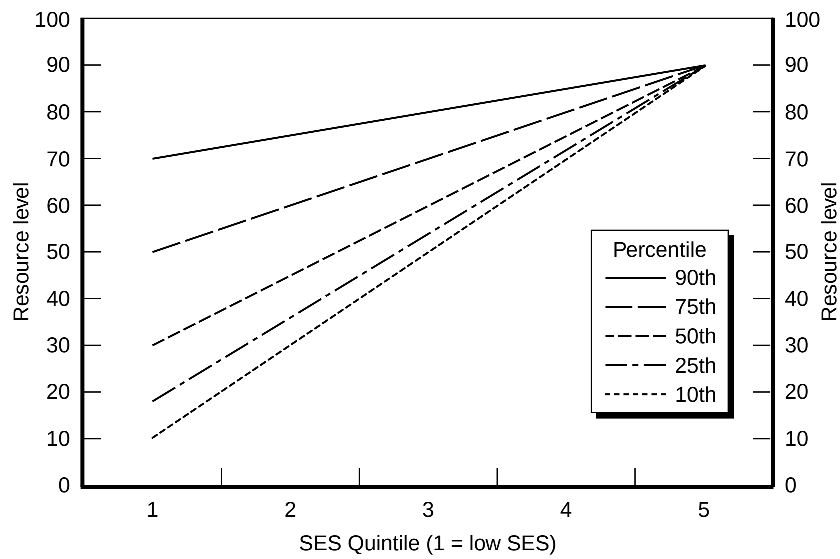

Figure 4.3—Hypothetical Resource Distribution, by SES Quintile: Converging Equality Levels

Next, we can ask the third question listed above—i.e., whether there are important variations in the dispersion of the resource within one SES group relative to another. The answer in both of the previous examples appears to be no, because the gap between the 75th and 25th, or even the 90th and 10th, percentiles is constant across SES groups.[6] Figure 4.3 shows another possibility, in which, as before, resource levels increase with the SES level of the student body. In this example, the bottom two SES groups exhibit considerable heterogeneity, or inequality, within the

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[6]A second way to answer this question is to examine the *ratio* of the 25th to the 75th percentiles. In our examples, these ratios will rise slightly as we move to higher-SES groups because the gap, although constant in absolute terms, is a smaller percentage of the value of the resource level at the 75th percentile. For this reason, we will tend to emphasize absolute differences in the 25th and 75th percentiles, rather than the p25/p75 ratio, when comparing inequality *within* groups between high- and low-SES schools.

groups of schools. In contrast, there appears to be absolutely no inequality in resource levels within the group of schools in the top-SES group. In this example, it would also be incorrect to argue that SES explains "most" of the variations in the resource across schools, because substantial inequality exists within the bottom two or three SES groups.

Below, we analyze a number of school characteristics in this way. We list the 10th, 25th, 50th, 75th, and 90th percentiles in appendices to the report, although we graphically analyze the distribution of resources in this chapter. Because of space constraints, in many cases we graph only medians (50th percentile) against SES group. But in cases that resemble Figure 4.3 in the sense that inequality within SES groups varies considerably, we graph all five percentiles for a given grade span. We also present the detailed figures in cases such as Figure 4.2, where the amount of inequality in the resource level *within* SES groups is particularly high. The reader is of course encouraged to examine the underlying data in the appendices.

Distributions Across Socioeconomic Status

Students

To answer the question of whether different types of students are equally distributed across SES status, we begin with an analysis of the distribution of nonwhite students by socioeconomic status. Figure 4.4 represents the trend seen in elementary schools. The pattern in other grade spans is similar. Not surprisingly, at all percentile points in this distribution there is a lower percentage of minorities in schools with less-disadvantaged student populations than in schools with more-disadvantaged student populations. For example, in K–6 schools, the

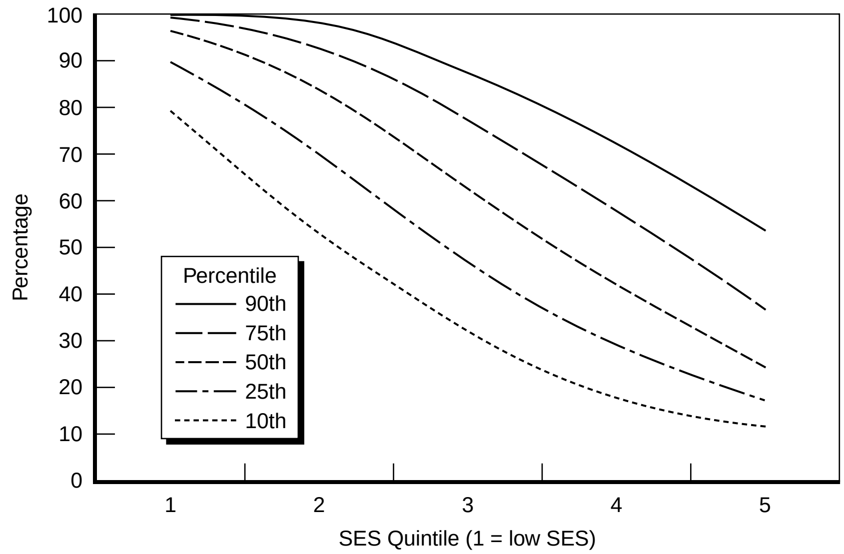

Figure 4.4—Percentage of Nonwhite Students, by SES Quintile, Grade Span K–6, Fall 1997

median percentage nonwhite ranges from 25 percent in the least-disadvantaged school populations to almost 97 percent in the most-disadvantaged school populations. There are positive and very high correlations between free or reduced-price lunch recipients and LEP status (0.74) and between nonwhite percentage and percentage LEP (0.76). From these correlations, we would expect that being nonwhite,[7] receiving free or reduced-price lunches, and LEP status would all exhibit similar distribution patterns, and in fact they do. Furthermore, they are all factors that may contribute to a student's level of disadvantage.[8]

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[7]Over 65 percent of nonwhite students are Latino. When we performed an analysis weighted by separate ethnic enrollment, we found that median resource levels for blacks and Latinos are very similar to those we see for SES and nonwhites.

[8]The distributions of LEP students and of specific minority groups by SES group are shown in the first part of Appendix Table B.1. In addition, the distributions of all

It is also worthwhile to examine disparities *within* SES groups. As Figure 4.4 shows, there is much more disparity in the distribution of nonwhite students across schools within the most-advantaged school group. This pattern holds true for all three grade spans. This disparity suggests that nonwhite students may be clustered in just a few schools for the most-advantaged school populations, whereas they are more evenly distributed across schools for the least-advantaged school populations.

Another way of seeing this point is to examine interquartile ratios for each SES group, which are shown in Table 4.2. Note that in K–6 schools, the nonwhite interquartile ratio is 0.91 (close to equal distribution) in the most-disadvantaged school populations, whereas in the least-disadvantaged school populations it is 0.47 (quite unequal distribution). This pattern is also observed in Table 4.2 for 6–8 and 9–12 schools, although not quite as strongly, and across specific ethnic minority groups.[9] The distribution of LEP students also exhibits less

Table 4.2

Interquartile Ratios for Selected Student Characteristics, by SES Quintile, Fall 1997

		SES Quintile (Q1 = Low SES)				
Variable	Grade Span	1	2	3	4	5
% nonwhite students	K–6	0.91	0.76	0.61	0.50	0.47
	6–8	0.85	0.76	0.63	0.50	0.50
	9–12	0.80	0.69	0.54	0.44	0.42
% LEP students	K–6	0.63	0.51	0.38	0.29	0.28
	6–8	0.59	0.55	0.39	0.37	0.22
	9–12	0.53	0.41	0.39	0.34	0.34

key variables when schools are grouped into five categories based on the percentage of nonwhite students, rather than on the percentage receiving free or reduced-price lunches, appear in Appendix Table B.2.

[9]See Appendix Tables B.1, B.2, and B.5.

equality (p25/p75 = 0.28) across higher-SES school populations than lower-SES school populations (p25/p75 = 0.63) and may indicate an even higher degree of LEP clustering than nonwhite clustering in all five SES quintiles.

The section above provides evidence that nonwhite and LEP students have the strongest presence in schools with the most-disadvantaged student populations, and they may be concentrated in just a few schools within the highest-SES quintile. However, further analysis is necessary to understand how resources provided to students by schools—such as class size, availability of core-subject classes, and teacher qualifications—are distributed across these students and schools. The remaining sections of this chapter examine the variations in these resources across SES levels and levels of nonwhite students in California schools.

Classes

Average Class Size. As we discussed in Chapter 3, the distribution of average class size across schools in all three grade spans is remarkably equal. Even more notable, this pattern does not change when we look at the distribution across school populations' SES levels. Figure 4.5 shows the medians of overall average class sizes for the three grade spans, which range from just over 23 to just under 30 students. The medians of average class sizes are also very close to each other along all SES groups. The figure indicates that elementary schools tend to have considerably smaller classes than do middle and high schools, probably due in large part to the CSR initiative.

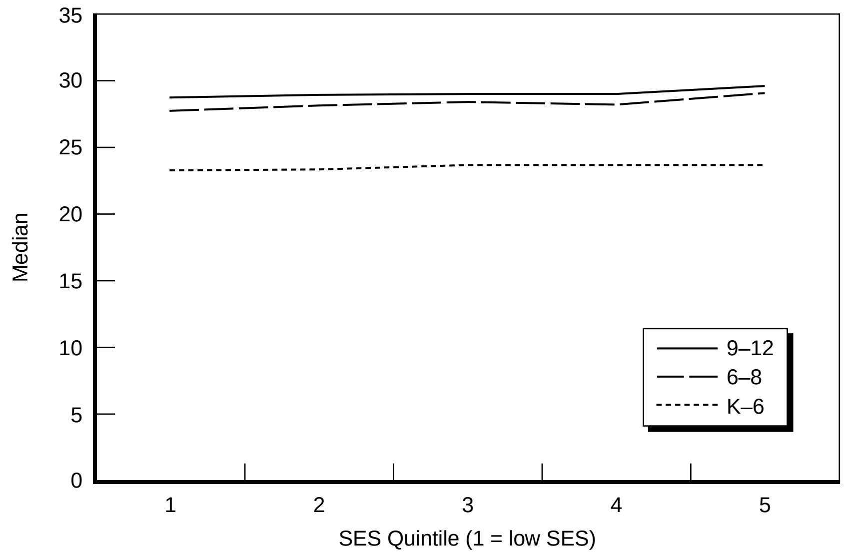

Figure 4.5—Medians of Average Class Sizes, by SES Quintile, Fall 1997

Furthermore, Table 4.3 shows that the interquartile ratios for each SES group exceed 0.81, indicating a high degree of equality of class size within SES groups in each grade span. The table also makes clear that the degree of within-SES-group inequality is highly similar across SES groups.

In addition to analyzing class size for each grade span, we also searched for a link between the SES of schools' students and class size by grade for K–6 schools and by core subject for 6–8 and 9–12 schools.[10] For all of these measures of class size, and both measures of student disadvantage, similar patterns emerge. It appears that neither SES nor the

[10]Detailed distributions for these variables are shown in Appendix Table B.1, whereas Table 4.3 shows the interquartile ratios in class size by SES group. Similarly, Appendix Table B.2 shows the distributions of class size when schools are grouped by the percentage of nonwhite students attending.

Table 4.3

Interquartile Ratios for Class Size, by SES Quintile, Fall 1997

		SES Quintile (Q1 = Low SES)				
Variable	Grade Span	1	2	3	4	5
Overall average class size	K–6	0.83	0.82	0.84	0.82	0.84
	6–8	0.91	0.87	0.88	0.89	0.88
	9–12	0.91	0.87	0.88	0.88	0.88
Subject class sizes						
English	6–8	0.89	0.87	0.88	0.87	0.86
	9–12	0.87	0.84	0.85	0.88	0.87
Math	6–8	0.90	0.87	0.87	0.89	0.87
	9–12	0.90	0.88	0.88	0.89	0.90
Science	6–8	0.92	0.88	0.88	0.89	0.88
	9–12	0.89	0.89	0.87	0.90	0.87
Social science	6–8	0.90	0.88	0.88	0.90	0.89
	9–12	0.91	0.89	0.90	0.90	0.88
“a–f” class sizes						
English	9–12	0.85	0.84	0.84	0.86	0.88
Math	9–12	0.91	0.88	0.87	0.88	0.90
Science	9–12	0.89	0.89	0.88	0.88	0.89
Social science	9–12	0.90	0.91	0.88	0.90	0.89
AP class sizes						
English	9–12	0.68	0.70	0.74	0.77	0.78
Math	9–12	0.54	0.58	0.69	0.67	0.78
Science	9–12	0.61	0.63	0.71	0.71	0.74
Social science	9–12	0.74	0.78	0.75	0.80	0.80

percentage of minority students is related to average class size, with three notable exceptions. Schools with more-disadvantaged school populations appear to have larger kindergarten and grade 3 classes throughout the distribution, as shown in Appendix Table B.1. This disparity suggests that schools in disadvantaged areas have faced greater difficulties in responding to the state’s incentives to reduce class sizes. Conversely, schools with more-disadvantaged school populations tend to have smaller AP class sizes than do schools with less-disadvantaged school populations. The reasons for these patterns are not fully clear without regression techniques such as those employed in Chapter 6, which will explore in further detail the relative significance of the effects of SES and race/ethnicity on class size.

On the whole, then, class size is not strongly linked to SES. Finally, Table 4.3 shows that *within* SES groups there is little variation in any of these measures of class size, except, again, for AP classes.

“a–f” and Advanced Placement Classes. We turn now to the distribution of “a–f” and AP course offerings across higher and lower levels of student SES in 9–12 schools. Because the availability of these classes may have a bearing on the amount and quality of college preparation a student receives and may be directly associated with the students’ ability to enter more-distinguished postsecondary schools, it is important to analyze their distribution across schools and different types of students. Unlike average class size, there is substantial variation in the percentage and numbers of these classes available to students of varying SES and race/ethnicity—particularly in AP offerings.

“a–f” Classes. Figure 4.6 presents the distribution of percentage of “a-f” classes across SES groups. The median percentage of “a–f” offerings ranges from 52 percent in the most-disadvantaged school populations to 63 percent in the least-disadvantaged school populations. This figure demonstrates that as the percentage of disadvantaged students declines (toward group 5), the level of “a–f” offerings generally rises at each point across the distribution—with the exception of group 2, where it actually declines slightly before rising again. These classes are more equally distributed within the group of schools with more-advantaged school populations (interquartile ratio closer to 1.0) than with more-disadvantaged student populations. In each SES group, there is a fairly

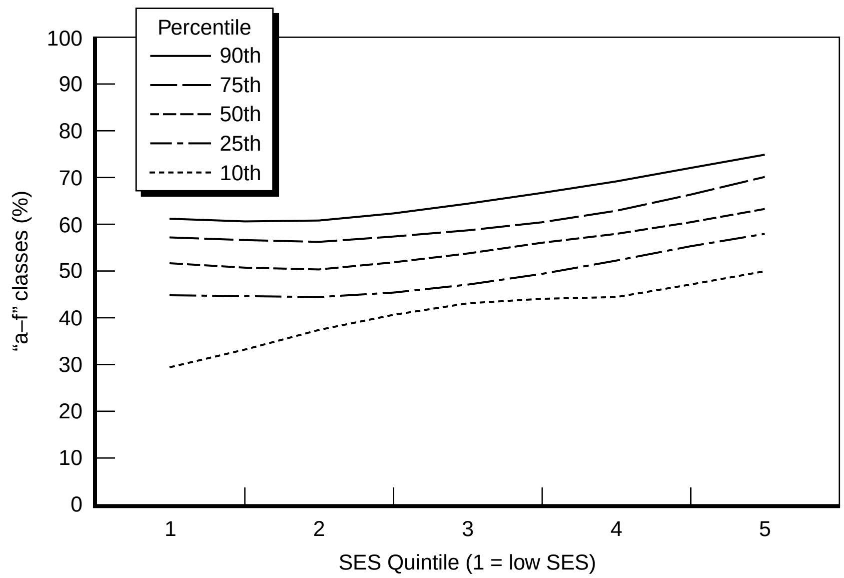

Figure 4.6—"a–f" Classes, by SES Quintile, Grade Span 9–12, Fall 1997

high degree of equality (at least 0.78) in the distribution. Chapter 6 will further explore these relationships using regression techniques.

Analyses of the distribution of core-subject "a–f"[11] course offerings revealed similar patterns to the *overall* "a–f" offerings across both SES and nonwhite dimensions. The interquartile ratios, ranges, and distributions for the core "a–f" courses are presented in Appendix Tables B.1 and B.2. It is evident from the interquartile ratios that there is some variation in the distribution of core "a–f" course offerings, particularly in science classes, both across *and within* SES and minority student groups. This conclusion naturally raises the question of how much variation there is in the supply of AP courses.

[11]English, math, science, and social science.

Advanced Placement Classes. Figure 4.7 shows the distribution of the percentage of AP classes offered across SES groups. Because AP classes are generally offered only in grades 11 or 12, the numbers of AP classes are relatively small compared to the total number of classes at a school. The median percentage of AP classes varies from approximately 2 percent in the most-disadvantaged school populations to just over 3 percent in the least-disadvantaged school populations—the median high-SES school has over 50 percent more AP courses than the median low-SES school. However, there is also much disparity in the distribution of these classes *within* SES groups, as evidenced by the low interquartile ratio values in Appendix Table B.1, particularly in the fourth SES group. Surprisingly, some of the schools with more-advantaged school populations have the least equality in the distribution of AP classes,

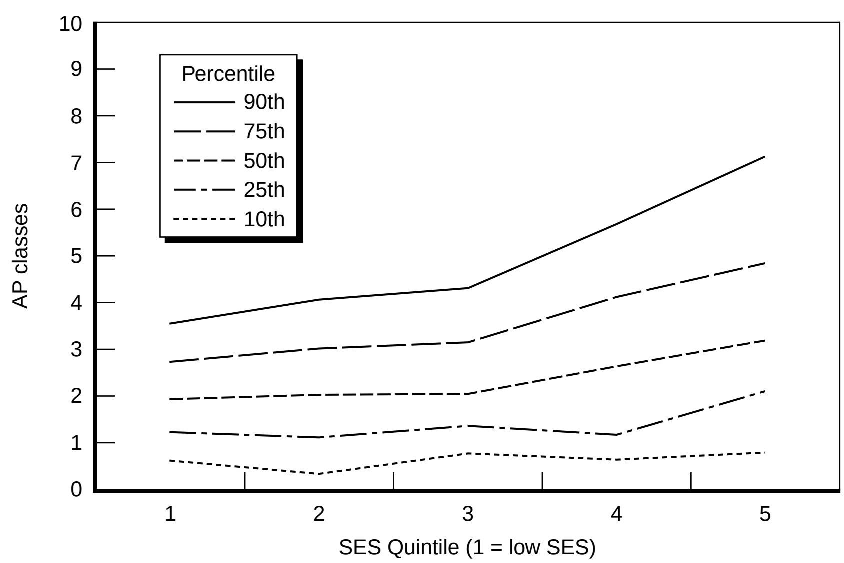

Figure 4.7—AP Classes, by SES Quintile, Grade Span 9–12, Fall 1997

suggesting that even within less-disadvantaged school populations, AP course offerings may be clustered or concentrated in a few schools. Core subject AP offerings exhibit much the same patterns as overall AP offerings. Science and social science showed substantially more variation than math and English in median AP offerings across SES groups.[12]

In terms of our three illustrative examples of resource distribution shown in Figures 4.1 through 4.3, the graph of AP course availability shares some of the characteristics of Figures 4.2 and 4.3. As in Figure 4.2, it would be wrong to claim that SES can explain all or even most of the variation in course availability. Moreover, inequality varies considerably within SES groups. In terms of the overall spread between the 90th and 10th percentiles, the group of schools with the largest disparities is group 5, serving the most-advantaged students.

In sum, we found little variation in the distribution of class sizes across the dimensions of SES or race/ethnicity in California. We did find some variation in the availability of "a–f" and AP course offerings in higher grades. Only a small part of the variation in AP course offerings appears to be linked to the socioeconomic ranking of schools, regardless of which measure of disadvantage is used—the percentage of students receiving free or reduced-price lunches or the percentage who are nonwhite.

Teacher Characteristics

Our analysis of the distribution of teacher characteristics focuses on four areas of interest: experience, education, certification, and ethnicity. We find a high degree of inequality in the distribution of several of these

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[12]Appendix Tables B.1 and B.2 contain complete information on the distributions for these variables.

teacher characteristics across California schools. It is important to understand *where* this inequality in teacher characteristics exists, because differences in teachers can affect the quality of preparation that students receive.

Experience. We use three measures of teaching experience—the percentage of teachers with low experience (0–2 years), the percentage with high experience (at least ten years), and the average number of years of experience of the overall teaching force. The table and figures below demonstrate that there are fewer low-experience teachers than high-experience teachers in each SES group.[13] The distribution of mean years of experience is very similar to the distribution of the percentage of highly experienced teachers and will be discussed briefly at the end of this section. The results also reveal that there is more inequality in the low-experience distribution than in the high-experience distribution in each SES group.

Figure 4.8 presents the median percentage of low-experience teachers in the three grade spans. Elementary schools in general employ a much larger share of inexperienced teachers than do middle and high schools. The median percentage of low-experience teachers in K–6 schools ranges from 24 percent in the most-disadvantaged school populations (quintile 1) to 17 percent in the least-disadvantaged school populations (quintile 5). In grade spans 6–8 and 9–12, the low-experience medians range from 14 percent in the most-disadvantaged school populations to 10 percent in the least-disadvantaged school populations. There is also a high disparity in the low-experience distribution within all SES groups. Appendix Table B.1 shows the distribution and interquartile (p25/p75)

[13]Appendix B.1 also shows that there are fewer low-experience teachers than high-experience teachers at all points within the distribution in every SES group.

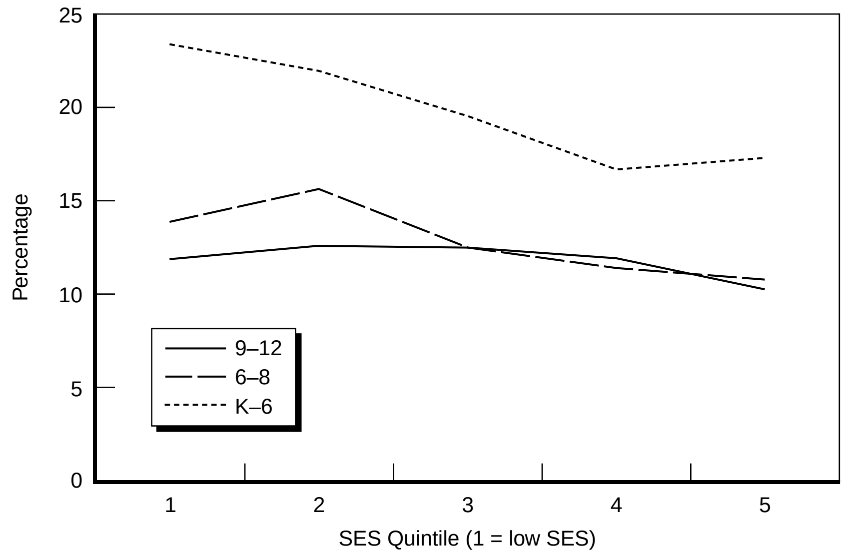

Figure 4.8—Median Percentage of Teachers with 0–2 Years of Experience, by SES Quintile and Grade Span, Fall 1997

ratios for the three grade spans. The interquartile ratios make apparent the high disparity in the low-experience distribution within SES groups: All interquartile ratios are less than 0.6 and most are below 0.5, which indicates that the percentage of less-experienced teachers is twice as high at the 75th percentile school than it is at the 25th percentile school.

Figure 4.9 displays the median percentage of highly experienced teachers across SES groups. In contrast to the medians for low-experience teachers, these medians are much higher, ranging from 43–53 percent in K–6 schools, 52–59 percent in 6–8 schools, and 61–63 percent in 9–12 schools. The figure reveals a positive but weak association between student SES and the proportion of teachers who have ten or more years of experience. The interquartile ratios for high

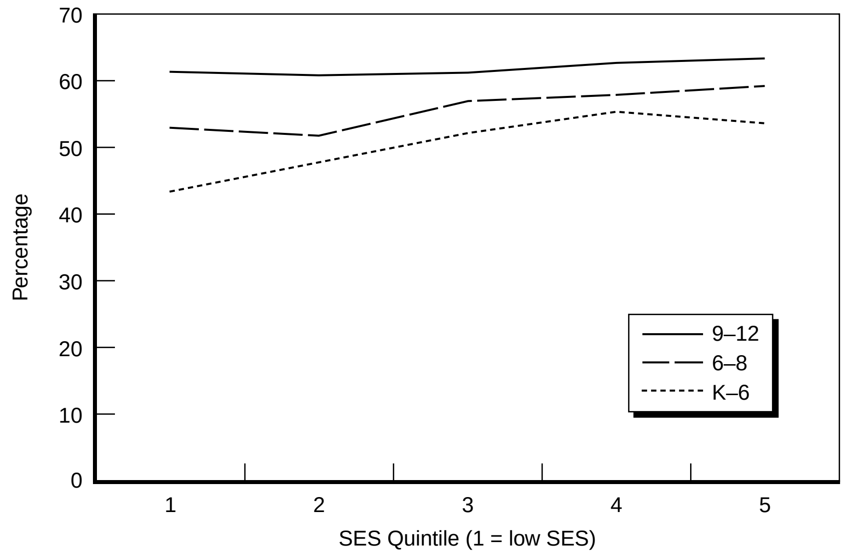

Figure 4.9—Median Percentage of Teachers with 10 or More Years of Experience, by SES Quintile and Grade Span, Fall 1997

experience in Appendix Table B.1 (all over 0.6) also show a higher level of equality *within* SES groups than we saw for low-experience teachers (all under 0.6), which in part reflects the relatively low percentage of low-experience teachers in schools generally.

These results on the distribution of teacher experience suggest that low-experience and high-experience teachers vary in different ways across SES quintiles, with the distribution of low-experience teachers showing a much stronger link to student SES. We also compared these two ends of the experience range to the distribution of average years of teacher experience across SES groups.[14] It appears that the most variation is in

[14]The amount of variation in the high-experience and average-experience variables are very close in each grade span, whereas much more variation exists in the distribution

the distribution of low-experience teachers, and that they are concentrated in low-SES schools.

Education. As shown in Figures 4.10, 4.11, and 4.12, patterns in the distribution of teachers with low levels (at most a bachelor's degree) and high levels (at least a master's degree) of education are similar to the patterns we found for low and high levels of experience. There is a strong positive link between low SES and low-education levels, whereas there is a weak link between SES and high-education level. Figure 4.10 shows the medians for percentage of low-education teachers as we move across the quintiles from low-SES schools to high-SES schools in grade

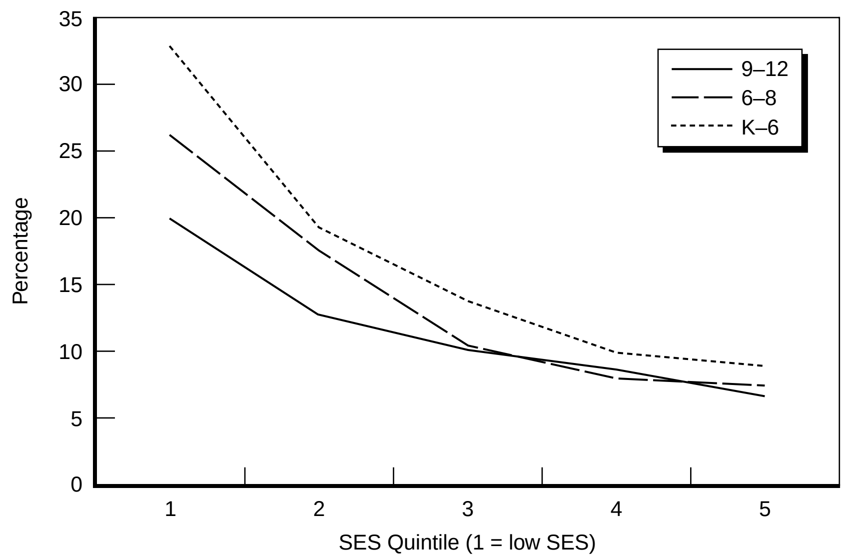

Figure 4.10—Median Percentage of Teachers with At Most a Bachelor's Degree, by SES Quintile and Grade Span, Fall 1997

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of low-experience teachers. A more detailed distribution of experience is presented in Appendix Tables B.1 and B.2.

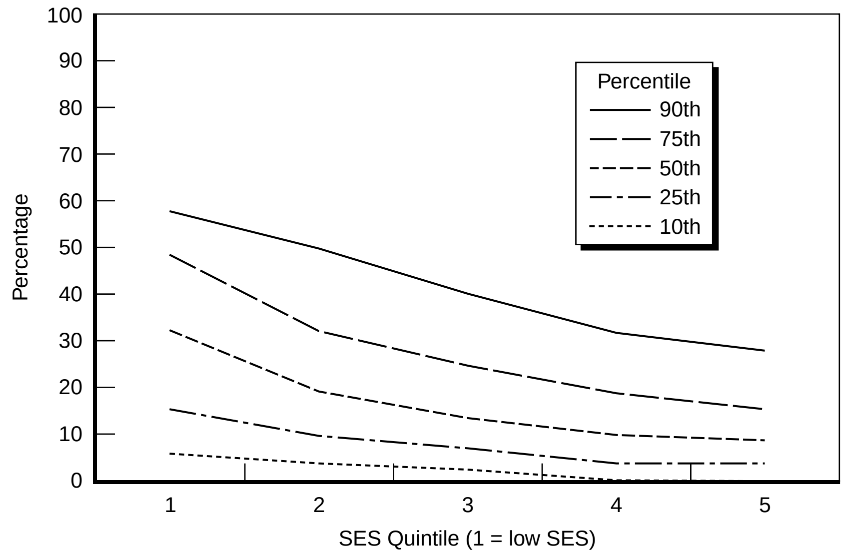

Figure 4.11—Percentage of Teachers with At Most a Bachelor's Degree, by SES Quintile, Grade Span K–6, Fall 1997

spans K–6 (33 to 9 percent), 6–8 (26 to 7 percent), and 9–12 (20 to 6 percent).

Within SES school groupings, the patterns for grade spans 6–8 and 9–12 are similar to those shown for K–6 in Figure 4.11. In this figure, there is slightly more equality in the distribution of low-education teachers across schools with the least-advantaged student populations (interquartile ratio of 0.32) than among more-advantaged groups (interquartile ratio of 0.26 for quintile 5). This result suggests that although more-advantaged schools have fewer teachers with low education, they may be clustered in just a few schools. Figure 4.11 also makes clear from the wide range in the share of teachers with at most a bachelor's degree among schools in each SES quintile that the socioeconomic status of a school's student body does not explain all of

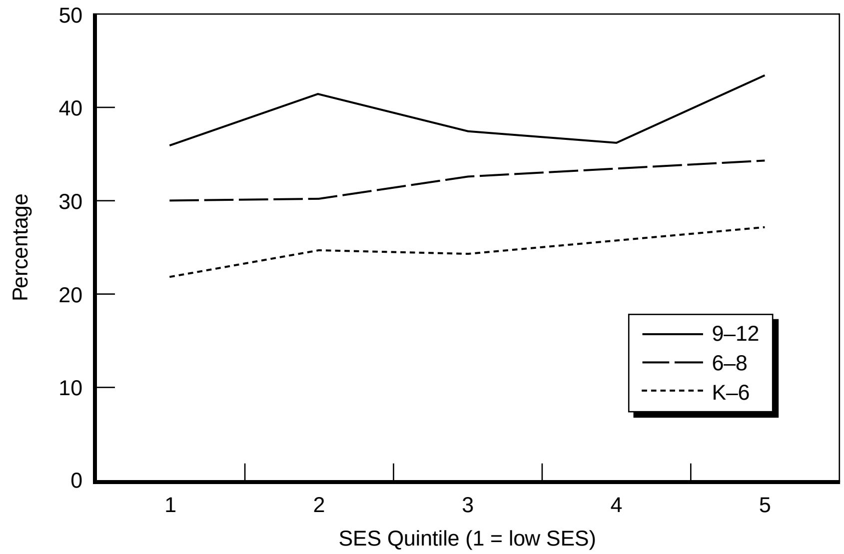

Figure 4.12—Median Percentage of Teachers with At Least a Master's Degree, by SES Quintile and Grade Span, Fall 1997

the variation in the share of teachers with low education, especially in the lower SES groups.

As Figure 4.12 shows, the medians for the percentage of teachers holding at least a master's degree are higher and exhibit a narrower range across quintiles. In K–6, 6–8, and 9–12 schools, they range from 22–27 percent, 30–34 percent, and 36–43 percent, respectively. However, in the middle-SES groups of high schools—groups 2, 3, and 4—there is no clear relationship between more- or less-disadvantaged student populations and high-education level.

When we analyzed teacher education distributions across schools excluding the five largest districts, we found a striking difference in the median percentage of teachers with low education in the *bottom-SES* *quintiles*.[15] Indeed, in K–6 schools, the median for the percentage of teachers with low education in the lowest-SES quintile was over 50 percent higher with all schools (32.6 percent) than without the five largest districts' schools (20.5 percent). Grade spans 6–8 and 9–12 exhibited similar patterns, although not as dramatic. These results suggest that low-education teachers may be concentrated in large, mainly urban districts.

Certification. Chapter 3 showed clearly that teachers who do not have full credentials are distributed across schools in a highly skewed fashion. This section explores how these teachers are distributed across disadvantaged students. Figures 4.13 and 4.14 depict two aspects of the

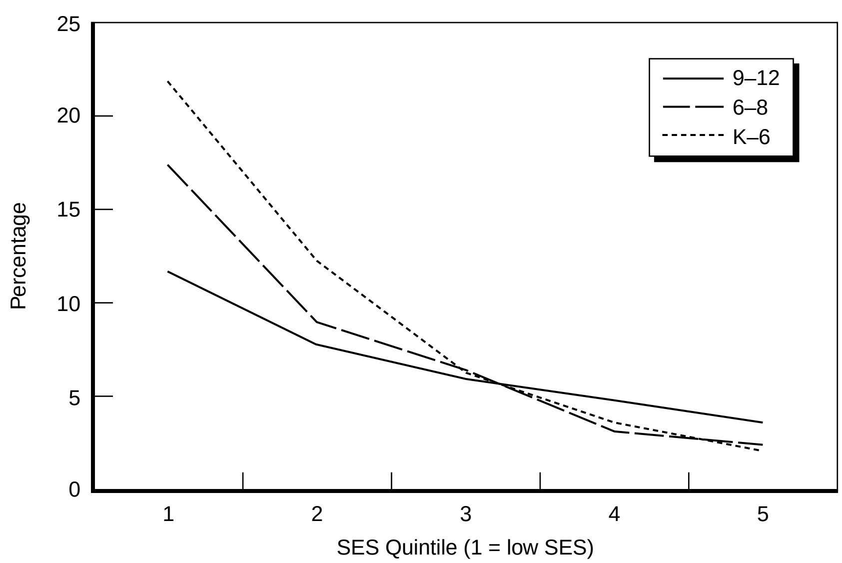

Figure 4.13—Median Percentage of Teachers Without a Full Credential, by SES Quintile and Grade Span, Fall 1997

[15]See Appendix Table B.5.

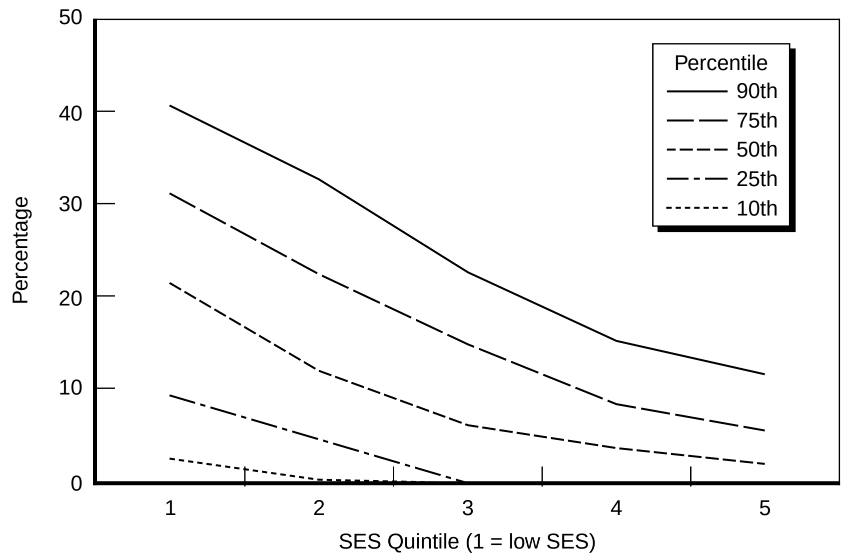

Figure 4.14—Percentage of Teachers Without a Full Credential, by SES Quintile, Grade Span K–6, Fall 1997

distributions of teachers without full credentials. As shown in Figure 4.13, the median percentage of teachers without full certification ranges from a mere 2 percent in K–6 schools with the least-disadvantaged student populations to an alarming 22 percent in schools with the most-disadvantaged student populations. In grade 6–8 schools, the percentages range from 2 percent to 17 percent, and in grade 9–12 schools from 4 percent to 12 percent. Clearly, disadvantaged student populations have more teachers who lack full credentials.

Figure 4.14 presents the distribution of noncertified teachers for K-6 schools within SES groups, which again is representative of the trend in all three grade spans. Not only is there a great amount of disparity *across* SES groups, but the distribution of teachers without full credentials is more highly dispersed *within* some SES groups than others. The figure suggests that the gap between the 90th and 10th percentiles in the percentage of teachers without full credentials is almost 40 percentage points in the lowest-SES schools, whereas in the highest-SES schools the range is much smaller. These results suggest that teachers without full credentials are clustered in only a few schools in these SES groups.

When we excluded the five largest school districts, we found striking differences in the median percentage without full credentials in the *bottom-SES quintiles*. All three grade spans exhibited this pattern. The median for the percentage of teachers without full credentials in low-SES schools was almost 36 percent higher in K–6, almost 56 percent higher in 6–8, and over 34 percent higher in 9–12 grade spans with all schools than *without* the five largest districts' schools (see Appendix Table B.5). These results provide evidence that teachers lacking full credentials may be concentrated in large and mainly urban districts.

It is evident from the figures presented above that much disparity exists across schools both in the proportions and in the distribution of uncertified teachers across SES groups. Chapters 5 and 6 elaborate on where this disparity exists and factors that may contribute to it.

Ethnicity. The final teacher characteristic we examine is ethnicity. As shown in Figure 4.15, the median percentage of nonwhite teachers in K–6 schools ranges from 47 percent in schools with the most-disadvantaged student populations to only 7 percent in schools with the least-disadvantaged student populations. In grade 6–8 schools, medians range from 33 percent to 7 percent, and in grade 9–12 schools, from 32 percent to 10 percent.

Figure 4.16 presents the distributions of nonwhite teachers within SES groups in K–6 schools. In all three grade spans, but especially in elementary schools, the range in the percentage of nonwhite teachers

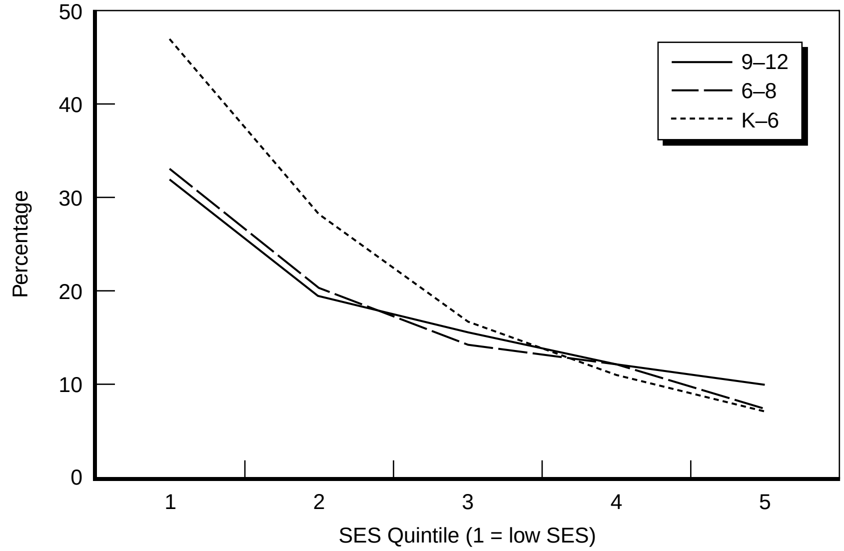

Figure 4.15—Median Percentage of Nonwhite Teachers,
by SES Quintile and Grade Span, Fall 1997

tends to be far wider among the lower-SES groups. Recall that in Chapter 3, correlation analysis revealed that the percentage of nonwhite teachers is positively and highly correlated with the percentage of nonwhite students in all grade spans, with a correlation above 0.7. Accordingly, we would expect that nonwhite teachers are also distributed unequally across different percentages of nonwhite students, and that is exactly what the results in Appendix Table B.2 show. Chapter 6 explores these issues in more detail.

Teacher Characteristics, by Subject Area, in Grade Span 9–12

We turn now to the final set of teacher characteristics that we examine in this chapter—the experience, education, and teachers' subject

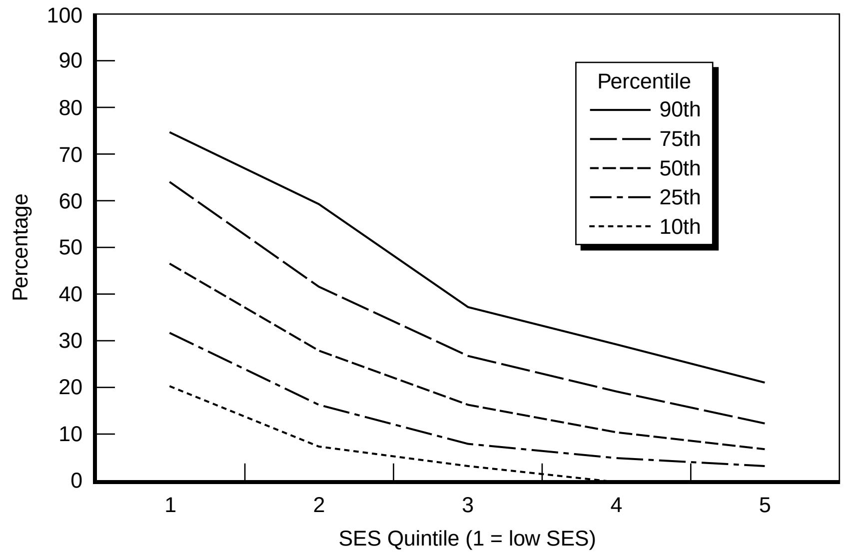

Figure 4.16—Percentage of Nonwhite Teachers, by SES Quintile, Grade Span K–6, Fall 1997

authorizations for specific subject areas in grades 9–12. We have presented evidence that teacher characteristics, not class size, are distributed inequitably across schools in this grade span. Given this evidence, we focus in this section on the distribution of teacher characteristics for core subjects and AP core subjects across more- and less-disadvantaged student populations.

Core Subjects. Detailed distributions for average experience, low experience, high experience, high education, and subject authorization are contained in Appendix Tables B.3 and B.4. Patterns observed at the medians are generally consistent across subject areas. The percentage of highly experienced teachers is most strongly and positively linked to student SES in science (a weak negative pattern exists for English teachers). Similarly, math is the subject area that exhibits the strongest positive link between student SES and the percentage of teachers with master's degrees.

Of particular note is the positive relationship between SES and the percentage of high school teachers who are authorized to teach their subject. Figure 4.17 presents the median percentage of teachers authorized to teach in each of the four core subject areas—English, math, science, and social science. It shows that in all subjects except science, approximately 10 percent more teachers have subject authorizations in high-SES schools than in low-SES schools.

What about variations in these measures of teacher preparation within SES groups? Which measures show the greatest dispersion? The

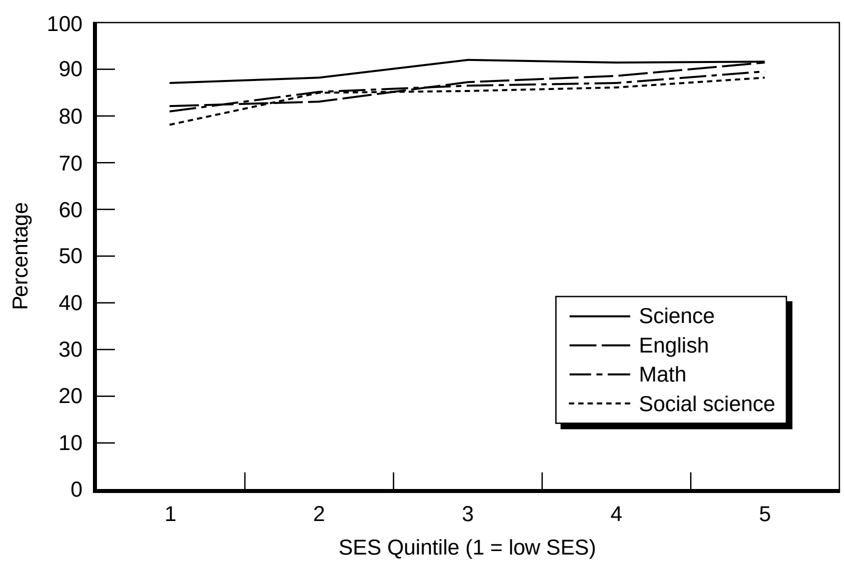

Figure 4.17—Median Percentage of Teachers with Subject Authorization, by SES Quintile and Subject Area, Fall 1997

interquartile ratios in Appendix Tables B.3 and B.4 show that low-experience teachers are the least equally distributed in all of the core subjects across both SES and nonwhite student groups, whereas correct subject authorizations are the most equally distributed.

When we repeated this analysis for AP teachers (not shown), we found that almost no teachers have low experience and that almost all teachers have the correct subject authorization. There is virtually no variation in this pattern across SES and nonwhite quintiles. However, there is some evidence of concentration of particular teacher qualifications within AP course offerings. Chapter 6 provides more analysis of the relationships among SES, teacher qualifications, and AP course offerings.

Specific Racial/Ethnic Group Analysis

In addition to weighting our resource distributions by total student enrollment, we examined resources weighted by different types of students to compare distributions across subgroups. These weights are number of students receiving free or reduced-price lunch, number nonwhite, number Asian, number black, number Latino, and number white. We include all, free or reduced-price lunch, and nonwhite for comparison purposes only. The goal of this analysis is to explore the possibility that any inequality in the level of resources is unlikely to be a phenomenon that is "race/ethnicity-neutral."

Table 4.4 presents median resource levels for several measures.[16] For average class sizes, we find almost no variation across racial/ethnic

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[16]Because receiving free or reduced-price lunch and being nonwhite are highly and positively correlated, we expect that distributions across these two dimensions are likely to

Table 4.4

Median of Selected School and Teacher Characteristics, Weighted by Number of Students Enrolled, by Grade Span, 1997

	Student Enrollment Weight (number)						
	All	Low-Income	Non-white	Asian	Black	Latino	White
Grade Span K–6							
Average class size	23.3	23.2	23.3	23.4	22.8	23.4	23.4
Teachers							
Average experience	12.1	11.6	11.7	12.8	11.6	11.5	12.7
% 0–2 years	20.0	21.6	21.6	19.4	21.7	22.1	17.6
% 10+ years	50.0	47.5	47.6	52.0	47.2	46.7	53.2
% at most bachelor's	15.5	20.0	19.6	12.2	21.4	21.4	10.3
% at least master's	24.0	23.1	23.7	23.5	26.1	23.3	24.5
% not fully certified	7.4	12.2	12.0	5.1	12.0	14.3	3.2
Grade Span 6–8							
Average class size	28.1	28.0	28.1	28.0	28.0	28.1	28.2
Teachers							
Average experience	13.6	13.4	13.5	14.5	13.0	13.4	13.8
% 0–2 years	12.8	13.7	13.5	12.2	14.7	13.5	11.8
% 10+ years	55.0	53.7	53.9	57.7	52.4	53.6	56.3
% at most bachelor's	12.2	16.4	16.0	10.2	18.9	17.4	8.7
% at least master's	31.6	30.6	31.4	31.2	31.9	31.3	31.8
% not fully certified	6.5	10.0	9.6	4.3	11.9	11.1	3.2
Grade Span 9–12							
Average class size	28.9	28.7	28.8	28.9	28.5	28.9	28.9
% "a–f" classes	54.9	52.2	54.0	55.4	54.3	53.1	56.1
% AP classes	2.2	2.1	2.1	2.8	2.0	2.1	2.5
Teachers							
Average experience	15.3	15.0	15.2	16.1	14.9	15.0	15.6
% 0–2 years	12.2	12.3	12.4	11.9	12.6	12.4	11.8
% 10+ years	61.5	61.1	61.1	63.2	59.8	60.8	62.3
% at most bachelor's	10.9	13.6	12.7	9.5	15.4	13.7	9.0
% at least master's	37.7	37.1	37.7	40.1	38.9	37.1	38.7
% not fully certified	6.3	8.7	8.4	5.7	10.1	9.8	4.3

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be similar, and these two medians for selected resources in Table 4.4 are within a half of a percent for 78 percent of the variables.

groups in each grade span. In high schools, the percentage of "a–f" classes also exhibits very little difference among groups. However, the median Asian student attends a school with 40 percent more AP classes than the median black student. As discussed above and explored more fully in Chapter 6, it is not clear whether this difference in number of AP courses represents an increased supply of these courses or is in response to different demands for AP courses across different groups of students.

When looking at teacher characteristics, we also find that the median Asian or white student attends a school where the resource level is higher than the resource level in a school attended by the median black or Latino student. Asians and whites are being taught by teachers who are more experienced, better educated, and more likely to be fully credentialed, relative to the teachers who teach blacks and Latinos. However, the medians for black and Latino students are virtually identical to those for students receiving free or reduced-price lunches. Thus, it is not necessarily the case that the race of students is driving these differences. Indeed, given the high correlation between schools with disadvantaged students and nonwhite students, we often cannot disentangle these differences. One striking exception to this pattern is that the median black student in K–6 schools is more likely to have a teacher with at least a master's degree than any other racial/ethnic group. Recall however that these comparisons do not control for other measures of SES across students.

Summary

This chapter has looked for a link between the inequities in school resources noted in Chapter 3 and SES. In some cases, a strong positive relationship emerges between SES and the level of resources provided.

Far and away, the two strongest examples are the dramatic links between SES and both the percentage of teachers who lack full credentials and the percentage who hold a bachelor's degree or less. These patterns appear to be strongest in elementary schools but are evident in middle and high schools as well. Measures of teacher experience also suggest that disadvantaged students, on average, are taught by less-experienced teachers, although the variations are quite weak except in elementary schools. In sharp contrast, there is little variation in class size across student SES groups.

In most cases, considerable inequality in resources also exists within SES groups. The degree of dispersion in school resources tends to be fairly similar among SES groups. The exception to this rule is the share of teachers with a bachelor's degree or less, which exhibits far larger variations among bottom-SES schools than among the higher-SES groupings. This finding points to clustering of teachers with low-education levels within the low-SES schools, in a relatively small number of these schools.

Because we found a strong correlation between our main measure of student SES (the percentage of students receiving free or reduced-price lunches) and the percentage of students who are nonwhite, it is not surprising that we found similar patterns when grouping schools based on the percentage of the student body that is nonwhite.

Turning to course offerings in high schools, we found that the highest-SES schools offered about 10 percent more "a–f" courses than the lowest-SES schools. Similarly, in the highest-SES schools the median percentage of courses that were AP was about 3 percent, compared to about 2 percent in the bottom-SES schools. Intriguingly, student SES appears to explain only a small portion of the variation across schools in

AP course offerings. Indeed, the SES group that exhibited the most dispersion in AP course offerings was the most-advantaged group of schools. Similar findings emerged when schools were ranked not by SES but by the percentage of the student body that was nonwhite. It is not clear whether these correlations reflect variations in the courses that schools are willing to supply, or variations in the courses that high school students demand, or a combination of both.

Given that this chapter finds strong disparities, particularly in teacher characteristics and high school course offerings, the next chapter examines a related question—whether strong geographic disparities exist. Chapter 6 then uses regression analysis in an attempt to disentangle the possibly confounding influences of student SES, geography, and the size of the school district and the school.

5. Geographic Disparities in School Resources

Introduction

Chapter 3 showed that schools differ in resource levels, especially those resources related to teachers. A natural question arises: *Where* are the schools that receive fewer resources? This chapter searches for geographic patterns in the distribution of school inputs. It does this by aggregating mean school resources across urban, suburban, and rural school categories (as defined by the California Department of Education) and by tabulating resources by county for five key variables.[1] Appendix Table C.1 shows the student enrollment by county for the K–6, 6–8 and 9–12 grade spans. It also includes a combination category of "other" regular schools that do not fit precisely into one of these grade ranges. As

[1]As in the previous chapter, we examine school means for variables such as class size and teacher experience. We then calculate the value of these school characteristics for the median, or middle, student, when students are ranked by the mean level of resource at their schools.

noted in Chapter 2, combination schools, such as K–12 schools, enroll only about 7 percent of the overall student population. However, as shown in Table C.1, these schools play an important role in some of the less-densely populated rural counties. As the blank cells in Table C.1 indicate, some of these rural counties do not have schools that fit into the elementary/middle/high school ranges that more generally typify the state's schools.

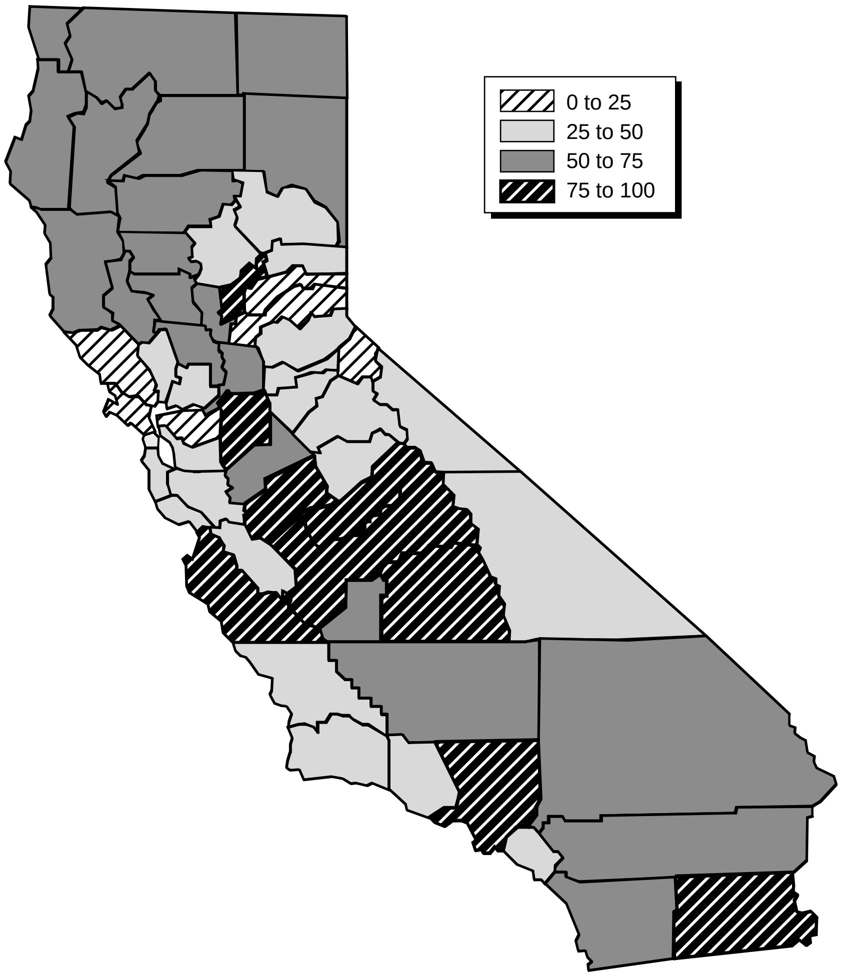
Continuing the theme of the last chapter, we begin by examining how the share of disadvantaged students in the local school population varies geographically. Table 5.1 shows that remarkable variations exist between suburban and other areas in the percentage of public school students who receive free or reduced-price lunches. The disparities are most notable in elementary schools: By this measure, 80 percent of K–6 urban students are disadvantaged compared to 59 percent in rural areas and 41 percent in suburban areas. Figure 5.1 shows how these large variations in SES in elementary schools map out across the state's counties.[2] Many rural counties, such as those in the Central Valley, have high percentages of disadvantaged students. Among highly urbanized

Table 5.1

Median Percentage of Students Receiving Free or Reduced-Price Lunches, by Urbanicity and Grade Span

Grade Span	Urban	Suburban	Rural
K–6	80.0	41.0	58.9
6–8	67.9	30.6	49.0
9–12	41.0	17.8	23.5

[2]Appendix Figure C.1 labels the individual counties.



NOTE: Because Trinity County has no schools fitting into the K–6 grade span, figures were imputed for that county by taking an average for the surrounding counties of Siskiyou, Shasta, Tehama, Mendocino and Humboldt.

Figure 5.1—Percentage of K–6 Students Receiving Free or Reduced-Price Lunches, by County

areas, Los Angeles County has an unusually large percentage of disadvantaged students.

Table C.2 shows county results for the K–6, 6–8, and 9–12 grade spans. It shows large geographic variations in students' SES. In rural Madera, Merced, and Tulare Counties, the percentage of K-6 students receiving lunch assistance soars to nearly 83 percent. In the case of many counties, schools in neighboring areas enroll quite different shares of disadvantaged students. For instance, in the San Francisco Bay area's K–6 schools, the rates of disadvantage are 26 percent in San Mateo County compared to 60 percent in San Francisco County, immediately to the north. Figure 5.1 and the underlying data in Table C.2 suggest that SES and region are intricately linked. Thus, the relation between school resources and SES identified in Chapter 4 is likely to have important regional undertones. In the following sections, we examine in greater detail the extent to which school resources are distributed unequally across urban, suburban, and rural schools and across counties.

Variations in Resources Between Urban, Suburban, and Rural Schools

Table 5.2 lists mean school characteristics for the median, or middle, student in urban, suburban, and rural schools. Variations in average class size between these types of schools are in general very small. The largest gaps occur in high schools, in which the median rural student attends a school with a mean class size of 27.3 compared to 28.8 and 29.4 in urban and suburban schools, respectively. It is likely that the especially small variations in mean class size between urban, suburban, and rural elementary schools is due to the strong financial incentives for reducing

Table 5.2

Median School and Teacher Characteristics, by Urbanicity and Grade Span

Characteristic	Urban	Suburban	Rural
Grade Span K–6			
Average class size	23.1	23.7	23.2
Teachers			
% at least master’s	23.1	28.0	16.7
% bachelor’s or less	25.9	12.1	11.4
Years of experience	12.0	12.2	12.4
% 0–2 years experience	21.3	20.0	17.7
% at least 10 years experience	48.1	50.0	54.6
% not full credential	16.7	4.3	4.1
% nonwhite	35.1	13.2	10.0
Grade Span 6–8			
Average class size	28.2	28.4	27.3
Teachers			
% at least master’s	30.7	35.1	22.4
% bachelor’s or less	24.2	10.1	8.0
Years of experience	13.7	13.6	13.5
% 0–2 years experience	13.5	12.8	11.0
% at least 10 years experience	54.0	55.6	56.3
% not full credential	14.1	3.6	4.4
% nonwhite	28.9	11.3	10.0
Grade Span 9–12			
Average class size	28.8	29.4	27.3
Teachers			
% at least master’s	37.0	43.9	29.7
% bachelor’s or less	18.1	9.6	8.9
Years of experience	14.9	15.8	15.3
% 0–2 years experience	11.8	12.3	11.8
% at least 10 years experience	60.7	62.3	62.4
% not full credential	11.1	4.9	5.7
% authorized in science	87.5	91.7	92.3
% authorized in English/drama	82.1	88.8	87.0
% authorized in math	81.5	87.3	88.4
% authorized in social science	78.4	87.0	89.8
% nonwhite	28.1	12.8	11.0
% “a–f” of all classes	54.5	56.7	49.8
% AP of all classes	2.1	2.6	1.8

class size embodied in the class-size reduction initiative for K–3, and in goals set by teacher contracts for other grades.

Larger disparities emerge in teacher characteristics. In each grade span, a roughly 11–15 percentage point gap in the share of teachers holding at least a master's degree emerges between the three types of schools, with suburban schools employing the most highly educated pool of teachers, followed in diminishing order by urban schools and rural schools. Of course, this measure represents only one way to measure disparities in teacher education. By a second measure—the percentage of teachers who hold a bachelor's degree or less—urban schools lag behind. For instance, in elementary schools, the median urban student attends a school where almost 26 percent of teachers hold a bachelor's degree or less, compared to about 11–12 percent for rural and suburban schools.

Surprisingly, few inequities emerge when examining mean years of teacher experience. To examine the "tails" of the distribution, we also tabulate the median percentage of teachers with 0–2 and greater than ten years of experience. Both of these measures suggest that urban school teachers tend to be slightly less experienced than those in suburban schools, which have less-experienced teachers than do rural schools.

The median percentage of teachers who do not hold a full credential provides another useful measure of teacher preparation. In this regard, urban schools appear to suffer from a significant shortage of qualified teachers. For instance, in K–6 schools, the median percentage of teachers not fully certified is 16.7 percent in urban schools, compared to only 4.3 percent and 4.1 percent in suburban and rural schools, respectively. The CSR Research Consortium (1999) notes a large increase in the share of K–3 teachers not fully certified between the 1995–1996 and 1997–1998 school years—from 4 to 12 percent. The consortium attributes part of the increase to the boost in the demand for teachers created by the CSR initiative. We have no reason to doubt that this initiative has increased the share of teachers who are not fully certified in the state. What is particularly remarkable about our findings is that in the 1997–1998 school year, middle schools and high schools had only slightly smaller shares of uncertified teachers than did elementary schools. Shortages of fully certified teachers appear—at least for the present—to be generic in California's schools. Table 5.2 clearly shows that urban schools currently bear the brunt of the shortages.

An alternative measure of teacher preparation at the high school level is the proportion of teachers who hold authorizations for the subjects they teach.[3] In high schools, 80–90 percent of teachers are typically authorized in the four subject areas listed in Table 5.2. Little difference emerges between suburban and rural schools. However, in English, math, and social science, urban schools lag behind both suburban and rural schools in authorization rates by 4 to 12 percent.

Finally, we note that minority teachers are strongly concentrated in urban schools. The differences in the percentage of teachers who are nonwhite are particularly large in K–6 schools.

Turning from teacher characteristics to curriculum, we find that the proportions of high school classes that are college-preparatory and Advanced Placement depend on the urbanicity of the school. Somewhat surprisingly, it is not urban high schools but rural high schools that offer the lowest percentages of "a–f" and AP classes in their curriculum, as shown at the bottom of Table 5.2. As we cautioned in previous chapters,

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[3]Although one can compile similar information for middle schools, subject authorizations are not required at this level, making any variations across schools difficult to interpret.

it is difficult to tell whether variations in the percentages of these courses in the overall curriculum reflect variations in the number of courses that schools are willing to supply or variations in the demand for these courses by students. It is certainly conceivable that the dominant reason for the smaller percentage of college-preparatory and AP classes in rural schools is that many of the schools are small. As such, they do not enjoy the economies of scale that may allow larger districts and schools to offer a wider range of academic opportunities.

Variations in Resources, by County

We can obtain a more detailed picture of the geographic distribution of school resources by calculating the median of school resources for each county in California. Appendix Tables C.3 through C.7 show the medians by county and grade span for selected measures of school resources: class size, the percentage of teachers with at least a master's degree, teachers' mean years of experience, the percentage of teachers without full credentials, and—for high schools—the percentage of classes that are Advanced Placement. The wealth of information contained in these tables is perhaps best viewed graphically in the corresponding maps shown in Figures 5.2 through 5.6. All but the last figure, which examines AP class availability in high schools, focus on the distribution of resources in K–6 schools.[4]

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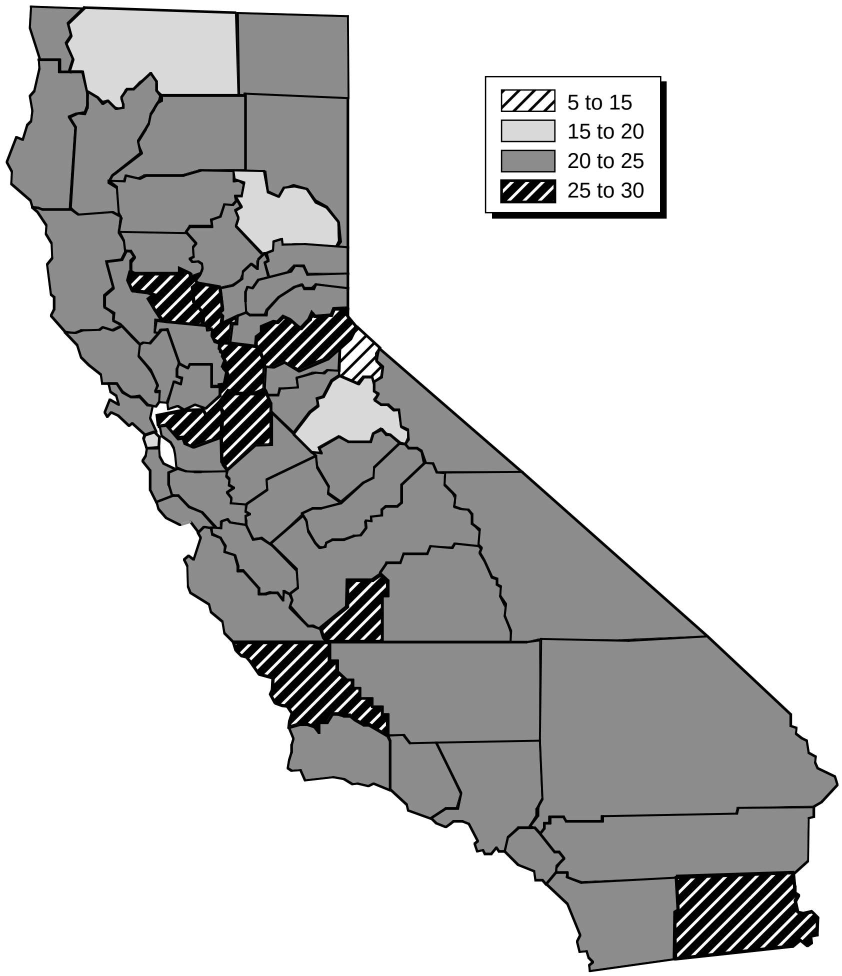
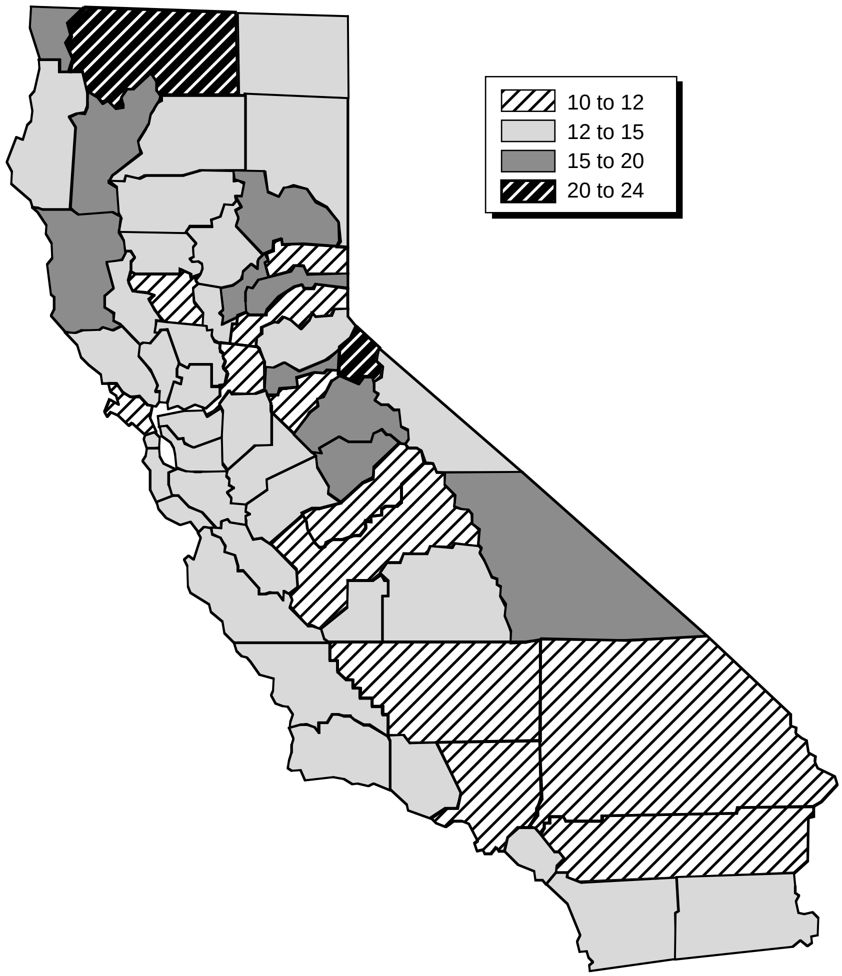
[4]As reflected in appendix tables, the 1997–1998 data show no K–6 regular schools in Trinity County. For the purpose of the maps, we assigned values for the given school resources equal to the simple average for geographically contiguous counties. An alternative approach would have been to use the values for combined grade span schools in Trinity County, which would have produced highly similar results. The largest difference is that our estimate of the percentage of teachers with a master's degree or higher, based on the average for neighboring counties, was 14.04, whereas the average in combination schools in Trinity County was 14.39.



NOTE: Because Trinity County has no schools fitting into the K–6 grade span, figures were imputed for that county by taking an average for the surrounding counties of Siskiyou, Shasta, Tehama, Mendocino and Humboldt.

Figure 5.2—Median of K–6 School Mean Class Sizes, by County

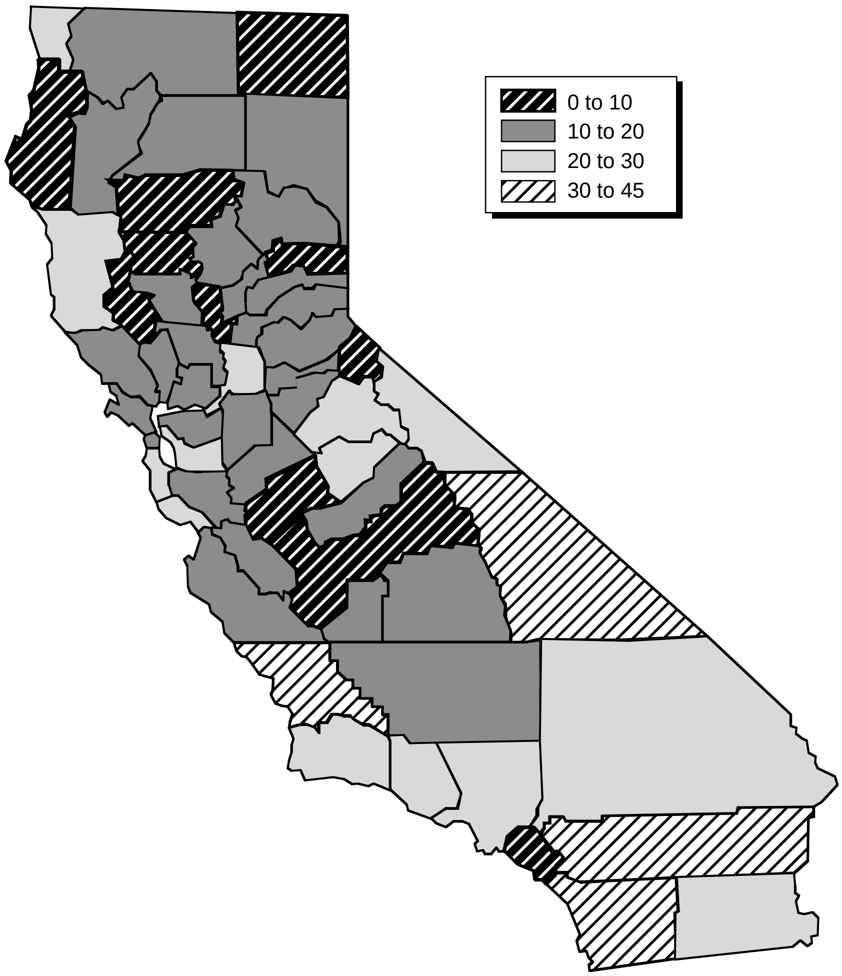
Figure 5.2 shows little dispersion across counties in average K–6 class sizes. Most of the “outlier” counties, both on the high and low side,



NOTE: Because Trinity County has no schools fitting into the K–6 grade span, figures were imputed for that county by taking an average for the surrounding counties of Siskiyou, Shasta, Tehama, Mendocino and Humboldt.

Figure 5.3—Median of Mean Years of K–6 Teachers' Experience, by County

represent largely rural areas. Of course, the CSR initiative has given schools in *all* regions powerful incentives to equalize K–3 class sizes at 20



NOTE: Because Trinity County has no schools fitting into the K–6 grade span, figures were imputed for that county by taking an average for the surrounding counties of Siskiyou, Shasta, Tehama, Mendocino and Humboldt.

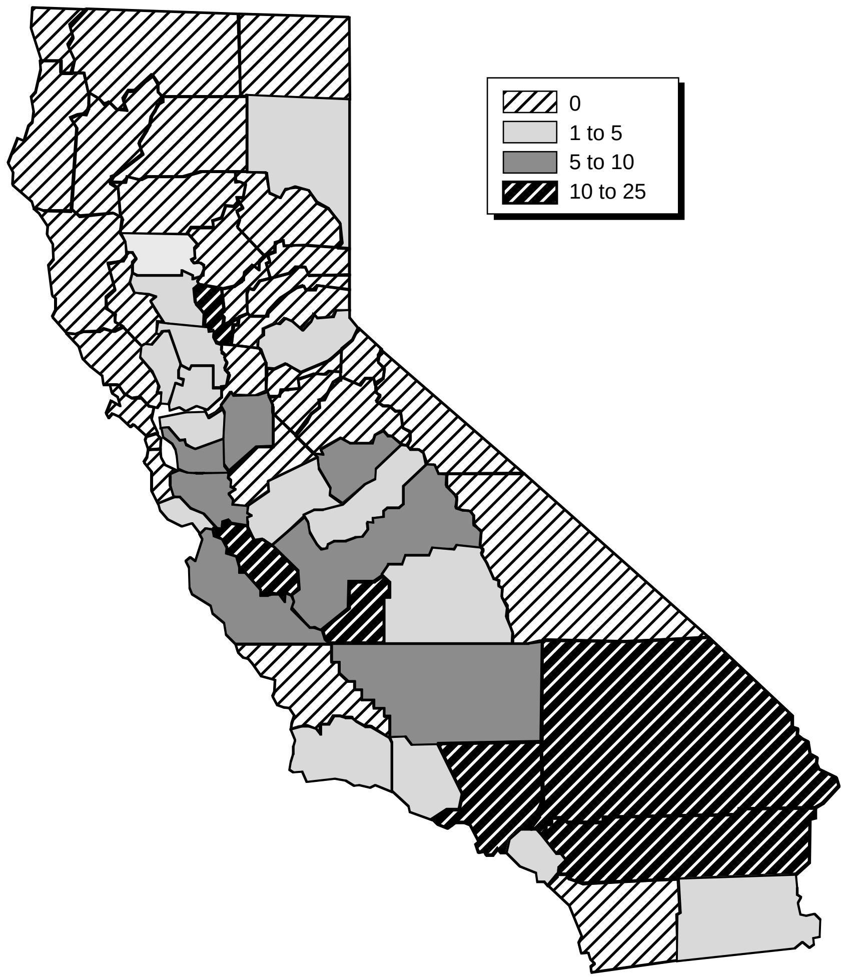
Figure 5.4—Median of Percentage of K–6 Teachers with At Least a Master's Degree, by County

pupils; as we showed in Chapter 3, the fairly high degree of uniformity in class sizes also occurs in middle and high schools. Figure 5.2 shows that geographic variations in class size are not particularly large; Table C.3 shows slightly larger intercounty variations in class size in middle schools and high schools.

Chapter 3 provided evidence that interschool inequalities have less to do with variations in class size than with variations in teacher characteristics. Figures 5.3 through 5.5 bear this conclusion out, as each shows that a given measure of teacher preparation varies substantially across counties. Figure 5.3 reveals that rural Southern California counties tend to have the least experienced K–6 teachers, whereas rural counties in the central and northern regions tend to have the most highly experienced teachers. Los Angeles County stands out as an urban county in which teachers are relatively inexperienced.

Figure 5.4 shows equally dramatic variations in the share of K–6 teachers who hold at least a master's degree. San Diego and Orange Counties emerge as two urbanized counties with highly educated teachers; most of the remaining counties with high or intermediate shares of teachers with master's degrees are scattered throughout the state. The counties with the lowest percentages of teachers with a master's degree or higher are mainly rural counties in Central and Northern California.

Figure 5.5 maps the percentages of K–6 teachers who are not fully certified. Again, Los Angeles County emerges as an urbanized county with unusually large difficulties in hiring or keeping certified teachers, relative to other urban counties such as San Diego, Orange, or more-distant urban counties in the San Francisco Bay area. Shields, Marsh, and Powell (1998) document that the Los Angeles Unified School District, which is the largest district in the state, has accounted for a large fraction of emergency permits. Figure 5.5 supports this: No other highly urbanized county in the state has as large a share of teachers



NOTE: Because Trinity County has no schools fitting into the K–6 grade span, figures were imputed for that county by taking an average for the surrounding counties of Siskiyou, Shasta, Tehama, Mendocino and Humboldt.

Figure 5.5—Median of Percentage of K–6 Teachers Not Fully Certified, by County

without full credentials. Other counties with markedly large percentages of teachers lacking full certification tend to be rural counties in Central and Southern California. Taken together, these three figures suggest that the labor market for teachers in California is far from homogeneous, with teacher preparation varying in important ways along a number of dimensions.

Appendix Table C.7 and the corresponding Figure 5.6 illustrate variations in the availability of Advanced Placement classes in the state's high schools. Note that the darkest shading indicates counties in which the median student attends a high school at which *0 percent* of classes are AP. Not surprisingly, because most students enrolling in AP classes will be in grade 12 (or possibly grade 11) rather than grade 9 or 10, only a small share of overall classes are AP. Still, significant variations occur between counties. Northern rural counties tend to be those that offer the lowest percentages of AP classes, although important exceptions exist. Highly urbanized counties tend to offer a larger percentage of AP classes than do less-urbanized counties. Among these urbanized counties, San Mateo and Orange County schools offer relatively large percentages of AP classes, with San Francisco and Alameda Counties offering relatively low percentages. The largely rural-urban split in these data might indicate that schools vary in the number of AP classes that they are able to supply, or that students vary in their demand for college preparatory courses, or a combination of these factors.

Summary

The socioeconomic status of students varies sharply across geographic areas. About twice as large a proportion of students receives lunch assistance in urban schools than in suburban schools; students in rural schools lie somewhere between. Sharp variations also occur across counties.

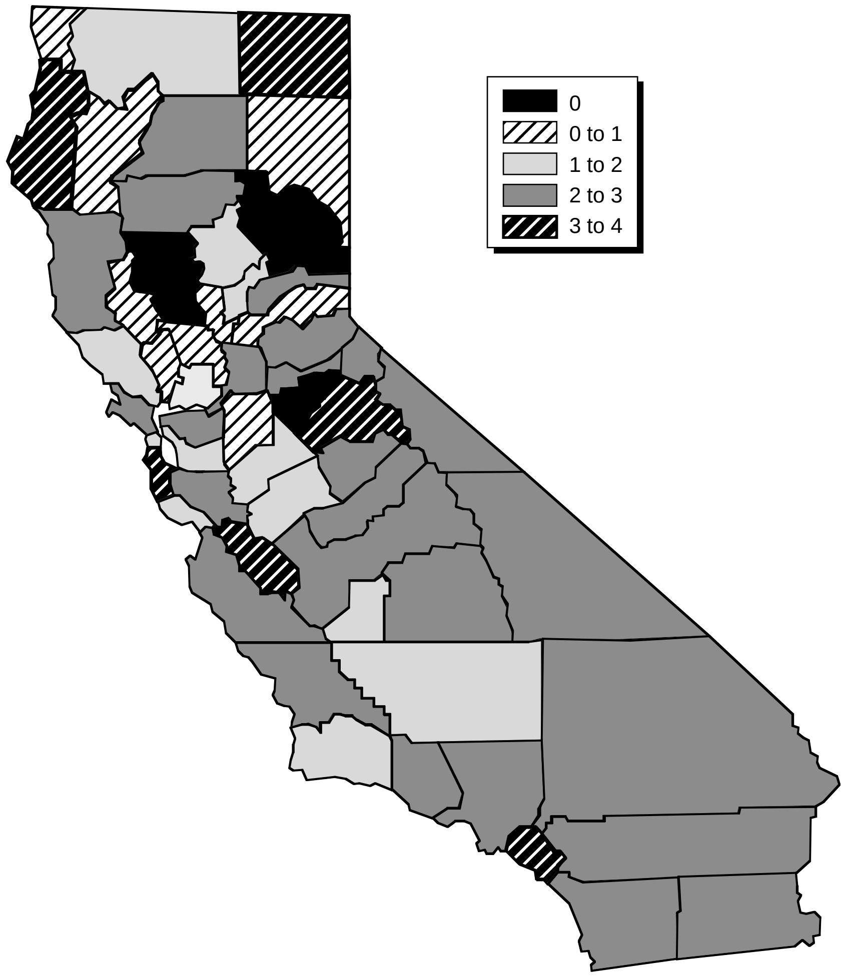


Figure 5.6—Median of Advanced Placement Classes As a Percentage of Total 9–12 Classes, by County

Regions also vary substantially in the level of school resources they provide to students. The evidence points to a strong geographic element in existing inequities, related not so much to class sizes, which are fairly uniform throughout the state, but more to inequities in teacher preparation and in Advanced Placement offerings.

Teacher characteristics differ quite dramatically between urban, suburban, and rural schools. Urban schools lag behind suburban and rural schools in most dimensions. Most strikingly, it is urban schools that have the largest share of teachers who are not fully certified—about two to four times the shares in suburban schools, depending on the grade span studied. Rural schools tend to have a marginally larger share of uncertified teachers than do suburban districts. Similarly, urban high schools have lower shares of teachers authorized to teach in their subject areas than do suburban or rural schools. Urban districts have the least-experienced teachers and rural schools have the most highly experienced teachers, although the variations are not large.

Although public debate in the United States often focuses on inequities between inner city and suburban schools, we believe that attention should also be given to rural schools, which lag behind in some ways. For instance, the proportion of teachers holding master’s degrees or higher is sharply lower in rural schools than in suburban schools, with urban schools in between. Similarly, at the high school level, rural schools have the lowest percentage of college-preparatory and Advanced Placement courses, whereas suburban schools have the highest. Although rural counties often have fewer resources than more-urbanized counties, resources within rural schools vary considerably by county.

In a comparison of highly urban areas, we find that many counties, including those in the San Francisco Bay area, Orange County, and San Diego County, tend to attract teachers with above-average education levels. Although Los Angeles does not lag behind other highly urbanized counties in teacher education substantially, the data suggest that it is an urban county with especially large deficits in other types of teacher preparation. The percentages of both highly experienced and fully certified teachers in Los Angeles County lag behind other urban areas remarkably. The median percentage of teachers without a full credential provides the starkest contrast. In many of the urban counties in Southern California and the Bay area, 0–3 percent of teachers lack a full credential; in Los Angeles County, the corresponding figures for K–6, 6–8, and 9–12 schools are 22.5 percent, 17.0 percent, and 13.2 percent, respectively. One implication of these variations between areas, all of which are highly urbanized, is that the labor market for teachers in California is highly fractured, with sharp variations in the balance of demand for and supply of well-trained and experienced teachers from one county to the next.

6. Multivariate Regression Estimates of the Distribution of Resources Across and Within School Districts

Introduction

In the previous two chapters, we examined how the distribution of teacher qualifications, class sizes, and subject offerings has varied across different types of schools, as categorized by differences in socioeconomic status and geographic locations. Schools and school districts have many other characteristics that can affect the distribution of resources (e.g., the size of the school and the number of special education students). To examine how these different characteristics interact and cumulatively influence the allocation of our key resources, we use regression analysis. Regression analysis allows us to disentangle relationships among variables and to estimate how much of the perceived inequality across students of different socioeconomic status is *actually* driven by differences in school location and size. Using these estimates, regression analysis allows us to predict how resources would differ if we were to change only one characteristic of a school. For example, we examine how the number of AP courses changes if we move from an urban school to a rural school of the same size. We also investigate whether certain disparities in resources, such as course offerings, are driven by the size of the school and district student populations.

In addition to examining the marginal effects of resources across school districts, we examine how teachers and classes are distributed *within* a district. Because the state allocates most school revenues to districts rather than to individual schools, it is important to see if there are variations in teacher characteristics and course offerings within districts.[1] On the one hand, the distribution of resources might reflect deliberate district policies that allocate resources differently to different schools. For example, a district might assign more ESL (English as a Second Language)-certified teachers to schools with more LEP students. On the other hand, the distribution and disparity of resources, especially staffing decisions, might be the unintended by-product of district policies such as accommodation of teacher preferences. For example, we find that nonwhite teachers are more likely to teach in schools with more students of the same ethnicity. This may not reflect a systematic policy on the part of school districts to place teachers with co-ethnic students as much as the aggregation of individual teacher preferences.[2]

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[1]The notable exception to this results from the CSR initiative, which was implemented in 1996. Individual schools, not districts, receive funds based on class sizes of fewer than 20.4 students in grades K–3.

[2]"Co-ethnic" refers to people of the same ethnicity (Portes and Schauffler, 1994; Portes, 1995).

In this chapter, our unit of observation will be the school rather than the student.[3] We first present information on the relation between student characteristics and teacher characteristics. To better illustrate the variation in these variables across schools, we investigate how the resources would change from a school with more disadvantaged students to a school with the median number of disadvantaged students to a school with fewer disadvantaged students. As in previous chapters, our measure of the socioeconomic status of students within a school is based on the number of students who are eligible for free or reduced-price lunches. This measure is highly correlated with the percentage of nonwhite and LEP students attending a school. Because of this high correlation, it is difficult to calculate the separate effect of these student population characteristics.

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[3]Although our unit of analysis throughout the report is the school, previous chapters have used student population weights to account for differences in student population sizes among schools. Our approach in this chapter will put the same weight on larger and smaller schools, so that we can better contrast differences across schools. This is especially important when we examine how teacher characteristics and course offerings change across schools of different sizes. Unless otherwise specified, our basic regression analysis includes the following variables: percentage of students eligible for free or reduced-price lunches, the size of the student population within the school (in hundreds), the size of the student population within the school district (in thousands), and indicator variables for whether the school was self-classified as suburban or rural.

We have also done the analysis using different specifications, including both the percentage of students who are nonwhite and the percentage of students who are LEP as explanatory variables. In addition, we have included the percentage of students who are black, Asian, and Latino. Because of the high correlation between the nonwhite variable and the socioeconomic status variable, it is difficult to disentangle the separate effects of each. In addition, we ran each regression including a quartic term in socioeconomic status to check for nonlinearities in the effect of the free or reduced-price lunch variable. Although the higher-order terms are sometimes statistically significant, including them does not change the effect of SES on school resources by more than 1 percentage point. Therefore, unless otherwise specified, we have presented the results using only a linear term in the percentage of students receiving free or reduced-price lunches to represent the socioeconomic status of the school. The results of the alternative specifications are available upon request from the authors.

We next examine class sizes across the different grade spans and then focus on the percentage of courses taught by authorized teachers in high schools. We then examine the distribution of AP courses across high schools.

In all of our analyses, we also ran a set of regressions that included a district-specific effect. This eliminates the variation across school districts so that the estimates are based solely on variations that occur within a school district. We do this as a comparison, to see how much of the variation in school resources across schools in California is in fact from within-district differences. The results are most interesting for elementary schools, since there are many more K–6 schools (on average 7.5) than there are middle schools (2.3) or high schools (2.2) in a school district. These within-district estimates help us understand how much inequality might remain even if all school districts received the same per-pupil funding.[4]

Throughout this chapter, the reader should bear in mind that the regressions do not show the direction of causation. They merely document how strongly individual school resources are correlated with student and district characteristics. What distinguishes the results in this chapter from those in Chapter 4 is that the predicted effects of changing SES of students are based on models that also control for school and district enrollment and for whether the school is rural or suburban.

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[4]This fixed-effect approach necessarily reduces the precision with which we can estimate the relation between a given type of school resource and student characteristics because it "removes" much of the variation. Furthermore, some districts contribute no information to this fixed-effect analysis, because there is only one school of a given grade span in the district. Of the 606 school districts in our sample that contain at least one elementary school, only 138 contain only one elementary school. The number of school districts that contain only one middle school or high school is much higher: 243 of the 440 school districts with middle schools contain only a single middle school, and 219 of the 386 school districts with high schools contain only a single high school.

Teacher Characteristics

In this section, we examine the results from regressions that model teacher characteristics as functions of student SES, school and district size, and indicator variables for whether the school is suburban or rural. To predict what would happen to particular teacher characteristics at any random school if the SES of its students were to change, we use three representative urban schools of median size in a district of median size, so they differ *only* in student SES. The three schools represent a low-SES school, a median-SES school, and a high-SES school.[5]

The Effect of Student Socioeconomic Status

To examine the relationship between student SES and teacher characteristics, we graph the predicted percentage of teachers with the specified characteristic associated with schools that contain different percentages of students receiving free or reduced-price lunches in our low-SES, median-SES, and high-SES school. We find that increasing the socioeconomic status of the school is correlated with increasing values of teacher characteristics that are commonly thought to improve teaching effectiveness. That is, teachers with less experience and less education teach at schools with a higher percentage of students participating in the lunch program.

The first set of bars in Figure 6.1 shows the percentage of teachers at a given K–6 school with at most a bachelor's degree after we have controlled statistically for the other characteristics of schools listed

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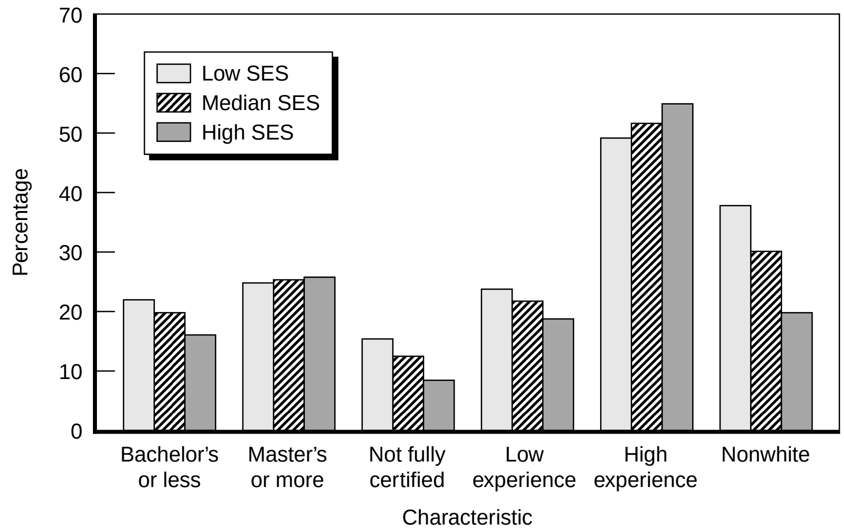
[5]75 percent, 50 percent, and 25 percent of students in the state, respectively, attend schools with fewer students in the free or reduced-price lunch program than our three representative schools.



NOTE: Estimates are based on calculations assuming an urban school with the median number of students attending the school in a median-sized district.

Figure 6.1—Predicted Percentage of Teachers with Given Characteristic, K–6 Schools, and Student SES

above.[6] In the low-SES school, 22 percent of teachers have a bachelor's degree or less compared to 16 percent in the high-SES school. A large discrepancy also exists between schools in the percentage of teachers who are not fully certified. In the low-SES school, almost 16 percent of teachers are not fully certified, compared to a little over 8 percent of teachers in the high-SES school. There is little difference in the number of teachers with at least a master's degree.

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[6]Figure 6.1 examines this relationship for elementary schools. For K–6 schools, our low-, median-, and high-SES schools have 85, 61, and 30 percent of their students, respectively, receiving lunch assistance.

Schools with more-disadvantaged students also have a more inexperienced teaching force. Average years of teaching experience are predicted to be slightly lower in low-SES schools (12 years) than in high-SES schools (13 years). This difference in years of experience appears to be associated with having more teachers with two or less years experience and fewer with ten or more years experience in low-SES schools. In our low-SES school, 24 percent of the teaching force is predicted to have two or less years experience as compared to 19 percent in our high-SES school. There is a corresponding decline in the percentage of teachers with ten or more years experience in low-SES schools (49 percent) as compared to high-SES schools (55 percent). Indeed, the change in the percentage of teachers in each of these groups is approximately equal but in opposite directions. Thus, schools with higher levels of in-need students seem to have 6 percent fewer highly experienced teachers. These results are stronger if we include other measures of student disadvantage (not shown).

Finally, the largest effect we find is that nonwhite teachers are teaching in disproportionate numbers at schools of lower socioeconomic status. We estimate that 38 percent of the teachers at our low-SES school are nonwhite as compared to 20 percent of teachers at our high-SES school.[7] This result is largely driven by teachers working at schools with a higher proportion of co-ethnic students. If it is believed that

[7]Thus, the percentage of nonwhite teachers is 18 percent higher at a school with the percentage of students in the free or reduced-price lunch program at the 75th percentile level than at the 25th percentile level. In results not shown, we found that the relationship between SES and the percentage of teachers who are nonwhite is stronger if we include variables for percentage of the student body that is nonwhite and LEP and also allow for interquartile changes in these variables as well. Below, we do examine the relationship between the percentage of the student population of a given ethnicity and the percent of the teaching force of the same ethnicity.

students respond better to co-ethnic teachers, this last finding is encouraging. However, to date, researchers such as Ehrenberg, Goldhaber, and Brewer (1995) have found no measurable effect on student achievement (i.e., test scores) of students being taught by co-ethnic teachers.

Table 6.1 presents estimates for elementary schools, middle schools, and high schools. Our results are very similar to what we found for elementary schools above; however, the overall number of students eligible for free or reduced-price lunches declines in higher grades. The percentage of students receiving lunch assistance in each of these hypothetical schools is given in the first row of Table 6.1. Our representative low-, median-, and high-SES schools still correspond to schools at the 75th, 50th, and 25th percentile levels of free or reduced-price school lunch participation.

Teachers at the low-SES school had less education and less experience than those at the high-SES school. They were also more likely to be on an emergency credential. There are 2 to 3 percent more teachers with a bachelor's degree or less in a low-SES school than in a high-SES school. Middle schools with more disadvantaged students have 4 percent more teachers who are not fully certified when compared to our representative high-SES school. Among high schools, there is a 2 percent difference in the percentage of teachers lacking certification. There again seems to be little difference in the percentage of teachers with a master's degree or more. The pattern in the percentage of new teachers (two or less years of experience) and highly experienced teachers

Table 6.1

Predicted Percentage of Teachers with Given Characteristic, by Grade Span and Student SES

	Low-SES	Median SES	High-SES
Grade Span K–6			
% students in lunch program (used to calculate estimates)	84.6	60.8	30.1
Bachelor's or less	22.1	19.5	16.2
Master's or more	25.0	25.3	25.8
Not fully certified	15.7	12.5	8.4
2 or less years experience	24.0	21.7	18.8
10 or more years experience	49.1	51.5	54.6
Nonwhite	37.7	29.9	19.8
Grade Span 6–8			
% students in lunch program (used to calculate estimates)	70.1	47.9	25.1
Bachelor's or less	18.2	16.6	14.9
Master's or more	32.7	32.1	31.5
Not fully certified	11.7	9.6	7.4
2 or less years experience	16.1	14.7	13.3
10 or more years experience	56.1	57.5	59.0
Nonwhite	29.3	23.8	18.1
Grade Span 9–12			
% students in lunch program (used to calculate estimates)	45.6	25.4	13.0
Bachelor's or less	16.3	14.9	13.9
Master's or more	39.4	39.7	40.0
Not fully certified	8.5	7.3	6.5
2 or less years experience	14.9	13.6	12.7
10 or more years experience	59.9	61.1	61.8
Nonwhite	28.7	24.4	21.7

NOTES: Estimates are based on an urban school with the median number of students in a district of median size.

(ten or more years of experience) is also very similar to that in K–6 schools, with a 2 to 3 percent difference in the number of new teachers in low-SES schools as compared to high-SES schools. We also find similar patterns in the percentage of the teaching force that is nonwhite. We estimate that 29 percent of teachers at our representative low-SES middle school and high school are nonwhite as compared to 18 and 22 percent, respectively, of teachers at our representative high-SES schools.[8]

Relation Between Student SES and Teacher Characteristics Across and Within Districts

In this section, we compare the relative strength of the relation between student SES and teacher characteristics overall in California and within districts. To do this, we compare differences in teacher characteristics across all the schools in the state and an average of differences in teacher characteristics that occur *within* school districts. The overall differences presented in Figure 6.2 will correspond to the difference between the low-SES bar and the high-SES bar in Figure 6.1.[9] To estimate the differences within a school district, we need to examine the changes in teacher characteristics across schools of different SES within the same school district. We take as our "experiment" the average

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[8]In Figure 6.1 and Table 6.1, we have not given any indication of the precision with which our estimates are calculated. Appendix Tables D.1 to D.3 present the regression results from which these estimates are derived. They provide evidence on how specific teaching force characteristics are correlated with our measure of student disadvantage for K–6, 6–8, and 9–12 schools, respectively. In all cases except for the models of the percentage of teachers with a master's degree or more, the percentage of students in the free or reduced-price lunch program enters significantly at less than the 5 percent level.

[9]Again, this change reflects an interquartile difference in student SES or a change from the 75th percentile of students in the free or reduced-price lunch program to the 25th percentile of students in that program.

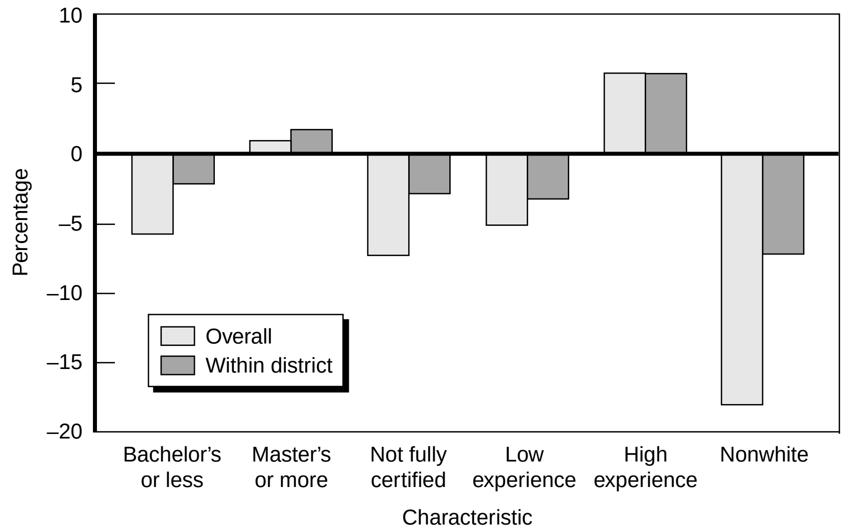

Figure 6.2—Interquartile Differences in Percentage of Teachers with Given Characteristic, K–6 Schools, Overall and Within District

within-district interquartile difference in the percentage of students in the free or reduced-price lunch program. Note that these differences are smaller than the changes across the state because they involve only within-district inequality. If a school district has seven elementary schools, each with equal enrollment, and we arranged them so that school 1 had the lowest percentage of children in the program and school 7 had the highest percentage, the within-district interquartile difference would be the difference between the percentage of students in the program in the sixth school as compared to the percentage in the second school. In districts with only one school, there is *no within-district* variation. Table 6.2 lists the interquartile differences in student characteristics across all schools within the state and the average

Table 6.2

Interquartile Differences in Percentage of Schools with Given Characteristic, by Grade Span, Statewide and Within District

	K–6		6–8		9–12	
	Statewide	Within District	Statewide	Within District	Statewide	Within District
% students in lunch program	54.4	26.0	45.0	17.8	32.7	15.3
% LEP	41.0	21.3	25.4	12.2	17.6	9.7
% nonwhite	54.0	18.6	48.8	13.2	47.0	13.5

differences in student characteristics within school districts. On average, the within-district variation in our socioeconomic status variables is about half that of the within-state variation. Thus, within school districts there is still wide variation in the proportion of disadvantaged students at a given school.

In Figure 6.2, we compare the predicted differences between a low-SES school and a high-SES school across all schools and *within* school districts for elementary schools. Overall, the within-district patterns are very similar to those across the state, although the amount of inequality within a district is, on average, about half the inequality across the state as a whole. Teachers with more experience and education are still found in higher-SES schools. Indeed, given that the size of the increase in variables we are considering is smaller, these within-district changes are more striking. On average, schools with fewer disadvantaged students compared to other schools within the same school district have slightly more teachers with at least a master's degree and 3 percent fewer teachers with at most a bachelor's degree. They also have a smaller percentage of teachers with little experience and 6 percent more highly experienced teachers (that is, teachers with 0–2 and ten or more years of experience, respectively). We find very similar results for middle schools and high schools.

Again, we want to stress that our finding that more-experienced teachers teach in schools with more-advantaged students does not necessarily reflect an explicit school district policy. This sorting of teachers could reflect individual teacher preferences to be assigned to certain schools and a policy of basing both voluntary and involuntary transfers of teachers within a district at least partly on tenure.

We find some evidence in favor of this hypothesis in collective bargaining agreements in some of the state's largest school districts. According to Section 15.3 of the *Contract Between the San Francisco Unified School District (SFUSD) and United Educators of San Francisco* that covered teachers from July 1, 1995, to June 30, 1998; Sections 12.2 and 12.3 of the San Diego Education Association's contract with the San Diego Unified School District (SDUSD); and Section 11.9 of the *Collective Bargaining Agreement Between the United Teachers Los Angeles (UTLA) and the Los Angeles Unified School District* (LAUSD), July 1, 1995, to June 30, 1998, voluntary transfers of teachers are based largely on seniority of teachers within a district, whereby the most senior teachers are chosen for open positions in schools, other qualifications being equal.[10] Such contract stipulations could lead to the most highly experienced teachers transferring over time to schools where students have high SES. Similarly, the agreements state that in the case of involuntary transfers, the districts must transfer teachers with the least

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[10]These other teacher qualifications include subject authorizations, special skills and credentials, and in Los Angeles and San Francisco, the ethnic composition of the school's teaching force.

amount of tenure, assuming everything else is equal (SFUSD Section 15.5.2, SDUSD Section 12.7.3.1, and LAUSD Section 11.6.09). These involuntary transfers occur mainly when there are position reductions in certain schools and unfilled vacancies in others, which are more likely to occur among schools in more-disadvantaged areas.

Although there is evidence that within school districts there are more uncertified teachers clustered at certain schools, the effect is less than in statewide comparisons. Unlike teacher experience and education, emergency certification seems to vary much more across districts than *within* districts.

Similarly, it appears that although nonwhite teachers are more likely to teach at a school with more-disadvantaged students within a district, there is a much bigger effect across school districts. However, we still find evidence of some sorting of nonwhite teachers across schools *within* a district. If we change the percentage of students eligible for free or reduced-price lunches within a district from the 25th to the 75th percentile, the predicted proportion of nonwhite teachers increases by 7 percentage points.[11] Interestingly, both the San Francisco and Los Angeles teachers' contracts mention that involuntary transfers are based partially on being "consistent with the principle of maintaining or improving the racial and ethnic balance at each school site consistent with the racial and ethnic balance of members of the bargaining unit" (Section 15.5.2 in SFUSD contract and Appendix B in LAUSD contract). Thus, our findings that nonwhite teachers appear to be

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[11]Appendix Table D.4 presents the underlying regressions upon which the within-district results for elementary schools are based. Appendix Tables D.5 and D.6 present similar regressions for middle schools and high schools. In most cases, the coefficients on the free or reduced-price lunch variable are statistically significant at the 5 percent level.

teaching disproportionately at schools with students of a similar ethnic or racial composition seems to be based on *teacher* preferences rather than on an underlying district policy. Indeed, this finding provides evidence that school districts have *not* been fully able to implement this stated policy goal. However, we do not know whether other districts in the state have similar policies.

Although we found that in general the predicted effects of interquartile differences in student SES on teacher characteristics are smaller within districts than for the state as a whole, the main reason for this smaller effect is that within-district variation in student SES is lower than statewide variation in student SES. Comparison of the statewide regressions in Appendix Tables D.1 to D.3 with those from the district-fixed-effect specifications in Appendix Tables D.4 to D.6 shows that the coefficients on the free or reduced-price lunch variable are typically quite similar in the two specifications. This means that a 1 percent increase in the number of students receiving free or reduced-price lunches is associated with a similar change in a given characteristic within *and* between districts. In some cases, such as the models of the percentage of teachers with a master's degree or more, the coefficients on the free or reduced-price lunch variable are considerably larger in the within-district model.

Teacher Ethnicity Sorting

In the regressions in Appendix Tables D.1 to D.3, the teacher characteristic most closely aligned with student characteristics such as SES and being non-white is teacher ethnicity. Both the size of the coefficient and the level of significance on the free or reduced-price lunch variable are larger in the model of the percentage of teachers who are nonwhite than in other models. To investigate this further, we modeled the percentage of teachers of specific ethnicities. Our analysis shows that schools with higher percentages of students of a given ethnicity have a higher percentage of teachers of that ethnicity. Appendix Tables D.7 to D.9 present the coefficient estimates of the relationship between the percentages of students and teachers who are Latino, black, and Asian. These results are from regressions similar to those listed in Appendix Tables D.1 to D.6, except that variables for the percentage of students who are LEP, and the percentage of students who are black, Latino, Asian, and other nonwhite have been added. The only coefficient that changed significantly is the coefficient on the percentage of the student population in the free or reduced-price lunch program, which becomes smaller and loses significance. We present only the coefficients on our measures of socioeconomic status for clarity in our discussion.

In Appendix Table D.7, we find that a 10 percentage point increase in the percentage of Latino students in K–6 schools is correlated with a 3 percentage point increase in the percentage of Latino teachers. The effect remains even after controlling for differences across school districts. Latino teachers are also less likely to teach in schools with more black and Asian students. The effect of increasing the percentage of black students is even larger on the percentage of teachers within a school who are black. A 10 percentage point increase in the percentage of students who are black is correlated with a 6 percentage point increase in black teachers within K–6 schools across the state and within a district. Similarly, a 10 percentage point increase in the number of Asian students is predicted to lead to a 4 percentage point increase in the number of Asian teachers. Again, part of this relationship could arise from Latino and Asian teachers being certified to teach bilingual education classes or to participate in other programs for LEP students. However, we have controlled separately for the percentage of students at the school who are LEP. The relationship could also be due to the preferences of individual teachers, and it may be beneficial for students to be taught by teachers of the same ethnicity. However, if school districts are trying to match the ethnic composition of teachers in individual schools with that of the entire teaching population within the school district (as stated in both the Los Angeles Unified and San Francisco Unified labor contracts), this objective has not been achieved in school districts across the state, according to our evidence.

School and District Size and Teacher Characteristics

Appendix Tables D.1 to D.6 also present the results of the partial effects of school and district size as well as the partial effect of a school being in a rural or suburban area (rather than an urban area). These variables are largely included as controls to try to disentangle the correlation between student socioeconomic status and teacher characteristics. Below, we briefly discuss the relation between school size and teacher characteristics.

Elementary Schools. We find that larger elementary schools have less-experienced teachers. Teachers in larger schools are also less likely to be fully certified. This relationship holds across schools within the state and also within schools in a given district. To further examine the effect of larger schools on teacher characteristics after controlling for student characteristics and location of the school, we examine what is predicted to happen to the teacher population in a given school if we increase the enrollment of that school and leave enrollment in other schools within the district constant. This means that, for example, if school enrollment increases by 100, district enrollment also increases by 100 students.

We find marginally significant but empirically small predicted effects from a 100 student increase in enrollment in elementary schools. The percentage of teachers within the school with a bachelor's degree or less increases by one-third of a percentage point. The mean years of experience decreases by 0.2 years. The percentage of teachers who have taught ten or more years is predicted to decline by seven-tenths of a percentage point and the percentage of teachers who are not certified increases by about the same amount. Larger schools and school districts have more uncertified teachers. They are also more likely to have higher percentages of nonwhite teachers. A 100 student increase would increase the percentage of nonwhite teachers by one-half of a percentage point.

We use the results from Appendix Table D.4 (the fixed-district-effects models) to examine how changing a school's size as compared to other schools within the same district would change teacher characteristics. The within-district effect of a 100 student increase is slightly smaller than the results using the statewide equations. The only major difference is that the percentage of teachers with a master's degree or more is predicted to decrease by one-third of a percentage point, whereas a corresponding increase in school size had little effect on this variable across all schools. Thus, larger elementary schools have slightly less-experienced and less-educated teachers compared to smaller schools both within the state and within their own district.

Middle Schools and High Schools. The results for middle schools and high schools are somewhat different. In middle schools, the enrollment variable tends to be statistically insignificant, with some exceptions. If we examine the effect of increasing the enrollment in a given middle school in a specific district by 100 students, we find that the percentage of teachers with a master's degree or more increases by one-half of a percentage point. There is also a decrease in the number of teachers who have two or less years of experience (–0.3 percent), but the overall effect of years of experience and the percentage of teachers who are not certified (–0.2 percent) is not statistically different from 0. If we look at what happens to teacher characteristics *within* a school district (Appendix Table D.5), the results are somewhat weaker statistically.

The effect of the same increase in size in a high school's enrollment gives similar but smaller predicted changes in teacher characteristics. This could result because high schools are larger, with median enrollments of 2,135 students as compared to a median middle school of 1,008 students and an elementary school with 682 students. In most cases, the effect of school enrollment is not statistically significant in the statewide regressions but is statistically significant in the fixed-effect models that explore variations in teacher characteristics within a district.[12]

Urban-Suburban-Rural Differences

Examining differences across urban, suburban, and rural schools reveals similar results to those found in Chapter 5. However, in many cases part of the variations in teacher characteristics between these types of schools appears to stem from variations in student SES between regions. We will focus on statewide differences because there is high within-district correlation with *which* of the three urban statuses a school

[12]The largest predicted effect at the high school level emerges in the within-district regressions, where the addition of 100 students is predicted to lead to a drop in the percentage of teachers who are nonwhite by 0.3 percent. This is opposite to the predicted effect found for elementary schools.

reports. Results are also consistent across the three grade spans we examine. For most teacher characteristics, suburban and rural schools resemble urban schools once we control for differences in student socioeconomic status and the size of a school. This does not mean that the results in Chapter 5 are incorrect. Rather, the results suggest that observed variations in teacher characteristics between urban, suburban, and rural schools stem in large part from variations in other variables such as student SES, which enters into the models in important ways.

In several cases, one or both of the suburban and rural school indicator variables remain highly statistically significant. Most prominently, rural schools have 6 to 10 percent fewer teachers with a master's degree than do urban schools—at all grade spans. Similarly, rural schools typically have significantly fewer noncertified teachers. Suburban schools tend to have a larger share of teachers with master's degrees than do urban schools, as shown in the raw data in Chapter 5, but the differences are only weakly significant in a statistical sense after controlling for other characteristics of the schools. Finally, teachers in suburban and rural schools are much less likely to be nonwhite. After controlling for student SES and school and district size, there are 6.5 to 9 percent fewer nonwhite teachers in suburban schools and 13 percent fewer nonwhite teachers in rural schools than in urban schools. Given that the average percentage of teachers who are nonwhite is 20 to 25 percent, this means that most nonwhite teachers are clustered in urban schools.

Average Class Size

Table 6.3 and Appendix Table D.10 present information on how average class sizes are related to student and school characteristics. Given

Table 6.3

Predicted Average Class Sizes in Schools, by Student SES

Grade Level	Low SES	Average SES	High SES
Grades K–3	21.6	21.4	21.1
Grades 4–6	29.7	29.9	30.1
Middle school	30.6	31.6	32.7
High school	31.3	31.8	31.9

that the class size reduction initiative has affected only K–3 classes, we have disaggregated the effect of different variables for grades K–3 and 4–6 class sizes. We find small but statistically significant effects of socioeconomic status on average K–3 and 4–6 class sizes. Moving from a low-SES to a high-SES school is predicted to decrease the average number of K–3 students by five-tenths of a student and to *increase* the average number of students in grades 4–6 by four-tenths of a student. Interestingly, the variation in average K–3 class sizes across the level of disadvantaged students within a school district is much smaller than across districts within the state (see the fixed-effect models in the fifth and sixth columns of Appendix Table D.10). Thus, certain districts seem to have done better than others in reducing K–3 class sizes, and it appears that school districts with a higher overall percentage of disadvantaged students are finding it more difficult to reduce K–3 class sizes. Interestingly, grade 4-6 classes are smaller in schools with a higher level of disadvantaged students within a district as well as to a lesser extent across districts. This result suggests that, if anything, districts attempt to compensate for disadvantaged student populations by slightly reducing the size of grade 4–6 classes. In middle schools and high schools, class sizes on average are smaller in our low-SES representative school than in our high-SES school. The average number of students per class increases by two students in middle schools, from 30.6 to 32.7. This difference is driven by differences across school districts rather than by variations within a given district.

Both K–3 and 4–6 class sizes are larger in schools with larger student enrollments. If the number of students in a school increased by 100 students, average K–3 classes would increase by one-quarter of one student, whereas grade 4–6 classes would increase by over one-third of one student. We obtained similar but smaller effects within a given school district and for middle schools and high schools. Thus, differences in socioeconomic status across schools seem to lead to much smaller differences in average class size than in teacher characteristics.

High-School Courses and Subject Authorizations

For the remainder of the analysis we focus on high schools. We first examine potential differences in the percentage of courses that are taught by authorized teachers. If classes are being taught by instructors without authorization in the given field, the quality of the course could suffer. In addition, a school might be less likely to offer more advanced courses in a field where the school had a shortage of authorized teachers.

Teacher Authorization, by Subject

Table 6.4 and Appendix Tables D.11 and D.12 examine differences in teacher authorization by subject. In Table 6.4, we again estimate the percentage of courses taught by authorized instructors for an urban school, with the average number of students in an average-sized district. Although over 80 percent of courses offered in the four subjects we examine are taught by an authorized instructor, we do find differences in authorization between low- and high-SES schools. This difference varies

Table 6.4

Predicted Percentage of Courses Taught by a Teacher Authorized in the Given Subject, by SES

	Low SES	Average SES	High SES
Math	80.6	82.3	83.3
English	81.8	84.7	86.5
Social studies	82.2	82.4	82.6
Science	82.7	84.8	86.0

from almost no difference in social studies (0.4 percent and not statistically significant) to 4.7 percent in English. There is a 3 percentage point difference in the predicted percentage of courses taught by authorized instructors in math and science. These are large differences, given that the total interquartile variation for percentage of teachers authorized in the given subject in high school is 14 to 20 percent, depending on the subject, as shown in Appendix Table A.2. Thus, about one-quarter to one-third of the difference between schools in number of authorized teachers can be explained by differences in student socioeconomic status. These differences are smaller within a district. Again, because approximately one-quarter of our schools are the only high school in their districts, it is not surprising that there is less variation within districts in percentage authorized.

"a–f" Subjects

In high schools with more disadvantaged students, a smaller percentage of all courses offered are "a–f" or college preparatory courses. Our representative low-SES school offers 5 percent fewer "a–f" courses than our high-SES school. In results not shown, we find that this difference increases to 8 percent if we include a measure of the percentage of LEP students who attend the school and shift from a school with more LEP students to one with fewer LEP students. Given that on average about half of all classes offered in a high school are college preparatory in nature, this difference is significant. The variation disappears within school districts. If, within a district, we increase the percentage of LEP students within a school, the percentage of "a–f" courses offered within that school declines by 2.5 percentage points. As we have mentioned throughout, it is not immediately apparent whether variations in curriculum reflect variations in student demand for courses, or in the supply of courses the school is able to offer, or both.

Advanced Placement Courses

As discussed in Chapter 1, two related lawsuits have been brought against the University of California system and the state on behalf of high school students in certain schools. The lawsuits claim that certain students are at a disadvantage in applying to the UC system because they have attended schools with few or no AP or honors courses. The lawsuits argue that because these courses are awarded an extra grade point in calculating students' GPA, lack of access to AP courses has left certain students at a disadvantage.

In this section, we examine how different school characteristics are correlated with the percentage and number of AP courses offered. Evidence of fewer AP courses being offered can be evidence of a lack of supply of these courses or a lack of demand on the part of students for these courses. We provide some evidence on how the number and percentage of AP courses are distributed throughout the state. We also examine whether variations in other school characteristics, such as teacher preparation and school and district size, can account for variations in offerings of AP courses. We study school size because any correlation between school size and AP courses might indicate the need for a certain level of demand for a course before that course can be offered. From a policy perspective, it is important to model AP course availability as a function of teacher characteristics and school size: A prescription that all schools should offer the same AP courses will come to little if underlying inequalities in other resources account for variations in course offerings.

Student and Teacher Characteristics. Tables 6.5 and 6.6 examine how the percentage and number of AP courses change as we vary student, teacher, and school characteristics. (The underlying regressions appear in Appendix Tables D.13 and D.14.) The first column in Table 6.5 shows our estimates of the percentage of all courses offered at a given school that are AP as we change different characteristics of the school. The first row corresponds to an urban school with the median number of students in the free or reduced-price lunch program at a median-sized school in a median-sized district. In addition, our estimates are based on a school with a teaching staff with the median level of experience and education. In our representative school, 2 percent of courses offered are Advanced Placement; this corresponds to about 9 AP courses (see Table 6.6). The other columns in the tables examine the relationship between school characteristics and specific subject offerings. We find more variation in the number and percentage of AP courses offered in specific subjects, with a little over 1 percent of all math courses being Advanced Placement (one course) to 5 percent of social studies courses offered being Advanced Placement (2.7 courses).

Table 6.5

Predicted Percentage of AP Courses Offered, by Student, Teacher, and School Characteristics

	All	Math	English	Social Studies	Science
Median school characteristics	2.0	1.3	1.4	5.0	0.8
Low-SES school	1.8	0.4	1.0	3.8	0.0
High-SES school	2.2	1.8	1.7	5.8	1.6
Less-experienced teachers	1.8	0.8	1.3	5.1	0.9
More-experienced teachers	2.3	1.8	1.6	4.9	0.8
Fewer authorized teachers	1.8	1.2	1.3	4.9	0.7
More authorized teachers	2.2	1.3	1.5	5.2	1.0
Fewer teachers with master's	1.9	1.5	1.4	4.2	0.3
More teachers with master's	2.3	1.1	1.7	5.9	1.4
Fewer teachers with bachelor's	2.0	1.2	1.4	4.9	0.7
More teachers with bachelor's	2.1	1.4	1.5	5.2	1.1
Rural school	2.3	0.0	2.1	4.8	0.5
Suburban school	2.6	1.3	2.3	5.2	2.8
Small school	1.7	0.9	1.2	4.2	0.2
Large school	2.5	1.7	1.8	6.0	1.7

In each row, the numbers correspond to the effect of changing one characteristic of our representative school. Thus, if we lower the socioeconomic status of the students at the school, the percentage of courses being offered that are Advanced Placement is predicted to decrease to 1.8 percent (or eight courses). This change is greater in specific subjects; for example, social studies course offerings decline from 5 percent to 4 percent (from three to two courses). In high-SES schools, 2.2 percent of all courses offered are Advanced Placement. This

Table 6.6

Predicted Number of AP Courses Offered, by Student, Teacher, and School Characteristics

	All	Math	English	Social Studies	Science
Median school characteristics	8.7	1.0	1.2	2.7	0.7
Low-SES school	7.7	0.5	0.9	2.1	0.2
High-SES school	9.3	1.2	1.3	3.1	1.1
Less-experienced teachers	8.2	0.9	1.0	2.8	0.7
More-experienced teachers	9.2	1.0	1.3	2.6	0.8
Fewer authorized teachers	7.7	0.9	1.1	2.7	0.7
More authorized teachers	9.4	1.0	1.2	2.7	0.7
Fewer teachers with master's	8.3	1.0	1.2	2.4	0.5
More teachers with master's	9.4	0.9	1.3	3.0	0.9
Fewer teachers with bachelor's	8.8	0.9	1.1	2.7	0.7
More teachers with bachelor's	8.6	1.0	1.2	2.8	0.7
Rural school	9.7	0.4	1.5	2.5	0.3
Suburban school	10.3	1.0	1.8	2.8	1.3
Small school	6.0	0.5	0.6	1.8	0.2
Large school	12.1	1.5	1.8	3.8	1.4

corresponds to 9.3 courses. In Table 6.6, we find that students who are more disadvantaged are offered 1.6 fewer AP courses and are especially offered fewer social studies and science courses.

The next rows correspond to an interquartile change in teacher characteristics. In addition, for the models of specific subject offerings of AP classes, we look only at the qualifications of teachers who teach in the given field (i.e., for percentage or number of AP math courses offered, we examine the qualifications of math teachers). In the fourth and fifth rows, we decrease and then increase overall teacher experience. In the high-experience school, we examine a school with a higher mean number of years of teaching and we also increase the percentage of teachers who have been teaching for ten or more years and decrease the percentage of teachers who have been teaching two or fewer years. This gives us the total effect of increasing teacher experience. We find that in schools with a more-experienced teaching force, both the percentage of AP courses offered and the number of courses increases by about one course. This effect is greatest for math courses and is not statistically significant (and goes in the opposite direction) for the other subjects. We next examine the result of decreasing and then increasing the percentage of teachers with a master's degree or more. We find that increasing the percentage of teachers with a master's degree or more is predicted to increase the probability of AP courses being offered. This effect is especially strong for the overall number of AP classes being offered and the percentage of social studies and science AP courses being offered. Changing the percentage of teachers with a bachelor's degree or less does not significantly change the predicted probability of more AP courses being offered.

It is particularly noteworthy that an interquartile increase in the percentage of teachers with a master's degree or more has an equal effect on the percentage of AP courses as does an interquartile change in student SES. It seems clear that a simple prescription to increase the share of AP classes in the curriculum may be difficult to carry out without a sufficiently educated pool of teachers.

Urbanicity and School Size. We examine the effect of changing the location of the school from an urban to a rural or suburban school and then examine the predicted effects of increasing the size of the school.

The results are more striking if we focus on the number of courses offered (Table 6.6) rather than on the percentage of courses offered (Table 6.5). Once we control for school size and other characteristics, rural schools offer more AP courses than urban schools (ten compared to nine), but the puzzling result is that these AP courses do not seem to be in the major fields. In contrast, suburban schools offer both a larger number and percentage of AP courses, with the largest effect occurring in science courses. Attending a larger school as compared to a smaller school increases the number of AP courses overall by about six courses and adds one to two sections of each of our specific subject courses. Of course, it is not particularly surprising that schools with larger enrollment offer a greater number of AP courses. Note, however, that a similar result occurs for the *percentage* of AP courses that are offered. Increasing the size of the school from the 25th percent level to the 75th level increases the percentage of AP courses offered by almost one percentage point and increases the percentage of science and social studies courses by one and one-half percentage points. This is a large effect, given that the average statewide percentages of AP science and social studies courses are approximately 3 and 5 percent, respectively.

Table 6.7 presents the probability of a school offering no AP classes and no AP courses in a given subject. The story is largely the same as that found in Tables 6.5 and 6.6. The difference in the probability of no AP courses being offered in a given subject in a low-SES school as compared to a high-SES school is between 2 and 11 percent. This effect is especially strong in math and science. The probability of no AP math or no AP science courses being offered increases by 10 percentage points in schools with more-disadvantaged students. For subjects other than math, schools with a higher percentage of teachers with at least a master's

Table 6.7

Predicted Percentage Probability That School Offers No AP Courses, by Student, Teacher, and School Characteristics

	All	Math	English	Social Studies	Science
Median school characteristics	2.3	31.0	29.2	18.3	41.0
Low-SES school	2.0	37.6	31.0	21.1	48.2
High-SES school	2.5	27.2	28.2	16.6	36.7
Less-experienced teachers	2.6	33.9	31.6	19.1	41.1
More-experienced teachers	2.0	28.0	27.0	17.5	40.9
Fewer authorized teachers	2.2	31.6	30.5	19.5	41.2
More authorized teachers	2.3	30.6	28.2	17.2	40.9
Fewer teachers with master's	2.4	29.0	29.2	22.0	43.5
More teachers with master's	2.1	33.4	25.8	14.9	38.5
Fewer teachers with bachelor's	2.1	31.4	30.7	18.9	41.5
More teachers with bachelor's	2.6	30.5	27.0	17.4	40.2
Rural school	0.7	43.0	19.6	18.8	41.3
Suburban school	0.8	30.2	17.5	14.3	28.9
Small school	8.4	41.3	39.1	26.9	50.7
Large school	0.3	20.2	19.0	10.3	29.8

degree are more likely to offer at least one AP course in that subject. Rural schools are also more likely to offer no AP math or science courses. Finally, what seems to have the largest effect on whether or not a given subject AP course is offered is the number of students in the school. High schools with student enrollment at the 25th percentile level are 8 percent more likely to offer *no* AP courses than those with student populations at the 75th percentile. Thus, it seems that there needs to be a certain student body size before a school can specialize by offering some AP courses.

The underlying question that motivates this section has been: Do disadvantaged students receive fewer AP courses? An important subsidiary question is: Do disadvantaged students who take AP classes have larger or smaller class sizes? Class size ought to affect the quality of the learning environment. In addition, if it is true that variations in AP course availability by student SES reflect variations in the supply of courses, rather than variations in student demand, it follows that in schools with low student SES, the size of AP classes should be unusually large, or at least no smaller than those offered at more affluent high schools, since fewer courses are offered.

With these questions providing motivation, Table 6.8 and Appendix Table D.16 examine the average class sizes of AP courses, given that an AP course is offered within the school in a given subject. We find that schools with a higher percentage of disadvantaged students have

Table 6.8

Predicted Class Size of AP Courses in Schools That Offer AP Courses, by Student and School Characteristics

	Math	English	Social Studies	Science
Median school characteristics	24.9	27.3	27.8	24.4
Low-SES school	22.8	26.3	26.6	22.5
High-SES school	26.2	27.9	28.5	25.6
Rural school	20.6	24.3	25.4	23.4
Suburban school	27.3	28.8	29.4	24.8
Small school	24.1	26.9	27.1	24.0
Large school	25.9	27.7	28.6	24.9

significantly fewer students within a class when an AP course is offered. If we move from our representative low-SES school to our high-SES school, which corresponds to decreasing the percentage of students in the free or reduced-price lunch program by 33 percent, we increase the average number of students enrolled in an AP course by between 1.6 (English) and 3.4 (math) students.[13] School enrollment also increases the average size of AP courses, and suburban schools have on average between an extra 0.4 students (science) and 2.4 students (math) as compared to urban schools. Rural schools on average have smaller AP classes than urban schools by 1.0 (science) to 4.3 (math) students.

Thus, certain classes, even when offered, appear not to be in high demand in more disadvantaged schools. This might be due in part to students being unable to take prerequisite classes necessary for the AP courses.

Summary

This chapter examined the effect of various student and school characteristics on the level of resources found in each school. In this way, we can ascertain whether, for instance, the socioeconomic status of students is significantly related to school resources after accounting for other factors such as school and district size and the location (suburban, urban, or rural) of the school.

[13]If we expand our regression specification to include the percentage of LEP students and the percentage Latino, black, and Asian students separately, increasing the percentage of students in each category from the 25th percentile to the 75th percentile level decreases the number of students in AP classes with the notable exception of the percentage of Asian students attending a given school. If we increase the percentage of the student population that is Asian, the predicted number of students attending an AP class increases, especially in math and science.

Teachers

We find that in schools with a higher percentage of disadvantaged students, teachers have less experience and less education. Teachers are clustered in schools that have more co-ethnic students, both within and across school districts. Of the three grade spans, elementary schools show the strongest link between student SES and teacher characteristics. After controlling for other influences such as school size and urbanicity, we find that an interquartile increase in the percentage of students receiving free or reduced-price lunches is associated with a 5.9 percent increase in the share of teachers holding a bachelor's degree or less, a 5.5 percent decrease in the share of teachers with ten or more years of experience, and an almost identical increase in the share of teachers with two or fewer years of experience. Patterns were similar in middle schools and high schools but roughly one-half to two-thirds as large.

Teachers in larger schools and school districts are more likely to lack full certification. Accounting for variations in school size and student socioeconomic status can account for some of the variations in school resources noted in Chapter 5 between rural, urban, and suburban schools. However, even after accounting for these confounding factors, we find that rural schools have fewer teachers with master's degrees than do urban schools, and that suburban schools have a greater share of teachers with a master's degree or higher than do urban or rural schools. Nonwhite teachers are much less likely to be teaching in rural or suburban schools.

Classes

We find little difference in class sizes across socioeconomic status, although we do find that schools with more disadvantaged students have smaller grade 4–6 classes. These same schools, however, seem to have had a more difficult time reducing class sizes in grades K–3. Classes are larger in large school districts. The percentage of high school classes taught by teachers not certified in a certain subject is higher in schools with more disadvantaged students.

Finally, we investigate how both student characteristics and teacher characteristics are predicted to affect the number and probability of AP courses being taught at any given school. We find that the proportion of disadvantaged students in the student population is negatively related to the number of AP courses being taught and the percentage of all courses that are AP. A key question about AP course offerings is: Why do inequities exist? The underlying cause could be variations in demand for AP courses by students, perhaps because of variations in the rates at which students take the prerequisite courses. Alternatively, some schools may not provide an adequate supply of AP courses to meet student demand.

One factor that might limit AP course availability is teachers' education and experience. We did find evidence that an interquartile increase in teacher preparation, as measured by education, experience, and authorizations in specific fields, could explain more of the inequities in AP offerings than could the interquartile variation in student SES, suggesting that restricted supply of AP courses might be partly to blame for inequalities. In particular, the presence of more teachers within the school who have at least a master's degree or more teachers *in a given field* who have at least master's degree is predicted to increase the number and probability of AP courses being offered, both overall and in subjects other than math. Similarly, we find that smaller schools and smaller districts offer significantly fewer AP classes, both in terms of absolute numbers and as a percentage of all courses. These findings suggest that teacher training and school size may affect the supply of AP courses that schools can offer.

We addressed the supply/demand question in a second manner, by asking whether schools with low student SES tend to have larger AP classes, which would be a sign that the supply of AP classes is not meeting demand in these schools. However, we find that AP class sizes are smaller in those schools with a higher percentage of students with lower socioeconomic status. Overall, it seems that variations in both students' demand for AP classes and schools' ability to provide them create the observed inequities across schools in the provision of Advanced Placement courses.

7. How Much Inequality Is There in Student Achievement in California?

Introduction

The earlier chapters of this report developed a detailed analysis of how school resources are allocated across California's schools. The analysis reveals a positive link between the socioeconomic status of students at a given school and the level of resources, especially measures of teacher training and experience and course offerings. Important regional variations and variations between suburban, rural, and urban schools also emerged.

This chapter turns from the question of school "inputs" to school "outputs," as measured by student achievement on the Stanford 9 test that was administered statewide for the first time in 1998. The tests were scored in terms of national "norms" for student performance. The California Department of Education released school-by-school results that showed the number of students in each grade who fell into the bottom quarter of students nationally, the next highest quarter, and so on. This approach does not provide an absolute yardstick of achievement against which students are compared, but rather a comparative one.

This chapter examines the following questions:

1. How much variation is there in student achievement?
2. Does achievement vary by grade?
3. Does achievement vary with socioeconomic status? Is there a relation between achievement and the percentage of students who are nonwhite?
4. Does achievement vary in important ways among urban, suburban, and rural schools? Does achievement vary among individual counties?

Because of space limitations, we focus on only the math and reading components of the Stanford 9 statewide test. We present results for each grade that was tested.

The STAR Program

California's Standardized Testing and Reporting program tests students statewide from grades 2 to 11 in key areas. Begun in spring 1998, this was the first statewide test administered since 1994.[1] In November 1997, the Stanford Achievement Test Series, Ninth Edition,

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[1]California used the California Learning Assessment System for the last time in 1994. For an overview of the CLAS test results from the mid-1990s and the policy debate that led to its cancellation, see Kirst et al. (1995).

Form T (Stanford 9), was designated as the 1998 STAR test.[2] The Stanford 9 is a multiple-choice test that allows comparisons with a national sample of students. Students in grades 2 through 8 were required to take tests in reading, mathematics, written expression, and spelling. Students in grades 9 through 11 were required to take tests in reading, writing, mathematics, science, and history/social science.[3]

School districts in California were required to test all students in grades 2 through 11 between March 15 and May 25, 1998. SB 376 allowed only two exceptions to these requirements: special-education students whose Individual Education Plan explicitly exempted them from such testing, and students whose parents or guardians submitted a written request for exemption. Total enrollment reported in grades 2 through 11 was 4.43 million, and 4.13 million students (93 percent) took the tests. Among those taking the tests in California, 806,000 (19.5 percent) were LEP students.

Our analysis of the statewide data suggests that test scores for LEP students are unlikely to provide highly reliable measures of achievement for this group of students, because a relatively high percentage did not take any or all of the tests. Sixty-nine percent of the students not taking *any* of the Stanford 9 tests were LEP students. Seventy-nine percent of LEP students took one or more of the tests, compared to 93 percent of

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[2]This section draws heavily on a description of the STAR program provided on the California Department of Education's web site, http://star.cde.ca.gov/star98/ (August 1999).

[3]Although our analysis focuses on reading and math test scores, we found similar patterns in student achievement for the other subject areas. Because of space limitations, we do not present analysis of these other examinations.

all students.[4] Focusing instead on the number of students in grades 2 through 11 who took a specific test, we find that 69 percent of LEP students took the reading test, compared to 91 percent of non-LEP students, and 74 percent took the math test, compared to 93 percent of non-LEP students.[5]

In addition to the fact that a possibly nonrandom subsample of LEP students took the tests, language barriers pose another ambiguity in the test results for LEP students. If, for instance, a LEP student scores at the 30th percentile nationally in the math test, does this imply that the student is well behind national norms in his or her understanding of math, or does it mean that the student, who is learning English, was unable to fully understand the questions?

For these reasons, in this chapter and the next, we focus primarily on the test scores of non-LEP students, in the belief that those scores provide a more representative measurement of the achievement of the underlying population than is true for scores that include LEP students.[6]

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[4]To calculate the percentage of LEP students taking the Stanford 9 exams, we compare the reported number of test takers on each exam section to the number of LEP students listed by grade in the 1997–1998 Language Census as compiled by the California Department of Education.

[5]Information on how we calculated school test statistics for non-LEP students is presented in Appendix E.

[6]This focus on non-LEP students becomes even more crucial in Chapter 8, which models achievement school by school. Although we can calculate the percentage of LEP students who did not participate at each school, we cannot determine which part of the achievement distribution the students who took the test came from and how this distribution varied across schools. The result will be a bias in an unknown direction. For this reason, we do not model LEP test scores in Chapter 8. However, we supplement our models of achievement in the non-LEP population with models of achievement among all students, both LEP and non-LEP, and these results are presented in Appendix E.

Overall Distribution of Test Scores Among California's Students

Description of the STAR Data and Subsample

The California Department of Education has released information on the percentage of California students who scored in each quartile in the 1998 STAR test, as measured against national norms. We use these national norms to categorize score quartiles in our sample.[7] Below, we examine the number of students scoring in each comparable national quartile and then focus primarily on the percentage of students who score at or above the national median. The median score is the middle score in the distribution: A student who scores above the median therefore ranks in the top half of students nationally. If the achievement of California's students was identical to that of students in the country as a whole, then exactly 50 percent of California's students should be at or above the national median. If fewer than 50 percent of California's students are at or above the national median, their achievement lags behind national norms.

In this and the next chapter, we use a subsample of the STAR test scores for our analysis. As noted in Chapter 2, we exclude continuation schools and schools with grade spans that overlap the traditional K–6, 6–8, and 9–12 ranges. In addition, as mentioned above, we focus primarily on the test scores of non-LEP students. The gap in test scores between LEP and non-LEP students in California, however, is dramatic enough

[7]Note, however, that the national sample has only 1 to 2 percent LEP students, whereas California has almost 20 percent LEP students. Much of the controversy over the accuracy of comparisons to a nationally normed sample revolves around this difference.

to warrant some examination, and thus we begin our analysis by comparing the nationally normed test scores of *all* California students with the scores of non-LEP and LEP students in the state.

Important Distinctions Between LEP and Non-LEP Students

The public release summary report of the 1998 STAR results includes data taken from all schools for all students and for LEP students. Using these summary data, we calculated results for non-LEP students. Figures 7.1 and 7.2 show the results for math and reading, respectively. The bottom line in Figure 7.1 shows the percentage of LEP students taking the math test who scored at or above the national median. The percentage is low—26 percent in grade 2 and then declining to below 20 percent by grade 4. The middle line shows the corresponding results for all California students who took the math test. Here, the results are not as striking, but they still indicate that California's students as a whole lag behind national norms. In all cases, more than half of *all* California students fall below the national median. The top line in the figure shows our estimates for non-LEP students in California. The results are stronger than the results for California's total school population. In grades 6 and 9, over half of California's non-LEP students meet or exceed the national median, indicating that California's non-LEP students in these grades have done slightly better on average than students in the nation as a whole.

When a simple average of the percentage of students who meet national norms is taken across grade levels, we find that 42 percent of students overall, 18 percent of LEP students, and 48 percent of non-LEP

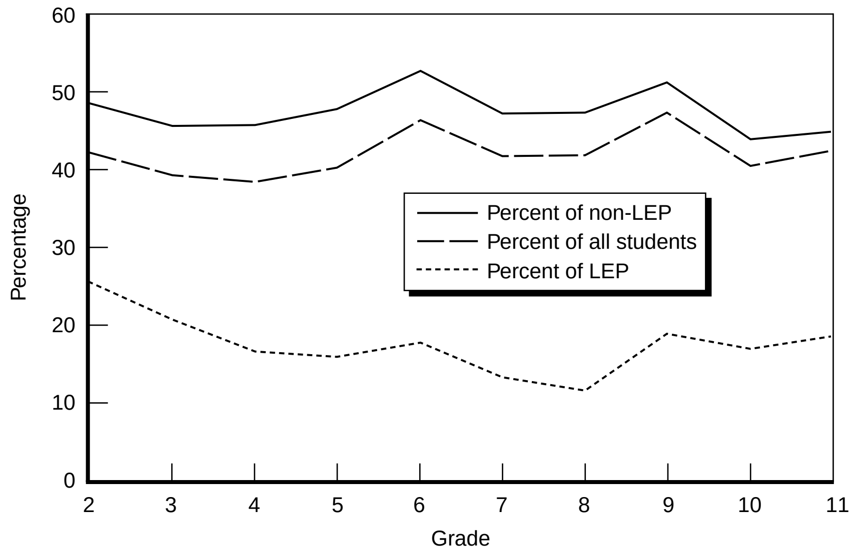

Figure 7.1—Percentage of California Students Scoring Above the National Median in Math: Statewide Summary Data

students in California meet or exceed national medians.[8] These results suggest that California's non-LEP students are performing fairly well in math—at least relative to students in the country as a whole—and that a large chasm exists between the math achievement of LEP and non-LEP students.

Figure 7.2 shows similar data for reading achievement. Not surprisingly, the gap in achievement between LEP and non-LEP students is even more dramatic in this subject. The simple average across grades

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[8]We have also calculated the overall percentage of students in California scoring *above* the national median. These overall percentages are always within one-half of one percentage point of the simple averages listed above, and they are often within one-tenth of a percentage point.

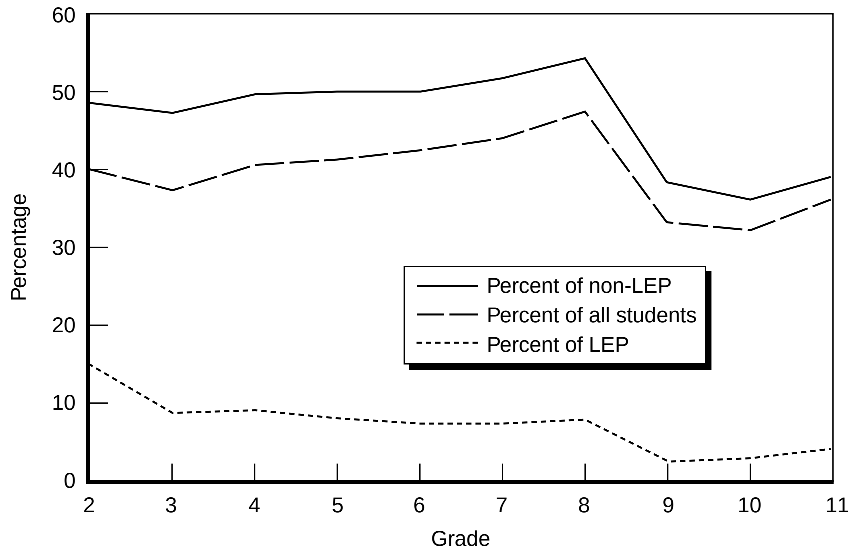

Figure 7.2—Percentage of California Students Scoring Above the National Median in Reading: Statewide Summary Data

in the percentage of students at or above the national median is 39 percent of students overall, 7 percent of LEP students, and 46 percent of non-LEP students. After grade 2, 10 percent or fewer LEP students ever achieve reading scores at or above the national average.[9]

One measure of the "achievement deficit" between California's students and students nationally is calculated by subtracting from 50 the percentage of California's students in the top half of students nationally on a given test. For math, on average the learning deficit is 50 – 42 = 8 percent, indicating that an additional 8 percent of California's students would have to score at or above the median national score for California

[9]No grade level has more than 15 percent of LEP students scoring at or above the national average.

to match national norms. However, note that once we focus on subgroups, the achievement deficits look very different. Among non-LEP students, the achievement deficit in math drops from 8 percent to just 2 percent. Similarly, the deficit in reading scores drops from 11 percent for all students to 4 percent, once we focus exclusively on non-LEP students.

These findings suggest that policymakers must interpret state test results carefully—much of the gap in performance between California's students and those elsewhere appears to be due to the relatively low performance of LEP students. The national sample of students tested using the Stanford 9 includes only 1 to 2 percent LEP students, whereas almost 20 percent of the California sample consists of LEP students.[10] The large share of LEP students in the state's public schools appears to "explain" about two-thirds to three-quarters of the test-score gap between California and the nation as a whole. It is worth noting the precipitous drop in the percentage of students scoring above the national median in reading in grade 9. (The percentage of non-LEP students scoring above the median level drops from 53 to 39 percent between grades 8 and 9.) This difference has concerned policymakers and the public. Some public commentary has questioned whether the drop in student achievement in reading in grades 9 and higher is genuine, or whether it reflects the way the reading test is normed nationally in grades 9 and higher (see Schrag, 1999).

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[10]Finding ways to improve the achievement of English learners, ideally to the national median level, is a highly worthy goal. Nevertheless, it seems unfair to expect fully commensurate performance by LEP students on a test given in English and normed on a national sample of essentially non-LEP students.

Inequality in Achievement Among Non-LEP Students

So far, we have discussed published statewide comparisons of nationally normed test scores for *all*, LEP, and non-LEP students in California. For the remainder of this and the next chapter, we focus on a subsample of the test scores of non-LEP students—the vast majority of students taking the tests. However, we present the published state scores along with our subsample data for comparison purposes. As noted above, 31 percent and 26 percent of LEP students in California did not take the Stanford 9 tests in reading and math, respectively, so that it is quite unlikely that the LEP test results are representative of the overall population of LEP students in the state. Table 7.1 shows the percentage of English-proficient students who scored at or above the national median in math and reading for the entire state and for our subsample, which excludes continuation schools and schools with grade spans that overlap the traditional K–6, 6–8, and 9–12 ranges. The results from our subsample, presented in the third and fourth columns of Table 7.1, based on a school-by-school analysis, quite closely match the overall state results listed in the first two columns of the table and shown earlier in Figures 7.1 and 7.2.

To examine the degree of *equality* in student achievement, we present in Tables 7.2 and 7.3 the detailed distributions of non-LEP students by the four national quartiles.[11] If there were less variation in student achievement among California's students as compared to

[11]If we exclude the five largest school districts in California from our analysis, the results do not change substantively. There is a slight rightward shift in achievement, with a decrease of about 1 percent in the number of students scoring in the bottom quartile and an increase of the same amount scoring in the top quartile.

Table 7.1

Percentage of Non-LEP Students in California Scoring Above the National Median, by Subject

Grade	Math (State)	Reading (State)	Math (Sample)	Reading (Sample)
2	49.1	48.1	47.7	47.2
3	46.4	47.4	45.7	45.2
4	46.0	49.5	45.2	47.3
5	48.1	50.1	47.1	48.4
6	52.7	50.1	52.6	49.5
7	47.9	51.6	47.7	50.9
8	47.6	53.3	47.3	53.3
9	51.3	38.6	53.6	39.7
10	44.3	35.9	47.7	38.3
11	45.8	39.7	49.6	42.3
Average across grades	47.9	46.4	48.4	46.2

Table 7.2

Percentage Distribution of California's Non-LEP Students' Math Scores Relative to National Norms, by Quartile

	National Quartile (1 = Lowest)			
Grade	1	2	3	4
2	30.4	21.9	23.4	24.2
3	31.1	23.1	23.5	22.2
4	32.3	22.5	22.0	23.3
5	33.0	20.0	24.0	23.1
6	26.8	20.6	23.3	29.2
7	29.1	23.2	24.0	23.7
8	29.7	23.0	25.0	22.4
9	23.1	23.3	28.1	25.5
10	25.8	26.5	27.8	19.9
11	27.3	23.0	23.8	25.9
Average across grades	28.9	24.5	23.9	23.9

Table 7.3

Percentage Distribution of California's Non-LEP Students' Reading Scores Relative to National Norms, by Quartile

	National Quartile (1 = Lowest)			
Grade	1	2	3	4
2	31.7	21.1	25.4	21.8
3	32.0	22.8	25.1	20.1
4	29.5	23.2	22.5	24.8
5	28.6	23.0	24.6	23.8
6	26.1	24.4	24.8	24.8
7	26.4	22.7	26.1	24.7
8	22.3	24.4	30.7	22.6
9	32.6	27.7	25.0	14.7
10	36.9	24.8	22.3	16.0
11	30.2	27.5	22.2	20.1
Average across grades	29.7	24.2	24.9	21.4

students in the entire nation, and if the average achievement level were near national norms, we would expect to see a strong clustering of students in the middle two quartiles, with relatively few students in the top and bottom quartiles. The tables show that in neither subject, and in no grade, does either scenario even remotely occur. In reading, 21 percent of California's students score in the top national quartile, whereas almost 30 percent score in the bottom quartile. Similarly, in the math test, about 24 percent and 29 percent of students, respectively, score in the top and bottom national quartiles.[12] The reading and math achievement of California's students clearly varies widely.

[12]Given the gulf in achievement between LEP and non-LEP students, we might have expected larger numbers of California's students to have scored in the bottom national quartile. But recall that in these tables we focus exclusively on non-LEP students, which makes the spread in test scores all the more noteworthy.

Alternatively, if there was more variation in California than in the nation overall, we would expect students to be clustered in the bottom and top quartiles. This also does not occur. Our results suggest that the amount of dispersion in achievement among California's English-proficient students is quite close to the level of dispersion nationally. Note that in both tests, 48 to 49 percent of students, on average, score in the middle two quartiles. We would have expected 50 percent of students to belong to these quartiles, if the level of inequality in achievement were identical in California and elsewhere. (Of course, these statements are valid only to the extent that the norming process adopted for the Stanford 9 test was performed accurately.)

Relation Between Math and Reading Test Scores and Students' Socioeconomic Status

To examine the extent to which variations in student achievement are associated with the level of disadvantage among students at each school, we divide schools into SES quintiles (as in Chapter 4), which are based on the percentage of students participating in the free or reduced-price lunch program. Figure 7.3 shows the percentage of students who meet or exceed the national median scores for math and reading, weighted by enrollment across grades. Tables 7.4 and 7.5 show the grade-by-grade results for math and reading, respectively. The figure shows a steep and steady increase in the percentage of students who score in the top half nationally as we move from left to right in the figure toward schools with progressively fewer students who receive lunch assistance. The accompanying tables show that this overall pattern applies in all grades, with some minor variations.

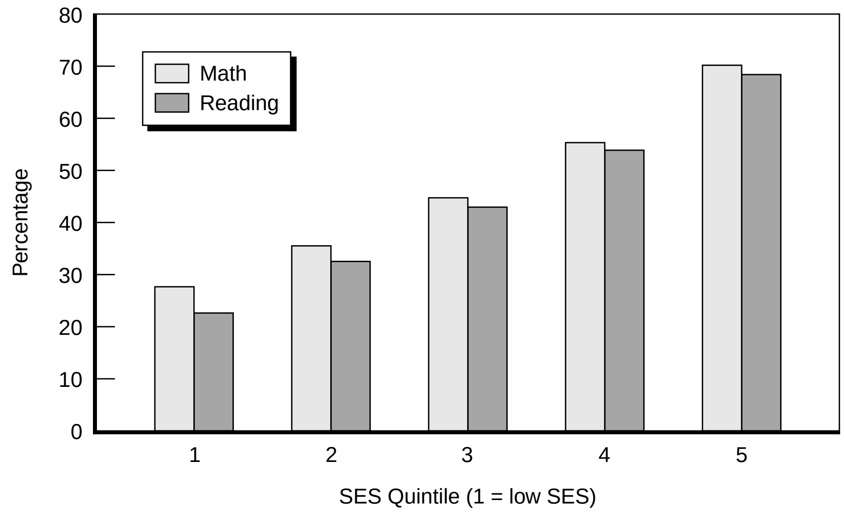

Figure 7.3—Percentage of Non-LEP Students Scoring Above National Medians in Math and Reading, by SES Quintile

Table 7.4

Percentage of Non-LEP Students Scoring Above the National Median in Math, by Participation in the Lunch Program

	National Quintile (1 = Most Students in Lunch Program)				
Grade	1	2	3	5	5
2	25.8	33.9	42.5	54.2	69.1
3	21.9	30.7	40.5	52.4	69.1
4	21.5	29.8	39.7	52.1	68.6
5	24.7	31.9	41.9	53.2	70.4
6	29.2	38.0	50.3	60.2	75.6
7	25.6	34.4	45.3	55.2	70.5
8	24.3	34.8	43.8	55.7	70.3
9	34.9	44.2	51.9	62.6	73.6
10	31.6	38.6	45.4	54.7	65.6
11	34.2	40.6	46.9	56.5	65.9
Average across grades	27.4	35.7	44.8	55.7	69.9

Table 7.5

Percentage of Non-LEP Students Scoring Above the National Median in Reading, by Participation in the Lunch Program

	National Quintile (1 = Most Students in Lunch Program)				
Grade	1	2	3	4	5
2	22.5	31.2	42.2	54.5	69.6
3	18.1	28.3	40.4	53.4	69.6
4	19.8	30.0	42.3	55.7	71.3
5	22.4	32.1	44.2	55.9	72.1
6	24.0	34.0	47.7	58.2	72.9
7	26.3	38.1	49.3	59.2	73.1
8	28.6	41.4	52.0	61.8	74.6
9	21.0	30.7	37.7	48.3	59.6
10	20.7	29.9	36.3	45.8	56.3
11	25.3	34.1	40.1	49.5	58.1
Average across grades	22.9	33.0	43.2	54.2	67.7

Tables 7.6 and 7.7 show the results when the percentage of nonwhite students is used as a measure of SES instead of the percentage of students receiving lunch assistance. The tables show positive links between this measure of SES and student achievement similar to those seen in Tables 7.4 and 7.5. The overall gap between the top and bottom SES groups is slightly smaller when SES is defined in terms of race rather than share of students receiving lunch assistance. One potential explanation for the stronger relation between the free or reduced-price lunch variable and test score results is that family income, rather than race or ethnicity, has a larger effect on student achievement. A second explanation might be that the division of schools into five groups based on students' race and ethnicity is a less-accurate measure of SES for the subsample of non-LEP students.

Table 7.6

Percentage of Non-LEP Students Scoring Above the National Median in Math, by Percentage Nonwhite

	National Quintile (1 = Most Nonwhite)				
Grade	1	2	3	4	5
2	27.9	36.2	45.5	55.7	63.8
3	23.7	34.1	43.6	53.5	63.7
4	23.2	33.8	44.2	52.8	62.6
5	26.6	35.8	45.3	54.6	64.7
6	30.2	42.6	52.2	61.5	69.6
7	26.3	39.3	47.9	57.3	63.7
8	25.8	38.0	47.2	57.3	64.6
9	35.2	46.9	57.0	65.2	68.3
10	31.1	41.9	51.0	57.1	60.1
11	33.9	44.0	51.9	59.1	61.1
Average across grades	28.4	39.3	48.6	57.4	64.2

Table 7.7

Percentage of Non-LEP Students Scoring Above the National Median in Reading, by Percentage Nonwhite

	National Quintile (1 = Most Nonwhite)				
Grade	1	2	3	4	5
2	24.3	34.7	45.4	55.4	64.6
3	19.0	31.2	43.7	54.2	65.6
4	20.6	33.7	45.9	56.3	67.6
5	23.3	35.7	47.2	56.9	68.4
6	24.3	38.3	50.0	59.1	68.1
7	26.7	41.1	52.3	61.3	67.9
8	29.7	43.3	54.4	63.8	70.9
9	21.0	32.4	42.6	51.5	55.8
10	20.1	31.7	41.0	49.5	52.8
11	24.7	36.0	44.6	52.5	55.9
Average across grades	23.4	35.8	46.7	56.0	63.8

To further investigate differences in student achievement across SES, we examine differences across schools in the percentage of non-LEP students scoring in the bottom national quartile by SES quintile. These students have lower achievement than 75 percent (those scoring at or above the 25th percentile) of students nationally. Recall, as shown in Tables 7.3 and 7.4, that overall 27 to 30 percent of California students scored in this range. This is slightly more than the predicted 25 percent if California test scores were at the same level as the nation as a whole.

Figure 7.4 and Tables 7.8 and 7.9 even more dramatically reflect disparities between students attending low-SES and high-SES schools. About half of all students attending schools with the largest number of students receiving lunch assistance scored in the bottom national quintile in math, compared to 13 percent of students at schools with the fewest

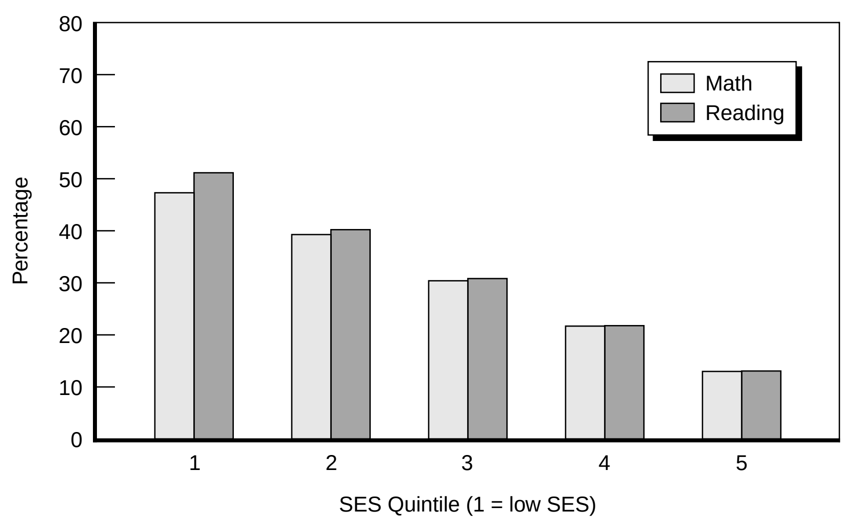

Figure 7.4—Percentage of Non-LEP Students Scoring in the Bottom National Quartiles in Math and Reading, by SES Quintile

Table 7.8

Percentage of Non-LEP Students Scoring in the Bottom National Quartile in Math, by Participation in the Lunch Program

	National Quintile (1 = Most Students in Lunch Program)				
Grade	1	2	3	4	5
2	51.5	41.6	33.7	23.6	13.0
3	55.0	44.0	34.2	23.2	12.3
4	56.0	45.9	35.4	24.4	13.2
5	54.4	46.4	36.0	26.0	14.0
6	47.0	38.0	27.1	19.6	10.2
7	48.4	39.9	29.8	21.6	12.1
8	50.2	39.7	30.8	21.9	12.4
9	36.1	29.1	23.5	16.9	10.9
10	37.5	31.9	26.4	20.7	14.3
11	38.8	33.2	28.8	22.2	16.6
Average across grades	47.5	39.0	30.6	22.0	12.9

Table 7.9

Percentage of Non-LEP Students Scoring in the Bottom National Quartile in Reading, by Participation in the Lunch Program

	National Quintile (1 = Most Students in Lunch Program)				
Grade	1	2	3	4	5
2	55.5	45.9	34.8	23.9	13.1
3	59.2	46.8	34.3	23.2	11.7
4	56.0	43.8	31.5	20.7	10.9
5	52.2	41.8	30.6	20.9	10.7
6	48.3	37.9	25.7	18.1	9.5
7	47.8	36.1	26.3	18.7	10.1
8	41.7	30.2	21.9	15.4	8.4
9	50.7	40.3	33.0	24.2	16.2
10	54.7	44.5	37.9	29.3	21.1
11	44.2	36.9	31.4	24.2	18.2
Average across grades	51.0	40.4	30.7	21.9	13.0

students in the lunch program. These differences are greatest for elementary and intermediate school students and diminish for high school students. Similar results are found when the percentage of nonwhite students is used as a measure of SES instead of the percentage of students receiving lunch assistance.

These findings do not necessarily prove that a rise in the level of disadvantage in a given school's student body *causes* student achievement to fall. Earlier chapters have shown that schools with more-disadvantaged students receive lower levels of some resources. These variations in school resources might be responsible for some of the correlation between SES and test scores. (Chapter 8 will attempt to disentangle the independent effects of student SES and school resources on student achievement.) Nevertheless, the relation between SES and test scores is sufficiently powerful to suggest that students' SES almost certainly plays an important role in determining student achievement.

Geographical Variations in Student Achievement

Tables 7.10 and 7.11 list the percentages of non-LEP students in our samples of urban, suburban, and rural schools who meet or exceed national medians in math and reading, respectively. Test scores in these two subjects yield similar results, with a 15-point gap between the percentage of urban and suburban schools' students who rank in the top half of their grade levels nationally. Rural schools fall in between but are closer to urban schools than to the top-achieving group—suburban schools. Some variations occur within grades, but every grade level shows the same ranking, with suburban schools ranked highest, rural schools ranked in the middle, and urban schools ranked lowest.

Table 7.10

Percentage of Non-LEP Students Scoring Above the National Median in Math, by School Area Type

Grade	Urban	Suburban	Rural
2	40.9	53.5	43.5
3	37.9	52.5	40.9
4	37.8	51.9	40.2
5	39.6	53.9	41.8
6	43.8	59.7	48.5
7	38.5	55.6	42.4
8	38.7	54.5	42.9
9	44.2	60.7	50.9
10	40.7	53.3	43.7
11	43.3	54.9	44.8
Average across grades	40.5	55.1	44.0

Table 7.11

Percentage of Non-LEP Students Scoring Above the National Median in Reading, by School Area Type

Grade	Urban	Suburban	Rural
2	39.7	53.3	43.3
3	36.4	51.9	42.5
4	38.4	53.9	45.3
5	39.6	55.3	45.7
6	39.9	56.8	46.7
7	40.9	58.6	47.7
8	43.7	60.4	51.2
9	30.2	46.5	37.9
10	30.0	44.2	36.2
11	34.4	47.7	39.8
Average across grades	37.3	52.9	43.6

Appendix Tables E.3 and E.4 show the percentage of non-LEP students in each county who rank in the top half nationally for their grades in math and reading, respectively, for selected grades. Figures 7.5 and 7.6 provide maps of California that show the grade 5 test score ranges across counties for math and reading, respectively. The maps show patterns somewhat reminiscent of those in maps of school resource levels shown in Chapter 5. Students in the more rural counties, such as those in the Central Valley and the Imperial Valley, tend to fare relatively poorly on the two tests. Students in highly urbanized counties, primarily along the coast, tend to score more highly. These counties contain a combination of mostly suburban and urban schools. Among the highly urbanized counties near the coast, test scores in Los Angeles County lag behind test scores in Orange and San Diego Counties and counties in the San Francisco Bay area.

Summary

The 1998 STAR results in math and reading suggest that, as a whole, California's students do lag behind students nationally in both reading and math skills. On average, only 42 percent of California students taking the math test scored in the top half nationally, and only 39 percent scored in the top half of the reading test. Although these results suggest that student achievement lags behind that in the nation by considerable amounts, the picture changes once LEP students are excluded. Among non-LEP students, 48 percent and 46 percent scored in the top half nationally in the math and reading tests. Clearly, the challenges faced by the large number of English learners in California's schools account for much of the achievement deficit between California and the rest of the nation.

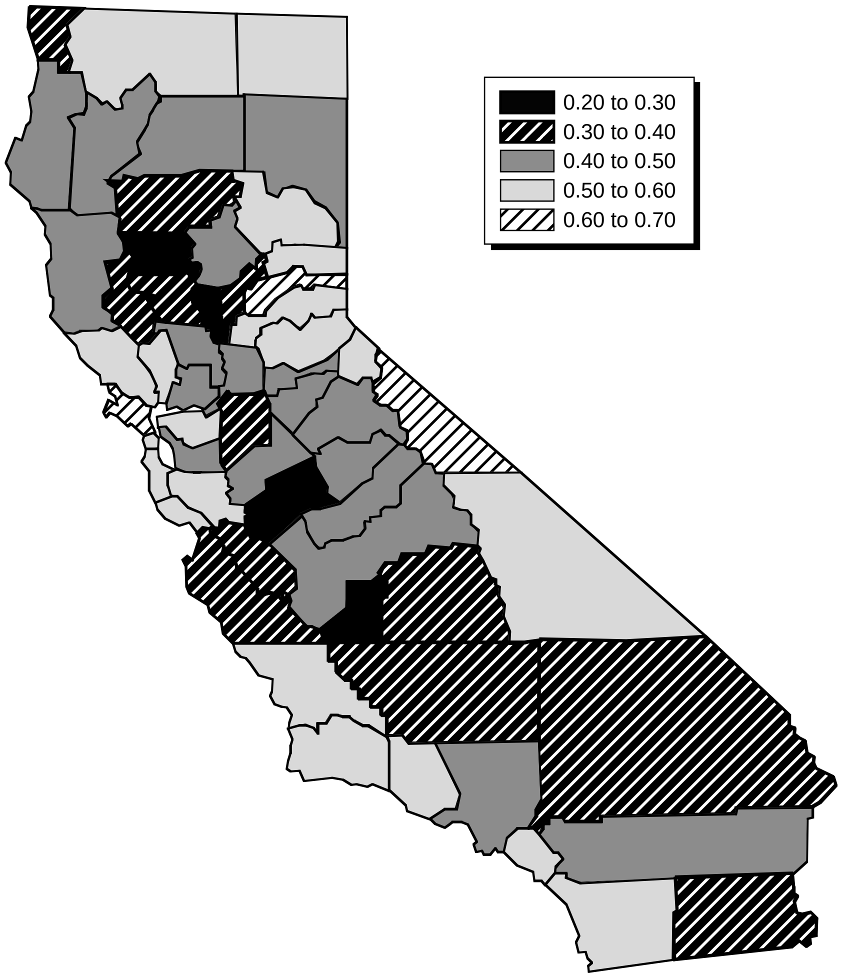

Figure 7.5—Proportion of Non-LEP Students in Grade 5
Scoring At or Above the National Median in Math,
Spring 1998, by County

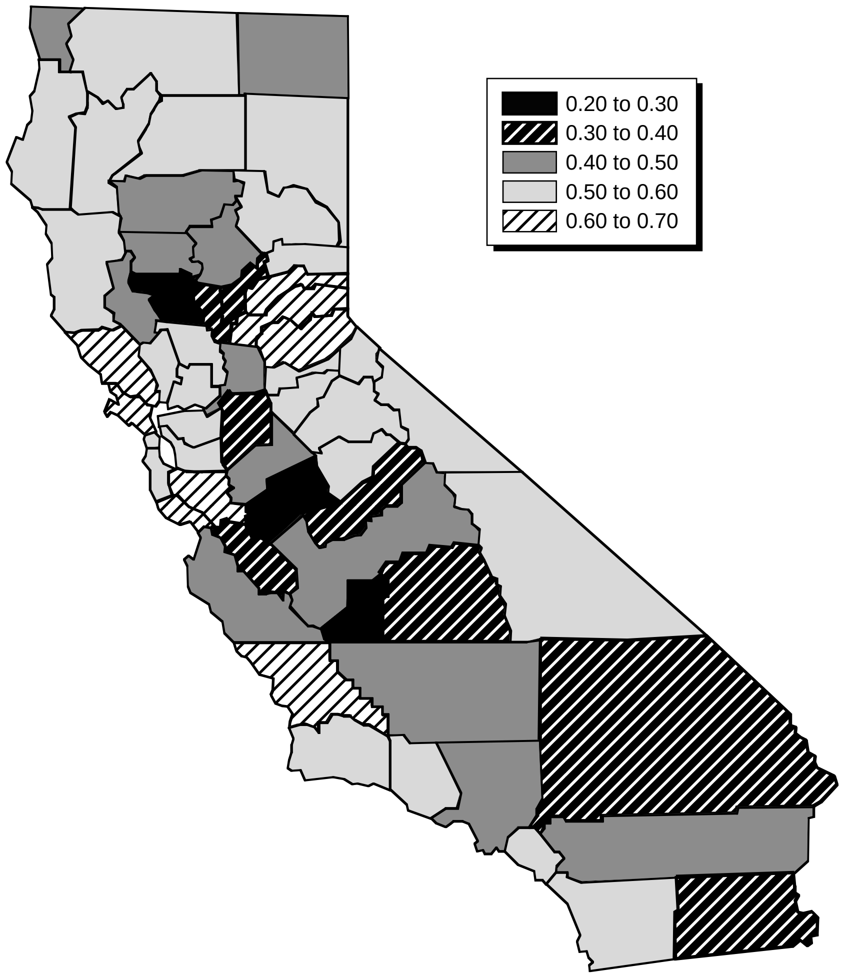

Figure 7.6—Proportion of Non-LEP Students in Grade 5
Scoring At or Above the National Median in Reading,
Spring 1998, by County

The LEP students' test scores are unlikely to provide a wholly representative measure of their academic achievement, because of the high proportion of LEP students who did not take the test. In addition, there are uncertainties about whether low scores among LEP students indicate low achievement in the given subject or difficulty faced by these students in understanding the questions in the test, which was given in English. Thus, in this chapter we focused primarily on the scores of non-LEP students.

Even among this group of English-proficient students, sharp variations in achievement exist. The level of inequality in student achievement appears to mirror the level of inequality observed nationally, as implied by the "national norms" that test developers have provided.

Earlier chapters have explored how the SES of students and the geographic location of schools are linked to the resources that schools receive. We undertook analogous explorations of the patterns in the test score data. An extremely strong link emerges between test scores and the level of disadvantage among students, especially when disadvantage is measured in terms of the percentage of students receiving lunch assistance. For instance, using this definition of SES, on average about 27 percent of students in schools in the bottom-SES group scored in the top half nationally on the STAR math test, compared to 70 percent of students in the top-SES group. The corresponding percentages for the reading test were 23 percent and 68 percent. Indeed, about half of all students in the bottom-SES group scored in the lowest national quartile on both math and reading tests.

This chapter also reveals strong geographical variations in academic achievement. Students in suburban schools had the highest test scores in math and reading, followed by rural and then urban schools. In both subject areas, there exists a 15 percentage point gap in the share of students scoring in the top half nationally in suburban schools relative to urban schools. Even larger variations arise among individual counties. Rural counties—especially in Southern California generally and in the Central Valley more specifically—tend to lag behind the more highly urbanized counties along the coast. Among these latter counties, Los Angeles County tends to have lower shares of students at or above national medians than other highly urbanized counties.

In sum, the link between students' SES and academic achievement is powerful. Similarly, urban—and to a lesser extent rural schools—lag behind suburban schools considerably in terms of test scores. However, simple cross-tabulations cannot determine the direction of causation. In particular, earlier chapters have shown that student SES and school location are correlated with the level of certain school resources, such as the share of teachers who are highly experienced. It is possible that patterns in test scores across SES groups or regions may in part arise because of variations in school resources. The prime goal of Chapter 8 is to test whether there is any systematic link between school resources and student achievement, or whether student SES is the predominant factor in determining test scores.

8. Do Student Socioeconomic Status and School Resources Affect Student Achievement?

Introduction

The goal of this chapter is to use multiple regression analysis to model test scores in order to disentangle the relative importance of SES, school inputs, and school location in determining test scores. Specifically, our variables of interest include student SES measured both by the percentage of students receiving free or reduced-price lunches and by the percentage of students who are LEP; class size; teacher education, experience, and certification; the size of the school and the district; and the location of the school, as measured by indicator variables for suburban and rural schools. The most central questions are:

1. Which set of factors is more important in determining student achievement—student SES or school resources?

2. Which types of school resources contribute most to variations in test scores between schools?

3. Do the inequalities in school resources identified in Chapters 3 and 4 create inequalities in student outcomes?

We use regression analysis in this chapter to supplement the tabular analysis in Chapter 7 because a set of simple correlations between test scores and one other variable at a time—be it SES or a measure of school inputs—does not take account of confounding factors. For example, the previous chapter has illustrated quite large variations in student achievement in math and reading in California's schools. It appears that test scores are much higher in schools where fewer students participate in the lunch program. In addition, we found sharp variations in student achievement between rural, urban, and suburban schools. These patterns are suggestive, but they do not establish the direction of causation. For example, the fact that test scores in urban schools lag behind test scores in suburban schools might in part reflect variations in SES at these schools, rather than the effect of geographic location itself. Similarly, Chapter 6 established that levels of school resources related to teachers and curriculum appear to be correlated with student SES and region. Could the apparent link between student achievement and both student SES and region in part reflect variations in school resources with respect to SES and region? Multiple regression analysis can account for all of these potential influences at once. However, as in all cross-sectional analysis, the direction of causation can never be known with certainty.

We model test scores at the school level in reading and math. As in Chapter 7, we focus on grades that represent as closely as practical the ones in which students graduate from one grade span to the next: grades 2, 5, 8, and 11.[1]

Our regression analysis models the percentage of students at or above national medians in reading and math at each school. In addition, we model the percentage of students in the bottom quarter of national achievement scores. By examining student achievement at two points in the distribution, we can examine overall which factors are related to average student achievement (percentage scoring above the median) as well as which factors are related to students' lagging further behind (students scoring in the bottom quarter). As in Chapter 6, we estimate models with and without "fixed effects" for the school districts. The addition of indicator variables for each district reduces the precision of the estimated effects but is useful because it removes any variation in test scores that might be due to unobserved districtwide policies. As in Chapter 6, the regressions for elementary schools will be more precise than for middle schools and high schools because of the increased average number of schools per district.

Several limitations with our modeling approach should be noted. First, in the literature that models student achievement it has become best practice to examine *gains* in the test scores of individual students from one grade to the next. This value-added approach is often preferred to modeling *levels* of test scores because the test score in a certain grade will depend on the entire stream of educational inputs—not to mention family and peer-group influences—over the student's school career. Our

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[1]We chose grade 5 instead of grade 6 because several hundred schools in the K–6 grade span end in grade 5. We chose grade 11 because students in grade 12 are not tested in the program. We included grade 2 as a measure of the early achievement of students in elementary school and because this grade is strongly affected by the class size reduction initiative.

analysis varies from this ideal in two ways. First, the data provide school-level test scores, rather than individual scores. In addition, because 1998 was the first year in which the Stanford 9 test was administered statewide, it is not possible to examine gains in test scores for individual students or even individual age cohorts over time. For this reason, our models of levels of test scores at each school are likely to give imperfect measures of the effect of school inputs in the 1997–1998 school year because we cannot control for the average level of school resources in prior years. It seems likely that our models of grade 2 and 5 test scores will suffer least from this problem because students are still early in their educational careers. For this reason, school resources in the current year are likely to play a relatively larger role in measuring achievement in the lower grades than in grades 8 and 11.

Second, because a significant minority of LEP students opted out of the test in 1998, we focus for the most part on the test scores of non-LEP students at each school. However, in appendices we provide corresponding models for achievement among *all* students at the school who took the tests, both LEP and non-LEP.

It is worth noting that the existing literature on the determinants of student achievement does not provide compelling evidence that school resources play an important role in determining student achievement. Hanushek (1996) reviews the literature and finds that of 277 published estimates of the effect of the teacher-pupil ratio, 72 percent found no significant effect on student achievement. Only 15 percent found a statistically significant and positive link to achievement. Almost as many studies (13 percent) revealed a negative and significant relation. Similarly, unconvincing patterns emerge for other measures of school resources. However, it is noteworthy that several measures of teacher characteristics exhibit slightly stronger patterns. In the strongest of these patterns, 29 percent of 207 estimates suggest that teacher experience is positively related to student achievement, compared to only 5 percent that find a negative and significant relation (Hanushek, 1996).

In another recent article examining the relationship between math teacher characteristics and math test results in California, Fetler (1999) finds that student poverty has the strongest relationship with test scores. After controlling for student socioeconomic status, teacher experience and preparation exhibited the strongest relationships with test scores in high school grades.

The strongest evidence that class size reduction might boost student achievement comes from the Tennessee experiment in grades K–3. As articles in the spring 1999 issue of *Educational Evaluation and Policy Analysis* make clear, class size reductions in Tennessee appear to have boosted student scores. But puzzlingly, most of the gains occurred during the first year in which the students were in smaller classes.

In California, the CSR Research Consortium is currently engaged in a detailed evaluation of the class size reduction initiative in grades K–3. Because the Stanford 9 test was not administered statewide in California until 1998, the consortium's initial work, like our own, is not able to adopt a value-added approach in which students' improvement over time is evaluated. Nonetheless, it is noteworthy that a comparison of test scores between students in smaller classes and larger classes in grade 3 suggests that class size reduction is correlated with a statistically significant but small difference in performance. For instance, Bohrnstedt and Stecher (1999) report that smaller classes in grade 3 are associated with an increase in the percentage of students scoring at or above the national median by 1.9 percent in reading and 2.8 percent in mathematics. As the authors are extremely careful to point out, interpretation of the results is complicated by the fact that low-SES schools appear to be the more likely to have failed to implement class size reduction in grade 3 in the 1997–1998 school year. Finally, it is important to note that none of these evaluations indicate whether reductions in class size above grade 3 affect student achievement.

Bearing in mind the mixed evidence from past work on the link between achievement and school resources, we now turn to our empirical analysis of math and reading achievement in grades 2, 5, 8, and 11. We begin by first presenting evidence on different regression specifications, in a somewhat technical discussion of the relationship between school resources and student achievement. Following our presentation of the regression results, we examine the predicted change in student achievement that occurs if we change the level of different school characteristics, holding all other school characteristics constant. This is similar to the analysis done at the beginning of Chapter 6.

Regression Results

Elementary Schools

We estimate four main models in each grade level and subject area, using models that include and exclude district fixed effects and two different measures of school characteristics. For elementary schools, we use class size and teacher characteristics estimated for the entire school, and in a separate specification we instead use student, class size, and teacher characteristics estimated for the given grade. In this second specification, we examine how the number and composition of students in the given grade and teacher characteristics in that grade are related to student achievement. We find similar results if we examine the students scoring above the median level nationally or students scoring in the bottom quartile.[2] For brevity, we focus on the median test scores; bottom quartile results are presented in appendix tables.

In all regressions, we control for the percentage of LEP students who took the given test. The median percentage of LEP students tested is between 14 and 20 percent, depending on grade and subject. By including a measure of the percentage of LEP students in the school (or grade) and the percentage who have taken the given test, we can control for any selection that might occur at a given school in the number of LEP students who are tested. (Although a significant minority of LEP students are not tested, this percentage can vary across different schools.) We find a high correlation (around 90 percent) between the percentage of students in a given grade who are classified as LEP and the percentage of test-takers who are LEP. We have two goals in including these two LEP measures. First, we wish to test for any spillover effects created by the presence of LEP students on the performance of non-LEP students at the school. Second, we are concerned that even in our main regressions that focus on the scores of non-LEP students, schools might vary in whether a student with given English proficiency and achievement is included in the set of non-LEP students. Variations of this sort could bias our estimates unless we control for the percentage of LEP students at the school as well as the estimated proportion of LEP students who took the tests.

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[2]Note that because in this second set of outcomes we focus on the percentage of students *below* the national 25th percentile, the signs on our estimates are opposite to those found for regressions of the percentage of students scoring *above* the national median.

In all regressions, we also include a number of variables that are measured at the school level. These include the percentage of students participating in the lunch program, the percentage of teachers who do not have a full credential, overall district enrollment, and indicator variables for whether the school has been self-classified as suburban or rural.

Table 8.1 presents the results of modeling the percentage of non-LEP students at a given school who have scored at or above the national median on the exam in the stated grade. Columns 1–4 present the results for grade 2 and 5 students, not including a fixed district effect, and columns 5–8 include a district fixed effect. We find that student socioeconomic status, as measured by the percentage of the school population receiving free or reduced-price lunches, has a large and negative relationship with average student achievement. A 10 percentage point increase in the number of students receiving free or reduced-price lunches is predicted to lead to a 5 to 6 percentage point decline in the number of students scoring at or above the national median on reading tests, in both grade levels and in all model specifications. A similar result is found for math test scores in Table 8.2, as well as for test scores of all students (including LEP students), which are presented in Appendix Tables E.5 and E.6.

The results on the percentage of the school (or grade level) population that is LEP are more mixed. In most cases, the percentage of students within a school or grade who are classified as LEP is positively related to the percentage of *non-LEP* students scoring at or above the national median on the Stanford 9 exams. This latter result could be an effect of different rules being used to classify students as LEP within

Table 8.1

Regressions of STAR Reading Test Scores for Non-LEP Students in Grades 2 and 5 Scoring Above the National Median (Stanford 9)

	Grade 2	Grade 2	Grade 5	Grade 5	Grade 2	Grade 2	Grade 5	Grade 5
% in lunch program	–0.550	–0.559	–0.582	–0.564	–0.490	–0.511	–0.505	–0.489
	(0.017)	(0.018)	(0.020)	(0.020)	(0.014)	(0.013)	(0.013)	(0.012)
% LEP students	0.006	0.027	0.007	–0.120	–0.050	–0.018	–0.029	–0.186
	(0.026)	(0.027)	(0.033)	(0.032)	(0.023)	(0.022)	(0.023)	(0.024)
% LEP test-takers	0.053	0.034	0.086	0.177	0.054	0.033	0.070	0.179
	(0.022)	(0.025)	(0.029)	(0.030)	(0.019)	(0.021)	(0.021)	(0.024)
Enrollment (100s)	–0.459	–1.883	–0.292	–0.366	–0.389	–1.904	–0.105	0.221
	(0.124)	(0.624)	(0.119)	(0.733)	(0.093)	(0.504)	(0.090)	(0.559)
Average class size	0.035	–0.118	0.042	–0.042	0.058	–0.029	0.057	0.054
	(0.059)	(0.075)	(0.051)	(0.072)	(0.039)	(0.068)	(0.037)	(0.053)
Average teacher experience	0.195	0.158	0.315	0.118	0.494	0.220	0.590	0.136
	(0.102)	(0.037)	(0.099)	(0.035)	(0.073)	(0.034)	(0.070)	(0.025)
% of teachers with master's or more	0.041	0.026	0.048	0.006	–0.021	0.009	0.006	0.002
	(0.039)	(0.017)	(0.041)	(0.012)	(0.020)	(0.009)	(0.020)	(0.007)
% of teachers with bachelor's or less	–0.031	–0.022	–0.004	–0.018	–0.014	–0.021	–0.022	–0.014
	(0.024)	(0.013)	(0.029)	(0.010)	(0.025)	(0.011)	(0.024)	(0.008)
% of teachers not fully certified	–0.159	–0.165	–0.159	–0.167	–0.166	–0.181	–0.086	–0.136
	(0.052)	(0.053)	(0.057)	(0.054)	(0.029)	(0.026)	(0.028)	(0.025)
District enrollment (1000s)	0.007	0.006	0.006	0.006				
	(0.002)	(0.002)	(0.002)	(0.002)				
Suburban school	0.485	0.570	1.752	1.816				
	(1.120)	(1.146)	(1.050)	(1.108)				
Rural school	–0.209	–0.064	1.590	0.913				
	(1.190)	(1.168)	(1.035)	(1.017)				
Constant	72.17	75.616	70.351	75.347	67.92	73.231	64.875	70.571
	(2.197)	(2.107)	(2.391)	(2.468)	(1.705)	(1.612)	(1.647)	(1.750)
Fixed effects	No	No	No	No	Yes	Yes	Yes	Yes
Grade-spec. attributes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	4328	4241	4186	3953	4328	4241	4186	3953
Adjusted R-squared	0.658	0.665	0.700	0.708	0.741	0.746	0.768	0.778

NOTE: Robust standard errors are in parentheses. Regressions with grade-specific attributes replace school-level variables with variables describing the students and teachers in grade 2 and 5 classes, respectively.

Table 8.2

Regressions of STAR Math Test Scores for non-LEP Students in Grades 2 and 5 Scoring Above the National Median (Stanford 9)

	Grade 2	Grade 2	Grade 5	Grade 5	Grade 2	Grade 2	Grade 5	Grade 5
% in lunch program	–0.526 (0.022)	–0.528 (0.023)	–0.589 (0.021)	–0.557 (0.021)	–0.464 (0.016)	–0.473 (0.015)	–0.526 (0.016)	–0.492 (0.015)
% LEP students	0.033 (0.037)	0.048 (0.038)	0.109 (0.038)	–0.020 (0.040)	–0.008 (0.028)	0.011 (0.027)	0.118 (0.028)	–0.095 (0.029)
% LEP test-takers	0.065 (0.035)	0.045 (0.038)	0.069 (0.033)	0.142 (0.039)	0.027 (0.023)	0.010 (0.025)	–0.018 (0.025)	0.139 (0.029)
Enrollment (100s)	–0.417 (0.142)	–1.414 (0.764)	–0.152 (0.133)	0.156 (0.836)	–0.444 (0.107)	–1.705 (0.583)	0.102 (0.106)	1.140 (0.668)
Average class size	0.023 (0.073)	–0.097 (0.092)	0.035 (0.062)	–0.058 (0.091)	0.118 (0.046)	–0.039 (0.079)	0.056 (0.044)	0.049 (0.063)
Average teacher experience	–0.062 (0.116)	0.077 (0.049)	0.235 (0.107)	0.126 (0.039)	0.301 (0.084)	0.177 (0.039)	0.468 (0.083)	0.140 (0.030)
% of teachers with master's or more	0.092 (0.043)	0.042 (0.020)	0.086 (0.041)	0.022 (0.013)	–0.019 (0.024)	0.001 (0.010)	0.008 (0.023)	0.006 (0.008)
% of teachers with bachelor's or less	–0.027 (0.031)	–0.021 (0.016)	–0.013 (0.027)	–0.019 (0.011)	–0.041 (0.029)	–0.031 (0.012)	–0.057 (0.029)	–0.013 (0.009)
% of teachers not fully certified	–0.134 (0.057)	–0.129 (0.056)	–0.143 (0.053)	–0.144 (0.052)	–0.161 (0.033)	–0.174 (0.030)	–0.095 (0.034)	–0.147 (0.030)
District enrollment (1000s)	0.005 (0.002)	0.004 (0.002)	0.005 (0.002)	0.005 (0.002)				
Suburban school	0.052 (1.375)	0.485 (1.431)	1.415 (1.258)	1.594 (1.310)				
Rural school	–0.318 (1.469)	–0.227 (1.457)	–0.791 (1.263)	–1.548 (1.260)				
Constant	73.006 (2.618)	73.911 (2.648)	67.001 (2.779)	72.233 (2.896)	68.862 (1.972)	72.964 (1.864)	63.711 (1.947)	67.725 (2.089)
Fixed effects	No	No	No	No	Yes	Yes	Yes	Yes
Grade-spec. attributes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	4340	4247	4191	3954	4340	4247	4191	3954
Adjusted R-squared	0.528	0.534	0.584	0.588	0.657	0.663	0.679	0.689

NOTE: Robust standard errors in parentheses. Regressions with grade-specific attributes replace school-level variables with variables describing the students and teachers in grade 2 and 5 classes, respectively.

different schools or districts. In Table 8.2, similar results are found for math test scores.[3]

We find mixed evidence on whether class size has an effect on student outcomes. In the grade 2 regressions, we find a negative effect of larger grade 2 classes on grade 2 reading scores, although this result is only marginally significant. We find little evidence of class size mattering in grade 5 classes, and overall school class size does not seem related to our measure of student achievement. In other regressions (not shown), we do find some significant and positive effects of reduced class size on student achievement for grade 3 students. This finding is similar to effects found by Bohrnstedt and Stecher (1999) and seems to occur only in grade 3 test results. As Bohrnstedt and Stecher point out, it is not clear if student achievement results found in grade 3 reflect gains from smaller class sizes or the lower ability of schools in disadvantaged areas to meet the class size reduction limits.

We do find evidence that students in larger schools—and especially in schools with larger numbers of students within a given grade—have lower test scores than do students in smaller schools. A 100 student increase in a school's population is predicted to decrease the percentage of students scoring at or above the national median in grade 2 reading and math tests by approximately one-half of a percentage point. A 100 student increase in the number of students in grade 2 (columns 2 and 6) is associated with a 2 percentage point decline in the number of students

[3]In regressions run on the percentage of *all* students scoring above the national median, the percentage of test-takers classified as LEP is negatively related to the percentage of students scoring above the national median level. These are the only coefficients that change significantly if we examine the percentage of all test-takers as compared to the percentage of non-LEP test-takers. See Appendix Tables E.5 and E.6.

scoring at the national median. There is little effect on grade 5 test scores using either grade 5 enrollment or total school size. This effect of school or grade size on grade 2 student achievement could indicate that student learning is affected by school size. But it could also plausibly be an indicator that schools with more students have a more difficult time achieving class size reduction goals because of the physical limitations of buildings, such as shortages of classrooms. In our achievement regressions, we also examine the effect of district size. In elementary schools, there is a small gain associated with being in a larger school district, but these numbers, although statistically significant, lead to relatively small changes in outcomes. An increase in district enrollment by 10,000 students leads to an increase in student achievement by one-twentieth of a percentage point.

There is little evidence that elementary students in suburban or rural schools do significantly better than students in urban schools, once we control for student socioeconomic status and other school characteristics. There is a marginally significant effect on reading test scores for grade 5 students. The percentage of students scoring above the national median in the grade 5 reading test is 1 or 2 percentage points higher in suburban schools and rural schools after other school characteristics are controlled for. There is little evidence of a corresponding improvement in math scores. Thus, the differences that Chapter 7 documented in levels of achievement across elementary schools in different geographic areas (urban, suburban, or rural) seem largely driven by other school characteristics.

Finally, we examine how different teacher characteristics are correlated with student achievement. We focus on three measures of teacher qualifications: average years of experience,[4] teacher education,[5] and the percentage of teachers without a full credential. We find that there is a systematic positive relationship between student achievement and teacher experience. Interestingly, this relationship is larger if we consider all teachers within a school rather than just a specific grade's teachers. This relationship is also stronger within a district than across school districts. If average teacher experience at a school is increased by ten years, the percentage of students scoring at or above the national median level in reading is predicted to increase by between 1 and 3 percentage points. However, if average experience is increased by ten years, *compared to teacher experience in other schools within the school district*, the percentage of students scoring at or above the national median is predicted to increase by between 2 and 6 percent. Similar, if smaller, differences in outcomes occur for math scores.

On a related note, we find a negative and statistically significant relationship between the number of teachers not fully certified and student achievement. A 10 percent increase in the percentage of noncertified teachers employed at a school is predicted to decrease the percentage of students scoring at or above the national median by one to two percentage points.

We also find a positive (but often not statistically significant) relationship between the percentage of elementary school teachers with at least a master's degree and student test scores—especially math test

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[4]We have also run regressions including the percentage of teachers with 0–2 years of experience and ten or more years of experience. These variables are negative and usually not statistically different from 0. In regressions where they are included, the coefficient on the average years of experience increases slightly.

[5]We have included both the percentage of teachers with at least a master's degree and the percentage of teachers with at most a bachelor's degree in these regressions.

scores—in our overall statewide regressions. This relationship disappears if we only use within-district variation to identify correlations between teacher characteristics.

Finally, we find a negative and marginally significant relationship between the percentage of teachers with at most a bachelor's degree teaching within a given grade and student achievement. This relationship is strengthened if we use only within-district variation. However, the percentage of teachers in the school as a whole who have only a bachelor's degree does not seem related to student achievement. Again, we need to stress that the relationships we have found between school characteristics and student achievement do not necessarily imply causality. Recall that teacher placements are partially determined by district seniority. If teachers prefer to work in schools with students who score higher on tests, it might be the case that more-experienced teachers choose to teach at certain schools because there are higher-achieving students at these schools. Nevertheless, the regressions presented above present some evidence of relationships between certain school characteristics and student achievement.

In sum, the models of test scores suggest that some measures of teacher characteristics, such as teacher certification and experience—and to a lesser extent, teacher education—are positively and significantly related to student test scores. Class size and the location of the school (urban, suburban, or rural) do not bear strong relations to test scores. The predicted variations across schools in test scores resulting from variations in class size and teacher characteristics are extremely small. By far, the most important predictor of student achievement is student SES.

Middle Schools and High Schools

In analyzing grades 8 and 11 student achievement, we again estimate four specifications for each grade-test combination. First, we estimate models with and without district fixed effects. Although school districts generally have many elementary schools, on average they include only a little over two middle schools or high schools. Fully 55 percent of school districts that include middle schools have only one middle school within the district, so we were able to estimate fixed-effect regressions on only the 761 remaining schools in 197 districts. These models are therefore estimated with less precision than the elementary school fixed-effects models and are descriptive of only these larger school districts. The models with and without fixed effects are estimated in two ways. First, we estimate models based on overall school averages of student and teacher characteristics. Next, we estimate a second model based on grade-level information for student characteristics, and class size and teacher characteristics based on information provided by math and English teachers. For example, in this second specification for grade 8 math achievement regressions, we include the percentage of grade 8 students who are LEP, the percentage of grade 8 students who took the Stanford 9 math test, and grade 8 enrollment. In addition, we include information on the average size of math classes, the average experience of teachers of math classes, the percentage of math teachers with at least a master's degree, and the percentage of math courses taught by teachers authorized to teach math. (For reading scores we use similar variables for English classes and English teachers.) In this way, we can examine if having nonauthorized teachers teaching math affects math achievement in a given school. Again, our regression results are based on school averages, so we are unable to control for the effect of a specific teacher with given characteristics on a given set of students.

Our regression results are presented in Tables 8.3 (reading) and 8.4 (math). The results are very similar to what we found in elementary schools. (Regression results for all students, as opposed to non-LEP students, are presented in Appendix Tables E.7 and E.8.) Socioeconomic status is significantly related to the percent of students scoring at or above the national median. For grade 8 students, a 10 percentage point increase in the number of students receiving lunch assistance (a decrease in student socioeconomic status) is predicted to decrease the percentage of students performing at or above the national median in reading and math tests by 4–6 percentage points. The effect is weaker in the models where we control for fixed district effects. A similar, if smaller, relationship between socioeconomic status and student achievement is also found in grade 11 reading and math test scores. A 10 percentage point increase in the number of students receiving lunch assistance is related to a 2 to 4 percentage point decline in student achievement.

For middle school and high school students, the percentage of students who are classified as LEP is also negatively related to student achievement. (However, for grade 8 students this effect is mainly offset by a positive relationship between the percentage of test-takers who are classified as LEP and non-LEP student test scores.) The increased negative relationship between the percentage of LEP students and non-LEP test scores is especially strong for grade 11 test scores. This result could partly explain the reduced relationship between the percentage of students in the free or reduced-price lunch program and student achievement found above for high school students, given the high

Table 8.3

Regressions of STAR Reading Test Scores for Non-LEP Students in Grades 8 and 11 Scoring Above the National Median (Stanford 9)

	Grade 8	Grade 8	Grade 11	Grade 11	Grade 8	Grade 8	Grade 11	Grade 11
% in lunch program	–0.550	–0.565	–0.297	–0.383	–0.422	–0.428	–0.181	–0.314
	(0.027)	(0.028)	(0.035)	(0.038)	(0.032)	(0.031)	(0.038)	(0.036)
% LEP students	–0.212	–0.223	–0.521	–0.466	–0.270	–0.281	–0.629	–0.462
	(0.053)	(0.053)	(0.098)	(0.094)	(0.063)	(0.062)	(0.090)	(0.088)
% LEP test-takers	0.262	0.285	0.284	0.311	0.123	0.132	0.153	0.157
	(0.055)	(0.057)	(0.094)	(0.093)	(0.057)	(0.059)	(0.089)	(0.090)
Enrollment	0.111	0.033	0.231	0.188	0.124	0.548	0.628	0.813
(100s)	(0.113)	(0.287)	(0.075)	(0.313)	(0.123)	(0.329)	(0.069)	(0.317)
Average class size	0.026	0.012	0.021	–0.002	0.113	0.077	0.243	0.169
	(0.013)	(0.011)	(0.024)	(0.027)	(0.065)	(0.041)	(0.080)	(0.066)
Average teacher	0.473	0.104	0.339	0.291	0.319	–0.014	–0.236	0.052
experience	(0.159)	(0.091)	(0.211)	(0.131)	(0.153)	(0.090)	(0.191)	(0.125)
% of teachers with	–0.009	–0.010	0.043	0.057	–0.006	0.019	0.108	0.071
master’s or more	(0.047)	(0.024)	(0.051)	(0.031)	(0.044)	(0.022)	(0.059)	(0.035)
% of teachers with	–0.038	–0.039	–0.020	0.032	0.017	0.023	–0.048	0.024
bachelor’s or less	(0.034)	(0.026)	(0.069)	(0.037)	(0.054)	(0.033)	(0.082)	(0.047)
% of teachers not	–0.127	–0.148	–0.151	–0.159	–0.143	–0.195	–0.199	–0.380
fully certified	(0.079)	(0.085)	(0.148)	(0.141)	(0.063)	(0.057)	(0.104)	(0.096)
% of teachers with		–0.022		0.012		0.021		0.024
subject authorization		(0.019)		(0.041)		(0.021)		(0.039)
District enrollment	–0.008	–0.008	–0.007	–0.007				
(1000s)	(0.003)	(0.002)	(0.004)	(0.003)				
Suburban school	1.151	1.065	5.381	5.737				
	(1.455)	(1.526)	(1.650)	(1.668)				
Rural school	1.317	0.789	1.168	1.379				
	(1.341)	(1.420)	(1.850)	(1.878)				
Constant	70.444	78.919	40.519	45.028	66.581	70.246	35.973	43.202
	(3.082)	(3.084)	(4.002)	(4.890)	(3.719)	(2.637)	(4.937)	(4.870)
Fixed effects	No	No	No	No	Yes	Yes	Yes	Yes
Grade-spec. attributes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	1004	983	832	806	1004	983	832	806
Adjusted R-squared	0.736	0.736	0.468	0.532	0.828	0.829	0.690	0.728

NOTES: Robust standard errors are in parentheses. In regressions with grade-specific attributes, for middle and high school students, student attributes are calculated at the grade level and teacher attributes are calculated for teachers who teach English.

Table 8.4

Regressions of STAR Math Test Scores for Non-LEP Students in Grades 8 and 11 Scoring Above the National Median (Stanford 9)

	Grade 8	Grade 8	Grade 11	Grade 11	Grade 8	Grade 8	Grade 11	Grade 11
% in lunch program	–0.592	–0.605	–0.281	–0.381	–0.421	–0.429	–0.147	–0.274
	(0.034)	(0.034)	(0.044)	(0.046)	(0.037)	(0.035)	(0.048)	(0.043)
% LEP students	–0.057	–0.038	–0.406	–0.320	–0.146	–0.172	–0.566	–0.384
	(0.058)	(0.057)	(0.110)	(0.110)	(0.073)	(0.069)	(0.113)	(0.106)
% LEP test-takers	0.180	0.161	0.200	0.220	0.044	0.070	0.078	0.072
	(0.059)	(0.060)	(0.109)	(0.111)	(0.066)	(0.066)	(0.112)	(0.106)
Enrollment	0.193	0.166	0.459	0.699	0.401	1.213	0.936	1.100
(100s)	(0.137)	(0.322)	(0.093)	(0.330)	(0.141)	(0.371)	(0.088)	(0.390)
Average class size	0.026	0.013	0.049	0.075	0.080	–0.016	0.367	0.463
	(0.018)	(0.013)	(0.035)	(0.049)	(0.074)	(0.052)	(0.102)	(0.108)
Average teacher	0.935	0.519	0.652	0.633	0.690	0.477	–0.008	0.362
experience	(0.182)	(0.107)	(0.238)	(0.132)	(0.175)	(0.094)	(0.244)	(0.148)
% of teachers with	–0.002	–0.009	–0.031	–0.006	0.022	–0.027	0.059	0.049
master’s or more	(0.053)	(0.028)	(0.061)	(0.033)	(0.050)	(0.024)	(0.076)	(0.037)
% of teachers with	–0.006	–0.003	–0.033	0.009	0.066	0.003	–0.105	0.059
bachelor’s or less	(0.033)	(0.023)	(0.069)	(0.040)	(0.062)	(0.031)	(0.105)	(0.052)
% of teachers not	–0.142	–0.152	–0.147	–0.151	–0.173	–0.194	–0.233	–0.461
fully certified	(0.086)	(0.094)	(0.168)	(0.165)	(0.072)	(0.064)	(0.134)	(0.121)
% of teachers with		0.009		0.067		0.035		0.121
subject authorization		(0.017)		(0.037)		(0.021)		(0.039)
District enrollment	–0.009	–0.008	–0.012	–0.009				
(1000s)	(0.003)	(0.003)	(0.004)	(0.003)				
Suburban school	0.802	0.620	4.219	3.626				
	(1.661)	(1.667)	(1.968)	(1.934)				
Rural school	–0.598	–1.328	–1.602	–2.287				
	(1.681)	(1.713)	(2.169)	(2.104)				
Constant	57.26	65.256	40.542	41.39	51.132	57.881	31.508	26.705
	(3.887)	(3.704)	(4.564)	(4.580)	(4.265)	(3.039)	(6.303)	(5.860)
Fixed effects	No	No	No	No	Yes	Yes	Yes	Yes
Grade-spec. attributes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	1004	987	833	806	1004	987	833	806
Adjusted R-squared	0.668	0.67	0.381	0.474	0.780	0.806	0.568	0.654

NOTES: Robust standard errors are in parentheses. In regressions with grade-specific attributes, for middle and high school students, student attributes are calculated at the grade level and teacher attributes are calculated for teachers who teach math.

correlation between the percentage of students in the lunch program and the percentage of students who are classified as LEP.

There is little relationship between school enrollment, grade-level enrollment, or class size and student achievement in grades 8 and 11. Indeed, although in most cases these variables are statistically not different from 0, in certain cases overall class size seems to be *positively* related to student achievement. This relationship is stronger for reading test scores than for math test scores and is similar to perhaps spurious relationships found in the work summarized in Hanushek (1996). This could be an artifact of the level of aggregation in our data and the fact that we are measuring overall school class size rather than an individual student's class size.

There is little difference in achievement in grade 8 test scores across rural, suburban, or urban school districts. However, in high schools that have self-classified as suburban, the percentage of students in grade 11 scoring at or above the national median is 5–6 percentage points higher in reading and 4 percentage points higher in math than students in either rural or urban schools.

In examining teacher characteristics, we again find a positive relationship between teacher experience and student achievement, with stronger relationships found between the experience of math teachers and the number of students performing at or above the median national level. We estimate that if average teacher experience was increased by ten years, the percentage of students performing at or above the national median would increase by 5 to 10 percentage points in math and 1 to 5 percentage points in reading, depending on the model we use. Similarly, we find that student achievement is lower in schools with a higher percentage of teachers who are not fully certified. If a school has 10 percent more teachers with only an emergency credential, approximately 1.5 percent fewer students score at or above the national median in both reading and math. These results are even stronger when we control for a district fixed effect, but recall that these fixed-effect regressions (columns 5–8, in Tables 8.3 and 8.4) are based only on school districts with at least two middle schools or high schools. Thus, it seems that the percentage of teachers who are not on a full credential within a school district is even more important in these larger school districts. In contrast to the results for teacher experience and certification, there seems to be little relationship between the presence of more teachers with at least a master's degree and student achievement. Finally, the percentage of English classes being taught by teachers who are not authorized in English seems to have little relationship to reading test scores. However, there is a small but statistically significant and positive relationship between having more high school math classes taught by teachers authorized to teach math.

In sum, student SES, the percentage of students at the school who are LEP, teacher experience, teacher certification, and—in the case of math scores—teacher authorization in the subject area are positively associated with student achievement in reading and math in middle schools and high schools. Class size, school and district size, and school location do not appear to affect test scores systematically.

How Large Are the Predicted Effects of Changes in Student SES and School Resources?

In the previous section, we examined the effect of different student and school characteristics on average student achievement within a school. The school characteristic most correlated with student achievement is the level of disadvantage within the school. We also find that average teacher experience and the percentage of teachers who are not fully certified are significantly related to student achievement and that the coefficients for these variables are about half as large as those for the percentage of the student population in the free or reduced-price lunch program. To conceptualize how large these effects are, it is also important to examine how much variation there is across schools in these variables. Table 8.5 presents the amount of variation that exists between a school with the 25th percentile level of a characteristic and a school with the 75th percentile level of a characteristic—that is, the difference between a school that has a relatively small amount of the given characteristic and a school with more of the characteristic. If there is little variation across schools in a given variable, even if the coefficient estimate is large, realistic changes in school characteristics would not necessarily explain much of the variation in student achievement.

To understand how these relative school characteristics translate into changes in student achievement, we examine the percentage of non-LEP students scoring above the national median at schools with different characteristics. As in Chapter 6, we refer to a high-SES school as one where 75 percent of students in the state attend schools with more students in the free or reduced-price lunch program. Our low-SES school is one where only 25 percent of students within the state attend schools with more students in the lunch program. Similarly, a school with large class sizes is one where 75 percent of the students in the state are in schools with average class sizes that are smaller, and schools with small sizes are those where only 25 percent of students in the state attend schools where class sizes are smaller. In all of the variables we examine, a school with a lot of a given characteristic is one where 75 percent of

Table 8.5

Interquartile Differences in Test Scores and School Attributes, Grades 2, 5, 8, and 11

full page

students attend schools with less of the given characteristic (i.e., fewer teachers with at least a master's degree, lower average teacher experience, fewer students, and so on), whereas a school with a low amount of a characteristic is one where 75 percent of students attend schools that have *more* of the given characteristic.[6] In this simulation, a school with the "average" amount has the median level of the characteristic. We assume throughout that our representative school is a median-sized school in a median-sized district with the median level of student and teacher characteristics. We also assume that it is an urban school. This exercise is similar to that in Chapter 6, which examines the effect of changing student socioeconomic status on school resources.

Note that there is much more variation in the percentage of students receiving lunch assistance than in teacher characteristics or class sizes. The figures and tables in the remainder of this chapter are based on regression results, holding all other characteristics constant except the listed characteristic. In this way, we can examine the effect of different teacher characteristics on test scores while controlling for student SES.

In Figure 8.1, we examine the effects on the reading achievement of grade 5 students, given different levels of student socioeconomic status, teacher characteristics, and class size. The figure examines differences in the percentage of non-LEP students scoring above the national median on the reading test. Percentages for grade 2 and 5 math and reading scores are presented in Table 8.6. In Figure 8.1, the three bars represent the percentage of students in each category for schools with a low level, the median level, and a high level of the characteristic. Note that the middle bar is the same in each cluster, as it represents our "typical"

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[6] We examine the results from the regressions using grade-specific characteristics. We find almost identical results using the regressions based on schoolwide characteristics.

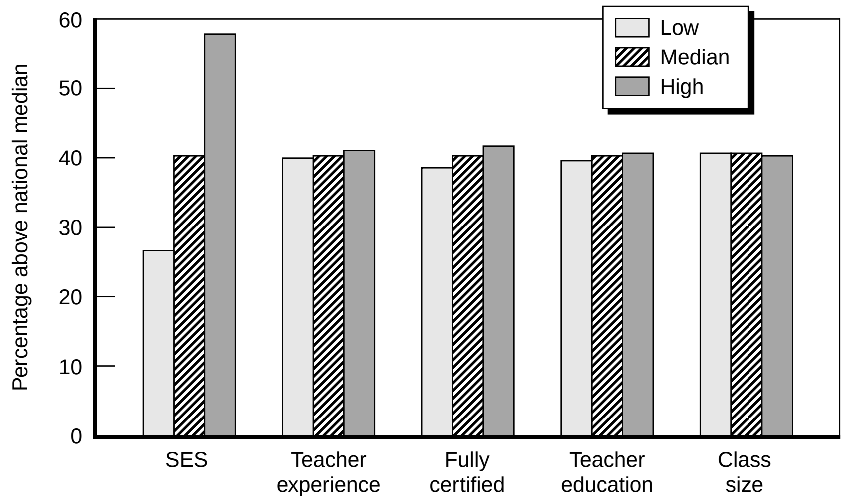

Figure 8.1—Predicted Percentage of Grade 5 Non-LEP Students Scoring Above the National Median in Reading, by Student, Teacher, and School Characteristics

school. We find that in our typical school, 40.2 percent of non-LEP grade 5 students score at or above the national median in math.

Changing SES dramatically changes the predicted percentage of students scoring above the national median. In low-SES schools, the estimated percentage of students scoring above the national median declines to 27 percent. In contrast, if we raise the SES status of students, the percentage scoring above the national median increases to 58 percent. Thus, twice the percentage of students at high-SES schools are scoring at or above the national median than in low-SES schools. This decline dwarfs the changes in student achievement caused by changing teacher and school characteristics. There is much less variation in test scores that can be attributed to variations in teacher characteristics. For instance, there is a ten-year difference in the average experience of grade 5 teachers

Table 8.6

Predicted Percentage of Students Scoring Above the National Median in Reading and Math, by Student, Teacher, and School Characteristics, and Grade

	Reading		Math	
	Grade 2	Grade 5	Grade 2	Grade 5
Median school	39.4	40.2	41.0	39.7
Low-SES school	26.1	26.8	28.5	26.5
High-SES school	56.6	57.5	57.2	56.8
Less-experienced teachers	38.8	39.6	40.7	39.1
More-experienced teachers	40.0	40.8	41.3	40.4
Fewer certified teachers	37.5	38.2	39.5	38.0
More certified teachers	40.6	41.4	41.9	40.8
Less-educated teachers	38.4	39.4	39.7	38.5
More-educated teachers	40.2	40.3	42.0	40.2
Smaller class sizes	39.5	40.2	41.0	39.8
Larger class sizes	39.3	40.1	40.9	39.6
Rural school	39.3	41.1	40.8	38.1
Suburban school	40.0	42.0	41.5	41.3
Small school	39.9	40.2	41.4	39.7
Large school	38.9	40.0	40.5	39.7

at the 25th and 75th percentile schools. Increasing the average experience of teachers by this amount raises the percentage of students at or above the national median by about 1 percentage point for grade 5 students in reading.

We next consider the effect of going from a school where 81 percent of teachers have a full credential to a school where all teachers have a full credential. This increases the predicted percentage of non-LEP students scoring at or above the national median by 3 percentage points. Interestingly, this effect is larger for reading (3.2 percent) than for math (2.8 percent). There is a 1 percentage point increase in increasing the educational attainment of teachers within the school. Finally, in most cases, the effect of class size was not statistically significantly different from 0 and in some instances was estimated to be *positively* related to class sizes. In the elementary school grade-specific regressions, the effect of average grade-level class size was negatively related to student outcomes, but given the minimal amount of dispersion in class sizes, this effect is small. Moving from a school with grade 5 classes at the 25th percentile level to the 75th percentile level involves increasing class sizes by 3.7 students. However, the effect of smaller class sizes in grade 5 is small and very close to 0. The results for the other variables show a similar pattern: Changing from the 25th to the 75th percentile is correlated with at most only a couple of percentage points difference in student achievement. These results can be found in Table 8.6.

Similar results are found for the predicted percentage of students scoring in the *bottom* quarter of national test scores, which are presented in Table 8.7.[7] As an example, Figure 8.2 shows the predicted variations in the percentage of non-LEP students scoring in the bottom quarter of national norms in grade 5 reading. Recall that having a larger number of students in this bottom category represents more students falling behind in school. Almost half of all non-LEP students in grade 5 in low-SES schools score in this bottom group in reading (46 percent). This is more than twice the number of low-scoring students in high-SES schools (22 percent). Again, teacher characteristics have much smaller effects—increasing the number of teachers who have a full credential decreases the predicted percentage of low-scoring students by 3.5 percentage points.

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[7]The regressions underlying these simulations, and similar analyses of the percentage of students scoring in the bottom quarter of the national population can be found in Appendix Tables E.9 to E.12.

Table 8.7

Predicted Percentage of Students Scoring in the Bottom National Quartile, by Student, Teacher, and School Characteristics, and Grade

	Reading		Math	
School Characteristic	Grade 2	Grade 5	Grade 2	Grade 5
Median school	38.9	35.9	36.9	39.8
Low SES school	50.0	46.5	47.2	50.9
High SES school	24.6	22.2	23.5	25.4
Less experienced teachers	39.7	36.5	37.2	40.4
More experienced teachers	38.1	35.3	36.5	39.2
Fewer certified teachers	40.9	38.1	38.4	41.6
More certified teachers	37.7	34.6	35.9	38.6
Less-educated teachers	39.8	36.6	38.1	40.9
More-educated teachers	38.3	35.8	35.9	39.4
Smaller class sizes	38.9	36.0	36.8	39.8
Larger class sizes	39.0	35.9	36.9	39.8
Rural school	38.3	33.8	35.6	39.8
Suburban school	37.8	33.5	35.1	37.5
Small school	38.5	35.8	36.6	39.9
Large school	39.5	36.0	37.2	39.7

As another indication of the dominant role played by student SES in explaining variations in achievement across California schools, note that variations in predicted test scores resulting from moving from a low-SES to a high-SES school are roughly as large as the gaps in the raw data. Virtually all of the interquartile differences in test scores are explained by changes in student population. In the raw data, there is a 33.3 percentage point difference between the percentage of non-LEP students in grade 5 who are at or above the national average in reading at the 25th percentile school and the 75th percentile school if schools are arranged

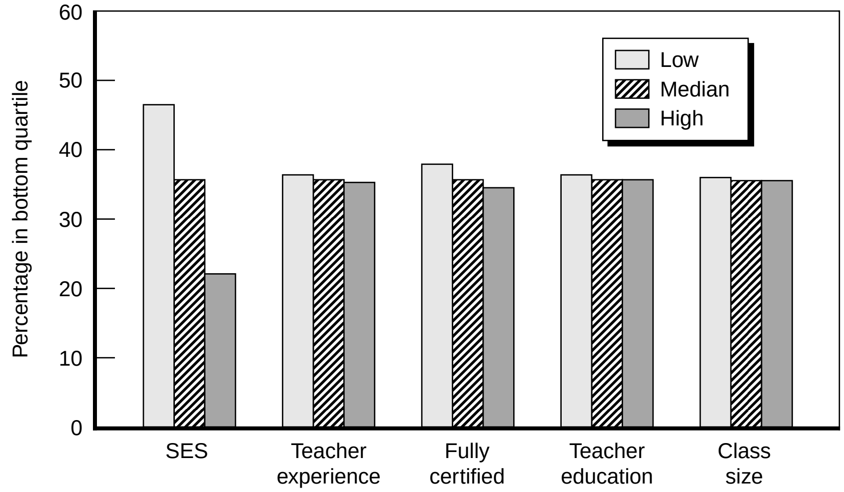

Figure 8.2—Predicted Percentage of Grade 5 Non-LEP Students Scoring in the Bottom National Quartile in Reading, by Student, Teacher, and School Characteristics

according to the percentage of students in grade 5 at or above the national median. The predicted gap in test scores resulting from interquartile variations in SES is 30 percentage points or 92 percent of the test score differential within the state.

Chapter 6 revealed that within-district variations in school resources in some cases are quite large. We now examine the implications of within-district variation in school characteristics on test scores. Figure 8.3 examines the effect of within-district dispersion on relative student achievement on the reading test for grade 5 students.[8] To do this, we calculate the school with characteristics at the 25th percentile level, the

[8]For the remainder of the within-district analysis we will focus on the percentage of grade 5 students scoring above the national median on reading tests. The results are similar for math tests, grade 2 test scores, and relationships of school characteristics to low-scoring students.

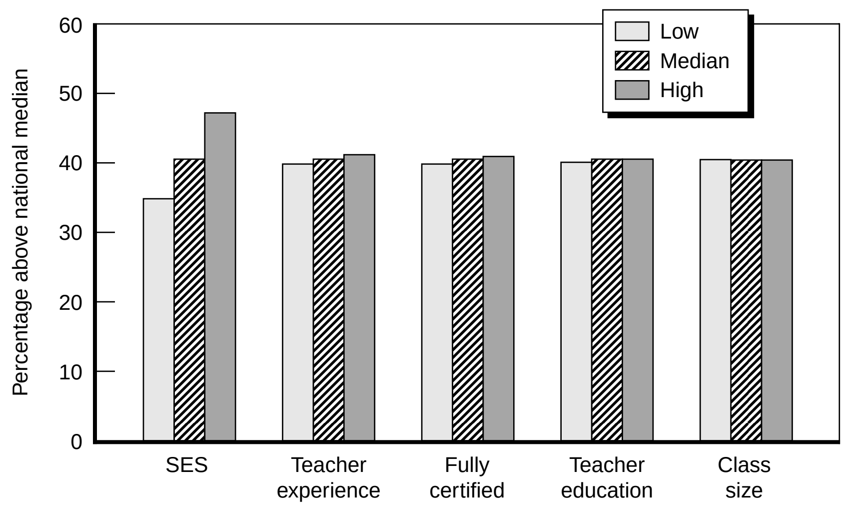

Figure 8.3—Predicted Percentage of Grade 5 Non-LEP Students Scoring Above the National Median in Reading, by Student, Teacher, and School Characteristics Within District

median or 50th percentile level, and the 75th percentile level within each district. We then take an average of values across all school districts and use these values to estimate the effects of changing school characteristics *within* a school district. We have normalized the results so that at our median school, the predicted percentage of students scoring at or above the national median is the same as in Figure 8.1. We then examine changes in characteristics caused by within-district differences. For instance, the first set of bars examines the predicted percentage of non-LEP students scoring at or above the national median at low-SES, median-SES, and high-SES schools.

Again, the effect of differences in the percentage of students in the free or reduced-price lunch program overwhelms all other effects. The percentage of grade 5 students scoring at or above the national median in reading is predicted to be 34.5 percent at low-SES schools and 47 percent at high-SES schools, or a 12.5 percentage point differential. The decrease in the size of this SES effect relative to the statewide results in Figure 8.1 and Table 8.6 occurs primarily because of the smaller amount of dispersion of disadvantaged students within a district than within the state as a whole. Given that the interquartile dispersion across schools within a district in student reading achievement is 19 percent, changing the level of student disadvantage within a district is predicted to explain 12.5 percentage points, or almost two-thirds, of the raw variation in test scores within districts.

In contrast to the distribution of disadvantaged students throughout the state and within school districts, on average there is as much dispersion in teacher characteristics within school districts as there is across school districts. (The amount of variation in the state as a whole as compared to the average district variation is presented in Table 8.5.) As Figure 8.3 shows, equalizing the number of teachers not fully certified across schools within a district seems to be related to a slight decline in the dispersion of test scores. Again, the relationship between teacher characteristics and student achievement is much smaller than differences caused by the level of disadvantage across schools.

In Table 8.8, we turn our attention to middle schools and high schools. In this table, we focus on the regressions using subject-specific teacher characteristics. The results are substantively the same if we use regressions based on all teachers and students within middle schools or high schools. Again, we examine the effect of changes in student socioeconomic status and teacher characteristics on student achievement in grades 8 and 11.[9] We find that the predicted effect of changing student socioeconomic status is much greater than the effect of changing teacher qualifications. Moving from a low-SES school to a high-SES school is correlated with a 27.2 percentage point rise in the number of grade 8 students scoring at or above the national median in math. A smaller effect is found on grade 11 test scores where a similar change leads to a 12.5 percentage point rise in the number of non-LEP students scoring at or above the national median in both math and reading. There are also small and positive effects of having more-experienced teachers in both English and math courses. Increasing the average experience of math teachers within a middle school by five years is predicted to lead to an additional 3 percent of students scoring above the national median level. Similar predicted effects of variations in teacher experience are also found in high schools. Finally, increasing the number of fully credentialed teachers within middle schools or high schools is correlated with a 2 percentage point rise in the number of students scoring at or above the national median in math in grades 9 and 11. Results for the other school characteristics are also presented in Table 8.8.

Summary

In this chapter, we have further examined the relationship between teacher, student, and school characteristics and student achievement. Many of our measures of school resources and school characteristics—such as class size, the location of the school (urban, suburban, or rural),

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[9]Because there are numerous middle school and high school districts with only one of each type of school within them, we focus on the statewide regressions.

Table 8.8

Predicted Percentage of Students Scoring Above the National Median, by Student, Teacher, and School Characteristics, and Grade

	Reading		Math	
School Characteristic	Grade 8	Grade 11	Grade 8	Grade 11
Median school	50.5	39.7	44.5	49.2
Low-SES school	37.9	32.0	31.1	41.5
High-SES school	63.4	44.5	58.3	53.9
Less-experienced teachers	50.2	39.0	42.9	47.7
More-experienced teachers	50.8	40.4	46.3	50.8
Fewer certified teachers	49.1	38.8	43.1	48.3
More certified teachers	51.2	40.4	45.2	49.8
Fewer authorized teachers	50.9	39.6	44.4	48.5
More authorized teachers	50.2	39.8	44.6	49.6
Less-educated teachers	50.0	39.5	44.6	49.4
More-educated teachers	50.8	40.2	44.4	49.0
Smaller class sizes	50.5	39.7	44.5	49.3
Larger class sizes	50.5	39.7	44.5	49.0
Rural school	51.3	41.1	43.2	46.9
Suburban school	51.5	45.5	45.1	52.8
Small school	50.4	39.5	44.3	48.5
Large school	50.5	40.0	44.7	50.0

and school size—did not demonstrate a systematic relationship with student achievement across all grades. However, we have found a positive relationship between student achievement and both the average amount of teacher experience and the percentage of teachers who are fully certified. Although statistically meaningful, these relationships are dwarfed by the size of the relationship between student test scores and student socioeconomic status. We find that virtually all of the variation in non-LEP student achievement within the state is related to differences in student socioeconomic status across the state.

Thus, in evaluating schools across California it is important to take into account differences in the student population when formulating policies to reward or punish the faculty and administration at different schools. In addition, we reiterate our earlier warning about the difficulty of determining causation when modeling the *level* of test scores as a function of school resources at the student's current school. Because it is impossible using the data at hand to expunge the influence of students' earlier educational experiences, examining gains in individual student achievement would be a better way of evaluating school achievement. At the least, the state should develop a system for examining changes in individual test scores over time, as this would control for differences in test scores that seem to be related to factors that might be beyond a school's control. If only across-school rankings were done each year and no attention were paid to relative changes in student achievement, the state may inadvertently discourage more experienced teachers and principals from working in schools with more disadvantaged students. We return to this important issue in the concluding chapter.

9. Policy Implications and Conclusions

This report examines three broad questions about California's public schools:

1. How do school resources—as measured by class size, curriculum, and teachers' education, credentials, and experience—vary across schools?
2. How are student socioeconomic status and geographic location of schools related to these differences in resources?
3. Are existing inequalities in school characteristics and resources related to inequalities in student achievement?

Our exploration of resource allocations shows very small variations in class size among schools. In sharp contrast, we find large variations in the characteristics of teachers, especially in teacher education and experience. The percentage of teachers who are not fully certified also varies in important ways across schools. These variations in teacher characteristics are systematically related to differences in student socioeconomic status. In general, schools with more-disadvantaged students tend to employ teachers with lower levels of experience, certification, and education. We also find evidence that the geographic location of schools is correlated with teacher characteristics. However, regression analysis suggests that many of the regional variations reflect underlying variations in student socioeconomic status.

We also find significant variation among schools in the percentage of high school courses that satisfy University of California or California State University entrance requirements (the "a–f" courses). Even stronger variations occur in the proportion of high school courses that are Advanced Placement. We find strong positive correlations between student SES and measures of AP and "a–f" course availability. Teachers' level of preparation may also explain a significant portion of the variation in course offerings in high schools.

Intriguingly, we find that inequities in school resources apparent in the statewide data replicate themselves to some extent within districts. In other words, within a given district, schools with more-disadvantaged students are likely to have less highly educated and less highly experienced teachers and to offer fewer advanced classes at the high school level. Evidence from a sampling of district contracts with teachers' unions suggests that in part these inequalities may result because the most experienced teachers typically have first right of transfer to other schools when vacancies appear. More generally, even without explicit transfer clauses in teacher contracts, experienced teachers may naturally gravitate toward schools in the most affluent areas of the district.

We next examine variations in student achievement in the 1998 STAR test results. Although it is true that California students lag behind national norms on these tests by substantial margins, two-thirds or more of the gaps in math and reading performance can be accounted for by the unusually high proportion of LEP students in California. However, even when we exclude these students from our measures—as we do throughout most of the analysis—we find substantial variation across schools in student achievement. Student SES, as measured by the proportion of students receiving free or reduced-price lunches, bears an astonishingly high correlation with student achievement at the school level.

The most important, but most difficult, question this report addresses is: *Do observed inequalities in school resources contribute to inequality in student achievement?* California test score data are not ideal for answering this question because the state does not yet have a student-level database that follows individual students over time. Therefore, we opted to model the level of test scores in selected grades as a function of student SES, school resources, and characteristics of the district. Our results should be considered as tentative, especially in the higher grades, because achievement in a given grade reflects not only the quality of schooling in that grade but also the attributes of the student's broader environment in all previous grades—yet the latter influences are unobserved.

Nevertheless, our results are similar to the results in earlier literature surveyed by Hanushek (1996) and Betts (1996). By far, the most important factor related to student achievement in both math and reading is our measure of SES—the percentage of students receiving free or reduced-price lunches. Among our school resource measures, the level of teacher experience and a related measure—the percentage of teachers without a full credential—are the variables that most strongly relate to student achievement. Class size bears little systematic relation to student achievement. To drive home the relative importance of student SES and teacher characteristics, we simulate the change in the percentage of students scoring in the top half of the Stanford 9 test nationally after an interquartile change in key variables. That is, we consider the predicted effects on student achievement if a student is moved from a school ranked 25th out of 100 to 75th out of 100 in a particular school resource or school characteristic. The case of reading achievement in grade 5 provides a representative result. Interquartile increases in the percentage of students receiving lunch assistance, the percentage of teachers with full credentials, and the mean years of teacher experience are predicted to change the percentage of students scoring in the top half of the test nationally by 30 percent, 3 percent, and 1 percent respectively. Clearly, although teacher experience appears to influence student achievement in meaningful ways, the effect is very small compared to the influence of variations in student SES. Furthermore, we cannot know for certain the direction of causation in the relationships between test scores and teacher experience or credential levels.

This report documents the level of inequality that existed in California schools in 1997–1998. We hope the study will serve as a useful benchmark in the evaluation and formulation of education policy. After examining differences in California schools based on the recently collected data, we arrived at a number of conclusions concerning education practices within the state. Some of our policy recommendations concern the collection of additional data. We believe that more information would help to inform the debate on California schools and help the California Department of Education, the Governor, the legislature, and California voters to better evaluate policies that have been, and will be, adopted. We now turn to these policy implications, beginning with a discussion of what we have learned about the five policy issues discussed in Chapter 1.

Policy Implications

Teacher Training

Our findings suggest that variations in school resources, especially teacher experience and the share of teachers who are fully certified, do affect student achievement. Thus, policymakers should make it a top priority to assure that an adequate supply of highly experienced and fully certified teachers is available to California's public schools. Direct interventions in the market for teachers, such as providing financial incentives for the have-not districts to seek out highly experienced teachers, or to accelerate training for their less-experienced teachers, might be in order.

We find that even *within districts*, schools with high percentages of disadvantaged students tend to have larger shares of teachers with emergency credentials, little experience, and relatively little education. A continuation of past policies designed to reduce inequities *across* districts cannot alone remedy this situation. In addition to interdistrict reallocations, the state might want to adopt policies to encourage districts to assign more-experienced teachers to schools with more-disadvantaged students *within* the district. This might require a within-district pay differential to encourage more senior teachers to accept assignments that are seen as less desirable.

An unfortunate side-effect of the class size reduction initiative has been to increase the share of less-experienced teachers and teachers who lack a full credential in California schools, especially at the elementary level. We recommend that any future education reforms of this scope be undertaken only after the state has performed a thorough analysis of the consequences of the proposed reforms for the teacher labor market.

Most of the above comments relate to the shortage of highly experienced teachers and, to a lesser extent, to the shortage of credentialed teachers. What about teachers' overall level of education? Our results, similar to what Hanushek (1996) has documented in the national literature, show that it is not easy to find a strong correlation between teacher education and the achievement of students in California. Our findings raise important questions about the quality of the formal education that the state's teachers receive in California's many colleges and universities that provide courses leading to a full credential. Unfortunately, our research can provide few answers about *which* types of formal teacher training work most effectively, because the CBEDS dataset contains information only on the highest level of education obtained by a teacher. California's policymakers could learn much from the construction of a more specific database that provided details on the entire educational background of the state's teachers. We make specific suggestions in this regard in our recommendations for extensions of the state's data-gathering efforts below.

School Accountability, Student Disadvantage, and the Market for Teachers and Principals

In summer 1999, the California Department of Education released a list of schools at which student achievement on the STAR test was unacceptably low. Schools scoring in the lower half of the statewide distribution of STAR in both 1998 and 1999 were eligible to participate in the Immediate Intervention/Underperforming Schools (II/USP) program. This represents the first iteration of school rankings mandated under SB 1X. In future years, the rankings are expected to expand to incorporate attendance rates, graduation rates in high schools, and various other measures.

In Chapter 1, we express concern that the planned system of rewards for high-performing schools and punishments for failing schools might discourage both teachers and principals from working in schools serving disadvantaged populations—unless the school ranking system takes account of the role that student SES might play in determining student achievement. Our results show that, indeed, extraordinary variations in student achievement occur among schools in different SES groups. The initial school selection method for the II/USP program in 1999 takes no account whatsoever of variations in the level of student disadvantage.

Although some details of the provisional Academic Performance Index (API) were released in 1999, the public does not yet know how the API will take student SES into account in the future. Notably, however, an advisory board to the State Board of Education has recommended that, in the future, schools be judged in part by "growth in the API in comparison with schools with 'similar characteristics,' a rather lengthy list of contextual or background factors."[1] This proposal, although short on details, would do much to allay our concern that the Public Schools Accountability Act will inadvertently discourage teachers and principals from seeking positions at schools serving disadvantaged populations.

The importance of choosing a relevant comparison group for each school became all the more important in November 1999 when the California State Board of Education voted to include LEP students in the calculation of the API. Given the evidence presented in Chapters 7 and

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[1]See http://www.cde.ca.gov/psaa/api/api_final.htm (8/29/99).

8 about the large achievement gap between LEP and other students, this decision virtually guarantees that schools with large percentages of LEP students will rank poorly. Of course, this problem is mitigated to some extent by the decision to reward schools in part based on their improvement from year to year, rather than just on their level of achievement.

In our opinion, the way in which comparison groups of schools are created for the API could make or break the Public Schools Accountability Act in the long run. The California Department of Education is on the horns of a dilemma. On the one hand, failure to take student SES into account will lead to many of the "punishments" outlined in SB 1X—including reassignment of the principal, allowing students to attend other schools, and closing schools down altogether—to be meted out to schools in disadvantaged areas. Such a practice could exacerbate the gap in teacher preparation that we observe at present between urban and suburban schools.

On the other hand, if the California Department of Education permanently adopts the practice of holding schools that serve disadvantaged students to lower standards, it creates a signal that less is expected of teachers, students, and principals in these schools. Few in society are likely to countenance such a system in the long run.

Resolution of this dilemma must stem from acknowledgment that at present the distribution of school resources, especially teachers, is not perfectly equal across schools. A move toward more equal allocation of school resources should reduce inequality in outcomes among schools somewhat. However, given how little school resources seem to affect student achievement, it is extremely unlikely that equalization of school resources could by itself equalize student achievement. Though politically difficult, a system that provided additional resources to schools in impoverished areas would narrow gaps in student achievement further. Such a redistribution could be phased in and combined with an equally gradual transition from an accountability system that gave “extra points” to schools serving disadvantaged populations to one in which all schools were held accountable to the same standards. In a dual reform of this nature, school accountability could lead to significant improvements in student outcomes.

Likely Consequences of Increased Devolution of Authority to School Districts

Chapter 1 briefly discusses the LAO’s recent report calling for a Master Plan for K–12 that would emphasize increased local control of schools. Our research cannot speak directly to the likely effects of such a reform, but we believe that we have uncovered several relevant insights.

First, as Chapters 4 and 5 show, there remain important differences in the resources received by students who are less or more disadvantaged, as well as closely related regional differences in school resources. Increased devolution of authority to school districts cannot by itself make all schools perform at or above national norms. Why do we make this claim? First, as discussed in Chapter 6, we find that some of the same inequalities that exist statewide also exist *within* school districts. Most notably, even *within* districts the schools with the most-disadvantaged student populations tend to have the least-experienced teachers and the largest shares of teachers who lack full credentials. For this reason, devolution of spending authority is unlikely to equalize resources fully among schools within districts. Second, we have presented considerable evidence in this report that student SES is systematically and strongly related to student achievement in all grade spans. These socioeconomic effects swamp the effects of existing variations in school resources. At the least, then, increased devolution of spending authority to districts should be accompanied by financial reforms that require all districts to provide a similar level of resources to students at different schools. But even if this goal is achieved, it seems unlikely that the combination of equal spending and greater local autonomy could fully equalize the differences in student achievement among schools in the state.

The Question of Inequalities in High School Curriculum

We find evidence that high schools vary considerably in the type of curriculum they offer. For instance, the percentage of college preparatory courses in high schools varies significantly among schools, with disadvantaged students in general attending schools with a smaller share of these courses in the curriculum.

Far more contentious, in light of two recent lawsuits, are variations in the availability of Advanced Placement courses. The lawsuits contend that California's educational system is biased against disadvantaged children because disadvantaged students do not enjoy as rich a high school curriculum as others. At the same time, the lawsuits contend that the University of California gives preferential treatment to students who complete AP courses. As noted above, we did find important variations in the availability of AP classes among high schools and evidence that disadvantaged students attend schools in which AP courses are relatively less prominent in the curriculum.

But do these findings necessarily imply that some high schools are not living up to their commitments to students? We have repeatedly stressed that we cannot know with certainty whether these variations in course offerings reflect differences in the ability or willingness of schools to provide advanced courses, or differences in student demand for these courses, or a combination of the two.

The last of these hypotheses—that variation in AP course offerings is a matter of both supply and demand—is most likely the closest to the truth. Chapter 6 establishes that smaller schools and smaller districts are likely to offer far fewer AP courses than larger schools or districts, probably because of a lack of economies of scale in smaller schools and districts. In addition, variations in teacher characteristics, especially teacher education, account for some of the variations in course offerings. Both of these results suggest that schools differ in their ability to supply AP courses. However, we find indirect evidence that student demand for AP courses varies among high schools as well. Imagine that at all schools—regardless of the percentage of students who receive lunch assistance—an equal number of students would enroll in a given AP class were it available. Because schools with more-disadvantaged students offer fewer AP classes, we would expect these classes to be much more crowded in disadvantaged schools. Yet, we find the opposite. Our regression analysis predicts that if we have two schools with identical resources but a 50 percent variation in the percentage of students participating in the lunch program, the school with more-disadvantaged students would have, on average, five fewer students in its math and science AP classes.

What do these findings imply for policy related to the provision of AP classes? First, a simple requirement that all high schools statewide must offer the same percentage of AP classes is likely to fail to equalize the proportion of students taking such courses. We suspect that smaller AP class sizes in schools with disadvantaged students result because of variations in course-taking patterns that begin many years before high school juniors and seniors begin to take AP classes. In short, curriculum reform cannot begin in grade 12—it must begin much earlier.

Second, smaller schools and districts offer markedly fewer AP courses as a percentage of total classes. Innovative solutions in which smaller schools use a combination of course sharing with other schools or "distance learning" via the Internet or other means could do much to narrow the observed gaps in AP course-taking patterns. Indeed, the most cost-effective solution, given differences in teacher characteristics across different schools, might be for more high schools to encourage promising students to take more courses at nearby community colleges.

Third, it seems clear that variations in teacher education, and to a lesser extent teacher experience and certification, account in part for variations in AP offerings. Again, we come back to one of the most important findings of this study: Inequalities in teacher preparation across schools are large, and they matter for student outcomes, whether measured in terms of test scores or course-taking patterns. In light of this result, it seems naïve to believe that a simple edict that all schools statewide offer identical sets of AP courses can succeed, unless inequalities in teacher preparation are first removed.

The Need for a Differential Cost-of-Living Adjustment or a More-Targeted Policy of Reducing Resource Inequalities Across Districts

Beyond a general principle of creating a level playing field in public schools, does the public have any additional reasons to be concerned about inequalities in school resources? In short, do inequalities matter? Our analysis of student outcomes suggests that variations in teacher experience and credentials are significantly related to student achievement. Consider two elementary schools that are identical, except that one is at the 25th percentile and the other at the 75th percentile, in terms of the percentage of teachers not fully certified. Our results predict about a 2 to 3 percent gap between these schools in the percentage of students scoring in the top half nationally in math and reading. Slightly smaller gaps in student performance are predicted to result from interquartile variations in teacher experience. Results in middle schools and high schools are similar but not as strong.

In light of these findings and the fact that we find significant variations in some measures of school resources among districts, the idea of differential cost-of-living adjustments between have and have-not districts in California, as evaluated in a recent LAO study, may have merit.

We note, however, that inequalities in school resources appear to be quite specific and they relate more to teachers than to class size. The specific way in which inequalities manifest themselves in California suggests that simply increasing funding per pupil at different rates across districts might not by itself guarantee that the have-not districts obtain the same highly trained and experienced teachers that other districts obtain. In addition, increasing funding per pupil at the district level does not address the inequality in resources found *within* districts. A policy of differential cost-of-living adjustments combined with incentives for districts to reach recommended levels in certain school resources—such as highly qualified teachers—might prove more effective than differential cost-of-living adjustments alone.

The Need for More-Detailed Data on California's Schools

Our experience with the CBEDS data that form the backbone of this report has been almost uniformly positive. In spite of the inevitable data-cleaning issues in a dataset of this size, we are convinced that the many thousands of people, mostly teachers, who fill out the annual survey forms do so in a very responsible manner. Another strength of the CBEDS data system, which is not displayed in our "snapshot" of the data for the 1997–1998 school year, is the considerable consistency in the PAIF (teacher) survey form across years.

We have several suggestions for enriching the data on California's schools. First, readers may find it puzzling that teacher education should have such a small and inconsistent relation to student achievement. One possible reason for this effect may be that it is not the highest degree earned that matters so much as the field in which the teacher studied. We recommend that the CBEDS teacher survey continue to ask about the highest level of education obtained but, in addition, ask about the teacher's undergraduate major and graduate major if she or he holds a master's degree. Shields, Marsh, and Powell (1998) also point out that the colleges and universities that offer teacher accreditation programs are quite diverse and have changed in relative importance over time. Thus, it would be useful for the California Department of Education to know the institutions from which teachers have graduated. Indeed, given the current increased demand for teachers, it would be beneficial to know the locations from which California is recruiting its teachers.

On a related note, we could learn a great deal about the interstate mobility of teachers by asking a short series of questions about teachers' accreditation, teaching experience, and education outside of California. It seems to us that local variations in the labor markets for teachers have much to do with the observed variations in teacher characteristics both *within* and among districts. Understanding the degree to which California relies on teachers trained elsewhere is a crucial ingredient in understanding the state's labor market for teachers.

The CBEDS survey could also obtain even richer information than it does now on within-district teacher experience. Our finding that teacher experience tends to be significantly higher at less-disadvantaged schools, even within a district, suggests to us that "first right of transfer" clauses typical in teachers' contracts might contribute to this pattern. At present, the CBEDS form asks teachers to list their total years of teaching experience and their total years of experience within the district. To gain important insights into within-district teacher mobility, the CBEDS form could also ask teachers to list their years of experience at their current school.

It would also be useful to inquire about the number of university courses middle school and high school teachers have taken in the specific subjects they are teaching, perhaps even inquiring as to whether a science teacher took mainstream university science courses or science education courses. Unlike our earlier suggestions for questions, this extension might add considerably to the length of the PAIF.

In making these recommendations, we stress that the original questions in the CBEDS forms should not be altered, so as to maintain the continuity in these questionnaires over time. Although we recognize that legislative requirements and information requests are often responsible for changes to the questionnaires, we think that inconsistency can be problematic for any analysis of education trends in California. For example, questions about district high school graduation requirements were dropped and then added again in the CDIF, and the school's attendance area (rural, suburban, urban) was included on the SIF in some years and omitted in others.

In this study, we used the first year of results of the STAR testing system to gauge the academic achievement of students. It seems clear that this system will evolve over the years. For example, in spring 1999, during the second year of the testing program, a separate testing component was added to the original Stanford 9 test to measure California students' knowledge of material stipulated in emerging statewide academic standards. Because the standards are likely to change in coming years, we expect that this additional component of the STAR testing system will evolve as well. We believe that it is important to maintain the original Stanford 9 component untouched for a number of years. Without an unchanging yardstick, it will be impossible for state policymakers to know whether students in California are improving.

We used the Stanford 9 results as a measure of average achievement by grade at each school. We also used the results to assess how existing variations in school resources and student demographics affect student achievement. The present system leaves much to be desired in this regard. Tracking performance at the individual student level, rather than at the school level, has become almost standard practice in the literature on "education production functions," because it reduces the chance that unobserved past school experiences are responsible for the measure of student performance. Thus, as we mentioned above, it is important to recognize that our models of levels of test scores, because they do not measure improvement in achievement during the school year, should be regarded as tentative.

A comprehensive statewide evaluation system would include not only year-by-year test scores for individual students but also information on student grades and courses taken by year. Such a system would provide additional measures of student outcomes, as well as insights into variations in course-taking patterns among individual students that are not yet available. Texas provides an example of a state that has already developed a detailed student-level database that follows student progress over time. California would gain much by adopting a similar system. California's Department of Education has already taken a tentative step in this regard through its plans for the California School Information Services (CSIS), a trial system in which certain districts will provide their students' transcripts in electronic form.

We understand that the above recommendations would involve more data collection and storage, but we believe that such an effort would be an immense help in evaluating the various policies California is implementing. Indeed, the ability to better evaluate different programs and school characteristics would help policymakers determine which programs are most effective and would help the state achieve its goal of improving the education and achievement of all students.

Conclusions

In closing, we return to the motivating question behind this study: Can we characterize California's schools as having "equal resources and equal outcomes?" On both counts, the answer is a resounding "no." Inequalities still exist in resources among schools, despite legislation spurred by the *Serrano vs. Priest* decisions and the centralization of school finances that resulted as a by-product of Proposition 13. As for test scores, large inequalities exist among schools, even when we take account of variations in test scores that result from uneven concentrations of LEP students across schools.

Thus, a more accurate depiction of California's schools might be: Unequal resources, unequal outcomes. In particular, our regression analysis suggests that variations in teacher experience and certification have contributed to unequal outcomes in the STAR test. We find only weak evidence that class size or the percentage of teachers with at least a master's degree are related to student achievement.

Clearly, the causation implied by the statement "unequal resources, unequal outcomes" ignores a deeper truth. The socioeconomic status of students plays a dominant role in determining student achievement in California; variations in school resources explain only a minor part of these variations. This disparity implies that massive reallocation of resources favoring disadvantaged students would be required if the current system were to equalize student achievement across SES groups.

If we are to "get serious" about education reform and equalizing opportunity, merely continuing past attempts to equalize resources among schools will not suffice. Furthermore, even if policymakers wish to equalize teacher resources across schools, strong incentive policies, perhaps linked to teacher pay, will be needed to overcome existing tendencies for the most-experienced teachers to work in the least-disadvantaged schools.

The main question that remains unanswered must then surely be: How could districts spend money more effectively so as to improve the academic performance of disadvantaged students in the state? The answer may lie in combining future spending initiatives aimed at teacher training and retention, especially in impoverished areas, with the further development of the state's fledgling system of accountability. Stricter accountability, coupled with improvements in incentives for both students and teachers to exert themselves to the utmost, may provide exactly the leverage needed to boost the productivity of the state's education dollars.

The new accountability system may provide leverage for change in a quite separate way. Over time, the publicity surrounding the release of state rankings of schools, and the identification by the state of failing schools in voters' backyards, may sear existing inequalities in student achievement indelibly into the public's consciousness. As the public becomes increasingly aware of the large disparities in achievement among schools, one of two things will happen. Either support for the state's tough new accountability system will erode and the system may be dropped, or support will remain strong, and at the same time public backing will galvanize for the implementation of spending increases and other reforms necessary to raise student outcomes in those schools that lag furthest behind. It is quite likely that the health of the economy, and of state coffers, will play a role in determining which of these scenarios comes closer to predicting the future.

Obviously, considerable uncertainty surrounds the viability of targeted spending in schools in disadvantaged areas, combined with statewide standards. Indeed, researchers as of today have only limited evidence on the effectiveness of creating higher educational standards.[2] In spite of this uncertainty, if California voters remain deeply concerned about variations in student achievement, the only system that may meet their expectations is one that might be described as follows: more resources for disadvantaged schools, equal accountability standards for all schools, and then, only then, equal outcomes.

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[2]For a review of the effect of educational standards on student outcomes, see Betts (1998).

Appendix A

Data Sources and Distributions of School and Student Characteristics

Data Sources

CBEDS

The CBEDS is a data system maintained and supported by the Educational Demographics Unit in the California Department of Education. It contains individual-level credentialed-personnel data and summary-level student and program data at the school and district levels. These data are collected through three report forms each October: the Professional Assignment Information Form, the School Information Form, and the County/District Information Form.

Variables available at the individual level (PAIF) include gender, age, ethnicity, education level, experience, and types of credentials held for credentialed personnel in California's public schools. The PAIF also collects information on specific classes taught and student counts per section for each teacher. In 1997, this dataset included over 307,000 individual observations and over 100 variables.

The school-level data (SIF) contain variables of two general types: (1) staff and student counts and (2) program types. Staff and student counts include classified staff counts and student enrollment, including student counts in specific types of programs (such as college preparatory and vocational education programs), as well as graduate and dropout counts. These variables are enumerated by gender and ethnicity. Program types include variables such as technology, educational calendar, and alternative education. The SIF contains over 500 variables reported for each of the 8,179 public schools in California. In 1997, the school's attendance area (e.g., suburban, rural, or urban) was not included in the SIF. Our data for this variable come from the 1996 SIF and from the Common Core of Data (CCD), a national dataset that includes over 88,000 schools nationwide.

Data available at the district level (CDIF) include teacher shortage and demand and enrollment in special programs (such as adult education, vocational education, and gifted-student enrollment). The CDIF contains reports for each of the 1,052 public school districts in California.

Aid to Families with Dependent Children

This school-level dataset contains counts and percentages of California children in families receiving AFDC and children enrolled in free or reduced-price lunch programs. According to the CDE, these AFDC data are collected each October through the cooperative efforts of the schools, districts, county offices of education, and the county offices of health and welfare. Schools report their meal program enrollment data annually, based on their October meal program enrollment files. (Both sets of data are collected on the California Department of Education, Education Finance Division Form No. CFP-2 School Level AFDC Report.)

The Language Census

The language census is a school-level summary that collects four types of data elements for the current school year each March. First, it enumerates the number of limited English proficient and fluent English proficient (FEP) students in California public schools (K–12) by grade and primary language other than English. Second, it counts the number of LEP students enrolled in specific instructional settings or services by type of setting or service. Third, it summarizes the number of LEP students from the prior year who are redesignated to FEP during the current year. Fourth, it counts the number of bilingual staff providing instructional services to LEP students by primary language of instruction. Our analysis uses only the first of these elements to calculate an overall LEP percentage for each school.

STAR Test Results

The STAR file is maintained by the Standards, Curriculum, and Assessment Division of the California Department of Education. It contains results from the *Stanford Achievement Test* Series, Ninth Edition, Form T (Stanford 9), administered by Harcourt, Brace & Co. These results are reported at the school level in two ways for each subject area and grade level (grades 2–11 only): first, for all students tested in the group, and second, for LEP students tested. From these two measures, we also calculated non-LEP students' test scores.

There are six subject-test areas: (1) reading, (2) math, (3) language (written expression), (4) spelling, (5) science, and (6) history/social science. Students in grades 2 through 8 are required by SB 376[1] to take tests in the first four subject areas above. Students in grades 9 through 11 were required take tests in areas 1, 2, 3, 5, and 6 above. Our analysis focuses on the first two subject tests.

The following six statistics were reported at school, district, county, and state levels: total number valid in each subject and grade, mean-scaled score, percentage of normal curve equivalency, percentage scoring above the 75th percentile (based on national norms), percentage scoring at or above the 50th percentile, and percentage scoring above the 25th percentile. We focus principally on the total number valid and the percentage scoring above the 50th percentile (median) in our analysis.

Methodology for Pupil-Teacher Ratio, Average Class Size, and Weight Variable Calculations

Pupil-Teacher Ratios

Pupil-teacher ratios are calculated at the school level as the number of students divided by the number of FTE teachers, where full-time equivalency for a teacher was calculated by CDE as the percentage of a full-time job the teacher holds.

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[1]California Department of Education: http://goldmine.cde.ca.gov (3/24/99).

Average Class Sizes

Average class sizes for each teacher were calculated based on up to eight classes or sections taught per teacher as

$$\frac{\sum_{s=1}^{8} a_s b_s}{\sum_{s=1}^{8} a_s}$$

where

a = 1 or 0, coded for whether a teacher teaches that section or not,

b = the number of students in the section, and

s = an index of the eight sections.

These teacher-specific averages of class size are then aggregated to school averages or statewide averages by taking a weighted mean, where the weights for teachers are the proportions of a FTE for which each teacher worked.

For specific grades and subjects, the teacher-specific average class size was calculated by replacing the a_s variables in the above formula with one that equals 1 if the given section s corresponds to the subject area or the grade level being analyzed, and 0 otherwise. To aggregate the resulting measures of average class size for a given subject or grade level for each teacher to school-level or statewide averages, these teacher-specific measures are averaged using weights. In this case, the weight variable is the proportion of the teacher's time devoted to the given subject or grade level multiplied by the proportion of an FTE that the teacher worked overall. For example, if a teacher teaches two sections of science and two sections of math, and his or her FTE is 100 percent, with 25 percent of available time spent each day in one of the four classrooms, then the class size for each subject would be weighted using a weight calculated as (proportion of teacher's time) $\times$ (proportion of FTE) = (2 $\times$ 0.25) $\times$ (1) = 0.5. This formula gives smaller weight to part-time faculty members. For example, consider a second teacher, working 75 percent time, teaching two math courses and one science course, each taking up 33 percent of his or her time. The weight for math would be (2 $\times$ 0.33) $\times$ (0.75) = 0.5, whereas the weight for science would be 0.25. In effect, by weighting the teacher's subject-FTE in the specific subject or grade, we are calculating average class sizes weighted by the time that the teacher spends on the given subject or grade level.

School-Level Means and Distributions

School-Level Teacher-Characteristic Means

We take weighted means of overall teacher characteristics, such as the proportions for ethnicity, experience, education, and credentials, for each school. These means are weighted by the teacher's percentage FTE. When taking means for teacher characteristics such as education, experience, and specific subject authorizations, we weight the means by the teacher's FTE *in that subject*, as described in the section above.

Grade-Span Means

We then take the weighted means shown in Table A.1 for all student, class, and teacher characteristics across schools in each grade span. We weight student and class means by the school's total enrollment, whereas we weight teacher means by the school's number of FTE teachers in order to give us an accurate picture of California's teaching force.

Table A.1

Weighted Means of Selected Variables, by Grade Span, 1997–1998

Variable	Grade Span	No. of Schools	Mean
Enrollment	K–6	4,574	728.3
	6–8	1,016	1,122.0
	9–12	866	2,211.4
	Other	865	882.8
No. of FTE teachers	K–6	4,574	34.1
	6–8	1,016	46.4
	9–12	866	87.8
	Other	865	36.2
Pupil-teacher ratio	K–6	4,574	21.2
	6–8	1,016	23.8
	9–12	866	24.8
	Other	865	24.5
Students			
% female	K–6	4,574	48.8
	6–8	1,016	48.9
	9–12	866	49.3
	Other	865	49.5
% male	K–6	4,574	51.2
	6–8	1,016	51.1
	9–12	866	50.7
	Other	865	50.5
% nonwhite	K–6	4,574	63.7
	6–8	1,016	60.8
	9–12	866	58.2
	Other	865	54.9
% white	K–6	4,574	36.3
	6–8	1,016	39.2
	9–12	866	41.8
	Other	865	45.1
% Latino	K–6	4,574	43.7
	6–8	1,016	39.9
	9–12	866	36.1
	Other	865	35.5

Table A.1 (continued)

Variable	Grade Span	No. of Schools	Mean
% black	K–6	4,574	9.1
	6–8	1,016	8.7
	9–12	866	7.8
	Other	865	8.1
% Asian	K–6	4,574	7.4
	6–8	1,016	8.3
	9–12	866	9.9
	Other	865	6.8
% Filipino	K–6	4,574	2.2
	6–8	1,016	2.4
	9–12	866	2.9
	Other	865	2.2
% other ethnicity	K–6	4,574	1.3
	6–8	1,016	1.4
	9–12	866	1.5
	Other	865	2.2
% LEP	K–6	4,456	31.7
	6–8	983	21.7
	9–12	794	16.0
	Other	634	21.7
% AFDC	K–6	4,574	21.4
	6–8	1,016	17.2
	9–12	866	14.3
	Other	865	15.7
% lunch program	K–6	4,574	56.7
	6–8	1,016	47.8
	9–12	866	30.8
	Other	865	45.5
Classes			
Average class size			
Overall	K–6	4,574	24.8
	6–8	1,016	30.1
	9–12	866	30.4
	Other	865	26.3

Table A.1 (continued)

Variable	Grade Span	No. of Schools	Mean
Regular	K–6	4,572	25.1
	6–8	1,012	32.7
	9–12	841	32.3
	Other	790	27.4
Special education	K–6	4,014	17.0
	6–8	970	14.1
	9–12	771	14.9
	Other	494	16.7
By grade	K–6		
Kindergarten		4,316	25.0
Grade 1		4,286	19.2
Grade 2		4,280	19.5
Grade 3		4,284	23.4
Grade 4		4,126	29.6
Grade 5		3,985	29.7
Grade 6		1,927	30.0
By grade	Other		
Kindergarten		404	23.6
Grade 1		369	19.0
Grade 2		372	20.1
Grade 3		386	23.5
Grade 4		398	28.3
Grade 5		421	28.8
Grade 6		322	28.8
By subject	6–8		
English		990	29.8
Math		995	31.2
Science		992	33.1
Social science		988	31.6
By subject	9–12		
English		833	29.4
Math		830	31.4
Science		830	32.7
Social science		829	32.6

Table A.1 (continued)

Variable	Grade Span	No. of Schools	Mean
By subject	Other		
English		445	27.5
Math		425	30.3
Science		407	30.9
Social science		404	29.0
By "a–f" subjects	9–12		
English		801	30.0
Math		806	32.3
Science		803	32.7
Social science		807	33.4
By "a–f" subjects	Other		
English		83	26.7
Math		83	29.0
Science		81	28.7
Social science		78	29.8
By AP subjects	9–12		
English		573	27.1
Math		472	25.1
Science		462	24.1
Social science		586	28.0
By AP subjects	Other		
English		25	26.9
Math		17	23.7
Science		21	22.8
Social science		27	29.1
Offerings			
Total no. of classes	K–6	4,574	36.9
	6–8	1,016	243.8
	9–12	866	425.2
	Other	865	122.3
No. of regular classes	K–6	4,574	33.0
	6–8	1,016	207.4
	9–12	866	383.0
	Other	865	106.4

Table A.1 (continued)

Variable	Grade Span	No. of Schools	Mean
No. of special-education classes	K–6	4,574	2.8
	6–8	1,016	20.9
	9–12	866	28.1
	Other	865	7.4
No. of “a–f” classes[a]	9–12		
Overall		866	228.6
English		866	60.6
Math		866	41.7
Science		866	36.4
Social science		866	44.6
% “a–f” classes[a]	9–12		
Overall		866	53.3
English		833	74.9
Math		830	67.6
Science		830	74.8
Social science		829	80.2
No. of AP classes	9–12		
Overall		866	11.5
English		866	2.2
Math		866	1.5
Science		866	1.9
Social science		866	3.2
% AP classes	9–12		
Overall		866	2.7
English		833	2.9
Math		830	2.3
Science		830	3.9
Social science		829	5.7
Teachers			
Experience (years)			
Average	K–6	4,572	12.3
	6–8	1,016	13.7
	9–12	865	15.2
	Other	862	13.0

Table A.1 (continued)

Variable	Grade Span	No. of Schools	Mean
% 0–2	K–6	4,572	21.1
	6–8	1,016	14.1
	9–12	865	13.0
	Other	862	17.5
% 3–4	K–6	4,572	9.8
	6–8	1,016	10.6
	9–12	865	9.2
	Other	862	10.0
% 5–9	K–6	4,572	18.9
	6–8	1,016	20.4
	9–12	865	16.9
	Other	862	19.3
% 10+	K–6	4,572	50.2
	6–8	1,016	55.0
	9–12	865	60.9
	Other	862	53.3
Education			
% less than bachelor's	K–6	4,572	0.5
	6–8	1,016	0.4
	9–12	865	0.9
	Other	863	0.6
% bachelor's	K–6	4,572	20.5
	6–8	1,016	17.4
	9–12	865	14.4
	Other	863	15.4
% bachelor's +30 semester units	K–6	4,572	53.0
	6–8	1,016	49.3
	9–12	865	45.2
	Other	863	57.4
% master's	K–6	4,572	12.1
	6–8	1,016	14.4
	9–12	865	15.6
	Other	863	11.6

Table A.1 (continued)

Variable	Grade Span	No. of Schools	Mean
% master's +30 semester units	K–6	4,572	13.6
	6–8	1,016	17.6
	9–12	865	22.3
	Other	863	14.2
% Ph.D.	K–6	4,572	0.4
	6–8	1,016	0.9
	9–12	865	1.5
	Other	863	0.8
% at most bachelor's	K–6	4,572	20.9
	6–8	1,016	17.8
	9–12	865	15.3
	Other	863	15.9
% at least master's	K–6	4,572	26.1
	6–8	1,016	32.9
	9–12	865	39.4
	Other	863	26.6
Credentials			
% without full credential	K–6	4,562	11.9
	6–8	1,015	10.0
	9–12	863	8.3
	Other	857	9.6
% with emergency credential/ waiver *only*	K–6	4,562	10.6
	6–8	1,015	9.4
	9–12	863	7.8
	Other	857	8.9
% with emergency credential/ waiver (may also have another main credential)	K–6	4,562	12.6
	6–8	1,015	12.3
	9–12	863	10.3
	Other	857	11.0

Table A.1 (continued)

Variable	Grade Span	No. of Schools	Mean
% with intern credential	K–6	4,562	1.6
	6–8	1,015	0.8
	9–12	863	0.6
	Other	857	1.0
% without full credential *and* with 0–2 years experience	K–6	4,561	8.7
	6–8	1,015	6.0
	9–12	863	5.1
	Other	856	6.7
Ethnicity			
% nonwhite	K–6	4,572	25.6
	6–8	1,016	20.0
	9–12	865	20.0
	Other	863	20.1
% white	K–6	4,572	74.4
	6–8	1,016	80.0
	9–12	865	80.0
	Other	863	79.9
% Latino	K–6	4,572	14.3
	6–8	1,016	8.6
	9–12	865	10.0
	Other	863	9.9
% black	K–6	4,572	5.1
	6–8	1,016	6.3
	9–12	865	4.8
	Other	863	4.5
% Asian	K–6	4,572	4.4
	6–8	1,016	3.3
	9–12	865	3.4
	Other	863	3.8
% Filipino	K–6	4,572	1.0
	6–8	1,016	0.7
	9–12	865	0.7
	Other	863	0.7

Table A.1 (continued)

Variable	Grade Span	No. of Schools	Mean
% other ethnicity	K–6	4,572	0.8
	6–8	1,016	1.1
	9–12	865	1.2
	Other	863	1.2
Qualifications in core subjects, grade 9–12 schools			
Average			
English		832	14.4
Math		829	14.6
Science		829	13.7
Social science		828	16.4
% 0–2 years			
English		832	14.7
Math		829	13.9
Science		829	15.3
Social science		828	11.9
% 10+ years			
English		832	57.3
Math		829	57.3
Science		829	55.9
Social science		828	63.2
% at least master's			
English		832	38.4
Math		829	38.1
Science		829	39.0
Social science		828	41.2
% authorized			
English		833	83.7
Math		830	81.7
Science		830	85.4
Social science		829	81.5

Table A.1 (continued)

Variable	Grade Span	No. of Schools	Mean
Qualifications in AP subjects, grade 9–12 schools			
Average			
Overall		726	18.1
English		572	20.4
Math		471	18.3
Science		461	16.0
Social science		586	19.3
% 0–2 years			
Overall		726	4.3
English		572	1.7
Math		471	3.6
Science		461	4.6
Social science		586	4.8
% 10+ years			
Overall		726	73.8
English		572	82.0
Math		471	75.6
Science		461	66.4
Social science		586	74.2
% at least master's			
Overall		726	50.0
English		573	56.9
Math		472	50.3
Science		462	51.4
Social science		586	50.0
% authorized			
English		573	88.8
Math		472	91.6
Science		462	86.5
Social science		586	85.1

[a]The "other" grade span category is omitted from this section because many schools in this category have no "a–f" or AP classes. Thus, taking a mean across all schools would give a number that is not accurate for these variables.

Grade-Span Distribution

We calculate the weighted distributions presented in Table A.2 for student, class, and teacher characteristics in each grade span. We weight each variable's distribution by the school's enrollment to show how these characteristics are distributed across the grade span's student population.

Table A.3 shows median resource levels with and without the five largest districts in the state. Table A.4 shows the correlations among various measures of school resources within each grade span.

Table A.2

Weighted Distribution of Selected Variables: Percentiles, Interquartile Ratios, and Interquartile Ranges, by Grade Span, 1997–1998

Variable	Grade Span	No. of Schools	Distribution Percentile 10th	25th	50th	75th	90th	Ratio (p25/ p75)	Range (p75- p25)
Students									
% nonwhite	K–6	4,574	20.7	37.7	68.6	91.7	98.8	0.41	54.0
	6–8	1,016	21.7	35.8	63.4	84.6	97.6	0.42	48.8
	9–12	866	20.5	34.6	58.9	81.6	96.0	0.42	47.0
% white	K–6	4,574	1.2	8.3	31.4	62.3	79.3	0.13	54.0
	6–8	1,016	2.4	15.4	36.6	64.2	78.3	0.24	48.8
	9–12	866	4.0	18.4	41.1	65.4	79.5	0.28	47.0
% Latino	K–6	4,574	8.3	16.6	38.7	68.0	89.3	0.24	51.4
	6–8	1,016	8.2	17.1	35.5	58.6	83.9	0.29	41.5
	9–12	866	8.3	14.8	29.6	52.7	77.7	0.28	37.9
% black	K–6	4,574	0.5	1.5	4.2	11.2	24.3	0.14	9.7
	6–8	1,016	0.7	1.8	4.4	10.6	22.3	0.17	8.8
	9–12	866	0.6	1.4	3.9	9.6	19.7	0.15	8.1
% Asian	K–6	4,574	0.2	1.0	3.2	8.8	20.1	0.12	7.8
	6–8	1,016	0.5	1.6	4.3	10.2	22.3	0.16	8.6
	9–12	866	0.8	2.0	5.2	12.6	25.7	0.16	10.6
% Filipino	K–6	4,574	0.0	0.2	0.8	2.2	5.2	0.10	2.0
	6–8	1,016	0.1	0.4	1.1	2.6	5.3	0.15	2.2
	9–12	866	0.1	0.5	1.4	2.9	7.1	0.18	2.4
% other ethnicity	K–6	4,574	0.0	0.3	0.8	1.7	2.9	0.17	1.4
	6–8	1,016	0.1	0.5	1.0	1.8	2.9	0.26	1.3
	9–12	866	0.2	0.5	1.0	1.8	3.1	0.29	1.3
% LEP	K–6	4,456	3.2	9.3	26.2	50.4	71.6	0.19	41.0
	6–8	983	2.7	7.4	17.3	32.8	49.5	0.23	25.4
	9–12	794	2.5	5.6	12.7	23.2	35.6	0.24	17.6
% AFDC	K–6	4,574	2.4	7.9	17.9	31.6	45.0	0.25	23.7
	6–8	1,016	2.4	6.1	14.1	24.8	35.8	0.25	18.7
	9–12	866	2.1	4.7	11.1	19.7	30.5	0.24	15.1

Table A.2 (continued)

Variable	Grade Span	No. of Schools	Distribution Percentile 10th	25th	50th	75th	90th	Ratio (p25/ p75)	Range (p75- p25)
% lunch program	K–6	4,574	11.4	30.1	60.8	84.6	94.9	0.36	54.4
	6–8	1,016	11.3	25.1	47.9	70.1	85.4	0.36	45.0
	9–12	866	5.9	13.0	25.4	45.6	63.7	0.28	32.7
Classes									
Average class size									
Overall	K–6	4,574	20.0	21.6	23.3	26.1	31.6	0.83	4.5
	6–8	1,016	25.0	26.5	28.1	30.1	32.5	0.88	3.6
	9–12	866	25.2	27.1	28.9	30.6	32.8	0.89	3.5
Regular	K–6	4,572	21.0	22.4	23.8	25.9	30.2	0.86	3.6
	6–8	1,012	27.3	28.9	30.6	32.5	34.3	0.89	3.6
	9–12	841	27.3	29.0	30.8	32.3	34.0	0.90	3.3
Special education	K–6	4,014	6.0	10.3	15.5	21.4	28.7	0.48	11.1
	6–8	970	7.5	9.5	11.7	15.8	22.5	0.60	6.3
	9–12	771	7.6	9.3	11.6	15.5	24.7	0.60	6.1
By grade	K–6								
Kindergarten		4,316	18.4	19.8	26.0	29.7	31.4	0.67	9.9
Grade 1		4,286	17.8	18.7	19.4	19.8	20.0	0.94	1.2
Grade 2		4,280	17.8	18.7	19.3	19.9	20.2	0.94	1.2
Grade 3		4,284	18.3	19.3	20.0	28.7	30.7	0.67	9.4
Grade 4		4,126	25.8	28.0	29.8	31.4	33.0	0.89	3.4
Grade 5		3,985	26.0	28.0	30.0	31.7	33.0	0.88	3.7
Grade 6		1,927	26.0	28.5	30.3	32.0	33.5	0.89	3.5
By subject	6–8								
English		990	24.2	26.2	27.9	29.8	32.1	0.88	3.7
Math		995	25.8	27.5	29.2	31.2	33.1	0.88	3.7
Science		992	26.8	28.5	30.0	31.8	34.1	0.90	3.3
Social science		988	25.9	27.7	29.5	31.2	33.4	0.89	3.6
By subject	9–12								
English		833	24.0	25.6	27.4	29.9	32.3	0.86	4.3
Math		830	26.9	28.6	30.5	32.3	34.2	0.89	3.7
Science		830	26.9	28.4	30.3	32.3	34.6	0.88	3.8
Social science		829	27.4	29.2	30.9	32.9	35.0	0.89	3.7

Table A.2 (continued)

Variable	Grade Span	No. of Schools	Distribution Percentile 10th	25th	50th	75th	90th	Ratio (p25/ p75)	Range (p75- p25)
By "a–f" subjects	9–12								
English		801	24.9	26.4	28.3	31.1	33.6	0.85	4.7
Math		806	27.5	29.5	31.4	33.3	35.3	0.88	3.8
Science		803	26.7	28.8	30.6	32.5	34.5	0.89	3.6
Social science		807	28.4	30.0	31.7	33.5	35.4	0.89	3.5
By AP subjects	9–12								
English		573	18.0	22.5	26.3	30.0	34.1	0.75	7.5
Math		472	13.8	19.3	24.7	30.0	35.0	0.64	10.7
Science		462	13.0	19.0	24.0	28.4	32.3	0.67	9.4
Social science		586	19.0	24.0	27.7	31.2	34.3	0.77	7.2
Offerings									
Total no. of classes	K–6	4,574	22.0	27.0	35.0	43.0	54.0	0.63	16.0
	6–8	1,016	126.0	173.0	222.0	290.0	390.0	0.60	117.0
	9–12	866	218.0	318.0	409.0	519.0	641.0	0.61	201.0
No. of regular classes	K–6	4,574	19.0	24.0	31.0	39.0	49.0	0.62	15.0
	6–8	1,016	108.0	148.0	186.0	246.0	340.0	0.60	98.0
	9–12	866	196.0	282.0	369.0	464.0	597.0	0.61	182.0
No. of special-education classes	K–6	4,574	1.0	1.0	2.0	4.0	5.0	0.25	3.0
	6–8	1,016	4.0	8.0	18.0	30.0	40.0	0.27	22.0
	9–12	866	7.0	15.0	26.0	39.0	52.0	0.38	24.0
No. of "a–f" classes	9–12								
Overall		866	92.0	161.0	219.0	291.0	367.0	0.55	130.0
English		866	22.0	41.0	58.0	76.0	104.0	0.54	35.0
Math		866	17.0	28.0	40.0	53.0	69.0	0.53	25.0
Science		866	12.0	22.0	33.0	48.0	64.0	0.46	26.0
Social science		866	17.0	31.0	43.0	58.0	72.0	0.53	27.0
% "a–f" classes	9–12								
Overall		866	40.8	47.2	54.9	61.1	67.0	0.77	13.9
English		833	49.4	68.9	79.8	88.1	93.1	0.78	19.2
Math		830	47.1	58.0	68.8	79.3	88.9	0.73	21.3
Science		830	47.5	61.1	78.4	93.0	100.0	0.66	31.9
Social science		829	57.1	71.7	85.7	93.5	97.6	0.77	21.9

Table A.2 (continued)

Variable	Grade Span	No. of Schools	Distribution Percentile 10th	25th	50th	75th	90th	Ratio (p25/ p75)	Range (p75- p25)
No. of AP classes	9–12								
Overall		866	2.0	5.0	10.0	15.0	22.0	0.33	10.0
English		866	0.0	1.0	2.0	3.0	5.0	0.33	2.0
Math		866	0.0	0.0	1.0	2.0	4.0	0.00	2.0
Science		866	0.0	0.0	1.0	3.0	5.0	0.00	3.0
Social science		866	0.0	1.0	2.0	4.0	7.0	0.25	3.0
% AP classes	9–12								
Overall		866	0.6	1.4	2.2	3.4	4.8	0.40	2.0
English		833	0.0	1.0	2.2	3.8	5.9	0.27	2.7
Math		830	0.0	0.0	1.7	3.4	5.6	0.00	3.4
Science		830	0.0	0.0	2.7	5.7	9.6	0.00	5.7
Social science		829	0.0	2.0	4.7	8.0	11.5	0.26	6.0
Teachers									
Experience (years)									
Average	K–6	4,572	8.2	9.9	12.1	14.4	16.6	0.69	4.5
	6–8	1,016	9.9	11.5	13.6	15.8	17.6	0.73	4.2
	9–12	865	11.9	13.6	15.3	17.0	18.5	0.80	3.4
% 0–2	K–6	4,572	7.4	13.0	20.0	28.2	35.8	0.46	15.1
	6–8	1,016	5.0	8.2	12.8	18.9	24.2	0.43	10.7
	9–12	865	5.2	8.4	12.2	16.8	21.7	0.50	8.4
% 3–4	K–6	4,572	2.0	5.0	9.0	13.6	18.4	0.37	8.6
	6–8	1,016	2.8	6.5	10.4	14.4	18.4	0.45	7.8
	9–12	865	3.3	5.8	8.6	11.9	15.3	0.49	6.1
% 5–9	K–6	4,572	7.5	12.5	18.4	24.7	30.8	0.51	12.2
	6–8	1,016	9.7	14.5	20.0	25.8	31.1	0.56	11.3
	9–12	865	9.3	12.6	16.6	21.1	24.7	0.60	8.4
% 10+	K–6	4,572	30.3	39.3	50.0	60.6	70.8	0.65	21.3
	6–8	1,016	37.5	45.4	55.0	64.1	72.0	0.71	18.7
	9–12	865	46.7	53.4	61.5	68.6	75.0	0.78	15.2
Education									
% less than	K–6	4,572	0.0	0.0	0.0	0.0	1.4	—	0.0
bachelor's	6–8	1,016	0.0	0.0	0.0	0.0	1.5	—	0.0
	9–12	865	0.0	0.0	0.0	1.2	3.1	0.00	1.2

Table A.2 (continued)

Variable	Grade Span	No. of Schools	Distribution Percentile 10th	25th	50th	75th	90th	Ratio (p25/ p75)	Range (p75- p25)
% bachelor's	K–6	4,572	1.7	6.9	15.2	30.4	48.1	0.23	23.4
	6–8	1,016	2.1	5.6	12.1	26.2	42.5	0.21	20.6
	9–12	865	2.4	5.4	10.4	19.4	34.4	0.28	14.0
% bachelor's + 30 semester units	K–6	4,572	23.9	37.5	54.0	68.7	79.8	0.55	31.2
	6–8	1,016	22.4	34.5	48.8	63.6	74.2	0.54	29.2
	9–12	865	24.0	33.2	43.9	58.0	66.7	0.57	24.8
% master's	K–6	4,572	0.0	5.0	10.0	16.4	23.8	0.30	11.4
	6–8	1,016	2.6	7.3	12.4	18.5	28.0	0.40	11.1
	9–12	865	2.1	8.8	13.7	19.7	28.6	0.45	10.9
% master's + 30 semester units	K–6	4,572	0.0	5.9	11.4	19.2	28.1	0.31	13.3
	6–8	1,016	4.0	9.3	15.6	24.4	33.8	0.38	15.1
	9–12	865	5.7	12.7	20.3	30.9	40.9	0.41	18.2
% Ph.D.	K–6	4,572	0.0	0.0	0.0	0.0	2.2	__	0.0
	6–8	1,016	0.0	0.0	0.0	1.9	3.2	0.00	1.9
	9–12	865	0.0	0.0	1.1	2.3	3.8	0.00	2.3
% at most bachelor's	K–6	4,572	1.9	7.1	15.5	30.6	50.0	0.23	23.5
	6–8	1,016	2.1	5.6	12.2	26.7	43.7	0.21	21.0
	9–12	865	2.5	5.7	10.9	20.3	37.2	0.28	14.5
% at least master's	K–6	4,572	9.8	16.0	24.0	34.1	45.2	0.47	18.1
	6–8	1,016	16.1	23.3	31.6	40.9	52.3	0.57	17.7
	9–12	865	23.5	30.3	37.7	48.9	57.5	0.62	18.6
Credentials									
% without full credential	K–6	4,562	0.0	0.0	7.4	19.1	30.9	0.00	19.1
	6–8	1,015	0.0	1.8	6.5	15.7	24.7	0.11	14.0
	9–12	863	0.0	2.3	6.3	12.2	17.6	0.19	10.0
% with emergency credential/ waiver *only*	K–6	4,562	0.0	0.0	6.5	17.0	27.8	0.00	17.0
	6–8	1,015	0.0	1.7	5.9	14.4	22.8	0.12	12.7
	9–12	863	0.0	2.0	5.9	11.5	16.5	0.18	9.5

Table A.2 (continued)

Variable	Grade Span	No. of Schools	Distribution Percentile 10th	25th	50th	75th	90th	Ratio (p25/ p75)	Range (p75- p25)
% with emergency credential/ waiver (may also have another main credential)	K–6	4,562	0.0	2.6	8.9	19.7	30.7	0.13	17.1
	6–8	1,015	0.0	3.3	9.2	17.8	27.3	0.19	14.5
	9–12	863	1.2	3.9	8.6	14.6	19.2	0.27	10.7
% without full credential *and* with 0–2 years experience	K–6	4,561	0.0	0.0	5.4	14.3	22.5	0.00	14.3
	6–8	1,015	0.0	0.0	4.2	9.3	13.9	0.00	9.3
	9–12	863	0.0	1.3	3.9	7.3	10.7	0.17	6.0
Ethnicity									
% nonwhite	K–6	4,572	3.3	8.3	20.0	37.9	60.5	0.22	29.6
	6–8	1,016	3.9	8.3	16.1	28.5	42.3	0.29	20.2
	9–12	865	6.3	9.6	16.1	27.9	41.1	0.35	18.2
% white	K–6	4,572	39.5	62.1	80.0	91.7	96.7	0.68	29.6
	6–8	1,016	57.7	71.5	83.9	91.7	96.1	0.78	20.2
	9–12	865	58.9	72.1	83.9	90.4	93.7	0.80	18.2
% Latino	K–6	4,572	0.0	2.9	8.5	21.3	38.8	0.14	18.4
	6–8	1,016	0.0	3.1	6.8	12.3	18.9	0.25	9.2
	9–12	865	2.8	4.9	8.0	12.9	20.2	0.38	8.0
% black	K–6	4,572	0.0	0.0	0.0	5.4	12.8	0.00	5.4
	6–8	1,016	0.0	0.0	2.5	7.6	15.0	0.00	7.6
	9–12	865	0.0	0.0	2.0	5.4	10.4	0.00	5.4
% Asian	K–6	4,572	0.0	0.0	2.7	5.9	11.4	0.00	5.9
	6–8	1,016	0.0	0.0	2.4	4.9	8.5	0.00	4.9
	9–12	865	0.0	0.9	2.4	4.6	7.7	0.20	3.7
% Filipino	K–6	4,572	0.0	0.0	0.0	1.2	3.7	0.00	1.2
	6–8	1,016	0.0	0.0	0.0	0.0	2.7	—	0.0
	9–12	865	0.0	0.0	0.0	1.1	2.0	0.00	1.1
% other ethnicity	K–6	4,572	0.0	0.0	0.0	0.0	3.3	—	0.0
	6–8	1,016	0.0	0.0	0.0	1.9	3.3	0.00	1.9
	9–12	865	0.0	0.0	0.9	1.7	2.9	0.00	1.7

Table A.2 (continued)

Variable	Grade Span	No. of Schools	Distribution Percentile 10th	25th	50th	75th	90th	Ratio (p25/ p75)	Range (p75- p25)
Qualifications in core subjects, grade 9–12 schools									
Average years experience									
English		832	9.9	12.0	14.4	16.8	19.3	0.71	4.8
Math		829	9.5	12.0	14.4	17.0	19.5	0.71	5.0
Science		829	8.3	10.6	13.7	16.7	19.3	0.63	6.1
Social science		828	10.6	13.4	16.5	19.4	22.4	0.69	6.0
% 0–2 years									
English		832	0.0	6.7	12.8	21.1	29.6	0.32	14.4
Math		829	0.0	5.3	12.1	20.7	29.4	0.26	15.3
Science		829	0.0	2.9	13.5	23.7	33.3	0.12	20.7
Social science		828	0.0	2.3	10.0	17.9	26.3	0.13	15.6
% 10+ years									
English		832	36.6	46.7	57.8	68.5	77.4	0.68	21.8
Math		829	33.3	45.6	57.7	69.8	80.4	0.65	24.2
Science		829	28.5	41.0	56.3	69.7	82.8	0.59	28.7
Social science		828	38.6	50.6	64.0	76.9	88.8	0.66	26.4
% at least master's									
English		832	17.9	27.2	37.1	48.5	59.4	0.56	21.3
Math		829	14.3	25.0	37.1	51.2	64.7	0.49	26.2
Science		829	13.7	25.6	38.5	51.2	64.3	0.50	25.6
Social science		828	15.6	27.8	40.8	54.3	68.8	0.51	26.5
% authorized									
English		833	69.9	78.7	86.7	92.9	98.6	0.85	14.2
Math		830	63.2	75.0	85.4	92.3	98.8	0.81	17.3
Science		830	64.7	79.7	90.4	100.0	100.0	0.80	20.3
Social science		829	60.6	74.3	85.0	94.6	100.0	0.79	20.2
Qualifications in AP subjects, grade 9–12 schools									
Average years experience									
Overall		726	10.8	14.0	18.1	22.0	25.5	0.64	8.0
English		572	8.7	13.5	21.0	27.0	32.0	0.50	13.5
Math		471	6.0	11.0	18.5	26.0	30.0	0.42	15.0
Science		461	5.0	9.2	15.0	22.3	27.6	0.41	13.1
Social science		586	7.0	12.5	19.3	26.3	31.0	0.48	13.8

Table A.2 (continued)

Variable	Grade Span	No. of Schools	Distribution Percentile 10th	25th	50th	75th	90th	Ratio (p25/ p75)	Range (p75- p25)
% 0–2 years									
Overall		726	0.0	0.0	0.0	0.0	15.5	—	0.0
English		572	0.0	0.0	0.0	0.0	0.0	—	0.0
Math		471	0.0	0.0	0.0	0.0	0.0	—	0.0
Science		461	0.0	0.0	0.0	0.0	0.0	—	0.0
Social science		586	0.0	0.0	0.0	0.0	0.0	—	0.0
% 10+ years									
Overall		726	40.0	61.0	77.4	94.1	100.0	0.65	33.1
English		572	0.0	75.2	100.0	100.0	100.0	0.75	24.8
Math		471	0.0	50.0	100.0	100.0	100.0	0.50	50.0
Science		461	0.0	33.3	100.0	100.0	100.0	0.33	66.7
Social science		586	0.0	50.0	100.0	100.0	100.0	0.50	50.0
% at least master's									
Overall		726	12.5	30.4	50.0	71.4	88.2	0.43	41.1
English		573	0.0	0.0	66.7	100.0	100.0	0.00	100.0
Math		472	0.0	0.0	50.0	100.0	100.0	0.00	100.0
Science		462	0.0	0.0	50.0	100.0	100.0	0.00	100.0
Social science		586	0.0	0.0	50.0	100.0	100.0	0.00	100.0
% authorized									
English		573	45.9	100.0	100.0	100.0	100.0	1.00	0.0
Math		472	66.7	100.0	100.0	100.0	100.0	1.00	0.0
Science		462	48.1	100.0	100.0	100.0	100.0	1.00	0.0
Social science		586	42.9	83.3	100.0	100.0	100.0	0.83	16.7

Table A.3

Medians for Key Resources: All School Districts, and Without Five Largest Districts,[a] 1997–1998

	Grade Span K–6		Grade Span 6–8		Grade Span 9–12	
	All Districts	Without 5 Largest	All Districts	Without 5 Largest	All Districts	Without 5 Largest
Average class size	23.3	23.7	28.1	28.0	28.9	29.0
% "a-f" classes					54.9	54.7
% AP classes					2.2	2.2
Teachers						
Average years experience	12.1	12.2	13.6	13.7	15.3	15.5
% 0–2 years experience	20.0	19.9	12.8	12.6	12.2	12.4
% 10+ years experience	50.0	50.0	55.0	56.1	61.5	61.8
% at most bachelor's	15.5	12.7	12.2	10.2	10.9	9.8
% at least master's	24.0	25.0	31.6	32.9	37.7	39.6
% not fully certified	7.4	6.0	6.5	4.7	6.3	5.8

[a]Los Angeles Unified, San Diego Unified, San Francisco Unified, Long Beach Unified, and Fresno Unified.

Table A.4

Resource Measure Correlations, Fall 1997

	% Min. of Master's	Expe-rience	% Not Full Credential	Mean Class Size	% "a–f"	No. AP
Grade Span K–6						
% minimum of master's	1					
Average experience	0.20	1				
% not full credential	–0.12	–0.31	1			
Mean class size	–0.05	0.04	0.02	1		
Grade Span 6–8						
% minimum of master's	1					
Average experience	0.21	1				
% not full credential	–0.14	–0.24	1			
Mean class size	0.07	–0.06	–0.02	1		
Grade Span 9–12						
% minimum of master's	1					
Average experience	0.31	1				
% not full credential	–0.10	–0.20	1			
Mean class size	0.13	0.01	–0.03	1		
% "a–f" of total classes	0.21	0.04	–0.09	0.03	1	
No. of AP classes	0.16	0.12	–0.01	–0.05	0.30	1

Appendix B

Resource Distribution Across Student Socioeconomic Status: Methodology and Data

This appendix contains the methodology we used to create groups of schools according to the socioeconomic status of their students. It also includes data tables with 10th, 25th, 50th, 75th, and 90th percentiles of a variable's distribution by SES quintile and grade span, as well as the interquartile ratios and ranges for each variable, SES quintile, and grade span.

Students' SES quintiles are based on the percentage receiving lunch assistance, and minority student quintiles are based on the percentage nonwhite. We determined these ranges by analyzing the unweighted distribution of each variable within each grade span, so that each quintile contains an identical number of schools. Although we considered using a definition to group schools weighted by enrollment, we decided to create groups of schools that have equal numbers of schools rather than equal numbers of students because our unit of analysis is the school. We are already accounting for schools that may have different numbers of students receiving lunch assistance to some degree, because the quintiles are based on the percentage rather than number of students in the lunch program. When these groups of schools are instead created using weights for enrollment, the lunch program boundaries and numbers of students in each quintile change approximately 2–5 percent, whereas the numbers of schools in each quintile vary by as much as 30 percent.

After defining the unweighted quintile ranges, we weighted distributions of our key measures across these schools by enrollment. Our low-SES group (most-disadvantaged students) comprises schools with the highest percentage of students receiving free or reduced-price lunches, whereas our high-SES group (least-disadvantaged students) includes schools with the lowest percentage of students receiving free or reduced-price lunches. Our groups of schools based on percentage of minority students are ranked with the highest percentage nonwhite in the first quintile or group, whereas the lowest percentage nonwhite is in the fifth group.

Table B.1

10th, 25th, 50th, 75th, and 90th Percentiles, Interquartile Ratios, and Interquartile Ranges of Selected Variables, by Grade Span and Student SES Quintile, 1997–1998

Variable	Grade Span	SES Q	Percentile 10th	25th	50th	75th	90th	Ratio (p25/p75)	Range (p75-p25)
Students									
% nonwhite	K–6	1	79.1	90.2	96.8	99.4	99.9	0.91	9.2
		2	53.1	70.1	83.8	92.8	98.2	0.76	22.7
		3	32.4	46.8	62.5	77.2	87.2	0.61	30.4
		4	17.4	29.0	42.3	58.2	72.4	0.50	29.2
		5	11.4	17.2	24.5	36.7	53.8	0.47	19.5
% nonwhite	6–8	1	74.3	83.9	94.4	99.2	99.9	0.85	15.3
		2	50.7	65.6	77.7	86.4	95.7	0.76	20.7
		3	33.0	44.5	58.0	71.1	81.8	0.63	26.6
		4	19.6	27.9	39.9	55.7	74.3	0.50	27.9
		5	12.3	17.9	25.9	35.9	54.4	0.50	18.0
% nonwhite	9–12	1	65.9	78.8	92.5	98.2	99.8	0.80	19.5
		2	38.3	55.4	67.3	80.0	92.9	0.69	24.6
		3	25.3	40.5	56.3	75.3	85.4	0.54	34.8
		4	14.7	23.6	36.8	53.4	72.7	0.44	29.8
		5	15.1	20.1	28.0	47.3	68.0	0.42	27.2
% white	K–6	1	0.1	0.6	3.2	9.8	20.9	0.06	9.2
		2	1.8	7.2	16.2	29.9	46.9	0.24	22.7
		3	12.8	22.8	37.5	53.2	67.6	0.43	30.4
		4	27.6	41.8	57.7	71.0	82.6	0.59	29.2
		5	46.2	63.3	75.5	82.8	88.6	0.77	19.5
% white	6–8	1	0.1	0.8	5.6	16.1	25.7	0.05	15.3
		2	4.3	13.6	22.3	34.4	49.3	0.40	20.7
		3	18.2	28.9	42.0	55.5	67.0	0.52	26.6
		4	25.7	44.3	60.1	72.1	80.4	0.61	27.9
		5	45.6	64.1	74.1	82.1	87.7	0.78	18.0
% white	9–12	1	0.2	1.8	7.5	21.2	34.1	0.08	19.5
		2	7.1	20.0	32.7	44.6	61.7	0.45	24.6
		3	14.6	24.7	43.8	59.5	74.7	0.42	34.8
		4	27.3	46.6	63.2	76.4	85.3	0.61	29.8
		5	32.0	52.7	72.0	79.9	84.9	0.66	27.2

Table B.1 (continued)

Variable	Grade Span	SES Q	Percentile 10th	25th	50th	75th	90th	Ratio (p25/p75)	Range (p75–p25)
% Latino	K–6	1	38.7	57.8	80.1	92.4	97.6	0.63	34.6
		2	23.6	40.1	58.0	75.9	88.3	0.53	35.8
		3	14.1	24.9	38.8	53.2	67.2	0.47	28.3
		4	8.6	13.9	22.0	31.6	41.8	0.44	17.8
		5	3.4	6.1	10.1	14.7	21.2	0.42	8.6
% Latino	6–8	1	38.1	50.6	71.5	89.7	96.5	0.56	39.0
		2	18.1	36.3	51.6	64.8	78.3	0.56	28.4
		3	15.7	24.1	35.8	44.3	58.2	0.54	20.2
		4	9.1	14.8	21.6	29.2	40.3	0.51	14.3
		5	4.0	6.2	9.9	14.8	20.6	0.42	8.5
% Latino	9–12	1	23.8	39.8	61.8	85.5	96.3	0.47	45.7
		2	13.7	27.5	40.2	56.4	73.8	0.49	28.9
		3	10.7	18.7	30.7	45.6	64.0	0.41	26.9
		4	7.5	12.4	17.3	27.8	39.5	0.45	15.4
		5	4.0	6.7	10.3	15.6	29.4	0.43	9.0
% black	K–6	1	0.3	1.1	4.5	17.0	33.4	0.06	15.9
		2	0.7	2.2	6.0	16.4	28.5	0.13	14.2
		3	1.0	2.4	6.1	13.8	24.1	0.18	11.3
		4	0.7	2.0	4.6	8.9	16.2	0.22	7.0
		5	0.6	1.1	2.1	3.9	6.9	0.27	2.9
% black	6–8	1	0.4	1.4	5.1	16.5	30.1	0.09	15.1
		2	1.2	2.7	6.7	16.7	31.6	0.16	14.1
		3	1.2	3.0	6.6	13.0	19.6	0.23	10.0
		4	0.7	1.8	3.7	6.5	14.9	0.28	4.7
		5	0.7	1.3	2.2	4.1	6.7	0.31	2.8
% black	9–12	1	0.3	1.1	4.4	14.9	28.5	0.07	13.8
		2	1.1	3.1	6.6	15.7	22.3	0.20	12.6
		3	0.7	1.9	5.7	10.9	15.5	0.18	9.0
		4	0.6	1.2	3.2	6.0	14.0	0.20	4.7
		5	0.8	1.3	2.0	3.6	6.4	0.36	2.3
% Asian	K–6	1	0.0	0.2	1.2	5.5	18.6	0.03	5.3
		2	0.3	0.8	2.2	6.8	19.5	0.11	6.1
		3	0.6	1.4	3.0	7.5	15.8	0.18	6.2
		4	0.8	1.8	3.8	9.3	20.8	0.19	7.5
		5	1.8	3.7	6.8	12.7	28.2	0.29	9.0

Table B.1 (continued)

Variable	Grade Span	SES Q	Percentile 10th	25th	50th	75th	90th	Ratio (p25/p75)	Range (p75–p25)
% Asian	6–8	1	0.1	0.4	2.5	9.0	24.2	0.05	8.5
		2	0.4	1.3	3.2	8.8	20.0	0.15	7.5
		3	1.0	1.9	4.3	9.5	17.1	0.20	7.6
		4	0.9	2.1	4.9	10.1	19.3	0.20	8.1
		5	2.0	4.1	7.5	13.5	32.5	0.31	9.4
% Asian	9–12	1	0.2	0.9	5.1	15.0	30.1	0.06	14.1
		2	1.2	2.0	5.0	12.8	21.7	0.16	10.8
		3	1.0	2.0	4.3	11.0	22.6	0.18	9.1
		4	1.1	2.2	4.8	10.7	16.6	0.21	8.4
		5	1.9	4.4	8.0	17.3	37.4	0.25	12.9
% Filipino	K–6	1	0.0	0.0	0.2	0.9	2.5	0.00	0.9
		2	0.0	0.2	0.8	2.2	5.4	0.08	2.0
		3	0.1	0.4	1.1	2.7	6.4	0.16	2.3
		4	0.1	0.5	1.2	3.3	7.2	0.16	2.8
		5	0.2	0.5	1.1	2.3	5.2	0.19	1.9
% Filipino	6–8	1	0.0	0.1	0.5	1.6	3.8	0.07	1.5
		2	0.1	0.4	1.2	3.1	5.6	0.12	2.8
		3	0.2	0.6	1.6	3.2	5.1	0.19	2.6
		4	0.2	0.5	1.3	2.9	8.5	0.19	2.3
		5	0.2	0.7	1.2	2.4	5.2	0.28	1.7
% Filipino	9–12	1	0.0	0.2	0.7	2.1	5.4	0.12	1.8
		2	0.2	0.8	2.0	3.8	7.7	0.20	3.0
		3	0.2	0.6	1.5	2.5	8.5	0.23	1.9
		4	0.3	0.6	1.6	3.3	7.6	0.19	2.7
		5	0.3	0.6	1.4	2.4	4.6	0.26	1.7
% other ethnicity	K–6	1	0.0	0.1	0.4	1.0	2.3	0.09	0.9
		2	0.1	0.3	0.9	1.9	3.4	0.17	1.5
		3	0.2	0.6	1.2	2.2	3.6	0.27	1.6
		4	0.2	0.6	1.2	2.1	3.3	0.29	1.5
		5	0.0	0.3	0.8	1.4	2.3	0.23	1.1
% other ethnicity	6–8	1	0.0	0.2	0.5	1.3	2.3	0.14	1.1
		2	0.2	0.5	1.0	1.8	3.2	0.29	1.3
		3	0.4	0.7	1.2	1.9	3.3	0.35	1.3
		4	0.3	0.8	1.3	2.1	3.3	0.36	1.4
		5	0.2	0.4	0.9	1.6	2.3	0.28	1.1

Table B.1 (continued)

Variable	Grade Span	SES Q	Percentile 10th	25th	50th	75th	90th	Ratio (p25/p75)	Range (p75–p25)
% other ethnicity	9–12	1	0.1	0.2	0.5	1.2	2.1	0.19	0.9
		2	0.3	0.8	1.2	2.2	3.4	0.35	1.4
		3	0.5	0.7	1.3	2.0	3.2	0.36	1.3
		4	0.4	0.7	1.3	2.2	3.4	0.32	1.5
		5	0.2	0.4	0.9	1.6	2.5	0.26	1.2
% LEP	K–6	1	32.3	47.6	63.3	76.1	83.6	0.63	28.5
		2	14.2	26.5	39.8	51.8	69.6	0.51	25.3
		3	6.0	12.7	23.6	33.3	43.3	0.38	20.6
		4	2.4	5.6	11.9	19.5	27.5	0.29	13.8
		5	1.1	2.5	4.7	8.7	14.2	0.28	6.3
% LEP	6–8	1	21.0	31.3	43.0	53.1	62.6	0.59	21.8
		2	8.3	19.2	26.0	35.2	44.1	0.55	16.0
		3	4.9	8.6	14.9	22.0	26.2	0.39	13.4
		4	2.7	5.3	9.5	14.3	19.4	0.37	9.0
		5	0.8	1.7	3.6	7.6	12.2	0.22	6.0
% LEP	9–12	1	14.8	20.8	29.8	39.5	48.8	0.53	18.7
		2	4.3	9.9	15.7	24.4	29.5	0.41	14.4
		3	2.9	7.0	11.8	18.0	24.7	0.39	11.0
		4	0.9	3.6	6.5	10.6	18.6	0.34	7.0
		5	1.0	2.9	4.5	8.7	16.3	0.34	5.7
Classes									
Average class size									
Overall	K–6	1	19.8	21.4	23.1	25.7	31.0	0.83	4.3
		2	19.4	21.5	23.2	26.2	31.7	0.82	4.8
		3	19.9	21.7	23.5	25.9	30.2	0.84	4.2
		4	20.1	21.6	23.5	26.5	32.1	0.82	4.9
		5	20.7	21.9	23.5	26.2	33.7	0.84	4.3
	6–8	1	24.5	26.3	27.6	29.0	30.7	0.91	2.7
		2	24.4	26.3	28.0	30.1	32.8	0.87	3.8
		3	25.0	26.7	28.3	30.4	32.3	0.88	3.8
		4	25.3	26.7	28.1	30.2	33.3	0.89	3.5
		5	25.8	27.4	28.9	31.0	34.0	0.88	3.6

Table B.1 (continued)

Variable	Grade Span	SES Q	Percentile 10th	25th	50th	75th	90th	Ratio (p25/p75)	Range (p75–p25)
	9–12	1	25.2	27.2	28.6	29.9	31.3	0.91	2.8
		2	24.8	27.1	28.8	31.2	34.0	0.87	4.1
		3	24.7	26.9	28.9	30.6	32.4	0.88	3.7
		4	25.3	26.8	28.8	30.5	32.5	0.88	3.7
		5	26.2	27.6	29.4	31.2	32.9	0.88	3.6
By grade									
Kindergarten	K–6	1	19.2	21.3	27.6	29.9	31.4	0.71	8.5
		2	18.7	20.0	26.7	30.0	31.8	0.67	10.0
		3	18.0	19.7	25.9	29.8	31.6	0.66	10.1
		4	18.3	19.4	23.3	29.3	31.0	0.66	9.9
		5	17.8	19.3	24.0	29.0	31.0	0.67	9.7
Grade 1		1	18.0	18.7	19.4	19.8	20.0	0.94	1.1
		2	17.9	18.7	19.3	19.8	20.0	0.94	1.2
		3	17.7	18.7	19.4	19.9	20.0	0.94	1.2
		4	17.8	18.6	19.4	19.9	20.0	0.94	1.2
		5	17.8	18.6	19.3	20.0	20.0	0.93	1.4
Grade 2		1	17.8	18.6	19.3	19.8	20.2	0.94	1.2
		2	17.8	18.6	19.3	19.9	20.5	0.94	1.3
		3	17.6	18.6	19.3	19.9	20.3	0.94	1.3
		4	18.0	19.0	19.5	20.0	20.2	0.95	1.0
		5	17.9	18.7	19.3	19.9	20.0	0.94	1.2
Grade 3		1	18.5	19.4	23.4	28.6	30.5	0.68	9.2
		2	18.2	19.3	20.5	28.5	31.0	0.68	9.3
		3	18.3	19.3	20.1	29.0	31.0	0.66	9.8
		4	18.3	19.3	20.0	29.0	31.0	0.66	9.8
		5	18.3	19.2	20.0	26.5	30.3	0.72	7.3
Grade 4		1	25.7	27.5	29.3	31.0	32.6	0.89	3.5
		2	25.8	27.8	29.7	31.5	33.0	0.88	3.8
		3	25.5	28.0	30.0	31.3	33.0	0.89	3.3
		4	26.0	28.0	30.0	32.0	33.0	0.88	4.0
		5	25.8	28.0	30.0	31.7	33.0	0.88	3.7

Table B.1 (continued)

Variable	Grade Span	SES Q	Percentile 10th	25th	50th	75th	90th	Ratio (p25/p75)	Range (p75–p25)
Grade 5		1	26.3	27.8	29.5	31.1	33.0	0.89	3.3
		2	26.0	28.0	29.8	31.8	33.3	0.88	3.8
		3	26.0	28.3	30.0	31.8	33.0	0.89	3.5
		4	26.5	28.5	30.3	32.0	33.0	0.89	3.5
		5	26.0	28.3	30.3	32.0	33.3	0.89	3.7
Grade 6		1	25.5	28.0	30.0	32.0	33.3	0.88	4.0
		2	26.5	28.7	30.3	32.0	33.3	0.90	3.3
		3	26.0	28.3	30.3	32.0	33.3	0.89	3.7
		4	26.5	28.8	30.7	32.3	33.5	0.89	3.5
		5	25.7	28.5	30.3	32.0	33.8	0.89	3.5
By subject									
English	6–8	1	23.7	25.7	27.2	28.7	31.2	0.89	3.0
		2	23.8	26.2	27.7	30.2	32.2	0.87	4.0
		3	24.4	26.8	28.4	30.5	32.1	0.88	3.7
		4	24.1	25.9	27.9	29.6	32.1	0.87	3.7
		5	24.6	26.2	28.5	30.4	32.3	0.86	4.2
Math		1	25.8	27.1	28.6	30.2	31.6	0.90	3.1
		2	25.3	27.1	29.4	31.2	33.0	0.87	4.1
		3	26.1	27.9	29.6	31.9	33.3	0.87	4.1
		4	26.0	27.7	29.3	31.1	32.6	0.89	3.5
		5	25.8	27.2	29.2	31.4	35.0	0.87	4.2
Science		1	27.3	28.7	29.9	31.2	33.5	0.92	2.5
		2	26.6	28.0	30.0	31.7	34.2	0.88	3.7
		3	26.6	28.5	30.5	32.4	33.8	0.88	3.9
		4	26.8	28.5	29.9	31.9	34.4	0.89	3.4
		5	26.7	28.2	29.8	31.9	35.4	0.88	3.8
Social science		1	25.9	27.3	28.8	30.3	32.4	0.90	3.0
		2	25.6	27.3	29.1	31.1	32.9	0.88	3.8
		3	25.8	28.0	30.1	31.9	33.9	0.88	3.9
		4	26.2	28.0	29.8	31.1	32.9	0.90	3.1
		5	26.3	27.9	29.6	31.5	34.8	0.89	3.5

Table B.1 (continued)

Variable	Grade Span	SES Q	Percentile 10th	25th	50th	75th	90th	Ratio (p25/p75)	Range (p75–p25)
English	9–12	1	24.2	25.6	27.3	29.4	31.5	0.87	3.8
		2	24.0	25.9	28.5	30.8	33.4	0.84	4.9
		3	24.1	25.6	27.7	30.0	32.1	0.85	4.4
		4	23.8	25.3	26.7	28.8	32.1	0.88	3.5
		5	24.2	25.6	27.1	29.3	33.1	0.87	3.7
Math		1	27.4	29.0	30.4	32.0	33.3	0.90	3.1
		2	26.2	28.5	30.7	32.5	34.4	0.88	3.9
		3	26.7	28.7	30.9	32.5	34.4	0.88	3.8
		4	26.5	28.2	29.7	31.7	33.6	0.89	3.5
		5	27.4	29.1	30.7	32.3	34.4	0.90	3.1
Science		1	27.3	29.2	30.8	32.7	33.7	0.89	3.5
		2	26.0	28.6	30.2	32.2	34.7	0.89	3.6
		3	26.7	28.3	30.4	32.4	34.9	0.87	4.1
		4	27.1	28.1	29.6	31.3	33.7	0.90	3.2
		5	27.2	28.5	30.4	32.7	34.8	0.87	4.2
Social science		1	27.1	29.1	30.4	32.0	34.3	0.91	3.0
		2	26.9	29.6	31.5	33.3	35.1	0.89	3.7
		3	27.6	29.3	31.6	32.7	34.8	0.90	3.4
		4	27.9	29.2	30.4	32.4	35.8	0.90	3.2
		5	27.4	29.4	30.9	33.4	36.2	0.88	4.0
By “a–f” subject									
English	9–12	1	25.3	26.4	27.9	31.0	33.5	0.85	4.5
		2	25.2	26.8	29.7	32.0	34.4	0.84	5.2
		3	24.7	26.4	28.1	31.5	33.6	0.84	5.1
		4	24.2	26.0	27.9	30.1	33.0	0.86	4.1
		5	25.0	26.3	27.9	30.0	34.4	0.88	3.7
Math		1	27.8	30.0	31.6	32.9	35.3	0.91	2.9
		2	27.1	29.5	31.6	33.4	35.4	0.88	4.0
		3	27.1	29.1	31.5	33.4	35.2	0.87	4.3
		4	27.5	28.8	30.7	32.6	35.6	0.88	3.8
		5	28.0	30.1	32.0	33.5	34.9	0.90	3.5

Table B.1 (continued)

Variable	Grade Span	SES Q	Percentile 10th	25th	50th	75th	90th	Ratio (p25/p75)	Range (p75–p25)
Science		1	26.3	29.3	30.9	32.8	34.0	0.89	3.5
		2	25.9	28.6	30.2	32.3	34.8	0.89	3.7
		3	26.5	28.7	30.6	32.5	34.7	0.88	3.8
		4	26.6	28.2	30.0	31.9	33.9	0.88	3.7
		5	27.5	29.1	30.8	32.6	35.1	0.89	3.4
Social science		1	28.7	30.1	31.7	33.5	34.8	0.90	3.4
		2	28.4	30.6	32.3	33.6	35.7	0.91	3.1
		3	28.2	29.8	31.8	33.9	35.6	0.88	4.1
		4	28.1	29.7	31.3	32.8	36.0	0.90	3.1
		5	28.6	29.8	31.5	33.5	38.3	0.89	3.7
By AP subject									
English	9–12	1	16.5	20.0	25.0	29.5	32.6	0.68	9.5
		2	17.0	21.0	27.0	30.0	34.0	0.70	9.0
		3	18.0	22.3	26.0	30.0	35.0	0.74	7.8
		4	19.8	23.0	26.5	30.0	33.8	0.77	7.0
		5	20.3	24.2	28.3	31.0	35.0	0.78	6.8
Math		1	11.0	14.0	21.0	26.0	28.0	0.54	12.0
		2	13.0	18.0	22.5	30.8	34.0	0.58	12.8
		3	16.0	20.0	24.0	29.0	37.0	0.69	9.0
		4	17.0	21.0	26.0	31.3	34.7	0.67	10.3
		5	19.5	25.9	29.0	33.3	37.0	0.78	7.4
Science		1	10.0	16.5	21.0	27.0	29.0	0.61	10.5
		2	11.7	17.5	24.0	28.0	31.4	0.63	10.5
		3	15.0	20.0	24.0	28.0	33.3	0.71	8.0
		4	16.0	20.5	24.0	28.8	32.0	0.71	8.3
		5	18.3	23.0	27.0	31.0	36.4	0.74	8.0
Social science		1	18.0	21.5	26.0	29.0	32.5	0.74	7.5
		2	19.4	24.7	28.0	31.5	33.7	0.78	6.8
		3	20.0	23.2	27.4	31.0	34.3	0.75	7.8
		4	21.5	25.5	28.7	32.0	35.1	0.80	6.5
		5	22.5	25.4	29.0	31.7	35.1	0.80	6.3

Table B.1 (continued)

Variable	Grade Span	SES Q	Percentile 10th	25th	50th	75th	90th	Ratio (p25/p75)	Range (p75–p25)
Offerings									
% "a–f" classes									
Overall	9–12	1	29.4	44.9	51.8	57.2	60.8	0.79	12.3
		2	37.3	44.5	50.1	56.3	60.8	0.79	11.8
		3	43.1	47.1	53.7	59.0	64.4	0.80	11.9
		4	44.5	52.3	57.7	62.9	69.2	0.83	10.6
		5	50.0	58.1	63.2	70.2	74.6	0.83	12.1
English		1	32.6	60.0	73.3	83.0	87.0	0.72	23.0
		2	45.3	64.6	76.3	84.8	90.5	0.76	20.3
		3	56.8	69.3	78.6	87.7	91.4	0.79	18.3
		4	58.4	74.0	82.7	90.2	95.6	0.82	16.2
		5	71.4	80.2	87.5	92.7	97.2	0.87	12.4
Math		1	41.0	52.9	64.4	74.3	83.9	0.71	21.3
		2	45.8	52.4	62.2	70.8	81.4	0.74	18.5
		3	47.9	59.5	67.3	77.5	87.3	0.77	18.0
		4	54.1	64.3	74.2	82.4	89.3	0.78	18.1
		5	63.5	72.3	81.4	88.9	93.7	0.81	16.5
Science		1	36.8	55.9	81.3	96.9	100.0	0.58	41.0
		2	44.4	54.4	68.4	86.6	95.5	0.63	32.2
		3	47.5	57.1	75.7	89.2	100.0	0.64	32.0
		4	57.1	67.4	78.8	95.2	100.0	0.71	27.8
		5	63.6	75.0	86.0	95.0	100.0	0.79	20.0
Social science		1	45.5	66.7	77.2	88.9	93.9	0.75	22.2
		2	51.1	65.2	84.4	92.9	96.6	0.70	27.6
		3	57.8	71.7	83.9	92.9	97.9	0.77	21.1
		4	64.9	77.0	90.0	95.5	98.0	0.81	18.5
		5	75.0	84.1	92.0	96.2	100.0	0.87	12.1
% AP classes									
Overall	9–12	1	0.6	1.2	2.0	2.8	3.6	0.45	1.5
		2	0.4	1.1	2.1	3.0	4.1	0.38	1.9
		3	0.8	1.4	2.1	3.2	4.3	0.44	1.8
		4	0.7	1.2	2.7	4.1	5.6	0.30	2.9
		5	0.8	2.1	3.2	4.9	7.1	0.43	2.8

Table B.1 (continued)

Variable	Grade Span	SES Q	Percentile 10th	25th	50th	75th	90th	Ratio (p25/p75)	Range (p75–p25)
English		1	0.0	0.8	1.6	2.9	4.3	0.29	2.0
		2	0.0	1.0	2.0	3.5	6.0	0.28	2.5
		3	0.0	1.1	2.4	4.0	6.2	0.28	2.9
		4	0.0	1.1	2.7	4.3	6.9	0.27	3.2
		5	0.0	1.3	2.7	4.6	6.2	0.29	3.3
Math		1	0.0	0.0	1.6	2.5	3.6	0.00	2.5
		2	0.0	0.0	1.4	2.7	4.3	0.00	2.7
		3	0.0	0.0	1.7	3.3	5.4	0.00	3.3
		4	0.0	0.0	2.4	4.3	6.4	0.00	4.3
		5	0.0	1.4	3.0	5.3	7.9	0.26	3.9
Science		1	0.0	0.0	2.2	4.8	7.1	0.00	4.8
		2	0.0	0.0	2.0	4.1	7.8	0.00	4.1
		3	0.0	0.0	2.6	5.0	7.3	0.00	5.0
		4	0.0	0.0	2.9	7.1	10.5	0.00	7.1
		5	0.0	2.1	4.9	8.2	12.5	0.26	6.1
Social science		1	0.0	1.8	3.4	5.6	7.0	0.33	3.7
		2	0.0	1.7	4.7	7.8	10.4	0.22	6.1
		3	0.0	2.2	4.3	7.5	10.3	0.29	5.3
		4	0.0	1.9	5.4	10.0	14.3	0.19	8.1
		5	0.0	3.7	7.0	10.4	15.1	0.36	6.7
Teachers									
Experience (years)									
Average	K–6	1	7.49	9.04	10.82	12.81	14.81	0.71	3.8
		2	8.02	9.92	11.80	13.94	16.07	0.71	4.0
		3	8.61	10.27	12.48	14.74	16.56	0.70	4.5
		4	8.98	11.00	13.16	15.46	17.53	0.71	4.5
		5	8.78	10.59	12.94	15.34	17.39	0.69	4.7
	6–8	1	9.86	11.20	12.94	15.03	16.61	0.75	3.8
		2	9.43	10.89	13.19	15.07	16.73	0.72	4.2
		3	10.04	11.71	13.67	15.71	17.41	0.75	4.0
		4	10.23	11.73	14.21	16.37	18.33	0.72	4.6
		5	10.08	12.14	14.50	16.66	18.43	0.73	4.5

Table B.1 (continued)

Variable	Grade Span	SES Q	Percentile 10th	25th	50th	75th	90th	Ratio (p25/p75)	Range (p75–p25)
	9–12	1	11.72	13.01	14.67	16.26	18.49	0.80	3.3
		2	11.11	13.55	15.27	16.69	17.99	0.81	3.1
		3	12.11	13.46	15.07	16.95	18.14	0.79	3.5
		4	11.36	13.82	15.99	17.35	18.50	0.80	3.5
		5	12.45	14.27	16.24	17.96	19.69	0.79	3.7
% 0–2	K–6	1	11.1	17.1	23.8	31.3	40.4	0.55	14.2
		2	9.8	15.1	22.1	30.8	37.8	0.49	15.7
		3	7.4	12.8	19.5	26.8	34.6	0.48	14.0
		4	5.6	10.3	16.7	24.0	31.8	0.43	13.7
		5	5.7	10.3	17.2	23.8	30.0	0.43	13.6
	6–8	1	5.9	9.2	14.2	20.8	25.0	0.44	11.6
		2	6.3	9.7	16.0	21.2	29.8	0.46	11.5
		3	5.0	8.1	12.5	18.1	22.7	0.45	10.0
		4	4.2	7.1	11.3	17.2	22.7	0.41	10.2
		5	2.7	6.5	10.7	15.9	20.3	0.41	9.4
	9–12	1	6.3	8.8	11.8	16.7	22.3	0.53	7.9
		2	5.2	10.3	12.9	17.9	22.3	0.58	7.5
		3	5.6	9.1	12.5	16.7	20.3	0.54	7.6
		4	4.8	8.2	11.8	17.2	22.5	0.47	9.0
		5	5.3	7.1	10.2	16.4	21.2	0.43	9.2
% 10+	K–6	1	26.2	35.1	43.3	54.1	64.3	0.65	19.0
		2	28.9	37.5	47.6	58.3	67.6	0.64	20.8
		3	32.1	41.3	51.9	62.0	71.7	0.67	20.7
		4	35.6	44.1	55.2	65.6	75.0	0.67	21.5
		5	33.5	42.7	53.3	63.2	73.3	0.68	20.4
	6–8	1	37.5	43.6	52.4	61.5	68.0	0.71	17.9
		2	34.1	43.0	51.8	60.4	69.5	0.71	17.4
		3	39.5	47.1	56.7	64.3	72.1	0.73	17.2
		4	40.7	47.3	57.4	65.7	73.6	0.72	18.5
		5	40.5	49.7	58.9	68.8	77.7	0.72	19.0
	9–12	1	47.3	52.2	60.8	65.1	74.2	0.80	13.0
		2	43.8	51.8	60.5	67.5	73.5	0.77	15.7
		3	48.2	53.4	60.9	68.4	73.0	0.78	15.0
		4	43.2	54.6	62.4	70.3	75.9	0.78	15.6
		5	49.4	57.1	63.2	70.3	76.7	0.81	13.2

Table B.1 (continued)

Variable	Grade Span	SES Q	Percentile 10th	25th	50th	75th	90th	Ratio (p25/p75)	Range (p75–p25)
Education									
% at most bachelor's	K–6	1	6.0	15.6	32.6	48.6	57.9	0.32	32.9
		2	4.0	9.8	19.2	32.1	50.0	0.30	22.4
		3	2.6	7.0	13.6	24.7	40.0	0.28	17.7
		4	0.0	4.2	10.0	19.0	31.8	0.22	14.9
		5	0.0	4.1	8.8	15.6	27.9	0.26	11.5
	6–8	1	3.8	12.5	26.2	42.8	48.4	0.29	30.3
		2	3.7	8.6	17.4	35.4	49.9	0.24	26.8
		3	2.3	5.9	10.4	19.0	35.3	0.31	13.2
		4	0.0	3.4	8.0	14.9	31.3	0.23	11.5
		5	0.0	3.3	7.4	12.5	21.2	0.26	9.3
	9–12	1	5.1	8.9	20.1	37.2	42.5	0.24	28.3
		2	4.7	8.3	12.8	19.9	37.0	0.42	11.6
		3	2.9	6.0	10.0	18.0	31.2	0.33	12.0
		4	2.1	4.4	8.5	15.7	29.1	0.28	11.3
		5	1.9	3.5	6.6	14.6	24.1	0.24	11.1
% at least master's	K–6	1	9.3	15.1	21.7	29.7	39.0	0.51	14.7
		2	9.7	16.4	24.5	33.3	44.9	0.49	16.9
		3	9.4	15.5	24.1	35.3	47.1	0.44	19.8
		4	10.6	16.7	25.6	35.6	47.9	0.47	18.9
		5	11.3	17.3	27.0	37.5	48.8	0.46	20.2
	6–8	1	16.3	23.5	29.8	38.6	47.2	0.61	15.1
		2	15.6	22.5	30.0	39.5	52.0	0.57	17.1
		3	16.3	23.5	32.3	40.9	57.0	0.57	17.4
		4	17.6	24.2	33.3	41.8	52.7	0.58	17.6
		5	15.5	24.0	34.1	45.4	54.8	0.53	21.4
	9–12	1	20.3	30.5	35.8	48.3	54.4	0.63	17.8
		2	22.4	29.9	41.2	48.4	55.7	0.62	18.4
		3	26.0	30.8	37.3	46.9	57.3	0.66	16.1
		4	23.5	29.3	36.0	48.9	57.4	0.60	19.6
		5	23.7	31.9	43.2	53.5	61.5	0.60	21.5

Table B.1 (continued)

Variable	Grade Span	SES Q	Percentile 10th	25th	50th	75th	90th	Ratio (p25/p75)	Range (p75–p25)
Credentials									
% without full credential	K–6	1	2.3	9.1	21.7	31.1	40.6	0.29	22.0
		2	0.0	4.4	12.1	22.6	32.7	0.19	18.2
		3	0.0	0.0	6.3	14.7	22.5	0.00	14.7
		4	0.0	0.0	3.5	8.7	15.4	0.00	8.7
		5	0.0	0.0	2.0	5.7	11.5	0.00	5.7
	6–8	1	2.3	8.8	17.3	24.0	31.4	0.36	15.3
		2	0.0	2.9	9.0	18.1	27.1	0.16	15.2
		3	0.0	2.1	6.4	12.2	18.0	0.17	10.1
		4	0.0	0.0	3.1	7.9	13.9	0.00	7.9
		5	0.0	0.0	2.3	5.1	9.5	0.00	5.1
	9–12	1	1.7	5.5	11.7	17.4	21.9	0.31	12.0
		2	0.0	3.2	7.8	13.1	16.9	0.24	9.9
		3	0.0	2.1	5.9	11.1	15.9	0.19	9.0
		4	0.0	1.6	4.8	8.4	12.8	0.18	6.8
		5	0.0	0.7	3.6	7.1	11.5	0.09	6.4
Ethnicity									
% nonwhite	K–6	1	20.5	31.7	46.8	64.1	74.5	0.49	32.4
		2	7.7	16.7	28.2	41.7	59.3	0.40	25.0
		3	3.7	8.3	16.7	27.0	37.5	0.31	18.7
		4	0.0	5.1	10.9	19.2	29.3	0.27	14.1
		5	0.0	3.3	7.1	12.5	21.2	0.26	9.2
% nonwhite	6–8	1	14.2	22.2	32.9	45.3	58.9	0.49	23.1
		2	7.1	11.8	20.2	31.3	46.8	0.38	19.5
		3	4.5	8.3	14.2	21.6	30.2	0.38	13.3
		4	3.3	6.1	12.1	18.1	26.5	0.34	12.0
		5	2.2	4.2	7.2	10.9	17.9	0.38	6.7
% nonwhite	9–12	1	14.3	21.1	31.9	46.9	55.8	0.45	25.8
		2	8.6	13.0	19.2	28.9	36.3	0.45	15.8
		3	5.9	9.0	15.6	23.6	31.0	0.38	14.5
		4	5.3	7.9	11.9	18.0	29.4	0.44	10.1
		5	5.1	6.9	9.9	14.2	20.0	0.49	7.3

Table B.2

Ranges for Percentage Nonwhite, by Minority Student Quintile, 1997–1998

Grade Span	Q 1	Q 2	Q 3	Q 4	Q 5
K–6	91.4–100	72.8–91.3	49.6–72.7	27.1–49.5	0–27.0
6–8	85.4–100	68.0–85.3	47.1–67.9	26.3–47.0	0–26.2
9–12	82.3–100	60.9–82.2	40.4–60.8	22.3–40.3	0–22.2

Percentiles, Interquartile Ratios, and Interquartile Ranges of Selected Variables, by Grade Span and Nonwhite Student Quintile

	Grade	Non-	Percentile					Ratio	Range
Variable	Span	white Q	10th	25th	50th	75th	90th	(p25/p75)	(p75-p25)
Students									
% nonwhite	K–6	1	93.4	95.3	98.0	99.6	99.9	0.96	4.2
		2	75.2	78.5	83.1	87.6	90.0	0.90	9.0
		3	52.0	56.1	61.7	67.6	70.8	0.83	11.5
		4	29.0	32.1	37.6	43.3	47.2	0.74	11.2
		5	9.6	13.4	18.3	22.5	25.2	0.59	9.1
% nonwhite	6–8	1	88.0	91.6	96.3	99.3	99.9	0.92	7.7
		2	69.8	73.4	78.0	81.8	83.8	0.90	8.3
		3	49.7	52.5	57.5	63.0	65.9	0.83	10.5
		4	28.3	31.7	35.7	40.7	44.7	0.78	9.1
		5	10.2	14.3	18.9	22.9	25.1	0.62	8.6
% nonwhite	9–12	1	84.6	88.1	94.2	98.2	99.8	0.90	10.1
		2	63.0	66.5	72.5	77.3	80.0	0.86	10.8
		3	42.2	46.0	49.8	55.4	58.9	0.83	9.5
		4	23.9	26.6	31.0	35.4	38.6	0.75	8.8
		5	9.1	12.8	16.7	20.3	21.7	0.63	7.5
% white	K–6	1	0.1	0.4	2.0	4.7	6.6	0.09	4.2
		2	10.0	12.4	16.9	21.5	24.8	0.58	9.0
		3	29.2	32.4	38.3	43.9	48.0	0.74	11.5
		4	52.8	56.7	62.4	67.9	71.0	0.84	11.2
		5	74.8	77.5	81.7	86.6	90.4	0.89	9.1
% white	6–8	1	0.1	0.7	3.7	8.4	12.0	0.08	7.7
		2	16.3	18.2	22.0	26.6	30.2	0.69	8.3
		3	34.1	37.0	42.5	47.5	50.3	0.78	10.5
		4	55.3	59.3	64.3	68.3	71.7	0.87	9.1
		5	74.9	77.1	81.1	85.7	89.8	0.90	8.6

Table B.2 (continued)

Variable	Grade Span	Non-white Q	Percentile 10th	25th	50th	75th	90th	Ratio (p25/p75)	Range (p75-p25)
% white	9–12	1	0.2	1.8	5.8	11.9	15.4	0.15	10.1
		2	20.0	22.7	27.5	33.5	37.0	0.68	10.8
		3	41.1	44.6	50.2	54.0	57.8	0.82	9.5
		4	61.4	64.6	69.0	73.4	76.1	0.88	8.8
		5	78.3	79.7	83.3	87.2	90.9	0.91	7.5
% Latino	K–6	1	38.0	61.8	84.3	93.8	98.1	0.66	31.9
		2	21.3	41.3	61.1	73.0	80.2	0.57	31.8
		3	15.2	26.5	39.6	50.0	57.2	0.53	23.5
		4	9.0	14.6	21.6	29.3	35.7	0.50	14.7
		5	3.2	5.3	8.6	12.3	16.2	0.43	7.0
% Latino	6–8	1	37.2	52.2	78.3	90.2	97.3	0.58	38.0
		2	17.3	35.7	53.7	64.4	71.3	0.55	28.7
		3	18.1	24.9	36.3	43.2	51.1	0.58	18.3
		4	9.2	14.5	20.8	27.7	33.6	0.52	13.2
		5	3.8	5.4	8.6	12.9	17.1	0.42	7.5
% Latino	9–12	1	21.0	41.3	68.5	86.2	96.3	0.48	44.9
		2	16.0	30.5	44.6	57.8	65.2	0.53	27.2
		3	11.6	20.9	29.2	37.8	42.3	0.55	16.9
		4	7.6	11.7	16.5	23.2	27.2	0.50	11.6
		5	3.6	5.4	8.3	11.8	15.3	0.46	6.3
% black	K–6	1	0.2	1.0	3.7	19.0	42.6	0.05	18.0
		2	1.2	3.3	7.3	16.2	27.5	0.20	12.9
		3	1.3	3.2	7.1	15.3	23.5	0.21	12.0
		4	1.0	2.1	3.9	7.6	12.6	0.27	5.5
		5	0.3	0.7	1.5	2.5	4.3	0.29	1.8
% black	6–8	1	0.4	1.4	5.0	20.6	38.5	0.07	19.1
		2	2.1	4.0	7.6	16.6	27.7	0.24	12.6
		3	1.6	3.8	7.1	13.0	19.1	0.29	9.2
		4	1.0	2.0	3.6	6.0	9.4	0.34	4.0
		5	0.5	0.8	1.4	2.4	3.8	0.34	1.6
% black	9–12	1	0.3	1.3	5.1	17.9	36.4	0.07	16.6
		2	1.1	4.0	7.8	13.9	23.1	0.29	9.9
		3	1.2	2.1	5.1	10.2	15.5	0.21	8.1
		4	0.8	1.6	2.7	4.4	7.3	0.36	2.8
		5	0.3	0.6	1.1	1.7	2.5	0.34	1.1

Table B.2 (continued)

Variable	Grade Span	Non-white Q	Percentile 10th	25th	50th	75th	90th	Ratio (p25/p75)	Range (p75–p25)
% Asian	K–6	1	0.0	0.1	1.0	5.4	19.1	0.03	5.3
		2	0.5	1.3	3.7	12.8	30.8	0.10	11.5
		3	0.8	1.8	4.4	12.0	24.6	0.15	10.2
		4	0.9	1.9	4.3	9.2	16.8	0.21	7.2
		5	0.5	1.3	3.2	6.3	9.6	0.21	4.9
% Asian	6–8	1	0.1	0.3	2.3	8.8	24.2	0.03	8.5
		2	1.0	2.4	5.6	15.9	34.0	0.15	13.5
		3	1.3	2.6	5.9	13.7	22.3	0.19	11.1
		4	1.3	2.2	5.0	9.1	16.3	0.24	7.0
		5	0.5	1.3	3.5	6.6	9.2	0.19	5.4
% Asian	9–12	1	0.3	0.8	5.2	18.0	35.2	0.05	17.2
		2	1.4	3.0	7.5	17.3	33.2	0.17	14.3
		3	1.7	3.2	6.5	14.1	27.4	0.23	10.9
		4	1.4	2.2	5.2	9.9	14.6	0.22	7.7
		5	0.7	1.1	2.2	4.9	7.9	0.22	3.8
% Filipino	K–6	1	0.0	0.0	0.3	1.2	4.8	0.00	1.2
		2	0.0	0.4	1.2	3.3	9.9	0.12	2.9
		3	0.2	0.5	1.2	3.1	6.6	0.16	2.6
		4	0.1	0.5	1.1	2.4	4.4	0.19	1.9
		5	0.0	0.2	0.5	1.1	1.9	0.16	0.9
% Filipino	6–8	1	0.0	0.1	0.5	2.3	6.8	0.05	2.2
		2	0.3	0.8	1.8	4.0	8.3	0.20	3.2
		3	0.3	0.7	1.7	3.1	7.1	0.24	2.4
		4	0.2	0.6	1.2	2.1	3.7	0.29	1.5
		5	0.0	0.3	0.6	1.2	2.1	0.24	0.9
% Filipino	9–12	1	0.0	0.2	1.4	4.4	11.7	0.06	4.1
		2	0.3	0.8	1.8	4.0	9.2	0.19	3.2
		3	0.4	0.9	1.7	3.3	6.6	0.28	2.4
		4	0.2	0.6	1.3	2.0	3.2	0.31	1.4
		5	0.0	0.3	0.5	0.9	1.8	0.28	0.7
% other ethnicity	K–6	1	0.0	0.1	0.3	0.8	1.8	0.09	0.7
		2	0.2	0.4	1.0	1.9	3.2	0.23	1.5
		3	0.2	0.6	1.2	2.1	3.3	0.27	1.5
		4	0.2	0.5	1.1	2.1	3.0	0.27	1.5
		5	0.1	0.4	0.9	1.7	3.1	0.22	1.3

Table B.2 (continued)

Variable	Grade Span	Non-white Q	Percentile 10th	25th	50th	75th	90th	Ratio (p25/p75)	Range (p75–p25)
% other ethnicity	6–8	1	0.0	0.1	0.5	1.2	2.3	0.12	1.1
		2	0.2	0.5	1.0	1.8	2.8	0.28	1.3
		3	0.3	0.7	1.2	2.1	3.1	0.34	1.4
		4	0.4	0.7	1.3	1.9	3.0	0.35	1.3
		5	0.2	0.5	1.1	1.9	3.2	0.27	1.4
% other ethnicity	9–12	1	0.1	0.2	0.5	1.3	2.5	0.17	1.1
		2	0.3	0.6	1.1	1.7	3.0	0.38	1.1
		3	0.3	0.6	1.1	1.9	3.3	0.30	1.3
		4	0.4	0.8	1.3	2.1	3.2	0.38	1.3
		5	0.3	0.7	1.3	2.3	4.5	0.31	1.6
% LEP	K–6	1	35.4	49.7	64.7	76.8	83.8	0.65	27.1
		2	18.7	28.0	37.6	50.1	60.6	0.56	22.2
		3	7.9	13.8	22.6	32.2	41.9	0.43	18.4
		4	3.1	5.4	10.1	16.9	24.4	0.32	11.5
		5	0.8	1.6	3.2	5.9	10.1	0.27	4.3
% LEP	6–8	1	19.3	31.3	42.3	54.0	64.9	0.58	22.6
		2	12.3	18.5	24.8	33.8	43.2	0.55	15.3
		3	5.7	8.5	14.5	21.9	29.0	0.39	13.4
		4	2.4	4.9	8.2	12.6	19.1	0.39	7.7
		5	0.6	1.4	2.7	4.9	7.8	0.28	3.5
% LEP	9–12	1	13.8	18.6	28.7	38.6	48.8	0.48	20.0
		2	7.4	11.6	17.1	24.8	30.8	0.47	13.2
		3	3.7	6.4	11.2	15.7	21.0	0.41	9.3
		4	1.6	3.2	5.6	8.6	12.0	0.38	5.3
		5	0.4	0.8	2.4	4.0	6.4	0.20	3.2
Classes									
Average class size									
Overall	K–6	1	19.6	21.4	23.0	25.4	30.4	0.84	4.1
		2	20.0	21.7	23.6	26.5	31.7	0.82	4.8
		3	19.7	21.6	23.7	26.7	32.4	0.81	5.1
		4	20.5	21.9	23.4	26.1	32.3	0.84	4.2
		5	20.3	21.7	23.2	25.6	31.2	0.85	3.9

Table B.2 (continued)

Variable	Grade Span	Non-white Q	Percentile 10th	25th	50th	75th	90th	Ratio (p25/p75)	Range (p75–p25)
	6–8	1	24.5	26.3	27.7	29.1	30.7	0.90	2.9
		2	24.7	26.5	28.2	30.1	32.1	0.88	3.5
		3	24.9	26.6	28.4	30.9	32.8	0.86	4.2
		4	25.6	26.9	27.9	30.2	33.1	0.89	3.4
		5	24.8	26.3	28.5	30.6	36.1	0.86	4.2
	9–12	1	24.7	26.7	28.6	30.4	32.9	0.88	3.7
		2	25.8	27.2	28.8	30.6	32.6	0.89	3.4
		3	25.7	27.5	29.2	30.6	33.1	0.90	3.2
		4	25.0	27.1	28.9	30.9	32.6	0.88	3.8
		5	24.2	26.2	28.6	30.2	32.5	0.87	4.0
By grade	K–6								
Kindergarten		1	19.4	22.1	27.6	29.9	31.5	0.74	7.7
		2	18.7	20.0	27.0	30.3	31.7	0.66	10.3
		3	18.0	19.7	25.3	29.8	31.6	0.66	10.1
		4	18.3	19.6	25.0	29.7	31.3	0.66	10.1
		5	17.5	19.0	20.0	28.0	30.4	0.68	9.0
Grade 1		1	18.0	18.7	19.3	19.8	20.0	0.95	1.1
		2	18.0	18.7	19.4	19.9	20.0	0.94	1.2
		3	17.6	18.6	19.5	19.9	20.0	0.94	1.3
		4	17.8	18.7	19.4	20.0	20.0	0.93	1.3
		5	17.6	18.5	19.3	19.8	20.0	0.93	1.3
Grade 2		1	17.9	18.6	19.3	19.8	20.4	0.94	1.2
		2	17.8	18.7	19.4	19.9	20.3	0.94	1.2
		3	17.5	18.6	19.4	20.0	20.3	0.93	1.4
		4	18.0	18.8	19.4	20.0	20.0	0.94	1.3
		5	17.8	18.7	19.3	19.9	20.0	0.94	1.2
Grade 3		1	18.5	19.5	23.0	28.7	30.0	0.68	9.2
		2	18.5	19.3	21.7	29.0	31.0	0.67	9.7
		3	18.2	19.2	20.5	29.3	31.0	0.66	10.1
		4	18.3	19.3	20.0	29.0	31.0	0.67	9.7
		5	18.0	19.0	19.8	20.8	29.5	0.91	1.8

Table B.2 (continued)

Variable	Grade Span	Non-white Q	Percentile 10th	25th	50th	75th	90th	Ratio (p25/p75)	Range (p75–p25)
Grade 4		1	25.6	27.5	29.2	31.0	32.7	0.89	3.5
		2	26.0	28.3	30.0	31.5	33.0	0.90	3.2
		3	26.0	28.0	30.0	31.5	33.3	0.89	3.5
		4	26.0	28.0	30.0	31.7	33.0	0.88	3.7
		5	25.3	27.3	29.5	31.3	33.0	0.87	3.9
Grade 5		1	26.3	27.8	29.5	31.2	33.0	0.89	3.3
		2	26.3	28.3	30.3	32.0	33.0	0.89	3.7
		3	26.3	28.4	30.0	32.0	33.0	0.89	3.6
		4	26.0	28.3	30.3	32.0	33.3	0.89	3.7
		5	25.7	27.8	29.7	31.3	33.0	0.89	3.6
Grade 6		1	26.0	28.1	30.3	32.0	33.0	0.88	3.9
		2	26.8	29.0	30.5	32.5	33.8	0.89	3.5
		3	26.0	28.3	30.3	32.0	33.3	0.89	3.7
		4	26.0	28.7	30.5	32.0	33.4	0.90	3.3
		5	25.5	27.7	30.0	32.0	33.8	0.86	4.3
By subject	6–8								
English		1	24.1	25.7	27.1	28.7	30.6	0.90	3.0
		2	24.0	26.5	28.4	30.2	32.0	0.88	3.8
		3	24.6	26.3	28.1	30.6	32.4	0.86	4.2
		4	24.1	26.2	28.0	29.8	32.1	0.88	3.6
		5	24.2	26.2	28.3	30.2	32.4	0.87	4.0
Math		1	25.3	27.1	28.6	30.5	31.4	0.89	3.4
		2	26.6	28.0	29.3	31.1	32.8	0.90	3.1
		3	26.2	28.1	30.0	31.9	33.7	0.88	3.8
		4	26.0	27.5	29.3	31.1	32.6	0.88	3.7
		5	25.1	26.6	28.9	31.2	35.1	0.86	4.5
Science		1	27.0	28.5	29.8	31.0	32.5	0.92	2.5
		2	26.8	29.0	30.5	31.9	33.8	0.91	3.0
		3	26.8	28.6	30.6	32.8	34.9	0.87	4.2
		4	27.0	28.4	29.9	31.7	33.3	0.89	3.3
		5	26.2	27.8	29.5	32.0	36.3	0.87	4.2

Table B.2 (continued)

Variable	Grade Span	Non-white Q	Percentile 10th	25th	50th	75th	90th	Ratio (p25/p75)	Range (p75–p25)
Social science		1	26.1	27.3	28.8	30.5	32.2	0.90	3.2
		2	25.9	27.5	29.5	31.1	32.5	0.88	3.6
		3	25.8	27.9	29.9	31.9	34.1	0.88	4.0
		4	26.2	28.0	30.0	31.6	33.3	0.89	3.6
		5	25.6	27.6	29.5	31.4	34.8	0.88	3.8
	9–12								
English		1	24.1	25.6	27.0	29.3	32.1	0.87	3.7
		2	24.5	26.2	28.0	30.8	32.4	0.85	4.6
		3	24.6	25.9	27.8	30.3	32.3	0.85	4.5
		4	23.4	25.1	27.3	29.3	32.2	0.86	4.2
		5	22.5	24.6	26.7	28.6	33.8	0.86	4.0
Math		1	27.4	28.6	30.4	31.9	33.7	0.90	3.2
		2	27.1	29.4	30.9	32.5	34.2	0.90	3.1
		3	27.3	28.9	30.7	32.5	34.3	0.89	3.6
		4	26.5	28.5	30.0	32.0	34.1	0.89	3.5
		5	24.1	27.7	29.5	31.7	34.1	0.87	4.0
Science		1	27.1	29.0	30.9	32.8	34.4	0.88	3.9
		2	27.3	28.9	30.8	32.3	34.8	0.89	3.5
		3	27.4	28.9	30.4	32.4	34.2	0.89	3.6
		4	26.3	28.3	29.7	31.2	33.8	0.91	3.0
		5	24.6	27.8	29.2	31.3	36.2	0.89	3.5
Social science		1	26.7	29.2	30.7	32.5	34.0	0.90	3.3
		2	27.6	29.4	31.2	32.9	34.8	0.89	3.5
		3	27.7	29.6	31.3	32.9	36.1	0.90	3.3
		4	27.7	29.1	30.6	33.2	35.1	0.88	4.1
		5	26.5	28.9	30.4	33.6	37.6	0.86	4.7
By “a–f” subject	9–12								
English		1	25.3	26.5	27.8	30.5	33.3	0.87	4.0
		2	25.8	27.0	29.0	32.0	33.9	0.84	5.0
		3	25.0	26.3	29.1	31.5	33.9	0.84	5.2
		4	24.2	26.1	28.4	30.4	33.3	0.86	4.3
		5	23.5	25.2	27.3	29.5	34.6	0.85	4.3

Table B.2 (continued)

Variable	Grade Span	Non-white Q	Percentile 10th	25th	50th	75th	90th	Ratio (p25/p75)	Range (p75–p25)
Math		1	27.8	29.8	31.4	33.1	34.2	0.90	3.3
		2	27.1	29.2	31.9	33.2	35.2	0.88	4.0
		3	28.1	29.6	31.1	33.5	35.8	0.88	3.9
		4	27.3	29.4	31.3	33.1	35.4	0.89	3.7
		5	25.8	28.8	30.4	33.0	36.2	0.87	4.2
Science		1	26.7	29.0	30.8	32.6	34.4	0.89	3.6
		2	26.7	28.7	30.9	32.6	34.7	0.88	3.9
		3	27.6	29.4	30.7	32.7	34.7	0.90	3.3
		4	26.2	28.5	30.2	31.7	33.7	0.90	3.1
		5	24.8	27.8	29.6	31.5	36.2	0.88	3.7
Social science		1	28.8	30.4	31.9	33.5	34.6	0.91	3.1
		2	28.6	30.3	32.1	33.9	35.4	0.89	3.6
		3	28.6	30.1	31.7	33.5	36.3	0.90	3.4
		4	27.7	29.4	31.5	33.3	35.7	0.88	3.9
		5	27.0	29.2	30.9	33.9	39.6	0.86	4.7
By AP subject	9–12								
English		1	16.0	20.7	25.0	29.0	34.0	0.71	8.3
		2	18.5	23.5	28.0	31.5	34.3	0.75	8.0
		3	18.0	22.5	26.5	30.0	34.3	0.75	7.5
		4	19.5	23.0	26.0	29.7	34.0	0.78	6.7
		5	17.0	21.0	26.0	30.0	34.9	0.70	9.0
Math		1	10.0	17.0	21.6	27.0	32.0	0.63	10.0
		2	14.5	19.0	23.6	29.8	36.8	0.64	10.8
		3	16.0	21.0	24.0	30.7	33.0	0.68	9.7
		4	19.0	23.0	27.5	33.0	35.5	0.70	10.0
		5	14.0	21.0	26.0	31.3	37.0	0.67	10.3
Science		1	10.0	16.0	20.9	27.0	31.5	0.59	11.0
		2	12.0	18.0	23.2	27.5	30.0	0.65	9.5
		3	17.0	21.7	26.0	30.4	33.3	0.71	8.7
		4	17.0	20.9	25.0	29.0	32.2	0.72	8.1
		5	14.0	20.0	24.0	29.0	40.5	0.69	9.0
Social science		1	18.1	22.0	26.5	30.0	32.5	0.73	8.0
		2	20.3	25.0	28.0	31.3	34.3	0.80	6.3
		3	20.0	24.0	28.0	32.0	34.7	0.75	8.0
		4	22.7	25.5	28.3	31.3	34.0	0.81	5.8
		5	20.0	23.0	28.0	32.0	36.9	0.72	9.0

Table B.2 (continued)

Variable	Grade Span	Non-white Q	Percentile 10th	25th	50th	75th	90th	Ratio (p25/p75)	Range (p75–p25)
Offerings									
% "a–f" classes	9–12								
Overall		1	33.6	44.9	52.3	57.9	62.3	0.78	13.0
		2	40.8	45.9	52.1	58.4	64.5	0.79	12.4
		3	42.8	47.8	56.5	62.3	68.1	0.77	14.5
		4	45.2	52.0	57.4	64.2	69.6	0.81	12.2
		5	44.8	49.2	57.9	63.8	70.2	0.77	14.7
English		1	35.0	61.9	76.3	83.3	88.6	0.74	21.5
		2	49.4	67.5	77.4	86.4	90.3	0.78	18.8
		3	54.7	71.4	81.4	88.6	94.6	0.81	17.2
		4	58.4	72.6	84.4	90.3	95.6	0.80	17.7
		5	61.0	76.0	85.7	93.4	97.2	0.81	17.4
Math		1	40.0	51.3	62.9	76.1	87.3	0.67	24.8
		2	47.1	57.7	67.7	76.3	87.1	0.76	18.6
		3	47.9	61.9	69.6	81.8	90.0	0.76	19.9
		4	56.5	64.0	74.2	81.1	90.2	0.79	17.1
		5	53.2	63.3	72.0	83.7	90.4	0.76	20.3
Science		1	38.5	55.2	80.0	96.6	100.0	0.57	41.4
		2	49.0	58.8	75.0	92.9	100.0	0.63	34.1
		3	48.9	63.6	80.4	92.9	98.8	0.69	29.2
		4	54.7	66.7	78.3	90.7	98.7	0.73	24.1
		5	52.2	63.2	78.4	90.0	100.0	0.70	26.8
Social science		1	49.7	66.7	79.6	90.2	96.7	0.74	23.6
		2	54.2	68.3	84.5	93.1	95.9	0.73	24.8
		3	57.8	76.5	89.6	95.0	98.0	0.81	18.5
		4	66.7	79.6	89.5	94.2	97.7	0.84	14.6
		5	63.6	76.9	87.8	95.7	98.0	0.80	18.7
% AP classes	9–12								
Overall		1	0.7	1.2	1.8	2.7	3.6	0.43	1.5
		2	0.6	1.4	2.2	3.2	4.8	0.45	1.8
		3	0.7	1.5	2.5	3.9	4.8	0.38	2.4
		4	0.6	1.3	2.8	4.3	5.7	0.31	3.0
		5	0.5	1.6	2.6	3.8	5.6	0.42	2.2

Table B.2 (continued)

Variable	Grade Span	Non-white Q	Percentile 10th	25th	50th	75th	90th	Ratio (p25/p75)	Range (p75–p25)
English		1	0.0	0.6	1.6	2.8	4.2	0.21	2.2
		2	0.0	1.1	2.0	3.3	5.7	0.32	2.3
		3	0.0	1.3	2.7	4.2	5.9	0.32	2.9
		4	0.0	0.0	2.6	4.2	6.3	0.00	4.2
		5	0.0	0.0	2.8	4.7	6.7	0.00	4.7
Math		1	0.0	0.0	1.6	2.9	4.8	0.00	2.9
		2	0.0	0.0	1.6	3.1	5.6	0.00	3.1
		3	0.0	0.0	2.0	3.6	6.1	0.00	3.6
		4	0.0	0.0	2.0	3.9	6.1	0.00	3.9
		5	0.0	0.0	2.2	4.2	6.9	0.00	4.2
Science		1	0.0	0.0	1.7	4.2	7.5	0.00	4.2
		2	0.0	0.0	2.9	5.6	9.8	0.00	5.6
		3	0.0	0.0	2.6	5.8	11.3	0.00	5.8
		4	0.0	0.0	4.0	6.7	9.8	0.00	6.7
		5	0.0	0.0	3.1	6.5	9.1	0.00	6.5
Social science		1	0.0	1.7	3.4	5.6	7.0	0.31	3.8
		2	0.0	2.1	4.7	7.7	10.2	0.27	5.6
		3	0.0	2.8	5.2	8.8	12.0	0.32	6.0
		4	0.0	2.5	6.1	10.3	15.0	0.24	7.8
		5	0.0	2.2	4.9	9.4	12.5	0.24	7.2
Teachers									
Experience (years)									
Average	K–6	1	7.5	9.2	11.1	13.0	15.1	0.71	3.8
		2	8.2	9.9	11.8	14.2	16.4	0.69	4.3
		3	8.4	10.2	12.4	14.9	17.0	0.69	4.6
		4	8.8	10.6	12.7	14.9	17.0	0.71	4.3
		5	9.0	10.8	13.1	15.3	17.1	0.71	4.5
	6–8	1	9.8	11.2	13.0	15.2	16.6	0.74	4.0
		2	9.9	11.8	13.8	15.5	18.2	0.76	3.7
		3	9.3	11.5	13.8	15.9	17.3	0.73	4.4
		4	10.2	11.7	13.5	16.6	18.3	0.70	4.9
		5	10.1	11.7	14.2	16.1	17.5	0.73	4.4

Table B.2 (continued)

Variable	Grade Span	Non-white Q	Percentile 10th	25th	50th	75th	90th	Ratio (p25/p75)	Range (p75–p25)
	9–12	1	11.7	13.6	15.0	16.6	18.4	0.82	2.9
		2	11.9	13.4	15.1	16.9	18.3	0.79	3.5
		3	11.3	13.3	15.2	16.7	18.5	0.80	3.4
		4	12.1	14.2	16.1	17.6	18.9	0.81	3.4
		5	12.1	13.9	15.7	17.1	18.8	0.81	3.2
% 0–2	K–6	1	12.7	17.6	24.0	32.0	40.4	0.55	14.3
		2	8.6	14.8	22.0	30.2	37.1	0.49	15.3
		3	6.5	12.5	19.0	27.3	35.2	0.46	14.8
		4	6.5	10.9	17.6	24.1	31.4	0.45	13.2
		5	4.3	9.1	15.6	22.2	29.0	0.41	13.1
	6–8	1	7.1	10.7	14.6	20.5	25.0	0.52	9.7
		2	5.3	8.8	13.8	20.6	27.2	0.43	11.8
		3	6.5	9.2	13.4	19.1	24.9	0.48	9.9
		4	3.8	6.5	11.5	16.7	20.0	0.39	10.1
		5	1.8	5.7	10.3	16.0	20.8	0.36	10.3
	9–12	1	6.3	9.1	12.3	15.8	21.2	0.58	6.6
		2	6.3	9.4	12.7	17.2	21.8	0.55	7.8
		3	5.3	9.5	13.9	18.7	22.4	0.51	9.2
		4	4.7	7.2	10.8	16.3	20.5	0.44	9.1
		5	4.5	6.0	9.3	14.4	21.2	0.42	8.4
% 10+	K–6	1	25.6	35.1	43.6	53.6	63.0	0.65	18.5
		2	29.8	38.2	47.6	58.3	68.1	0.66	20.1
		3	31.4	40.6	51.4	63.0	74.5	0.65	22.3
		4	34.6	43.2	53.6	62.7	72.2	0.69	19.5
		5	34.8	44.4	56.1	65.7	75.0	0.67	21.4
	6–8	1	35.1	43.0	52.4	60.7	67.7	0.71	17.6
		2	37.9	45.3	54.5	62.5	71.7	0.72	17.2
		3	34.7	45.5	54.2	62.9	71.4	0.72	17.5
		4	40.4	47.8	57.0	65.9	75.0	0.73	18.0
		5	40.1	49.1	57.7	68.5	75.0	0.72	19.4
	9–12	1	46.9	52.3	61.9	68.2	75.2	0.77	16.0
		2	46.9	52.3	59.6	66.9	73.2	0.78	14.7
		3	45.6	51.7	59.0	67.1	73.1	0.77	15.4
		4	50.3	57.9	64.9	70.5	76.4	0.82	12.7
		5	47.0	56.3	64.3	71.2	75.9	0.79	15.0

Table B.2 (continued)

Variable	Grade Span	Non-white Q	Percentile 10th	25th	50th	75th	90th	Ratio (p25/p75)	Range (p75–p25)
Education									
% at most bachelor's	K–6	1	7.4	17.7	34.3	50.0	58.5	0.35	32.3
		2	4.0	9.8	18.2	30.0	46.5	0.33	20.2
		3	3.0	7.3	14.0	25.0	38.5	0.29	17.7
		4	0.0	5.0	10.3	17.9	30.3	0.28	12.9
		5	0.0	2.9	6.9	13.6	25.0	0.21	10.8
	6–8	1	5.1	14.3	28.1	43.4	49.9	0.33	29.1
		2	2.9	7.5	14.9	30.3	45.6	0.25	22.8
		3	3.3	6.9	12.7	23.2	42.1	0.30	16.3
		4	1.3	3.4	7.7	12.1	20.0	0.28	8.8
		5	0.0	2.3	6.1	12.0	20.5	0.19	9.7
	9–12	1	3.6	8.6	17.8	37.2	42.8	0.23	28.6
		2	4.1	7.2	13.1	23.7	35.5	0.30	16.6
		3	3.7	6.6	10.9	18.9	28.6	0.35	12.3
		4	1.5	4.0	7.4	11.9	18.7	0.33	8.0
		5	1.6	2.8	6.5	12.2	21.0	0.23	9.4
% at least master's	K–6	1	10.7	16.7	22.8	31.4	40.4	0.53	14.7
		2	9.5	16.5	24.0	34.1	44.8	0.48	17.7
		3	9.5	15.8	24.2	35.4	48.1	0.45	19.6
		4	10.0	16.3	25.7	36.3	48.0	0.45	20.0
		5	9.7	15.0	23.8	34.7	46.3	0.43	19.7
	6–8	1	17.5	24.2	30.4	39.0	46.7	0.62	14.8
		2	17.3	22.5	31.0	39.6	51.0	0.57	17.1
		3	16.7	25.5	34.0	46.2	58.3	0.55	20.7
		4	16.1	21.6	32.0	43.6	56.0	0.50	22.0
		5	13.2	20.4	29.7	41.5	53.5	0.49	21.2
	9–12	1	25.0	30.8	36.4	48.3	55.8	0.64	17.5
		2	24.6	31.6	37.7	47.8	55.4	0.66	16.2
		3	23.5	30.3	40.0	49.3	60.6	0.61	19.1
		4	22.8	29.2	39.9	51.8	58.1	0.56	22.6
		5	20.8	27.4	35.2	48.8	56.7	0.56	21.5

Table B.2 (continued)

Variable	Grade Span	Non-white Q	Percentile 10th	25th	50th	75th	90th	Ratio (p25/p75)	Range (p75–p25)
Credentials									
% without full	K–6	1	5.1	13.5	24.3	32.6	41.5	0.41	19.1
		2	0.0	4.2	10.6	19.2	27.3	0.22	15.1
		3	0.0	0.0	6.3	13.2	20.7	0.00	13.2
		4	0.0	0.0	3.3	8.3	14.4	0.00	8.3
		5	0.0	0.0	0.0	3.8	8.2	0.00	3.8
	6–8	1	2.4	9.9	18.2	24.7	33.3	0.40	14.8
		2	0.0	2.9	8.7	14.8	22.6	0.20	11.9
		3	0.0	2.6	6.3	12.0	18.4	0.22	9.4
		4	0.0	0.0	3.1	6.8	13.0	0.00	6.8
		5	0.0	0.0	0.0	3.8	8.5	0.00	3.8
	9–12	1	2.1	5.9	12.2	17.4	20.8	0.34	11.5
		2	1.1	3.7	8.0	12.8	16.7	0.29	9.1
		3	0.5	3.0	6.3	11.4	15.5	0.26	8.4
		4	0.0	0.9	3.5	6.1	9.5	0.15	5.2
		5	0.0	0.0	1.7	5.8	8.2	0.00	5.8
Ethnicity									
% nonwhite	K–6	1	29.2	39.6	53.6	65.9	75.9	0.60	26.2
		2	11.8	19.4	28.0	36.8	45.8	0.53	17.4
		3	5.9	10.6	17.1	25.0	33.3	0.42	14.4
		4	0.0	4.8	9.3	14.8	21.3	0.33	10.0
		5	0.0	0.0	4.8	8.3	12.6	0.00	8.3
% nonwhite	6–8	1	16.8	26.4	37.0	49.8	64.2	0.53	23.4
		2	9.5	15.4	22.4	30.0	36.6	0.51	14.6
		3	5.6	10.0	14.3	20.2	26.4	0.49	10.3
		4	3.8	5.7	9.0	13.6	18.5	0.42	7.9
		5	0.0	2.9	5.5	8.8	11.8	0.33	5.9
% nonwhite	9–12	1	20.0	26.8	36.2	47.4	56.0	0.57	20.6
		2	10.3	15.4	20.4	27.8	33.0	0.56	12.3
		3	8.0	10.6	14.0	18.2	23.1	0.58	7.6
		4	5.2	6.6	9.1	12.8	15.3	0.52	6.2
		5	2.5	4.5	6.6	9.9	12.3	0.45	5.4

Table B.3

Percentiles, Interquartile Ratios, and Interquartile Ranges of Selected Variables, Teacher Characteristics in Grade 9–12 Schools, by Core Subject Area and Student SES Quintile, 1997–1998

Variable	Subject	SES Q	Percentile 10th	25th	50th	75th	90th	Ratio (p25/p75)	Range (p75–p25)
Experience (years)									
Average	English	1	10.6	12.1	14.2	16.4	19.9	0.74	4.3
		2	9.7	11.8	14.5	17.1	19.6	0.69	5.3
		3	10.1	11.8	14.4	16.8	18.5	0.70	5.0
		4	9.4	11.6	14.3	16.6	19.3	0.70	4.9
		5	10.2	12.5	14.7	17.4	19.2	0.72	4.9
	Math	1	9.3	11.4	13.6	15.7	18.3	0.72	4.3
		2	9.1	11.7	13.9	17.0	20.2	0.69	5.3
		3	10.4	12.1	14.6	17.0	19.4	0.71	4.9
		4	8.7	12.5	14.7	17.4	19.3	0.72	4.9
		5	10.3	12.9	15.2	17.9	20.5	0.72	4.9
	Science	1	8.2	10.2	12.5	15.6	19.1	0.66	5.4
		2	7.9	10.5	13.2	16.0	18.6	0.66	5.5
		3	8.6	10.4	13.4	16.8	19.4	0.62	6.3
		4	8.4	11.4	14.4	17.2	19.1	0.67	5.7
		5	8.8	11.1	15.3	17.7	20.4	0.63	6.6
	Social science	1	10.7	13.4	16.3	18.6	22.0	0.72	5.2
		2	10.3	13.2	16.1	19.2	21.9	0.69	6.0
		3	11.0	13.3	16.2	19.2	21.7	0.69	5.9
		4	10.5	13.9	17.7	20.2	23.0	0.69	6.3
		5	10.6	12.7	17.0	20.3	23.6	0.63	7.6
% 0–2	English	1	0.0	6.8	11.3	16.9	26.1	0.40	10.1
		2	0.0	6.4	15.6	22.7	33.3	0.28	16.2
		3	0.0	7.2	12.1	20.7	28.8	0.35	13.5
		4	2.4	6.7	14.7	22.0	30.2	0.31	15.2
		5	0.0	5.9	11.6	22.1	27.4	0.27	16.2
	Math	1	0.0	6.0	11.4	22.2	28.7	0.27	16.2
		2	0.0	5.7	12.2	22.6	32.0	0.25	16.9
		3	0.0	4.3	13.5	18.9	28.4	0.23	14.5
		4	0.0	6.9	12.2	19.7	32.1	0.35	12.8
		5	0.0	4.7	10.7	20.0	28.6	0.23	15.3

Table B.3 (continued)

Variable	Subject	SES Q	Percentile 10th	25th	50th	75th	90th	Ratio (p25/p75)	Range (p75–p25)
	Science	1	0.0	7.7	15.8	24.5	35.3	0.31	16.8
		2	0.0	0.0	14.3	25.4	36.8	0.00	25.4
		3	0.0	0.0	13.6	23.8	32.8	0.00	23.8
		4	0.0	0.0	11.6	20.4	35.9	0.00	20.4
		5	0.0	2.4	11.8	20.0	31.0	0.12	17.6
	Social science	1	0.0	1.3	8.6	15.3	23.2	0.08	14.0
		2	0.0	2.2	10.4	19.1	30.0	0.12	16.9
		3	0.0	2.7	10.2	18.6	29.0	0.14	16.0
		4	0.0	2.0	10.8	18.6	26.3	0.11	16.6
		5	0.0	2.6	9.1	18.3	24.5	0.14	15.7
% 10+	English	1	38.7	49.1	61.0	69.1	77.1	0.71	20.0
		2	34.2	45.5	56.1	70.7	78.4	0.64	25.3
		3	38.2	46.6	58.1	68.1	75.0	0.68	21.5
		4	31.6	45.4	56.7	67.7	79.5	0.67	22.3
		5	37.6	47.9	57.2	66.3	77.0	0.72	18.4
	Math	1	34.1	42.2	56.7	65.7	80.7	0.64	23.5
		2	31.5	43.7	56.1	68.8	78.3	0.64	25.0
		3	36.4	47.4	59.1	70.3	80.8	0.67	22.9
		4	32.1	46.2	57.9	72.0	79.5	0.64	25.9
		5	38.1	50.0	59.6	74.3	81.4	0.67	24.3
	Science	1	28.6	40.0	52.3	67.3	80.8	0.59	27.3
		2	26.5	38.2	54.8	67.3	88.9	0.57	29.1
		3	28.3	40.1	55.2	69.6	82.4	0.58	29.4
		4	31.1	45.5	59.1	72.9	82.4	0.62	27.4
		5	30.8	46.3	60.0	70.2	80.4	0.66	23.9
	Social science	1	40.0	53.9	64.8	75.4	89.0	0.72	21.4
		2	37.5	52.5	63.6	77.0	88.3	0.68	24.6
		3	39.0	50.0	61.6	76.9	87.5	0.65	26.9
		4	33.3	51.5	67.6	79.8	90.1	0.65	28.3
		5	37.6	47.5	62.1	75.5	88.4	0.63	28.0

Table B.3 (continued)

Variable	Subject	SES Q	Percentile 10th	25th	50th	75th	90th	Ratio (p25/p75)	Range (p75–p25)
Education									
% at least master's	English	1	15.8	26.7	37.0	46.8	58.6	0.57	20.2
		2	18.4	27.1	39.2	49.3	59.2	0.55	22.2
		3	18.1	27.1	36.6	46.3	58.4	0.59	19.2
		4	15.9	25.2	34.5	48.9	58.4	0.52	23.7
		5	23.3	30.2	40.3	52.2	63.5	0.58	22.0
	Math	1	14.1	23.6	32.1	43.2	63.5	0.55	19.6
		2	11.3	26.7	39.1	53.6	64.4	0.50	26.9
		3	16.7	26.8	37.4	52.9	67.2	0.51	26.2
		4	14.5	23.9	36.6	50.0	64.9	0.48	26.1
		5	14.3	28.1	42.4	55.1	64.8	0.51	27.0
	Science	1	13.2	25.8	39.0	51.6	66.7	0.50	25.8
		2	13.6	24.8	37.1	50.0	68.8	0.50	25.2
		3	15.9	26.9	38.5	51.0	63.6	0.53	24.1
		4	12.8	25.4	37.5	49.4	60.9	0.51	24.0
		5	11.9	25.0	40.0	57.7	65.3	0.43	32.7
	Social science	1	18.2	30.4	42.3	53.1	63.9	0.57	22.6
		2	12.1	26.7	38.8	55.3	69.8	0.48	28.6
		3	16.7	26.7	38.1	51.6	66.6	0.52	24.9
		4	16.1	25.9	41.4	56.3	69.2	0.46	30.4
		5	15.5	29.8	47.0	55.6	72.0	0.54	25.7
Credentials									
% correct subject authorization	English	1	66.7	74.8	82.1	89.5	94.9	0.84	14.7
		2	64.1	76.6	83.2	91.2	96.2	0.84	14.7
		3	72.1	80.8	87.5	92.2	97.5	0.88	11.4
		4	73.6	80.9	88.7	94.5	100.0	0.86	13.6
		5	79.7	85.1	91.9	96.4	100.0	0.88	11.4
	Math	1	63.0	72.3	81.2	88.9	96.6	0.81	16.6
		2	59.6	73.1	84.8	90.9	98.4	0.80	17.8
		3	62.9	75.0	86.4	93.8	100.0	0.80	18.8
		4	65.5	76.7	87.1	93.5	98.0	0.82	16.8
		5	70.8	80.0	89.5	95.0	100.0	0.84	15.0

Table B.3 (continued)

Variable	Subject	SES Q	Percentile 10th	25th	50th	75th	90th	Ratio (p25/p75)	Range (p75–p25)
	Science	1	63.6	76.1	87.5	94.0	100.0	0.81	17.9
		2	52.5	77.8	88.4	98.1	100.0	0.79	20.3
		3	69.0	81.6	92.1	100.0	100.0	0.82	18.4
		4	69.4	82.8	91.7	100.0	100.0	0.83	17.2
		5	68.4	82.5	91.7	100.0	100.0	0.83	17.5
	Social science	1	55.1	69.7	78.3	90.7	97.1	0.77	21.0
		2	59.9	75.6	85.1	93.8	100.0	0.81	18.1
		3	59.9	76.7	85.4	94.8	100.0	0.81	18.1
		4	62.5	77.6	86.3	96.2	100.0	0.81	18.7
		5	65.8	78.5	88.7	95.5	100.0	0.82	17.0

Table B.4

Percentiles, Interquartile Ratios, and Interquartile Ranges of Selected Variables, Teacher Characteristics in Grade 9–12 Schools, by Core Subject Area and Nonwhite Student Quintile, 1997–1998

Variable		Non-white Q	Percentile 10th	25th	50th	75th	90th	Ratio (p25/p75)	Range (p75–p25)
Experience (years)									
Average	English	1	10.6	12.5	14.6	16.4	20.9	0.76	3.9
		2	10.2	12.5	14.7	17.4	19.2	0.72	4.9
		3	9.7	11.0	13.9	16.5	18.5	0.67	5.5
		4	9.8	12.4	14.7	16.9	19.1	0.73	4.5
		5	9.2	10.6	14.2	16.2	19.1	0.65	5.6
	Math	1	9.4	11.3	13.5	16.3	18.3	0.69	5.0
		2	9.4	11.7	13.8	16.9	19.9	0.69	5.2
		3	9.3	13.0	14.6	17.4	19.8	0.75	4.4
		4	10.6	13.0	15.1	17.9	20.5	0.73	4.9
		5	9.9	12.1	14.8	16.9	19.2	0.72	4.7
	Science	1	8.2	10.0	12.8	15.5	18.6	0.64	5.5
		2	8.8	10.6	13.3	16.8	18.9	0.63	6.1
		3	7.2	9.5	13.6	16.4	18.9	0.58	7.0
		4	9.0	12.2	14.8	17.7	20.2	0.69	5.5
		5	8.8	11.8	14.7	17.7	20.1	0.67	5.9
	Social science	1	9.9	13.1	16.8	19.2	22.0	0.68	6.1
		2	10.9	13.5	16.1	19.4	22.6	0.69	5.9
		3	11.0	13.4	16.1	19.2	22.0	0.70	5.8
		4	10.6	14.1	17.4	20.0	22.7	0.71	5.9
		5	9.8	12.5	16.8	19.3	22.3	0.65	6.9
% 0–2	English	1	0.0	6.0	11.2	17.4	25.2	0.35	11.4
		2	0.0	7.4	13.0	21.4	30.1	0.34	14.0
		3	4.6	8.8	16.3	24.8	33.7	0.35	16.0
		4	0.9	6.8	12.7	21.3	28.1	0.32	14.5
		5	0.0	5.4	11.8	23.3	30.2	0.23	17.9
	Math	1	0.0	6.2	11.6	22.2	30.7	0.28	16.0
		2	0.0	7.1	13.5	21.9	28.6	0.32	14.8
		3	0.0	6.8	14.0	21.7	28.6	0.32	14.9
		4	0.0	2.4	9.9	17.3	30.4	0.14	14.8
		5	0.0	0.0	10.7	18.0	29.2	0.00	18.0
	Science	1	0.0	8.9	17.1	26.5	38.9	0.34	17.6
		2	0.0	0.0	13.6	24.6	33.3	0.00	24.6
		3	0.0	5.1	13.1	24.7	37.0	0.21	19.6
		4	0.0	0.0	10.2	18.5	30.6	0.00	18.5
		5	0.0	0.0	7.5	17.6	29.2	0.00	17.6

Table B.4 (continued)

Variable		Non-white Q	Percentile 10th	25th	50th	75th	90th	Ratio (p25/p75)	Range (p75–p25)
	Social science	1	0.0	1.6	8.2	15.9	24.6	0.10	14.3
		2	0.0	3.3	10.2	17.1	25.0	0.19	13.8
		3	0.0	5.6	12.2	19.7	26.7	0.28	14.1
		4	0.0	0.0	8.3	18.2	29.4	0.00	18.2
		5	0.0	0.0	9.2	18.9	26.7	0.00	18.9
% 10+	English	1	39.8	50.0	62.2	70.7	81.7	0.71	20.8
		2	40.2	47.3	57.9	69.0	75.0	0.69	21.6
		3	34.5	43.8	53.8	63.2	73.8	0.69	19.4
		4	32.0	48.4	58.3	70.5	77.4	0.69	22.1
		5	31.8	43.2	56.2	68.1	82.6	0.63	24.9
	Math	1	32.8	42.0	54.5	67.7	80.4	0.62	25.7
		2	32.6	43.2	56.7	67.7	78.4	0.64	24.4
		3	35.4	47.4	57.7	67.6	78.7	0.70	20.2
		4	39.1	53.8	61.4	75.0	83.2	0.72	21.2
		5	29.8	46.7	58.7	71.9	81.8	0.65	25.2
	Science	1	27.8	39.5	52.3	67.3	77.6	0.59	27.7
		2	27.9	39.7	55.5	67.1	80.8	0.59	27.5
		3	27.5	38.1	54.4	70.2	84.0	0.54	32.1
		4	33.3	48.4	60.0	70.9	84.0	0.68	22.5
		5	36.4	47.1	61.7	73.6	88.6	0.64	26.5
	Social science	1	38.8	50.7	67.9	78.3	89.0	0.65	27.6
		2	40.0	52.7	61.9	77.0	88.3	0.69	24.2
		3	42.4	49.0	61.3	73.4	83.3	0.67	24.5
		4	37.9	51.2	66.7	78.9	91.4	0.65	27.8
		5	31.5	45.0	63.5	76.9	85.7	0.59	31.9
Education									
% at least master's	English	1	24.0	30.2	38.5	48.4	59.8	0.62	18.2
		2	15.8	27.3	37.3	47.5	57.6	0.57	20.2
		3	19.3	27.0	37.1	50.5	66.7	0.53	23.6
		4	17.6	25.7	37.0	49.3	58.5	0.52	23.5
		5	12.3	22.8	32.6	46.1	60.0	0.49	23.3
	Math	1	14.1	23.4	32.7	46.0	60.7	0.51	22.6
		2	12.8	25.7	37.5	47.6	64.4	0.54	22.0
		3	17.2	28.7	40.3	55.0	67.2	0.52	26.3
		4	11.3	23.9	35.7	55.8	68.1	0.43	31.8
		5	13.2	24.1	36.8	51.2	59.1	0.47	27.1

Table B.4 (continued)

Variable		Non-white Q	Percentile 10th	25th	50th	75th	90th	Ratio (p25/p75)	Range (p75–p25)
	Science	1	14.2	25.8	38.5	51.1	67.8	0.50	25.3
		2	14.8	26.6	38.5	50.0	60.4	0.53	23.4
		3	11.4	25.9	38.2	51.2	63.6	0.51	25.3
		4	13.8	25.7	40.6	54.5	66.7	0.47	28.8
		5	11.6	21.4	35.9	50.8	65.3	0.42	29.4
	Social science	1	21.7	30.0	40.3	53.1	62.1	0.57	23.0
		2	16.7	31.7	41.8	53.6	69.2	0.59	21.9
		3	16.1	28.6	42.2	56.1	70.7	0.51	27.6
		4	13.7	26.6	42.8	57.3	70.4	0.46	30.7
		5	10.2	18.5	34.7	51.2	66.3	0.36	32.7
Credentials									
% correct subject authorization	English	1	68.4	75.0	82.7	88.3	93.7	0.85	13.3
		2	67.5	76.9	85.5	91.9	97.0	0.84	15.0
		3	69.6	78.9	87.2	92.2	98.6	0.86	13.2
		4	75.7	83.3	90.6	95.9	100.0	0.87	12.5
		5	78.7	84.7	93.4	97.0	100.0	0.87	12.2
	Math	1	62.5	72.3	81.3	87.1	94.3	0.83	14.8
		2	60.9	76.7	86.4	92.0	97.6	0.83	15.3
		3	66.7	77.6	87.1	93.2	100.0	0.83	15.5
		4	66.0	77.5	88.4	94.4	100.0	0.82	17.0
		5	62.6	76.6	86.2	94.5	100.0	0.81	17.9
	Science	1	64.5	76.9	88.1	94.6	100.0	0.81	17.7
		2	57.1	78.6	91.3	100.0	100.0	0.79	21.4
		3	65.9	81.9	90.3	100.0	100.0	0.82	18.1
		4	71.2	79.7	90.6	98.5	100.0	0.81	18.8
		5	67.7	84.5	95.0	100.0	100.0	0.85	15.5
	Social science	1	55.1	68.9	78.3	88.0	96.7	0.78	19.1
		2	53.1	73.8	85.2	94.4	98.9	0.78	20.5
		3	65.2	78.1	87.3	95.4	100.0	0.82	17.3
		4	63.9	77.8	87.3	95.5	100.0	0.81	17.7
		5	68.2	78.9	87.2	97.6	100.0	0.81	18.6

Table B.5

Medians for Key Resources: All School Districts and Without Five Largest Districts,[a] by School SES Quintile and Grade Span, 1997–1998

	Classes			Teacher Experience			Teacher Education and Credentials		
SES Q	Average Class Size	% "a–f"	% AP	No. Years Average	% 0–2	% 10+	% at Most Bach.	% At Least Mast.	% Not Full
Grade Span K–6									
All Schools									
1	23.12	n/a	n/a	10.8	23.8	43.3	32.6	21.7	21.7
2	23.20	n/a	n/a	11.8	22.1	47.6	19.2	24.5	12.1
3	23.49	n/a	n/a	12.5	19.5	51.9	13.6	24.1	6.3
4	23.51	n/a	n/a	13.2	16.7	55.2	10.0	25.6	3.5
5	23.51	n/a	n/a	12.9	17.2	53.3	8.8	27.0	2.0
Without 5 Largest Districts									
1	23.35	n/a	n/a	10.9	24.9	44.4	20.5	23.8	16.0
2	23.81	n/a	n/a	11.8	21.6	48.5	15.9	25.0	9.0
3	23.74	n/a	n/a	12.6	18.8	52.1	11.9	23.7	5.4
4	23.96	n/a	n/a	13.0	16.7	54.5	8.8	25.6	3.3
5	23.58	n/a	n/a	13.0	17.4	53.7	8.7	26.8	0.7
Grade Span 6–8									
All Schools									
1	27.6	n/a	n/a	12.9	14.2	52.4	26.2	29.8	17.3
2	28.0	n/a	n/a	13.2	16.0	51.8	17.4	30.0	9.0
3	28.3	n/a	n/a	13.7	12.5	56.7	10.4	32.3	6.4
4	28.1	n/a	n/a	14.2	11.3	57.4	8.0	33.3	3.1
5	28.9	n/a	n/a	14.5	10.7	58.9	7.4	34.1	2.3
Without 5 Largest Districts									
1	27.4	n/a	n/a	13.5	15.1	55.6	16.3	34.4	11.1
2	27.8	n/a	n/a	13.5	14.8	53.9	12.1	30.1	7.3
3	28.0	n/a	n/a	13.4	12.6	56.3	8.8	32.3	4.9
4	28.1	n/a	n/a	13.9	11.3	56.3	7.7	32.1	3.0
5	28.9	n/a	n/a	14.8	10.8	59.2	7.7	34.3	2.3
Grade Span 9–12									
All Schools									
1	28.6	51.8	2.0	14.7	11.8	60.8	20.1	35.8	11.7
2	28.8	50.1	2.1	15.3	12.9	60.5	12.8	41.2	7.8
3	28.9	53.7	2.1	15.1	12.5	60.9	10.0	37.3	5.9
4	28.8	57.7	2.7	16.0	11.8	62.4	8.5	36.0	4.8
5	29.4	63.2	3.2	16.2	10.2	63.2	6.6	43.2	3.6

Table B.5 (continued)

	Classes			Teacher Experience			Teacher Education and Credentials		
SES Q	Average Class Size	% "a–f"	% AP	No. Years Average	% 0–2	% 10+	% at Most Bach.	% At Least Mast.	% Not Full
	Without 5 Largest Districts								
1	29.3	47.8	1.6	15.7	13.3	62.3	13.0	41.8	8.7
2	28.8	50.8	2.2	15.1	14.2	59.0	11.5	40.4	7.4
3	28.6	53.7	1.9	15.4	12.2	62.0	8.4	36.9	4.9
4	29.0	59.3	2.7	15.9	12.1	62.4	7.5	36.0	4.8
5	29.3	64.3	3.2	16.1	10.0	62.3	6.6	44.3	3.5

[a]Los Angeles Unified, San Diego Unified, San Francisco Unified, Long Beach Unified, and Fresno Unified.

Appendix C

Geographic Data

A California map that labels each county is included in this appendix. The tables present information on student enrollment, students participating in the lunch assistance program, class size, teachers with at least a master's degree, average teacher experience, teachers lacking full credentials, and percentage of classes that are AP, by county and grade span.

Figure C.1—Map of California Counties

Table C.1

Total Student Enrollment, by County and Grade Span, 1997

County	Total Enrollment				
	K–6	6–8	9–12	Other	Total
Alameda	99,834	26,982	51,112	27,939	205,867
Alpine	7			125	132
Amador	2,305	826	1,402	123	4,656
Butte	16,562	5,269	9,211	2,413	33,455
Calaveras	2,948	1,038	1,829	694	6,509
Colusa	1,570	172	935	1,325	4,002
Contra Costa	72,568	32,445	39,156	2,743	146,912
Del Norte	1,750	827	1,281	1,114	4,972
El Dorado	12,153	4,673	8,076	2,753	27,655
Fresno	85,665	23,704	43,928	17,999	171,296
Glenn	2,099	550	1,432	1,706	5,787
Humboldt	6,698	1,633	5,884	6,616	20,831
Imperial	13,813	3,163	8,177	5,933	31,086
Inyo	1,103	544	1,024	708	3,379
Kern	71,276	21,239	35,842	9,053	137,410
Kings	10,640	2,871	6,131	4,148	23,790
Lake	4,359	1,692	2,607	1,110	9,768
Lassen	1,654	527	1,371	1,788	5,340
Los Angeles	798,302	270,476	380,654	98,019	1,547,451
Madera	9,151	2,608	6,273	5,204	23,236
Marin	12,150	5,290	7,504	2,462	27,406
Mariposa	1,140	321	746	473	2,680
Mendocino	6,432	2,684	4,192	1,976	15,284
Merced	21,576	8,187	12,923	4,922	47,608
Modoc	927	284	404	477	2,092
Mono	829	289	317	397	1,832
Monterey	35,902	11,924	14,631	3,384	65,841
Napa	10,064	2,853	4,997	516	18,430
Nevada	4,025	2,105	4,227	2,605	12,962
Orange	241,442	73,760	120,199	9,991	445,392
Placer	21,642	7,100	13,704	5,518	47,964
Plumas	1,740	275	530	977	3,522
Riverside	145,278	53,085	70,725	8,564	277,652
Sacramento	111,660	30,055	51,294	7,525	200,534
San Benito	3,737	1,663	2,567	2,147	10,114
San Bernardino	187,598	60,785	86,077	9,883	344,343

Table C.1 (continued)

County	Total Enrollment				Total
	K–6	6–8	9–12	Other	
San Diego	233,234	73,079	115,025	30,887	452,225
San Francisco	27,545	12,238	18,182	2,189	60,154
San Joaquin	43,410	12,538	27,619	22,573	106,140
San Luis Obispo	17,571	6,411	10,198	1,174	35,354
San Mateo	43,900	16,345	24,437	6,201	90,883
Santa Barbara	32,003	9,684	16,043	3,931	61,661
Santa Clara	115,924	40,667	65,190	10,198	231,979
Santa Cruz	20,438	7,660	10,264	447	38,809
Shasta	11,416	3,343	8,030	6,548	29,337
Sierra	381	142	197	866	1,586
Siskiyou	1,658		2,408	3,837	7,903
Solano	36,654	8,354	16,983	6,512	68,503
Sonoma	34,297	11,466	18,411	4,528	68,702
Stanislaus	46,052	14,172	23,646	5,148	89,018
Sutter	5,010	1,870	3,886	4,234	15,000
Tehama	3,965	1,667	3,107	2,061	10,800
Trinity			749	1,556	2,305
Tulare	37,139	11,014	20,985	12,312	81,450
Tuolumne	529		2,611	4,986	8,126
Ventura	66,328	23,282	34,674	3,796	128,080
Yolo	13,630	1,943	5,714	4,309	25,596
Yuba	5913	2257	3116	1370	12,656

NOTE: Data are missing for several smaller counties because the counties had no schools in the given grade span.

Table C.2

Median of Percentage of Students Receiving Free or Reduced-Price Lunches, by County and Grade Span, 1997

	Median of % of Students			
County	K–6	6–8	9–12	Other
Alameda	38.4	24.3	21.8	33.2
Alpine				
Amador	39.4	26.6	14.2	0.0
Butte	46.5	33.9	21.0	76.3
Calaveras	35.3	30.4	22.9	45.6
Colusa	73.3	66.9	49.6	70.0
Contra Costa	23.8	22.3	10.4	5.5
Del Norte	71.3	40.8	22.4	51.7
El Dorado	26.0	22.3	9.1	28.0
Fresno	79.0	71.4	42.6	67.9
Glenn	65.2	53.0	45.7	57.1
Humboldt	51.5	34.3	16.9	44.9
Imperial	76.7	60.4	65.1	77.0
Inyo	45.0	34.2	1.8	49.5
Kern	68.7	64.9	32.4	39.1
Kings	72.4	64.0	16.7	50.5
Lake	70.1	62.1	35.6	48.1
Lassen	54.1	32.1	7.9	33.9
Los Angeles	78.9	68.3	40.1	55.7
Madera	83.9	65.5	57.5	48.4
Marin	6.1	4.9	5.3	0.0
Mariposa	36.5	25.4	13.0	44.7
Mendocino	66.4	53.1	23.5	45.4
Merced	82.1	69.9	76.0	68.2
Modoc	57.3	50.5	8.1	58.3
Mono	34.2	24.3	17.1	38.5
Monterey	76.2	48.2	20.6	42.5
Napa	35.4	31.0	15.4	37.0
Nevada	22.6	13.0	9.4	22.1
Orange	44.1	34.7	13.6	7.1
Placer	21.2	17.9	9.8	10.7
Plumas	40.0	37.6	39.1	24.9
Riverside	61.1	45.6	34.4	97.5
Sacramento	57.3	37.4	24.9	20.4
San Benito	34.9	32.3	14.3	30.1
San Bernardino	61.4	49.9	30.1	19.4
San Diego	55.2	44.3	26.0	40.8
San Francisco	59.5	47.2	37.5	38.8

Table C.2 (continued)

County	Median % of Students			
	K–6	6–8	9–12	Other
San Joaquin	76.4	54.1	31.5	37.4
San Luis Obispo	32.4	30.8	21.2	48.0
San Mateo	26.0	21.6	10.5	87.2
Santa Barbara	45.1	30.8	15.9	28.6
Santa Clara	36.8	34.4	11.1	34.5
Santa Cruz	41.2	43.0	9.1	1.1
Shasta	60.1	49.7	23.2	40.7
Sierra	46.6	31.7	19.1	0.0
Siskiyou	51.2		15.3	58.0
Solano	39.4	20.9	14.4	29.3
Sonoma	23.8	21.8	12.7	25.7
Stanislaus	60.7	46.5	20.3	44.8
Sutter	58.7	47.7	25.4	37.4
Tehama	59.2	41.7	29.6	74.0
Trinity			36.9	56.4
Tulare	83.0	60.1	22.9	79.5
Tuolumne	38.1		13.2	43.0
Ventura	38.1	28.1	20.8	10.8
Yolo	51.8	58.7	25.0	33.0
Yuba	77.8	79.2	36.7	44.2

NOTES: Medians are missing for several smaller counties because the counties had no school in the given grade span. We deleted results for Alpine K-6 and combination schools in the belief that small samples led to the extreme values we obtained for the percentage of students receiving free or reduced-price lunch—0 and 100 percent, respectively.

Table C.3

Median Class Size, by County and Grade Span, 1997

County	Median Class Size			
	K–6	6–8	9–12	Other
Alameda	22.0	27.1	26.8	26.0
Alpine	7.0			16.2
Amador	22.2	26.8	27.7	3.9
Butte	23.1	28.8	28.5	24.8
Calaveras	21.4	28.1	24.8	25.6
Colusa	25.6	25.8	21.0	25.8
Contra Costa	26.1	27.9	28.3	23.1
Del Norte	20.7	27.3	26.7	22.3
El Dorado	25.3	28.4	30.4	28.4
Fresno	21.6	27.2	27.5	21.5
Glenn	22.5	24.6	24.2	24.9
Humboldt	22.4	25.1	25.4	26.0
Imperial	25.1	25.3	25.6	24.4
Inyo	24.8		28.8	19.4
Kern	21.5	25.4	28.6	26.6
Kings	25.2	28.2	27.3	29.4
Lake	19.4	24.2	22.7	25.1
Lassen	21.9	28.4	23.9	24.4
Los Angeles	23.2	28.7	29.3	28.4
Madera	24.2	26.9	29.4	24.0
Marin	20.6	26.2	26.4	22.3
Mariposa	21.4	24.7	25.4	21.1
Mendocino	23.3	27.6	21.5	19.2
Merced	22.6	25.1	27.7	22.9
Modoc	22.6	25.7	24.1	20.2
Mono	23.4	30.3	19.4	17.3
Monterey	24.9	28.0	29.2	25.8
Napa	23.0	27.1	27.4	24.2
Nevada	21.3	26.7	27.2	21.8
Orange	24.0	29.0	30.5	28.4
Placer	23.4	27.0	27.4	24.3
Plumas	19.9	21.7	22.0	24.0
Riverside	24.1	30.2	30.3	24.7
Sacramento	25.1	29.3	29.8	23.7
San Benito	23.7	27.6	28.5	24.2
San Bernardino	24.2	27.8	29.4	28.6
San Diego	22.3	28.5	29.3	25.8
San Francisco	18.1	24.4	22.4	20.7
San Joaquin	25.4	26.5	27.3	25.4

Table C.3 (continued)

County	Median Class Size K–6	6–8	9–12	Other
San Luis Obispo	25.1	27.2	25.6	22.4
San Mateo	22.7	26.6	29.4	24.7
Santa Barbara	22.1	25.9	27.6	22.8
Santa Clara	23.1	26.7	26.9	27.1
Santa Cruz	24.3	28.5	30.3	22.0
Shasta	22.6	26.0	29.1	24.1
Sierra	21.7	27.1	16.4	20.3
Siskiyou	17.9		23.7	22.3
Solano	24.5	27.2	26.8	28.0
Sonoma	23.0	26.7	27.0	24.1
Stanislaus	24.2	26.9	30.2	25.4
Sutter	25.6	24.9	27.3	26.3
Tehama	24.7	26.9	25.7	27.0
Trinity			23.8	22.0
Tulare	24.2	28.4	28.6	25.0
Tuolumne	19.9		29.4	29.5
Ventura	23.8	28.7	31.8	26.5
Yolo	24.5	24.8	27.6	29.3
Yuba	21.7	26.1	28.9	27.2

NOTES: Medians are missing for several smaller counties because the counties had no school in the given grade span. In Calaveras County, we dropped one high school and one middle school, in which mean class sizes were reported to be 73 and 173, respectively—much higher than pupil-teacher ratios reported for those schools. Similarly, the lone middle school in Inyo County was dropped because mean class size as reported by teachers was 91.

Table C.4

Median of Percentage of Teachers with At Least a Master's Degree, by County and Grade Span, 1997

	Median of % of Teachers			
County	K–6	6–8	9–12	Other
Alameda	23.3	25.0	34.4	28.5
Alpine	0.0			10.0
Amador	13.6	21.9	17.1	9.8
Butte	11.4	15.9	22.7	5.3
Calaveras	18.2	20.8	39.2	19.6
Colusa	11.8	0.0	23.2	11.1
Contra Costa	20.5	23.2	33.3	20.0
Del Norte	21.1	26.2	29.9	11.1
El Dorado	15.0	25.4	30.9	24.7
Fresno	9.3	15.8	20.1	13.3
Glenn	3.4	11.1	17.9	3.6
Humboldt	10.7	16.9	23.9	10.6
Imperial	27.4	31.6	36.9	25.0
Inyo	31.8	30.7	33.3	25.0
Kern	18.0	26.0	32.7	18.6
Kings	15.1	27.2	16.6	10.5
Lake	10.0	21.2	22.2	6.0
Lassen	11.8	5.2	20.3	8.3
Los Angeles	24.6	32.5	39.1	35.8
Madera	14.3	21.2	31.0	16.7
Marin	19.1	26.1	35.7	32.8
Mariposa	24.8	27.0	13.4	0.0
Mendocino	23.1	12.6	36.9	16.7
Merced	8.6	14.0	31.6	14.3
Modoc	4.0	8.3	19.8	23.9
Mono	29.0	10.0	56.9	16.7
Monterey	18.5	34.9	45.7	28.7
Napa	14.8	20.6	36.8	24.7
Nevada	12.4	22.9	28.6	25.8
Orange	31.8	40.7	49.8	45.1
Placer	14.9	18.3	23.5	20.0
Plumas	20.0	18.2	26.7	41.2
Riverside	36.2	43.6	52.4	31.4
Sacramento	22.9	30.1	36.9	27.6
San Benito	20.8	26.8	47.2	21.8
San Bernardino	28.1	34.1	45.7	17.4
San Diego	41.8	48.4	49.7	48.7
San Francisco	15.1	28.2	35.2	20.8

Table C.4 (continued)

County	Median % of Teachers			
	K–6	6–8	9–12	Other
San Joaquin	17.7	26.3	30.0	16.7
San Luis Obispo	31.6	35.5	38.8	33.3
San Mateo	24.0	30.2	42.5	26.8
Santa Barbara	29.6	39.1	40.7	26.8
Santa Clara	19.6	26.8	34.8	27.8
Santa Cruz	24.2	24.1	36.4	32.9
Shasta	13.6	23.1	21.4	9.8
Sierra	9.1	42.8	9.5	29.4
Siskiyou	16.1		28.9	13.8
Solano	19.5	26.7	31.5	25.6
Sonoma	17.1	19.2	29.3	19.4
Stanislaus	12.5	18.9	29.6	7.8
Sutter	10.1	17.0	38.7	18.1
Tehama	6.7	5.9	29.7	2.9
Trinity			32.9	14.4
Tulare	13.9	19.9	27.3	10.1
Tuolumne	22.2		48.9	17.4
Ventura	27.9	40.0	45.6	25.0
Yolo	20.7	24.8	22.7	21.7
Yuba	20.0	24.1	22.9	23.1

NOTE: Medians are missing for several smaller counties because the counties had no school in the given grade span.

Table C.5

Median of Mean Years of Teacher Experience, by County and Grade Span, 1997

	Median of Mean Years of Experience			
County	K-6	6-8	9-12	Other
Alameda	12.6	13.3	16.2	11.8
Alpine	24.0			10.1
Amador	15.1	13.7	14.3	7.2
Butte	14.2	14.8	15.8	10.4
Calaveras	11.4	14.1	17.2	16.4
Colusa	10.6	12.9	11.6	13.1
Contra Costa	12.7	13.7	16.3	21.0
Del Norte	15.6	10.4	15.2	12.4
El Dorado	13.9	14.4	15.6	14.3
Fresno	11.1	14.1	14.3	12.7
Glenn	15.0	15.6	14.1	16.6
Humboldt	14.5	16.2	15.9	14.2
Imperial	14.3	15.2	13.6	12.4
Inyo	17.0	16.1	16.0	20.9
Kern	11.5	12.3	14.1	11.9
Kings	12.6	9.2	14.9	11.8
Lake	12.3	11.4	13.6	11.7
Lassen	13.3	13.6	12.1	15.5
Los Angeles	11.7	13.5	15.0	13.4
Madera	11.6	10.5	16.2	13.1
Marin	11.4	15.8	15.8	15.9
Mariposa	16.0	14.1	17.8	12.9
Mendocino	15.8	16.0	17.1	12.6
Merced	12.0	12.2	14.2	11.5
Modoc	13.9	8.7	14.4	14.0
Mono	13.8	12.0	19.3	14.1
Monterey	13.5	14.2	17.1	11.0
Napa	12.2	16.3	17.0	14.4
Nevada	16.7	16.8	18.0	13.2
Orange	12.3	15.5	16.9	14.9
Placer	11.9	11.9	16.3	11.9
Plumas	16.2	8.0	17.0	18.7
Riverside	10.1	11.8	13.0	11.2
Sacramento	11.1	13.2	14.6	13.4
San Benito	13.0	12.3	12.2	11.5
San Bernardino	11.0	12.3	14.3	10.8
San Diego	12.1	13.5	14.5	13.5
San Francisco	13.5	17.0	17.8	16.1

Table C.5 (continued)

County	Median of Mean Years of Experience			
	K-6	6-8	9-12	Other
San Joaquin	12.1	13.7	15.1	11.9
San Luis Obispo	13.6	15.0	15.8	12.3
San Mateo	13.0	14.5	15.3	12.2
Santa Barbara	12.8	13.5	15.2	15.0
Santa Clara	13.9	14.8	17.7	13.3
Santa Cruz	12.9	14.2	15.5	17.3
Shasta	13.2	15.9	15.4	12.0
Sierra	11.6	21.9	17.5	10.6
Siskiyou	20.1	.	17.3	17.2
Solano	14.0	12.5	16.0	12.3
Sonoma	14.2	15.0	16.8	14.5
Stanislaus	13.4	14.8	15.5	12.9
Sutter	12.4	10.1	19.2	14.2
Tehama	14.1	10.5	17.5	12.4
Trinity			17.5	15.9
Tulare	13.3	13.7	16.6	12.6
Tuolumne	16.3		17.5	15.4
Ventura	12.7	15.5	16.4	14.3
Yolo	12.3	9.0	15.4	12.5
Yuba	15.9	13.0	18.3	13.9

NOTE: Medians are missing for several smaller counties because the counties had no school in the given grade span.

Table C.6

Median of Percentage of Teachers Without Full Credential, by County and Grade Span, 1997

	Median of % of Teachers			
County	K–6	6–8	9–12	Other
Alameda	7.1	3.9	7.7	8.5
Alpine	0.0			0.0
Amador	0.0	3.9	2.9	41.0
Butte	0.0	0.0	0.8	5.6
Calaveras	0.0	0.0	2.1	0.0
Colusa	3.6	10.3	4.5	0.0
Contra Costa	5.8	10.4	10.3	0.0
Del Norte	0.0	3.1	0.0	0.0
El Dorado	3.1	3.6	2.7	2.8
Fresno	6.5	3.9	5.4	2.7
Glenn	0.0	0.0	9.0	0.0
Humboldt	0.0	0.0	0.0	0.0
Imperial	4.9	14.1	16.4	15.8
Inyo	0.0	0.0	10.0	0.0
Kern	9.7	8.1	4.4	10.9
Kings	13.0	20.0	15.5	8.7
Lake	0.0	9.1	0.9	2.9
Lassen	3.9	5.2	26.7	7.7
Los Angeles	22.5	17.0	13.2	15.3
Madera	5.3	3.7	4.3	0.0
Marin	0.0	0.0	0.5	0.0
Mariposa	7.3	7.9	5.9	16.7
Mendocino	0.0	0.0	1.3	0.0
Merced	4.3	2.9	9.0	8.3
Modoc	0.0	8.3	0.0	2.1
Mono	0.0	0.0	6.3	0.0
Monterey	8.0	6.8	3.5	14.9
Napa	4.8	0.0	4.3	0.0
Nevada	0.0	0.0	1.2	0.0
Orange	5.0	2.9	2.5	4.4
Placer	0.0	0.0	2.9	0.0
Plumas	0.0	0.0	0.0	4.1
Riverside	11.8	9.7	9.5	20.0
Sacramento	0.0	1.9	5.6	0.0
San Benito	11.4	7.3	14.2	9.1
San Bernardino	11.9	8.7	8.5	10.0
San Diego	0.0	0.0	1.9	0.0
San Francisco	0.0	0.0	0.0	0.0

Table C.6 (continued)

County	Median of % of Teachers			
	K–6	6–8	9–12	Other
San Joaquin	6.9	4.4	6.5	3.3
San Luis Obispo	0.0	0.0	1.2	0.0
San Mateo	0.0	3.9	2.9	26.7
Santa Barbara	2.6	3.5	5.7	0.0
Santa Clara	6.1	5.6	5.7	4.3
Santa Cruz	4.0	3.1	4.5	8.2
Shasta	0.0	0.0	1.7	0.0
Sierra	0.0	0.0	0.0	22.6
Siskiyou	0.0		0.0	0.0
Solano	3.6	3.8	2.6	4.4
Sonoma	0.0	0.0	1.6	0.0
Stanislaus	0.0	0.0	0.6	6.0
Sutter	14.0	8.3	4.3	0.0
Tehama	0.0	0.0	0.0	0.0
Trinity			4.9	0.0
Tulare	5.9	3.7	6.7	11.1
Tuolumne	0.0		0.0	0.0
Ventura	4.0	3.3	3.1	4.1
Yolo	2.7	0.0	3.2	7.7
Yuba	0.0	6.3	3.0	3.6

NOTE: Several medians are missing for smaller counties because the counties had no school in the given grade span.

Table C.7

Median of Percentage of AP Classes in Grade Span 9–12 Schools, by County, 1997

County	Median of % of AP Classes
Alameda	1.23
Alpine	
Amador	2.07
Butte	1.93
Calaveras	0.00
Colusa	0.00
Contra Costa	2.49
Del Norte	0.35
El Dorado	2.30
Fresno	2.41
Glenn	0.00
Humboldt	3.29
Imperial	2.14
Inyo	2.19
Kern	1.15
Kings	1.16
Lake	0.55
Lassen	0.69
Los Angeles	2.46
Madera	2.96
Marin	2.22
Mariposa	2.26
Mendocino	2.43
Merced	1.50
Modoc	3.33
Mono	2.47
Monterey	2.08
Napa	0.89
Nevada	2.13
Orange	3.16
Placer	0.78
Plumas	0.00
Riverside	2.19
Sacramento	2.05
San Benito	3.17
San Bernardino	2.39
San Diego	2.79

Table C.7 (continued)

County	Median % AP Classes
San Francisco	1.04
San Joaquin	0.90
San Luis Obispo	2.24
San Mateo	3.70
Santa Barbara	1.16
Santa Clara	2.71
Santa Cruz	1.10
Shasta	2.68
Sierra	0.00
Siskiyou	1.25
Solano	1.32
Sonoma	1.18
Stanislaus	1.77
Sutter	0.53
Tehama	2.52
Trinity	0.68
Tulare	2.73
Tuolumne	3.65
Ventura	2.82
Yolo	0.63
Yuba	1.22

NOTES: The median for Alpine County is missing because the county had no school in the given grade span.

Appendix D

Resource Distribution: Regression Results Across and Within Districts

This appendix contains data tables with regression results based both on models with and without district fixed effects. District fixed-effects models estimate the relationships among variables within a district, whereas regression models without fixed effects estimate these relationships across all schools and school districts.

Table D.1

Regression Results of Teacher Characteristics for K–6 Schools on School Characteristics

Characteristic	% Master's or More	Bachelor's or Less	Mean Years Experience	10 or More Years Experience	2 or Less Years Experience	Not Fully Certified	% Nonwhite
% of students in lunch program	–0.0143	0.108	–0.0232	–0.102	0.0956	0.134	0.329
	(0.019)	(0.018)	(0.0040)	(0.021)	(0.0139)	(0.017)	(0.017)
School enrollment (100s)	0.107	0.292	–0.204	–0.683	0.200	0.585	0.501
	(0.169)	(0.209)	(0.0379)	(0.172)	(0.137)	(0.156)	(0.259)
District enrollment (1000s)	–0.004	0.042	0.0003	–0.002	–0.0018	0.0150	0.022
	(0.004)	(0.004)	(0.0006)	(0.003)	(0.002)	(0.003)	(0.003)
Suburban school	4.298	–2.268	–0.603	–3.249	0.809	–1.868	–6.490
	(2.739)	(3.095)	(0.360)	(1.940)	(1.456)	(1.844)	(2.230)
Rural school	–6.165	–5.076	–0.349	1.695	–3.015	–4.022	–13.490
	(1.889)	(3.215)	(0.393)	(2.200)	(1.563)	(1.588)	(2.518)
Constant	25.565	10.165	15.384	62.388	14.555	0.090	6.067
	(2.351)	(3.788)	(0.406)	(2.174)	(1.921)	(1.777)	(3.094)
No. of obs.	4572	4572	4572	4572	4572	4562	4572
R-squared	0.0750	0.3286	0.0664	0.0592	0.0668	0.2686	0.5033

NOTE: Robust standard errors are in parentheses.

Table D.2

Regression Results of Teacher Characteristics for 6–8 Schools on School Characteristics

Characteristic	% Master's or More	Bachelor's or Less	Mean Years Experience	10 or More Years Experience	2 or Less Years Experience	Not Fully Certified	% Nonwhite
% of students in lunch program	0.0274 (0.029)	0.075 (0.027)	–0.0141 (0.0061)	–0.0653 (0.0265)	0.0614 (0.0189)	0.0974 (0.0244)	0.248 (0.033)
School enrollment (100s)	0.576 (0.223)	–0.078 (0.205)	–0.0063 (0.0345)	0.137 (0.167)	–0.323 (0.127)	–0.247 (0.131)	–0.216 (0.196)
District enrollment (1000s)	–0.014 (0.004)	0.038 (0.0061)	–0.0020 (0.0008)	–0.0103 (0.0037)	0.003 (0.003)	0.0186 (0.003)	0.0218 (0.0038)
Suburban school	4.543 (2.578)	–2.604 (3.599)	–0.794 (0.455)	–3.541 (2.104)	0.493 (1.664)	–0.055 (2.281)	–7.059 (2.291)
Rural school	–7.800 (2.157)	–5.562 (3.510)	–1.136 (0.464)	–1.901 (2.267)	–1.947 (1.685)	–3.612 (1.740)	–13.123 (2.891)
Constant	26.115 (3.409)	13.139 (4.228)	15.195 (0.575)	59.608 (2.888)	14.491 (2.546)	6.767 (2.516)	13.454 (3.109)
No. of obs.	1016	1016	1016	1016	1016	1015	1016
R-squared	0.1317	0.2308	0.0257	0.0201	0.0322	0.1096	0.4527

NOTE: Robust standard errors are in parentheses.

Table D.3

Regression Results of Teacher Characteristics for 9–12 Schools on School Characteristics

Characteristic	% Master's or More	Bachelor's or Less	Mean Years Experience	10 or More Years Experience	2 or Less Years Experience	Not Fully Certified	% Nonwhite
% of students in lunch program	–0.017	0.074	–0.146	–0.056	0.0665	0.060	0.216
	(0.037)	(0.024)	(0.0059)	(0.026)	(0.0171)	(0.020)	(0.034)
School enrollment (100s)	0.0336	0.0074	0.0161	0.096	–0.050	0.005	–0.040
	(0.089)	(0.087)	(0.018)	(0.071)	(0.045)	(0.057)	(0.075)
District enrollment (1000s)	–0.006	0.0319	–0.0016	–0.004	–0.0052	0.011	0.019
	(0.0042)	(0.005)	(0.0006)	(0.003)	(0.002)	(0.002)	(0.003)
Suburban school	4.164	–3.182	–0.090	–0.375	0.174	0.057	–9.121
	(2.687)	(3.637)	(0.393)	(1.605)	(1.077)	(2.035)	(2.364)
Rural school	–9.949	–4.334	–0.390	1.368	–1.687	–0.949	–14.103
	(2.506)	(4.198)	(0.398)	(1.682)	(1.181)	(1.556)	(2.874)
Constant	39.672	12.461	15.615	60.872	12.804	5.509	19.342
	(2.716)	(4.638)	(0.475)	(1.963)	(1.382)	(1.896)	(3.010)
No. of obs.	865	865	865	865	865	863	865
R-squared	0.1454	0.2129	0.0197	0.0118	0.0306	0.0577	0.4042

NOTE: Robust standard errors are in parentheses.

Table D.4

Regression Results of Teacher Characteristics for K–6 Schools on School Characteristics, Including District Fixed Effects

Characteristic	% Master's or More	Bachelor's or Less	Mean Years Experience	10 or More Years Experience	2 or Less Years Experience	Not Fully Certified	% Nonwhite
% of students in lunch program	–0.0613	0.0877	–0.0487	–0.213	0.126	0.110	0.278
	(0.008)	(0.0070)	(0.0023)	(0.0107)	(0.0079)	(0.0058)	(0.0083)
School enrollment (100s)	–0.310	0.131	–0.0924	–0.410	0.0217	0.308	0.637
	(0.078)	(0.0679)	(0.0219)	(0.103)	(0.0766)	(0.055)	(0.080)
Suburban school	–0.740	–0.718	0.488	1.834	–1.588	–0.608	–0.847
	(0.923)	(0.815)	(0.263)	(1.236)	(0.920)	(0.665)	(0.960)
Rural school	–1.338	–0.467	–0.189	0.135	1.183	–0.020	0.0669
	(1.389)	(1.227)	(0.396)	(1.861)	(1.385)	(1.002)	(1.445)
F-test fixed effects	8.974	15.587	4.270	4.896	3.979	12.214	7.984
	(605,3962)	(605,3962)	(605,3962)	(605,3962)	(605,3962)	(604,3953)	(605,3962)
No. of obs.	4572	4572	4572	4572	4572	4562	4572
R-squared	0.5498	0.7708	0.3480	0.3789	0.3302	0.7056	0.7423

NOTE: Robust standard errors are in parentheses.

Table D.5

Regression Results of Teacher Characteristics for 6–8 Schools on School Characteristics, Including District Fixed Effects

Characteristic	% Master's or More	Bachelor's or Less	Mean Years Experience	10 or More Years Experience	2 or Less Years Experience	Not Fully Certified	% Nonwhite
% of students in lunch program	–0.0535	0.0414	–0.0290	–0.110	0.0748	0.0860	0.164
	(0.0221)	(0.0193)	(0.0066)	(0.030)	(0.0207)	(0.0165)	(0.0202)
School enrollment (100s)	–0.142	– 0.191	0.0516	0.279	–0.315	–0.147	0.028
	(0.130)	(0.114)	(0.0389)	(0.177)	(0.122)	(0.097)	(0.119)
Suburban school	–0.639	1.059	– 0.136	0.184	–0.463	–0.0566	0.350
	(2.589)	(2.263)	(0.774)	(3.513)	(2.427)	(1.927)	(2.363)
Rural school	–4.604	–1.818	–0.227	–.907	–1.084	–3.273	3.185
	(4.319)	(3.776)	(1.292)	(5.862)	(4.050)	(3.216)	(3.943)
F-test fixed effects	4.437	6.753	2.282	2.335	2.009	6.769	3.329
	(439,572)	(439,572)	(439,572)	(439,572)	(439,572)	(438,572)	(439,572)
No. of obs.	1016	1016	1016	1016	1016	1015	1016
R-squared	0.6503	0.7792	0.3716	0.3773	0.3245	0.7447	0.7268

NOTE: Robust standard errors are in parentheses.

Table D.6

Regression Results of Teacher Characteristics for 9–12 Schools on School Characteristics, Including District Fixed Effects

Characteristic	% Master's or More	Bachelor's or Less	Mean Years Experience	10 or More Years Experience	2 or Less Years Experience	Not Fully Certified	% Nonwhite
% of students in lunch program	–0.060 (0.030)	0.044 (0.020)	–0.028 (0.0078)	–0.068 (0.034)	0.047 (0.021)	0.003 (0.015)	0.134 (0.025)
School enrollment (100s)	–0.147 (0.074)	– 0.044 (0.049)	0.031 (0.019)	0.089 (0.083)	–0.0681 (0.052)	–0.097 (0.035)	–0.282 (0.060)
Suburban school	–2.883 (2.649)	0.981 (1.780)	0.681 (0.684)	0.986 (2.986)	0.158 (1.833)	0.841 (1.254)	–3.388 (2.143)
Rural school	2.339 (4.175)	–0.057 (2.789)	2.103 (1.078)	10.922 (4.700)	–1.072 (2.890)	2.213 (1.976)	2.667 (3.378)
F-test fixed effects	2.936 (385,475)	5.722 (385,475)	1.883 (385,475)	1.655 (385,475)	1.593 (385,475)	7.760 (384,474)	2.567 (385,475)
No. of obs.	865	865	865	865	865	863	865
R-squared	0.5401	0.7460	0.2942	0.2325	0.2303	0.7648	0.6483

NOTE: Robust standard errors are in parentheses.

Table D.7

Regression Results of the Percentage of Teachers of Different Ethnicity on Student Ethnicity for K–6 Schools

Characteristic	Latino Teachers	Black Teachers	Asian Teachers	Latino Teachers	Black Teachers	Asian Teachers
% of students in lunch program	–0.019	–0.037	–0.002	–0.065	–0.019	0.028
	(0.013)	(0.009)	(0.009)	(0.013)	(0.009)	(0.008)
% LEP students	0.162	0.062	–0.018	0.246	0.061	–0.035
	(0.038)	(0.016)	(0.023)	(0.019)	(0.012)	(0.011)
% Latino students	0.287	0.014	0.040	0.250	–0.019	–0.007
	(0.026)	(0.014)	(0.017)	(0.020)	(0.013)	(0.012)
% black students	–0.038	0.571	0.003	–0.059	0.584	–0.080
	(0.027)	(0.053)	(0.020)	(0.018)	(0.012)	(0.011)
% Asian students	– 0.078	– 0.024	0.400	–0.189	–0.049	0.363
	(0.028)	(0.021)	(0.066)	(0.022)	(0.015)	(0.014)
Include district fixed effects	No	No	No	Yes	Yes	Yes
No. of obs.	4572	4572	4572	4572	4572	4572
R-squared	0.5927	0.6203	0.4157	0.7181	0.7173	0.5494

NOTE: Robust standard errors are in parentheses.

Table D.8

Regression Results of the Percentage of Teachers of Different Ethnicity on Student Ethnicity for 6–8 Schools

Characteristic	Latino Teachers	Black Teachers	Asian Teachers	Latino Teachers	Black Teachers	Asian Teachers
% of students in lunch program	–0.005 (0.013)	–0.030 (0.025)	0.005 (0.010)	–0.023 (0.022)	–0.037 (0.028)	0.035 (0.016)
% LEP students	0.053 (0.031)	0.104 (0.039)	–0.042 (0.017)	0.074 (0.036)	0.083 (0.045)	–0.034 (0.025)
% Latino students	0.170 (0.021)	0.021 (0.020)	0.033 (0.012)	0.162 (0.035)	0.038 (0.044)	–0.040 (0.025)
% black students	–0.024 (0.023)	0.741 (0.090)	–0.012 (0.014)	–0.069 (0.030)	0.656 (0.039)	–0.071 (0.021)
% Asian students	0.028 (0.025)	– 0.063 (0.039)	0.177 (0.033)	–0.020 (0.037)	–0.080 (0.048)	0.090 (0.027)
Include district fixed effects	No	No	No	Yes	Yes	Yes
No. of obs.	1016	1016	1016	1016	1016	1016
R-squared	0.4851	0.6209	0.3284	0.5855	0.7354	0.5494

NOTE: Robust standard errors are in parentheses.

Table D.9

Regression Results of the Percentage of Teachers of Different Ethnicity on Student Ethnicity for 9–12 Schools

Characteristic	Latino Teachers	Black Teachers	Asian Teachers	Latino Teachers	Black Teachers	Asian Teachers
% of students in lunch program	–0.004 (0.021)	–0.005 (0.026)	–0.005 (0.011)	0.033 (0.023)	–0.041 (0.020)	–0.010 (0.012)
% LEP students	–0.035 (0.036)	0.045 (0.044)	0.045 (0.035)	–0.085 (0.043)	0.068 (0.037)	0.115 (0.022)
% Latino students	0.242 (0.020)	0.027 (0.013)	0.009 (0.016)	0.210 (0.034)	0.018 (0.029)	–0.043 (0.018)
% black students	–0.031 (0.021)	0.591 (0.085)	–0.021 (0.015)	–0.081 (0.035)	0.519 (0.030)	–0.056 (0.018)
% Asian students	0.095 (0.021)	– 0.024 (0.026)	0.183 (0.027)	0.028 (0.043)	–0.030 (0.036)	0.098 (0.022)
Include district fixed effects	No	No	No	Yes	Yes	Yes
No. of obs.	865	865	865	865	865	865
R-squared	0.454	0.650	0.440	0.4680	0.7051	0.4428

NOTE: Robust standard errors are in parentheses.

Table D.10

Regression Results of Class Size on School Characteristics

	Mean K–3 Class Size	Mean 4–6 Class Size	Mean 6–8 Class Size	Mean 9–12 Class Size	Mean K–3 Class Size	Mean 4–6 Class Size	Mean 6–8 Class Size	Mean 9–12 Class Size
% of students in lunch program	0.008 (0.003)	–0.007 (0.004)	–0.048 (0.021)	–0.026 (0.015)	–0.001 (0.002)	–0.017 (0.002)	–0.025 (0.013)	–0.028 (0.017)
School enrollment (100s)	0.236 (0.032)	0.369 (0.076)	–0.060 (0.231)	0.272 (0.069)	0.156 (0.016)	0.238 (0.024)	0.177 (0.075)	0.187 (0.040)
District enrollment (1000s)	–0.001 (0.001)	–0.002 (0.001)	0.004 (0.006)	–0.003 (0.003)				
Suburban school	0.362 (0.346)	0.643 (0.436)	3.454 (2.950)	4.482 (2.578)	0.120 (0.189)	0.319 (0.286)	– 0.109 (1.501)	– 0.261 (1.449)
Rural school	–0.285 (0.337)	–0.724 (0.487)	0.664 (1.446)	–0.703 (1.308)	0.102 (0.284)	–.296 (.438)	–0.131 (2.504)	–0.034 (2.284)
Constant	18.952 (0.365)	27.169 (0.752)	30.924 (3.116)	23.367 (1.790)				
Include district fixed effects	No	No	No	No	Yes	Yes	Yes	Yes
F-test on fixed effects					6.287 (603,3908)	4.414 (569,3769)	23.185 (439,572)	7.719 (385,476)
No. of obs.	4516	4343	1016	866	4516	4343	1016	866
R-squared	0.0683	0.0860	0.0188	0.1004	0.4536	0.3681	0.9074	0.7743

NOTE: Mean 4–6 class size includes grade 6 classes that are part of an elementary school. Mean 6–8 class size includes all classes taught in middle schools. Robust standard errors are in parentheses.

Table D.11

Regression Results of Course Authorization for 9–12 Schools on School Characteristics

	% Math Classes Taught by Authorized Teachers	% English Classes Taught by Authorized Teachers	% Social Studies Classes Taught by Authorized Teachers	% Science Classes Taught by Authorized Teachers	% “a–f” Classes
% of students in lunch program	–0.084 (0.037)	–0.144 (0.040)	–0.013 (0.034)	–0.102 (0.051)	–0.143 (0.035)
School enrollment (100s)	0.652 (0.120)	0.457 (0.134)	0.575 (0.132)	0.430 (0.113)	0.392 (0.117)
District enrollment (1000s)	–0.006 (0.005)	–0.004 (0.006)	–0.030 (0.005)	–0.007 (0.007)	0.010 (0.005)
Suburban school	8.117 (3.340)	5.773 (3.632)	4.781 (3.701)	3.984 (4.314)	7.103 (3.126)
Rural school	8.096 (3.529)	5.486 (3.898)	7.247 (3.952)	9.360 (3.852)	1.884 (3.662)
Constant	65.140 (3.917)	74.743 (4.513)	68.450 (4.636)	76.067 (4.393)	44.456 (4.115)
No. of obs.	830	833	829	830	866
R-squared	0.0916	0.0813	0.0876	0.0493	0.1446

NOTE: Robust standard errors are in parentheses.

Table D.12

Regression Results of Course Authorization for 9–12 Schools on School Characteristics, Including District Fixed Effects

	% Math Classes Taught by Authorized Teachers	% English Classes Taught by Authorized Teachers	% Social Studies Classes Taught by Authorized Teachers	% Science Classes Taught by Authorized Teachers	% “a–f” Classes
% of students in lunch program	–0.057	–0.104	–0.011	–0.051	–0.006
	(0.047)	(0.039)	(0.043)	(0.045)	(0.035)
School enrollment (100s)	0.605	0.437	0.393	0.549	0.682
	(0.120)	(0.103)	(0.115)	(0.118)	(0.085)
Suburban school	–2.870	1.883	–0.230	–0.684	4.125
	(3.859)	(3.311)	(3.593)	(3.780)	(3.049)
Rural school	–3.817	–1.479	2.535	0.450	–5.469
	(6.264)	(5.375)	(5.947)	(6.135)	(4.805)
F-test on fixed effects	2.467	3.108	2.897	2.593	2.108
	(385,440)	(385,443)	(385,439)	(385,440)	(385,476)
No. of obs.	830	833	829	830	866
R-squared	0.4582	0.5338	0.5139	0.4521	0.4253

NOTE: Robust standard errors are in parentheses.

Table D.13

Regression Results of the Number of AP Courses on School, Student, and Teacher Characteristics

	No. of AP Classes	No. of AP Math Classes	No. of AP English Classes	No. of AP Social Studies Classes	No. of AP Science Classes
% of students in	–0.050	–0.021	–0.014	–0.030	–0.028
lunch program	(0.011)	(0.003)	(0.004)	(0.005)	(0.005)
School enrollment	0.605	0.092	0.115	0.191	0.119
(100s)	(0.034)	(0.010)	(0.011)	(0.014)	(0.013)
District enrollment	0.008	0.002	0.002	0.000	0.003
(1000s)	(0.002)	0.000	(0.001)	(0.001)	(0.001)
Suburban	1.580	0.016	0.625	0.132	0.603
school	(0.599)	(0.187)	(0.224)	(0.269)	(0.249)
Rural school	0.943	–0.569	0.471	–0.325	–0.330
	(0.731)	(0.231)	(0.271)	(0.326)	(0.312)
Bachelor’s or less	–0.011	0.003	0.005	0.006	–0.001
	(0.018)	(0.004)	(0.006)	(0.007)	(0.006)
Master’s or more	0.060	–0.002	0.010	0.023	0.014
	(0.016)	(0.004)	(0.005)	(0.005)	(0.004)
Mean years	0.288	0.028	0.066	–0.021	0.014
experience	(0.139)	(0.030)	(0.039)	(0.037)	(0.036)
10 or more	–0.076	–0.001	–0.006	–0.003	–0.004
years experience	(0.035)	(0.006)	(0.008)	(0.009)	(0.008)
2 or less years	0.002	–0.002	0.002	–0.019	0.000
experience	(0.037)	(0.006)	(0.008)	(0.010)	(0.007)
Authorized	0.167	0.002	0.002	0.004	0.002
	(0.052)	(0.004)	(0.005)	(0.005)	(0.005)
Constant	–20.485	–0.919	–2.218	–1.209	–1.857
	(–5.643)	(–0.559)	(–0.712)	(–0.738)	(–0.752)
No. of obs.	854	820	823	819	820
No. of censored obs.	135	357	259	242	367
R-squared	0.1025	0.1016	0.0697	0.105	0.0929

NOTE: Robust standard errors are in parentheses.

Table D.14

Regression Results of the Percentage of AP Courses on School, Student, and Teacher Characteristics

	% of Classes That Are AP	% of Math Classes That Are AP	% of English Classes That Are AP	% of Social Studies Classes That Are AP	% of Science Classes That Are AP
% of students in lunch program	–0.013 (0.003)	–0.043 (0.009)	–0.020 (0.008)	–0.063 (0.013)	–0.060 (0.013)
School enrollment (100s)	0.076 (0.011)	0.078 (0.025)	0.059 (0.023)	0.180 (0.035)	0.149 (0.034)
District enrollment (1000s)	0.001 (0.001)	0.003 (0.001)	0.002 (0.001)	–0.002 (0.002)	0.005 (0.002)
Suburban school	0.535 (0.192)	0.047 (0.481)	0.832 (0.468)	0.130 (0.693)	1.962 (0.661)
Rural school	0.289 (0.233)	–1.860 (0.589)	0.667 (0.562)	–0.515 (0.830)	–0.551 (0.819)
Bachelor’s or less	0.002 (0.006)	0.006 (0.011)	0.010 (0.012)	0.015 (0.017)	0.015 (0.016)
Master’s or more	0.023 (0.005)	–0.013 (0.009)	0.022 (0.010)	0.066 (0.013)	0.045 (0.012)
Mean years experience	0.131 (0.044)	0.184 (0.075)	0.063 (0.080)	–0.027 (0.092)	–0.003 (0.093)
10 or more years experience	–0.042 (0.011)	–0.021 (0.016)	0.000 (0.017)	–0.033 (0.022)	–0.006 (0.019)
2 or less years experience	–0.013 (0.011)	–0.005 (0.016)	–0.004 (0.016)	–0.083 (0.024)	–0.018 (0.019)
Authorized	0.043 (0.017)	0.004 (0.009)	0.014 (0.010)	0.014 (0.013)	0.012 (0.013)
Constant	–3.461 –1.805	–0.673 –1.406	–2.319 –1.455	2.113 –1.852	–3.214 –1.945
No. of obs.	854	820	823	819	820
No. of censored obs.	135	357	259	242	367
R-squared	0.049	0.0331	0.0111	0.0307	0.0388

NOTE: Robust standard errors are in parentheses.

Table D.15

Probability of No AP Courses Being Offered in a Given Subject

	Probability of No AP Classes	Probability of No AP Math Classes	Probability of No AP English Classes	Probability of No AP Social Studies Classes	Probability of No AP Science Classes
% of students in lunch program	–0.003 (0.003)	0.009 (0.003)	0.002 (0.003)	0.005 (0.003)	0.009 (0.003)
School enrollment (100s)	–0.137 (0.017)	–0.061 (0.008)	–0.059 (0.009)	–0.064 (0.009)	–0.054 (0.007)
District enrollment (1000s)	–0.001 0.000	–0.002 0.000	–0.001 0.000	–0.001 0.000	–0.001 0.000
Suburban school	–0.391 (0.204)	–0.024 (0.167)	–0.386 (0.173)	–0.164 (0.174)	–0.329 (0.182)
Rural school	–0.437 (0.200)	0.254 (0.176)	–0.311 (0.165)	0.021 (0.162)	0.026 (0.194)
Bachelor's or less	0.006 (0.005)	–0.001 (0.004)	–0.006 (0.004)	–0.003 (0.004)	–0.001 (0.004)
Master's or more	–0.002 (0.004)	0.005 (0.003)	–0.009 (0.003)	–0.010 (0.002)	–0.005 (0.002)
Mean years experience	–0.036 (0.034)	–0.034 (0.022)	–0.028 (0.023)	–0.010 (0.020)	–0.001 (0.019)
10 or more years experience	0.014 (0.008)	0.003 (0.004)	0.004 (0.005)	0.006 (0.004)	0.002 (0.004)
2 or less years experience	0.013 (0.008)	0.001 (0.004)	0.004 (0.005)	0.009 (0.004)	0.004 (0.004)
Authorized	0.001 (0.025)	–0.002 (0.003)	–0.005 (0.003)	–0.004 (0.003)	0.000 (0.003)
Constant	0.497 (2.611)	0.875 (0.425)	1.613 (0.472)	0.822 (0.334)	0.803 (0.354)
No. of obs.	854	820	823	819	820

NOTE: Robust standard errors are in parentheses.

Table D.16

Average Class Size of AP Classes in Schools That Offer At Least One Course in the Subject

	Average Class Size in AP Math Classes	Average Class Size in AP English Classes	Average Class Size in AP Social Studies Classes	Average Class Size in AP Science Classes
% of students in lunch program	–0.106 (0.022)	–0.050 (0.029)	–0.057 (0.017)	–0.094 (0.022)
School enrollment (100s)	0.175 (0.076)	0.074 (0.060)	0.147 (0.058)	0.094 (0.057)
District enrollment (1000s)	–0.004 (0.002)	–0.004 (0.002)	–0.002 (0.002)	–0.003 (0.002)
Suburban school	2.403 (1.759)	1.528 (1.516)	1.664 (1.098)	0.443 (1.027)
Rural school	–4.264 (1.490)	–2.923 (1.032)	–2.413 (0.916)	–0.974 (1.559)
Constant	23.898 (2.143)	26.99 (1.924)	26.086 (1.528)	24.795 (1.553)
No. of obs.	463	564	577	453
R-squared	0.124	0.036	0.071	0.046

NOTE: Robust standard errors are in parentheses.

Appendix E

STAR Test Scores: Data Tables and Regression Results

Appendix E data tables include the distribution of 1998 California Stanford 9 test score results for all grades, and for selected grades by county. Regression results estimate the relationships between school characteristics and test scores for selected grades.

As discussed in Appendix A, the STAR file is maintained by the Standards, Curriculum, and Assessment Division of the California Department of Education. It records results from the *Stanford Achievement Test* Series, Ninth Edition, Form T (Stanford 9) administered by Harcourt, Brace & Co. These results are reported at the school level in two ways for each subject area and grade level (grades 2–11 only): first, for all students tested in the group, and second, for LEP students tested. Our analysis focuses on the percentage of students at each school who perform at or above a given percentile of the national averages in two subjects—reading and math. Using the percentage of all students who performed at or above a given national percentile and the number of students who took a given exam at each school, we calculate the number and percentage of non-LEP students who scored above a given percentile in the following way:

If

q_a = the number of all students who took a test at a given school,

p_{ax} = the percentage of all students exceeding the xth national percentile,

q_1 = the number of LEP students who took a test at a given school, and

p_{1x} = the percentage of LEP students exceeding the xth national percentile,

then we calculate

q_n = the number of non-LEP students who took a test at a given school as $q_n = q_a - q_1$

and

p_{nx} = the percentage of non-LEP students exceeding the xth national percentile as $p_{nx} = (p_{ax} * q_{ax} - p_{1x} * q_{1x}) / q_n$.

For confidentiality reasons, censoring of LEP test scores occurred if fewer than ten LEP students took the exam at any given school in any given grade.[1] In cases where no LEP test scores are given, or test statistics are censored, we have used the overall school percentiles as our measure of non-LEP test scores. Among schools that reported LEP test information, 1.5 percent of estimated non-LEP students attended schools where fewer than ten LEP students in the grade took the test. Censoring

[1]Censoring also occurred if, overall, fewer than ten students took the Stanford 9 exam at a given school in a given grade. In such a case, the school is omitted from our achievement regressions, since we have no information on how the students did.

occurred more in elementary schools than in middle schools or high schools, but in no grades were more than 3 percent of students attending schools with censored LEP test information.

Twelve percent of students taking the Stanford 9 tests attended schools that did not report LEP test information. Our concern in this regard is that some schools may have inadvertently labeled LEP students as non-LEP students, leading to a downward bias in our estimate of non-LEP test scores for that school. We performed three specification checks to test the validity of our assumption that schools missing LEP information had no LEP students. First, we eliminated schools without Language Census LEP information. Using the same format as Tables 7.2 and 7.3, Appendix Tables E.1 and E.2 present information on the distribution of test scores excluding all schools with missing LEP information. This adjustment limited our analysis to schools with at least some reported LEP students. The results are very similar to those in Tables 7.2 and 7.3. The number of students in the top quartile nationally decreases from 24 percent to 21 percent in reading but increases from 21 percent to 23 percent in math.

Appendix Tables E.3 and E.4 provide data on test scores by county and are discussed in Chapter 7.

In a second specification check, we examined the number of LEP students reported in each grade in the Language Census at each school with missing LEP test information. Of the 735 grade 2 schools that were missing LEP test score data, about half (52 percent in math and 49 percent in reading) had no LEP students in grade 2 and 80 percent of these schools had ten or fewer LEP students in grade 2. This means that only 147 (or 3 percent) of all of the 4,417 schools in our sample with

Table E.1

Non-LEP Students' Math Scores Relative to National Norms, by Grade

	Quartile (1 = Low)			
Grade	1	2	3	4
2	31.2	22.1	23.2	23.6
3	32.1	23.3	23.2	21.5
4	33.4	22.6	21.7	22.3
5	34.2	20.2	23.7	21.9
6	27.7	21.0	23.3	28.0
7	29.4	23.3	24.0	23.4
8	30.1	23.1	24.9	21.9
9	23.5	23.4	28.1	25.0
10	26.1	26.6	27.6	19.7
11	27.7	23.1	23.7	25.5
Average across grades	29.5	24.3	23.3	23.3

Table E.2

Non-LEP Students' Reading Scores Relative to National Norms, by Grade

	Quartile (1 = Low)			
Grade	1	2	3	4
2	32.6	21.3	25.1	21.1
3	33.1	23.0	24.8	19.1
4	30.7	23.6	22.3	23.4
5	29.9	23.5	24.3	22.3
6	26.9	24.9	24.7	23.5
7	26.6	23.0	26.1	24.3
8	22.4	24.8	30.7	22.1
9	33.1	27.9	24.8	14.2
10	37.4	24.9	22.1	15.7
11	30.8	27.7	21.9	19.6
Average across grades	30.4	24.4	24.7	20.5

Table E.3

Percentage of Non-LEP Students Scoring Above the National Median in Math, Selected Grades, by County

County	Grade 2	Grade 5	Grade 8	Grade 11
Alameda	49	47.9	55.6	55.2
Alpine				
Amador	52.1	47.4	54.7	66
Butte	41.4	39.8	52.8	54.3
Calaveras	39.8	44	57.5	51.7
Colusa	50.3	32.9	22.8	35.4
Contra Costa	50.7	53.1	57.5	60
Del Norte	34.3	30.7	41.3	47.8
El Dorado	56	54.4	63.6	61.2
Fresno	46.3	42.2	43.4	47.2
Glenn	46.5	27.2	48.3	43.6
Humboldt	39.6	46.7	60.3	60.1
Imperial	40	33.4	26.3	34.8
Inyo	51.7	60	73.5	46.9
Kern	42.4	38.1	40.1	39.1
Kings	37.8	26.1	26.3	33.1
Lake	34.5	39.3	44.4	47.9
Lassen	49.3	44.4	51.2	52
Los Angeles	43.7	43	39.5	43.5
Madera	36.6	39.7	41.7	37.1
Marin	73.7	78.2	76.1	65.1
Mariposa	51.4	49.3	51.8	49.7
Mendocino	31.8	44.3	50.2	53.3
Merced	30.7	27.8	39.6	36.8
Modoc	34.8	50.9	38.6	53
Mono	74.8	67.9	47.3	42.9
Monterey	38.7	38.7	39	42.3
Napa	53.2	51.3	56.5	61
Nevada	57.9	63.2	80.4	66.7
Orange	61.3	60.2	62.7	61.7
Placer	61	58.6	60.5	57.1
Plumas	56.1	52.5	37.2	46.7

Table E.3 (continued)

County	Grade 2	Grade 5	Grade 8	Grade 11
Riverside	42.3	41.9	35.4	41
Sacramento	43.2	42.8	45.5	50.5
San Benito	36	33.2	49	44.1
San Bernardino	37.3	36.6	35.9	41
San Diego	57.6	55.9	53.7	52.8
San Francisco	54	55.4	56.7	64.7
San Joaquin	38.9	34.6	38.8	45.2
San Luis Obispo	59.7	57.6	63.4	61.9
San Mateo	51.8	56.3	56.4	53.5
Santa Barbara	50.8	51.5	54.7	54.4
Santa Clara	58.7	59.4	61.4	57.8
Santa Cruz	58.4	57.7	52.8	50.5
Shasta	42.7	41.5	44.5	50.6
Sierra	52	52.5	72.2	43.2
Siskiyou	40.8	53.1		52.1
Solano	43	46.8	51.5	49.5
Sonoma	50.7	57.5	58.2	55.9
Stanislaus	44.8	42	47.6	49
Sutter	31.6	26	42.4	52.8
Tehama	36.8	36.9	45.3	43
Trinity				45.8
Tulare	37.2	33.8	33.1	38.4
Tuolumne	65.5	40		50.8
Ventura	51.9	51.6	53.2	55.8
Yolo	48.5	47	31.9	57.8
Yuba	27.1	33.5	28.8	42.1

NOTE: Data are missing for certain counties in which no schools in the pertinent grade span existed, or none in the given grade span had valid test score data.

grade 2 students had more than ten LEP students in grade 2 and no test scores for LEP students. The Language Census is not conducted at the same time as the STAR tests. Therefore, it is quite credible that, because

Table E.4

Percentage of Non-LEP Students Scoring Above the National Median in Reading, Selected Grades, by County

County	Grade 2	Grade 5	Grade 8	Grade 11
Alameda	49.9	51.2	61.4	47.2
Alpine				
Amador	52.2	55.9	66.3	61.2
Butte	44.8	48	59.2	47.2
Calaveras	48.2	54.1	59.2	44.8
Colusa	48.5	27.9	42.9	35.2
Contra Costa	54.2	58.2	63.8	52.1
Del Norte	36.2	40.3	55.6	43.8
El Dorado	61.4	66	71.3	55.6
Fresno	41.5	41.4	50.2	37.5
Glenn	49.4	42.2	50.7	40.5
Humboldt	46.5	54.6	70.9	54.3
Imperial	43.5	32.8	36.1	31.9
Inyo	51.8	56.6	62	47.3
Kern	41.2	40.2	44.1	33.3
Kings	39	28.4	39.2	27.2
Lake	40.7	41.7	48.6	41.4
Lassen	46.4	51.3	58.8	42.6
Los Angeles	41.9	42	44.3	35.3
Madera	33.5	35.7	49.1	31.1
Marin	74.3	78	78.7	61.3
Mariposa	44.6	55.4	66.7	50.7
Mendocino	35.5	51.4	57.4	49.1
Merced	27.7	29.4	40.6	31.8
Modoc	34.6	47.6	51.1	53.7
Mono	50	56.9	62	46.4
Monterey	44.5	43.4	47.6	42.7
Napa	51.9	58.5	63.4	54.4
Nevada	60.2	65.4	77.8	61.7
Orange	59.7	59.3	64.6	50.9
Placer	63.2	68.1	70.9	52.7
Plumas	53	53.8	61.4	50.7

Table E.4 (continued)

County	Grade 2	Grade 5	Grade 8	Grade 11
Riverside	41	41.7	45.1	36.9
Sacramento	46.9	45.4	50.9	41.4
San Benito	39.7	37	53.4	38
San Bernardino	34.7	38.5	44	35.5
San Diego	54.3	56.3	61	47
San Francisco	50.9	48.7	52.6	46.9
San Joaquin	34.6	36.8	46.8	35.7
San Luis Obispo	59.7	63.7	69.6	61.1
San Mateo	57.2	58.4	63.6	45.4
Santa Barbara	56.3	57	62.5	48.2
Santa Clara	60.8	60.1	64.5	49.1
Santa Cruz	54.8	62.1	63.4	48.2
Shasta	44.5	49.7	55.4	45.1
Sierra	55.3	57.4	75	47.7
Siskiyou	56.3	57.1		45
Solano	45.2	50.6	57.5	41.4
Sonoma	52.8	61.9	66.3	52.7
Stanislaus	41.7	44	53.5	40.2
Sutter	36.4	36.2	50.9	41
Tehama	45.3	43.6	48.9	35.8
Trinity				40.9
Tulare	32.4	33.4	43.7	31.5
Tuolumne	42.9	58.8		47.9
Ventura	54.3	56.5	61.2	51.5
Yolo	50	53.8	46.5	49.4
Yuba	36	38.9	39.8	38.3

NOTE: Data are missing for certain counties in which no schools in the pertinent grade span existed, or none in the given grade span had valid test score data.

of student transfers during the school year, a school that had 15 or 20 LEP students at the time of the census might have had fewer than ten LEP students enrolled at the time of the STAR test, leading to suppression of LEP test scores for that school. For grade 5 students, the numbers are even more encouraging. Whereas 932 out of 4,258 schools do not include test scores for LEP students for grade 5 students, 64 percent of these schools enroll no LEP grade 5 students and 90 percent of these schools enroll ten or fewer grade 5 LEP students. The story is the same for higher grades as well, where over half of all schools that are missing LEP test-score information do not enroll any LEP students in that grade and over 80 percent of these schools enroll ten or fewer LEP students in any given grade. In supplementary regression analysis, we excluded from our sample schools with no LEP test scores listed and, according to the Language Census, more than 20 LEP students in a grade. We obtained virtually identical results to regressions run on the entire sample for each grade level.

As a final specification check that our results are not being driven by excluding LEP students, Appendix Tables E.5 through E.8 reestimate the regression results found in Tables 8.1 to 8.4 on the percentage of *all* students above the national median. We find very similar results to those presented in Chapter 8. The main difference, once we include LEP students in the calculation of school achievement, is that the effect of the percentage of LEP students taking the test in the given grade becomes negative and significant, as expected. In other words, if a higher percentage of LEP students at a school take the test, the percentage of all students scoring above the national median is lower.

Appendix Tables E.9 to E.12 show regression results from models of the percentage of non-LEP students scoring in the bottom national quartile on STAR reading and math tests in various grades.

Table E.5

Regressions of the Percentage of All Students Scoring Above the National Median in STAR Reading, Grades 2 and 5

	Grade 2	Grade 2	Grade 5	Grade 5	Grade 2	Grade 2	Grade 5	Grade 5
% lunch program	–0.548	–0.556	–0.564	–0.553	–0.503	–0.519	–0.511	–0.501
	(0.017)	(0.017)	(0.018)	(0.019)	(0.012)	(0.012)	(0.011)	(0.010)
% LEP students	0.024	0.043	–0.021	–0.116	–0.011	0.019	–0.030	–0.150
	(0.024)	(0.024)	(0.031)	(0.030)	(0.020)	(0.020)	(0.019)	(0.020)
% LEP test-takers	–0.138	–0.155	–0.140	–0.075	–0.138	–0.159	–0.159	–0.076
	(0.021)	(0.024)	(0.027)	(0.024)	(0.017)	(0.018)	(0.018)	(0.020)
Enrollment	–0.570	–2.714	–0.433	–1.424	–0.437	–2.202	–0.250	–0.794
(100s)	(0.099)	(0.461)	(0.108)	(0.547)	(0.083)	(0.447)	(0.074)	(0.463)
Average class size	0.028	–0.099	0.016	–0.088	0.047	–0.035	0.064	0.023
	(0.055)	(0.065)	(0.045)	(0.061)	(0.035)	(0.061)	(0.031)	(0.044)
Avverage teacher	0.204	0.166	0.237	0.099	0.413	0.207	0.463	0.113
experience	(0.091)	(0.035)	(0.085)	(0.029)	(0.065)	(0.030)	(0.058)	(0.021)
% teachers with	0.033	0.020	0.043	0.009	–0.016	0.003	0.000	0.003
master's or more	(0.036)	(0.015)	(0.038)	(0.012)	(0.018)	(0.008)	(0.016)	(0.005)
% teachers with	–0.028	–0.014	–0.002	–0.013	–0.004	–0.011	–0.012	–0.010
bachelor's or less	(0.021)	(0.012)	(0.024)	(0.009)	(0.022)	(0.009)	(0.020)	(0.007)
% teachers not	–0.131	–0.138	–0.116	–0.120	–0.151	–0.162	–0.033	–0.067
fully certified	(0.045)	(0.047)	(0.047)	(0.045)	(0.026)	(0.023)	(0.023)	(0.021)
District enrollment	0.009	0.008	0.005	0.005				
(1000s)	(0.002)	(0.002)	(0.002)	(0.002)				
Suburban school	–0.168	–0.087	0.971	1.097				
	(1.030)	(1.054)	(0.915)	(0.994)				
Rural school	–1.174	–1.156	0.818	0.208				
	(1.055)	(1.029)	(0.895)	(0.852)				
Constant	73.954	76.845	73.801	78.557	70.077	74.413	67.947	73.164
	(2.056)	(1.856)	(2.171)	(2.170)	(1.519)	(1.432)	(1.369)	(1.450)
Fixed effects	No	No	No	No	Yes	Yes	Yes	Yes
Grade-spec. attributes	No	Yes	No	Yes	No	Yes	No	Yes
No. of obs.	4328	4241	4186	3953	4328	4241	4186	3953
Adjusted R-squared	0.749	0.755	0.812	0.818	0.816	0.821	0.863	0.870

NOTES: Robust standard errors are in parentheses. Regressions with grade-specific attributes replace school-level variables with variables describing the students and teachers in grade 2 and 5 classes, respectively.

Table E.6

Regressions of the Percentage of All Students Scoring Above the National Median in STAR Math, Grades 2 and 5

	Grade 2	Grade 2	Grade 5	Grade 5	Grade 2	Grade 2	Grade 5	Grade 5
% lunch program	–0.524	–0.527	–0.575	–0.549	–0.480	–0.491	–0.532	–0.502
	(0.021)	(0.022)	(0.021)	(0.021)	(0.015)	(0.014)	(0.014)	(0.013)
% LEP students	0.050	0.067	0.130	–0.023	0.028	0.047	0.104	–0.085
	(0.036)	(0.037)	(0.042)	(0.036)	(0.025)	(0.024)	(0.024)	(0.026)
% LEP test-takers	–0.051	–0.070	–0.147	–0.039	–0.073	–0.091	–0.162	–0.036
	(0.034)	(0.038)	(0.033)	(0.032)	(0.021)	(0.023)	(0.022)	(0.025)
Enrollment	–0.357	–1.521	–0.372	–1.410	–0.311	–1.159	–0.173	–0.366
(100s)	(0.118)	(0.589)	(0.123)	(0.766)	(0.099)	(0.537)	(0.093)	(0.584)
Average class size	–0.004	–0.078	–0.008	–0.106	0.075	–0.037	0.037	–0.008
	(0.068)	(0.083)	(0.058)	(0.075)	(0.042)	(0.073)	(0.039)	(0.055)
Avverage teacher	–0.003	0.084	0.222	0.119	0.288	0.157	0.409	0.127
experience	(0.105)	(0.045)	(0.095)	(0.034)	(0.077)	(0.036)	(0.073)	(0.026)
% teachers with	0.081	0.035	0.081	0.021	–0.018	–0.004	0.016	0.004
master's or more	(0.042)	(0.019)	(0.040)	(0.013)	(0.022)	(0.010)	(0.020)	(0.007)
% teachers with	–0.023	–0.016	–0.014	–0.021	–0.035	–0.026	–0.051	–0.017
bachelor's or less	(0.029)	(0.015)	(0.025)	(0.010)	(0.027)	(0.011)	(0.025)	(0.008)
% teachers not	–0.106	–0.101	–0.109	–0.111	–0.133	–0.139	–0.045	–0.092
fully certified	(0.050)	(0.049)	(0.045)	(0.045)	(0.031)	(0.028)	(0.029)	(0.026)
District enrollment	0.008	0.007	0.005	0.005				
(1000s)	(0.002)	(0.002)	(0.002)	(0.002)				
Suburban school	–0.514	–0.186	0.779	0.867				
	(1.316)	(1.377)	(1.150)	(1.226)				
Rural school	–1.367	–1.456	–1.647	–2.407				
	(1.388)	(1.368)	(1.152)	(1.129)				
Constant	73.439	74.286	70.668	76.264	69.627	73.104	67.011	71.872
	(2.554)	(2.466)	(2.574)	(2.491)	(1.816)	(1.716)	(1.706)	(1.827)
Fixed effects	No	No	No	No	Yes	Yes	Yes	Yes
Grade-spec. attributes	No	Yes	No	Yes	No	Yes	No	Yes
No. of obs.	4340	4247	4191	3954	4340	4247	4191	3954
Adjusted R-squared	0.590	0.595	0.688	0.694	0.709	0.715	0.770	0.779

NOTES: Robust standard errors are in parentheses. Regressions with grade-specific attributes replace school-level variables with variables describing the students and teachers in grade 2 and 5 classes, respectively.

Table E.7

Regressions of the Percentage of All Students Scoring Above the National Median in STAR Reading, Grades 8 and 11

	Grade 8	Grade 8	Grade 11	Grade 11	Grade 8	Grade 8	Grade 11	Grade 11
% lunch program	–0.531	–0.547	–0.280	–0.362	–0.431	–0.435	–0.177	–0.297
	(0.024)	(0.024)	(0.033)	(0.037)	(0.028)	(0.027)	(0.035)	(0.034)
% LEP students	–0.231	–0.244	–0.511	–0.455	–0.245	–0.257	–0.609	–0.463
	(0.049)	(0.046)	(0.091)	(0.089)	(0.055)	(0.054)	(0.084)	(0.084)
% LEP test-takers	–0.038	–0.014	0.015	0.035	–0.142	–0.132	–0.088	–0.081
	(0.043)	(0.043)	(0.080)	(0.080)	(0.050)	(0.052)	(0.083)	(0.085)
Enrollment	0.055	–0.213	0.167	–0.052	0.161	0.522	0.560	0.642
(100s)	(0.108)	(0.292)	(0.070)	(0.301)	(0.107)	(0.287)	(0.065)	(0.300)
Average class size	0.027	0.016	0.019	–0.002	0.091	0.074	0.235	0.168
	(0.012)	(0.011)	(0.024)	(0.028)	(0.057)	(0.036)	(0.075)	(0.062)
Avverage teacher	0.385	0.058	0.284	0.224	0.287	–0.036	–0.279	0.003
experience	(0.133)	(0.080)	(0.200)	(0.126)	(0.133)	(0.079)	(0.179)	(0.118)
% teachers with	–0.011	–0.006	0.041	0.053	–0.011	0.025	0.135	0.071
master's or more	(0.038)	(0.020)	(0.047)	(0.029)	(0.038)	(0.020)	(0.056)	(0.033)
% teachers with	–0.042	–0.043	–0.034	0.011	–0.001	0.014	–0.020	0.014
bachelor's or less	(0.029)	(0.022)	(0.063)	(0.035)	(0.047)	(0.029)	(0.077)	(0.044)
% teachers not	–0.099	–0.119	–0.135	–0.145	–0.072	–0.125	–0.157	–0.320
fully certified	(0.064)	(0.069)	(0.137)	(0.132)	(0.055)	(0.049)	(0.098)	(0.091)
% with subject		–0.026		0.007		0.016		0.026
authorization		(0.016)		(0.039)		(0.018)		(0.037)
District enrollment	–0.005	–0.005	–0.004	–0.004				
(1000s)	(0.003)	(0.002)	(0.003)	(0.003)				
Suburban school	0.470	0.272	4.737	5.100				
	(1.236)	(1.283)	(1.563)	(1.600)				
Rural school	1.384	0.703	1.166	1.3				
	(1.217)	(1.290)	(1.776)	(1.820)				
Constant	71.318	79.570	42.447	47.330	66.210	69.307	35.871	43.501
	(2.919)	(2.874)	(3.855)	(4.633)	(3.244)	(2.298)	(4.627)	(4.612)
Fixed effects	No	No	No	No	Yes	Yes	Yes	Yes
Grade-spec. attributes	No	Yes	No	Yes	No	Yes	No	Yes
No. of obs.	1004	983	832	806	1004	983	832	806
Adjusted R-squared	0.818	0.82	0.539	0.595	0.889	0.890	0.741	0.770

NOTES: Robust standard errors are in parentheses. In regressions with grade-specific attributes, for middle and high school students, student attributes are calculated at the grade level and teacher attributes are calculated for teachers who teach English.

Table E.8

Regressions of the Percentage of All Students Scoring Above the National Median in STAR Math, Grades 8 and 11

	Grade 8	Grade 8	Grade 11	Grade 11	Grade 8	Grade 8	Grade 11	Grade 11
% lunch program	–0.583	–0.597	–0.281	–0.381	–0.437	–0.444	–0.165	–0.289
	(0.031)	(0.031)	(0.042)	(0.044)	(0.034)	(0.032)	(0.046)	(0.042)
% LEP students	–0.076	–0.062	–0.409	–0.308	–0.138	–0.157	–0.549	–0.352
	(0.054)	(0.051)	(0.102)	(0.105)	(0.067)	(0.064)	(0.109)	(0.102)
% LEP test-takers	–0.017	–0.028	0.003	0.003	–0.122	–0.104	–0.117	–0.147
	(0.050)	(0.052)	(0.099)	(0.102)	(0.060)	(0.061)	(0.107)	(0.103)
Enrollment	0.083	–0.139	0.396	0.485	0.375	1.064	0.874	0.967
(100s)	(0.127)	(0.319)	(0.087)	(0.319)	(0.130)	(0.343)	(0.084)	(0.377)
Average class size	0.027	0.015	0.042	0.060	0.075	–0.018	0.350	0.438
	(0.018)	(0.013)	(0.034)	(0.048)	(0.068)	(0.048)	(0.098)	(0.104)
Avverage teacher	0.858	0.458	0.620	0.587	0.618	0.386	–0.066	0.315
experience	(0.160)	(0.097)	(0.227)	(0.129)	(0.161)	(0.087)	(0.234)	(0.143)
% teachers with	–0.001	–0.002	–0.031	–0.009	0.024	–0.021	0.076	0.047
master's or more	(0.047)	(0.025)	(0.058)	(0.032)	(0.046)	(0.022)	(0.073)	(0.036)
% teachers with	–0.009	–0.004	–0.042	0.001	0.050	–0.010	–0.110	0.054
bachelor's or less	(0.030)	(0.021)	(0.065)	(0.037)	(0.057)	(0.029)	(0.101)	(0.050)
% teachers not	–0.120	–0.131	–0.131	–0.138	–0.117	–0.138	–0.171	–0.389
fully certified	(0.072)	(0.079)	(0.153)	(0.151)	(0.066)	(0.059)	(0.128)	(0.117)
% with subject		0.008		0.064		0.033		0.120
authorization		(0.016)		(0.036)		(0.019)		(0.038)
District enrollment	–0.007	–0.006	–0.010	–0.007				
(1000s)	(0.003)	(0.003)	(0.004)	(0.003)				
Suburban school	0.203	–0.065	4.018	3.561				
	(1.493)	(1.487)	(1.899)	(1.865)				
Rural school	–0.998	–1.749	–1.748	–2.35				
	(1.540)	(1.568)	(2.052)	(1.996)				
Constant	59.074	66.805	42.620	43.844	52.106	59.176	33.439	28.823
	(3.662)	(3.467)	(4.378)	(4.453)	(3.919)	(2.813)	(6.051)	(5.662)
Fixed effects	No	No	No	No	Yes	Yes	Yes	Yes
Grade-spec. attributes	No	Yes	No	Yes	No	Yes	No	Yes
No. of obs.	1004	987	833	806	1004	987	833	806
Adjusted R-squared	0.732	0.733	0.432	0.523	0.780	0.806	0.615	0.693

NOTES: Robust standard errors are in parentheses. In regressions with grade-specific attributes, for middle and high school students, student, student attributes are calculated at the grade level and teacher attributes are calculated for teachers who teach math.

Table E.9

Regressions of the Percentage of Students Scoring in the Bottom National Quartile in STAR Reading, Grades 2 and 5

	Grade 2	Grade 2	Grade 5	Grade 5	Grade 2	Grade 2	Grade 5	Grade 5
% lunch program	0.458	0.466	0.468	0.445	0.465	0.473	0.460	0.444
	(0.019)	(0.020)	(0.020)	(0.019)	(0.018)	(0.019)	(0.019)	(0.018)
% LEP students	0.047	0.024	0.026	0.207	0.025	–0.001	0.055	0.195
	(0.033)	(0.034)	(0.053)	(0.041)	(0.029)	(0.029)	(0.045)	(0.039)
% LEP test-takers	–0.054	–0.037	–0.106	–0.253	0.186	0.204	0.196	0.092
	(0.028)	(0.031)	(0.043)	(0.037)	(0.027)	(0.030)	(0.038)	(0.034)
Enrollment	0.414	1.763	0.152	0.367	0.599	3.114	0.455	2.174
(100s)	(0.132)	(0.699)	(0.119)	(0.716)	(0.111)	(0.550)	(0.088)	(0.620)
Average class size	–0.021	0.099	–0.045	–0.022	–0.025	0.105	–0.009	0.009
	(0.055)	(0.089)	(0.051)	(0.071)	(0.050)	(0.084)	(0.046)	(0.057)
Average teacher	–0.253	–0.215	–0.296	–0.116	–0.284	–0.216	–0.271	–0.112
experience	(0.123)	(0.046)	(0.117)	(0.038)	(0.115)	(0.041)	(0.096)	(0.028)
% teachers with	–0.048	–0.023	–0.026	–0.004	–0.034	–0.013	–0.020	–0.006
master's or more	(0.036)	(0.016)	(0.033)	(0.010)	(0.036)	(0.015)	(0.034)	(0.011)
% teachers with	0.023	0.017	0.025	0.016	0.030	0.017	0.024	0.016
bachelor's or less	(0.026)	(0.014)	(0.030)	(0.011)	(0.022)	(0.012)	(0.026)	(0.009)
% teachers not	0.159	0.166	0.170	0.183	0.141	0.150	0.128	0.137
fully certified	(0.053)	(0.055)	(0.053)	(0.055)	(0.045)	(0.049)	(0.043)	(0.045)
District enrollment	–0.006	–0.005	–0.008	–0.007	–0.009	–0.008	–0.006	–0.005
(1000s)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Suburban school	–1.006	–1.168	–2.375	–2.388	–0.130	–0.283	–1.572	–1.619
	(1.125)	(1.164)	(1.051)	(1.057)	(1.042)	(1.071)	(0.886)	(0.922)
Rural school	–0.437	–0.598	–2.307	–2.146	1.248	1.113	–0.974	–0.990
	(1.297)	(1.276)	(1.150)	(1.137)	(1.145)	(1.129)	(0.963)	(0.938)
Constant	11.259	8.158	11.921	9.046	8.225	4.553	6.957	4.67
	(2.312)	(2.321)	(2.540)	(2.354)	(2.139)	(2.118)	(2.113)	(1.873)
Non-LEP only	Yes	Yes	Yes	Yes	No	No	No	No
Grade-spec. attributes	No	Yes	No	Yes	No	Yes	No	Yes
No. of obs.	4328	4241	4186	3953	4328	4241	4186	3953
Adjusted R-squared	0.611	0.618	0.636	0.655	0.737	0.743	0.813	0.824

NOTES: Robust standard errors are in parentheses. Regressions with grade-specific attributes replace school-level variables with variables describing the students and teachers in grade 2 and 5, respectively.

Table E.10

Regressions of the Percentage of Students Scoring in the Bottom National Quartile in STAR Math, Grades 2 and 5

	Grade 2	Grade 2	Grade 5	Grade 5	Grade 2	Grade 2	Grade 5	Grade 5
% lunch program	0.435	0.435	0.505	0.468	0.438	0.439	0.493	0.464
	(0.019)	(0.021)	(0.022)	(0.021)	(0.019)	(0.021)	(0.021)	(0.020)
% LEP students	–0.007	–0.018	–0.134	0.074	–0.034	–0.048	–0.096	0.078
	(0.037)	(0.040)	(0.050)	(0.044)	(0.036)	(0.037)	(0.043)	(0.040)
% LEP test-takers	–0.047	–0.032	0.011	–0.151	0.051	0.066	0.160	0.034
	(0.037)	(0.041)	(0.042)	(0.041)	(0.037)	(0.041)	(0.037)	(0.036)
Enrollment	0.333	0.979	0.018	–0.337	0.353	1.430	0.355	1.523
(100s)	(0.135)	(0.807)	(0.132)	(0.807)	(0.112)	(0.592)	(0.132)	(0.841)
Average class size	–0.002	0.088	–0.035	0.006	–0.002	0.084	–0.005	0.035
	(0.058)	(0.102)	(0.063)	(0.083)	(0.054)	(0.098)	(0.055)	(0.066)
Average teacher	–0.004	–0.092	–0.281	–0.120	–0.046	–0.095	–0.255	–0.113
experience	(0.110)	(0.049)	(0.108)	(0.042)	(0.102)	(0.043)	(0.091)	(0.035)
% teachers with	–0.071	–0.029	–0.059	–0.015	–0.070	–0.028	–0.059	–0.013
master's or more	(0.035)	(0.017)	(0.036)	(0.011)	(0.035)	(0.016)	(0.038)	(0.011)
% teachers with	0.023	0.028	0.019	0.021	0.024	0.021	0.024	0.023
bachelor's or less	(0.026)	(0.016)	(0.028)	(0.011)	(0.025)	(0.013)	(0.025)	(0.010)
% teachers not	0.136	0.132	0.149	0.157	0.109	0.105	0.127	0.135
fully certified	(0.056)	(0.054)	(0.053)	(0.053)	(0.049)	(0.048)	(0.046)	(0.047)
District enrollment	–0.004	–0.003	–0.007	–0.007	–0.007	–0.007	–0.005	–0.005
(1000s)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Suburban school	–1.370	–1.756	–2.357	–2.273	–0.523	–0.857	–1.431	–1.457
	(1.221)	(1.270)	(1.235)	(1.270)	(1.176)	(1.230)	(1.089)	(1.136)
Rural school	–1.344	–1.328	–0.870	0.036	–0.261	–0.114	0.519	1.178
	(1.348)	(1.349)	(1.275)	(1.309)	(1.270)	(1.260)	(1.128)	(1.124)
Constant	9.738	9.002	17.52	13.149	9.498	8.073	12.903	8.981
	(2.356)	(2.682)	(2.491)	(2.782)	(2.290)	(2.489)	(2.185)	(2.235)
Non-LEP only	Yes	Yes	Yes	Yes	No	No	No	No
Grade-spec. attributes	No	Yes	No	Yes	No	Yes	No	Yes
No. of obs.	4340	4247	4191	3954	4340	4247	4191	3954
Adjusted R-squared	0.517	0.522	0.552	0.56	0.572	0.576	0.681	0.688

NOTES: Robust standard errors are in parentheses. Regressions with grade-specific attributes replace school-level variables with variables describing the students and teachers in grade 2 and 5 classes, respectively.

Table E.11

Regressions of the Percentage of Students Scoring in the Bottom Quartile in STAR Reading, Grades 8 and 11

	Grade 8	Grade 8	Grade 11	Grade 11	Grade 8	Grade 8	Grade 11	Grade 11
% lunch program	0.380	0.397	0.232	0.307	0.376	0.395	–0.557	0.301
	(0.022)	(0.023)	(0.035)	(0.037)	(0.020)	(0.020)	(0.115)	(0.037)
% LEP students	0.265	0.260	0.557	0.527	0.301	0.293	–0.849	0.515
	(0.048)	(0.048)	(0.098)	(0.100)	(0.044)	(0.042)	(0.394)	(0.092)
% LEP test-takers	–0.327	–0.339	–0.374	–0.424	0.030	0.020	0.726	0.012
	(0.053)	(0.052)	(0.093)	(0.095)	(0.046)	(0.043)	(0.630)	(0.082)
Enrollment	–0.178	–0.242	–0.181	–0.178	–0.087	0.028	18.437	0.085
(100s)	(0.095)	(0.228)	(0.065)	(0.265)	(0.080)	(0.218)	(0.866)	(0.238)
Average class size	–0.020	–0.006	–0.010	0.007	–0.020	–0.011	0.100	0.007
	(0.011)	(0.007)	(0.024)	(0.020)	(0.010)	(0.007)	(0.145)	(0.022)
Average teacher	–0.343	–0.043	–0.353	–0.193	–0.251	–0.010	0.017	–0.122
experience	(0.136)	(0.073)	(0.200)	(0.130)	(0.115)	(0.063)	(0.764)	(0.123)
% teachers with	0.027	0.014	0.002	–0.020	0.016	0.008	0.314	–0.021
master's or more	(0.037)	(0.020)	(0.047)	(0.028)	(0.032)	(0.017)	(0.175)	(0.025)
% teachers with	0.037	0.035	0.007	–0.031	0.045	0.041	0.268	–0.013
bachelor's or less	(0.026)	(0.020)	(0.060)	(0.035)	(0.022)	(0.017)	(0.172)	(0.032)
% teachers not	0.138	0.150	0.189	0.196	0.115	0.127	–0.455	0.181
fully certified	(0.079)	(0.084)	(0.148)	(0.145)	(0.065)	(0.068)	(0.160)	(0.132)
% with subject		0.020		–0.020		0.020		–0.014
authorization		(0.014)		(0.036)		(0.013)		(0.035)
District enrollment	0.008	0.008	0.003	0.004	0.009	0.009	–0.244	0.003
(1000s)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.018)	(0.002)
Suburban school	–2.195	–1.945	–5.046	–4.965	–1.335	–1.076	17.184	–4.395
	(1.161)	(1.174)	(1.468)	(1.497)	(0.999)	(0.999)	(8.257)	(1.425)
Rural school	–1.355	–0.973	–1.211	–1.655	–0.93	–0.425	9.814	–1.492
	(1.114)	(1.131)	(1.734)	(1.748)	(0.952)	(0.956)	(10.602)	(1.616)
Constant	10.994	4.365	31.146	27.22	8.66	2.655	11.993	24.342
	(2.381)	(2.110)	(3.893)	(4.402)	(2.157)	(1.917)	(19.727)	(4.179)
Non-LEP only	Yes	Yes	Yes	Yes	No	No	No	No
Grade-spec. attributes	No	Yes	No	Yes	No	Yes	No	Yes
No. of obs.	1004	983	832	806	1004	983	847	806
Adjusted R-squared	0.684	0.681	0.432	0.489	0.828	0.828	0.886	0.629

NOTES: Robust standard errors are in parentheses. In regressions with grade-specific attributes, for middle and high school students, student attributes are calculated at the grade level and teacher attributes are calculated for teachers who teach English.

Table E.12

Regressions of the Percentage of Students Scoring in the Bottom Quartile in STAR Math, Grades 8 and 11

	Grade 8	Grade 8	Grade 11	Grade 11	Grade 8	Grade 8	Grade 11	Grade 11
% lunch program	0.451	0.464	0.195	0.266	0.449	0.465	0.196	0.266
	(0.031)	(0.031)	(0.037)	(0.038)	(0.028)	(0.028)	(0.036)	(0.037)
% LEP students	0.126	0.119	0.381	0.323	0.158	0.144	0.382	0.321
	(0.059)	(0.059)	(0.091)	(0.084)	(0.055)	(0.053)	(0.087)	(0.080)
% LEP test-takers	–0.203	–0.195	–0.193	–0.213	0.021	0.032	0.018	0.008
	(0.060)	(0.061)	(0.092)	(0.092)	(0.055)	(0.055)	(0.088)	(0.087)
Enrollment	–0.281	–0.373	–0.379	–0.654	–0.157	–0.083	–0.325	–0.465
(100s)	(0.129)	(0.282)	(0.066)	(0.257)	(0.117)	(0.260)	(0.064)	(0.253)
Average class size	–0.033	–0.016	–0.053	–0.058	–0.034	–0.017	–0.047	–0.049
	(0.020)	(0.016)	(0.029)	(0.042)	(0.020)	(0.015)	(0.027)	(0.040)
Average teacher	–0.700	–0.394	–0.344	–0.395	–0.636	–0.341	–0.319	–0.381
experience	(0.171)	(0.101)	(0.198)	(0.111)	(0.153)	(0.094)	(0.191)	(0.110)
% teachers with	0.025	0.021	0.048	0.012	0.025	0.016	0.044	0.013
master's or more	(0.048)	(0.025)	(0.049)	(0.027)	(0.044)	(0.023)	(0.046)	(0.025)
% teachers with	0.013	–0.001	0.023	–0.005	0.017	0.003	0.030	0.000
bachelor's or less	(0.029)	(0.021)	(0.051)	(0.031)	(0.027)	(0.019)	(0.048)	(0.030)
% teachers not	0.173	0.178	0.176	0.160	0.151	0.158	0.165	0.152
fully certified	(0.101)	(0.108)	(0.143)	(0.132)	(0.087)	(0.093)	(0.135)	(0.125)
% with subject		–0.001		–0.057		0.002		–0.058
authorization		(0.015)		(0.029)		(0.015)		(0.029)
District enrollment	0.009	0.008	0.007	0.005	0.009	0.009	0.006	0.004
(1000s)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)
Suburban school	–2.697	–2.424	–3.874	–3.109	–1.811	–1.536	–3.636	–2.980
	(1.535)	(1.529)	(1.428)	(1.370)	(1.410)	(1.395)	(1.419)	(1.359)
Rural school	–1.963	–1.359	–1.088	–0.747	–1.032	–0.471	–0.892	–0.552
	(1.592)	(1.610)	(1.558)	(1.494)	(1.485)	(1.499)	(1.501)	(1.435)
Constant	22.891	16.384	32.326	33.687	20.261	13.916	30.647	32.121
	(3.819)	(3.854)	(3.749)	(3.771)	(3.617)	(3.621)	(3.639)	(3.698)
Non-LEP only	Yes	Yes	Yes	Yes	No	No	No	No
Grade-spec. attributes	No	Yes	No	Yes	No	Yes	No	Yes
No. of obs.	1004	987	833	806	1004	987	833	806
Adjusted R-squared	0.649	0.653	0.356	0.44	0.741	0.745	0.428	0.515

NOTES: Robust standard errors are in parentheses. In regressions with grade-specific attributes, for middle and high school students, student attributes are calculated at the grade level and teacher attributes are calculated for teachers who teach math.

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