Occasional Papers

Funding Formulas for California Schools: Simulations and Supporting Data

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Summary

By many accounts, California's school finance system is ripe for reform. The shape of the current system was determined in the 1970s by court rulings and popular initiatives. Since then, the system has changed by accretion, with each year laying on another group of revenue programs. State revenue now flows to school districts through so many channels that it is difficult to determine why some districts receive more funding than others. Each revenue program also has its own restrictions on the use of funds, reducing the latitude of school districts to use state funds more effectively.

Any reform of this system should recognize the fundamental purpose of the state's school finance system, which is to ensure that schools have the resources their students need to learn the academic content the state has specified for them. One approach toward this objective is to use proficiency rates on state exams to guide the allocation of state revenue. Schools in which few students are proficient in English and math would receive additional resources. Although this approach would tie the state's school finance system to its academic goals, the approach would also create perverse consequences for schools. Schools that improved their effectiveness would be "rewarded" with fewer resources. An alternative approach is to allocate state revenue according to indicators of student needs that are external to schools. As an example, students from low-income families are less likely than other students to score in the proficient range on statewide tests. Schools with large percentages of such students may therefore require additional resources. Because family income is not affected by school effectiveness, revenue allocated according to that indicator would not create perverse consequences.

Just as student resource needs vary from school to school, the cost of educational resources varies from district to district. A school finance system that aims to provide students with the resources they need to be successful should recognize these cost differences. One approach to recognizing cost differences is to reimburse districts for unusually high expenditures. However, this approach removes the incentive districts have to achieve their objectives in the least costly manner. An alternative approach is to find indicators of cost that are external to districts. For example, districts with low population density may have unusually high costs for pupil transportation. A school finance system could direct more funds to such districts, reimbursing them for their unusually high costs without removing incentives to economize.

Bersin, Kirst, and Liu (2007) have recently proposed an alternative school finance system for California that conforms with many of these design principles. It is much simpler than the current system, allocating funds to districts through three simple formulas. Funds are also allocated according to student needs and district costs, using indicators of need and cost that are external to districts. This paper presents results from our efforts to simulate the proposed system. The simulations use data on the allocation of revenue to every school district in California through each one of the state's nearly 100 revenue programs in 2004-2005. Before presenting those simulation results, the paper briefly reviews evidence on student needs and district costs.

The percentage of a school's students who are proficient in English and mathematics is negatively correlated with two variables: the percentage of the school's students who are English learners and the percentage of the school's students who are economically

disadvantaged. Other variables may also be correlated with proficiency rates, but the correlations with these two variables are particularly strong. The two variables also overlap − eighty-five percent of English learners are also economically disadvantaged. When considered together as predictors of a school's proficiency rates, economic disadvantage appears to be more important than English fluency. That is, an increase in the percentage of economically disadvantaged students, holding constant the percentage of English learners, has a larger negative effect on the proficiency rate than does an equivalent increase in the percentage of English learners, holding constant the percentage of economically disadvantaged students.

California's current school finance system does tend to allocate more revenue to districts with higher percentages of low-income students. To investigate the link between revenue per pupil and the percentage of low-income students, we divided California school districts into nine groups based on grade span and size. Those nine groups are listed in Table S1. For each group, we then estimated the relationship between state revenue per pupil and the fraction of a district's students participating in its free or reduced-price lunch program.[1] The first and second columns of Table S1 display the parameters of that average relationship. The intercept is the average revenue per pupil for a school in which no students participate in its subsidized lunch program. For large unified districts, that intercept is $6,447 per pupil. The slope describes how revenue per pupil increases as the fraction of low-income students increases. For large unified districts, revenue per pupil increases from $6,447 to $7,616 as the fraction of low-income students increases from zero to unity. With the exception of medium-sized elementary and high school districts, state revenue follows the same general pattern: It increases as the fraction of low-income students increases. However, the rate of increase differs widely across district types, and revenue per pupil varies substantially among districts with similar fractions

Table S1
Average Relationship Between State Revenue per ADA and Percent Free or Reduced Price Lunch, All School Districts, 2004-2005

	Intercept	Slope	Percent of Districts Within $500 of Average Relationship	Percent of Districts Within $1,000 of Average Relationship
Elementary districts				
Small (0-250 ADA)	9,253	1,372	8	17
Medium (251-1,500 ADA)	7,307	-283	60	90
Large (1,501+ ADA)	6,582	421	87	98
High school districts				
Small (0-1,500 ADA)	8,241	2,967	15	41
Medium (1,501-6,000 ADA)	8,199	-624	37	85
Large (6,001+ ADA)	7,653	791	52	93
Unified districts				
Small (0-3,000 ADA)	9,052	174	16	22
Medium (3,001-10,000 ADA)	6,804	431	85	98
Large (10,001+ ADA)	6,447	1,169	84	98

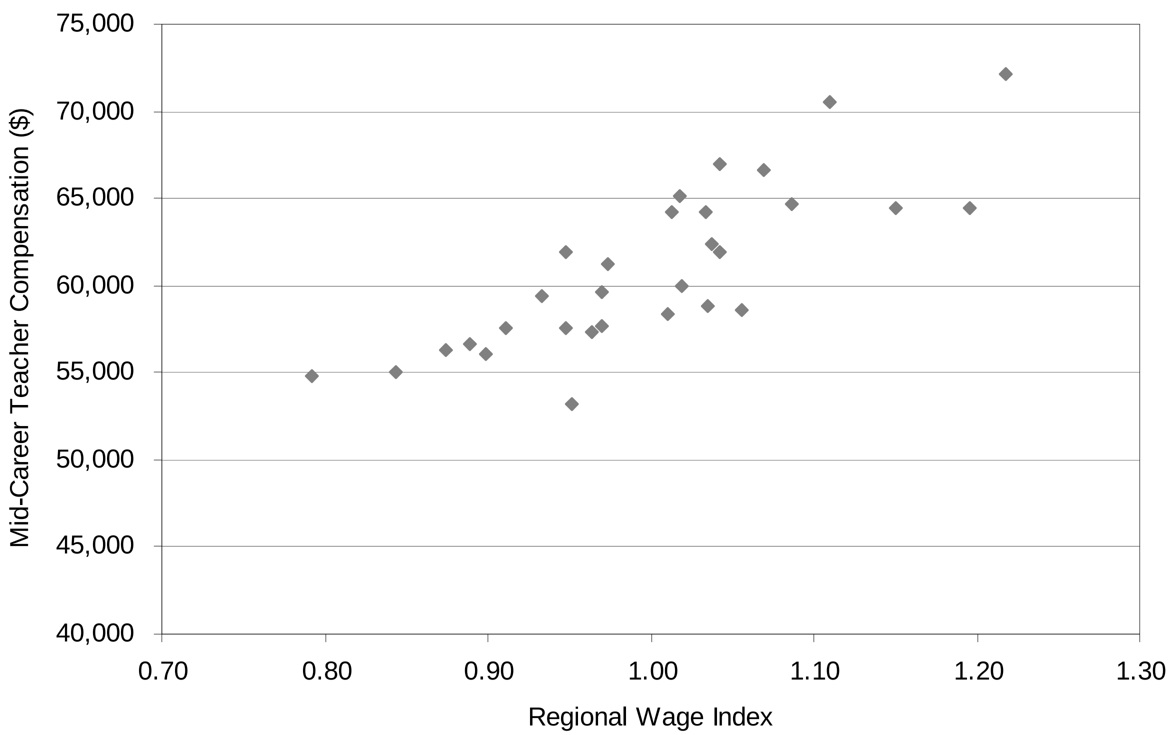
[1] State revenue includes revenue limit funds (state and local), revenue for locally funded charter schools, lottery revenue, all other state categorical revenue, and federal local assistance for special education.

of low-income students. The latter fact is represented in the third and fourth columns of Table S1. The third column shows the percentage of school districts of each type that have revenue per pupil within $500 of the average relationship. Eighty-four percent of large unified districts fall in this band; very few small districts do. On average, however, small districts have higher revenue per pupil than large districts.

Although California's present school finance system does recognize differences across districts in the need for school resources, it does not recognize differences across districts in the cost of school resources. Those cost differences can be substantial. In 2003-2004, school districts in Santa Clara and Orange Counties offered annual compensation averaging $70,000 for teachers with average experience and education. In contrast, the average compensation for teachers of the same education and experience was only $55,000 for districts in Del Norte, Humboldt, Lake, Mendocino, and Yolo Counties.

These compensation differences were clearly driven by differing labor market conditions. Districts that offered relatively high compensation for their teachers were located in areas of the state in which employees in other enterprises were also offered relatively high compensation. This relationship is depicted in Figure S1. The figure plots the average

Figure S1
Mid-Career Teacher Compensation and Regional Wage Index, California Regions, 2003-2004



compensation of a mid-career teacher against a regional wage index. The index is based on the average wage of college-educated workers in a region who are not employed in school districts. Regions are either a single county or groups of adjoining counties based on the Metropolitan

Statistical Areas defined by the U.S. Census. As the figure reveals, the average teacher compensation in a region is positively correlated with the wage of college-educated, non-teachers in the region.

Teacher compensation constitutes roughly half of total school district expenditures. Compensation for other school district employees comprises another 30 percent of district expenditures. Compensation for these other employees is also likely to be higher in high-wage regions. Thus, districts in high-wage regions have substantially higher costs without substantially higher revenue. They respond by employing relatively fewer educational resources. In a region in which the wage index is 10 percent above the state average, districts on average will have student-teacher ratios that are 2 percent above the state average.

Pupil transportation costs can also be very high for some districts. These districts are primarily small and rural. In general, we find that per-pupil transportation costs are negatively related to population density, suggesting that density may be an external factor that could be used in a school finance formula accounting for unusually high transportation costs. This paper also investigates variation among districts in utility expenditures. Some of that variation is correlated with weather-related utility usage. However, the differences across districts in this cost area are relatively small.

Differences in student needs and district costs are clearly addressed in the finance system proposed by Bersin, Kirst, and Liu. Their proposal has five basic elements:

- Base Funding. All school districts would receive a grant to cover the basic costs of education. The grant would be proportional to district enrollment (an equal amount per pupil).

- Special Education Funding. All districts would receive a grant for special education. The grant would also be proportional to district enrollment (an equal amount per pupil).

- Targeted Funding. All districts would receive a grant for the additional needs of targeted students, defined as English learners or students participating in the district's free or reduced-price lunch program. The grant would be proportional to the number of targeted students as long as the percentage of those students is less than 50 percent of enrollment. For percentages above 50 percent, the grant would increase more than proportionally to the number of targeted students.

- Regional Cost Adjustments. The funds in each of the three programs noted above would be adjusted for regional wage differences.

- Hold Harmless Condition. No district would receive less revenue from the three programs than it currently receives from state and local programs serving the same purposes as the new programs.

This paper simulates the Bersin, Kirst, and Liu proposal under a number of assumptions about parameter values for the three programs. For a representative set of parameter values, the program would require an additional $7.2 billion in revenue − an 18 percent increase over the revenues schools were provided in 2004-2005. The last column of Table S2 breaks that total cost into the costs associated with each of the three programs in the new system. The base program would have required an additional $1,783 million, the special education program an additional $750 million, and the targeted program an additional $4,657 million.

Table S2
Additional Cost of Bersin-Kirst-Liu Proposal
(dollars in millions)

Scenario	#1	#2	#3	#4
Hold Harmless Condition?	No	Yes	No	Yes
Regional Wage Adjustment?	No	No	Yes	Yes
Base program	1,049	1,550	1,049	1,783
Special education program	655	765	655	750
Targeted program	4,671	4,695	4,640	4,657
Total	6,375	7,010	6,344	7,190

The first column of the table shows those costs under a different scenario: Districts are not held harmless, and funds are not adjusted for regional wage differences. This scenario reduces the cost of the program by $815 million. The second and third columns show costs of the proposal under two other scenarios for the hold harmless condition and the regional wage adjustment. The paper also presents cost estimates with different parameters for each of the three programs.

Because of the hold harmless condition, all districts would receive at least as much revenue under the proposed system as they received in 2004-2005. However, because the alternative program adds $7 billion in revenue, some districts would have significantly greater revenue under the proposed system. Due to the targeted program and the regional wage adjustment, the biggest gainers are districts with many low-income students located in regions with higher than average wages. High-poverty districts in low-wage regions would also experience significant revenue gains. Low-poverty, high-wage districts also gain, although considerably less on average than do high-poverty districts.

Bersin, Kirst, and Liu have provided a good starting point for discussing school finance reform in California. They offer a simple alternative to the current system, an alternative that is also more directly related than the current system to variations in student needs and district costs. We hope that this alternative causes other groups to also propose alternatives to the current system. As these proposals emerge, we intend to use our simulation model to analyze them.

Those proposals could take many forms, but, based on our experience simulating the Bersin, Kirst, and Liu proposal, we believe there are two particularly fruitful areas to investigate. The first concerns small school districts, which would, on average, receive less revenue under the Bersin, Kirst, and Liu funding formula than they currently receive. The higher average revenue of small districts may be an historical accident, but it may also reflect the realities of providing an adequate education to students living in sparsely populated areas of the state. If population density is an issue in the cost of education, a school finance formula might want to recognize it. A related issue is the financing of county offices of education, which provide many services to small districts. Under the Bersin, Kirst, and Liu proposal, many of the categorical programs providing revenue for those services would be eliminated, raising the issue of whether the services ought to be continued and, if so, how they ought to be financed.

Acknowledgements

In constructing the simulation model used in this paper, we were guided by an advisory group consisting of Carol Bingham and Sandra Silva of the California Department of Education, Paul Warren of the Legislative Analyst's Office, and Nicolas Schweizer of the California Department of Finance. Their assistance was invaluable. We are particularly indebted to Carol and Sandra, who provided most of the revenue data used in our model and spent many hours with us explaining the intricacies of California's school finance system.

We also benefited from extended discussions with a number of people: Michael Ricketts of the California County Superintendents Education Services Association, Jeannie Oropeza of the California Department of Finance, Loren Kaye of the California Foundation for Commerce and Education, and Robert Manwaring of the Governor's Committee on Educational Excellence. We particularly thank Rob for his early support of this project and his valuable advice at every stage along the way.

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Introduction

In their summary of the “Getting Down to Facts” research project, Loeb, Bryk, and Hanushek (2007) conclude that California’s public school finance system is overly complex, unnecessarily restrictive, and fundamentally irrational. In their view, it is overly complex because school districts receive state funds through too many different programs, each with its own complicated rules and regulations. It is unnecessarily restrictive, they believe, because these rules and regulations often prevent school districts from allocating their revenue to its most effective use. Finally, the authors contend that the present system is fundamentally irrational because the funds that districts receive are not systematically related to student needs and district costs. Timar (2004) reaches similar conclusions.

The difficult task of devising a better alternative has been initiated by Bersin, Kirst, and Liu (2007). Their alternative is certainly simple, it places few restrictions on the use of funds, and it clearly allocates funds according to student needs and district costs. The system has three elements: a base program, a special education program, and a targeted program. Funds in the base and special education programs are allocated to districts in proportion to total enrollment. Funds in the targeted program are allocated according to the number of low-income students and English learners. Funds in all three programs are adjusted for regional labor market conditions.

This paper presents results from simulating this alternative system. Working with colleagues in the Department of Education, the Department of Finance, and the Legislative Analyst’s Office, we have assembled data detailing the funds that each California school district received in 2004-2005 from each of the state’s nearly 100 revenue programs. Using that data as a foundation, we have constructed a model that simulates the revenue every school district would receive in alternative school finance systems and compares that sum to the funds it received in 2004-2005.[2]

Before describing the application of this model to the Bersin-Kirst-Liu (BKL) proposal, the paper briefly reviews evidence on student needs, district costs, and the allocation of revenue under the present system. The goal is to provide an empirical base for evaluating alternatives to that system. In particular, the first two sections of the paper address the following questions: What are students’ needs and how do they vary across districts? What are the most important cost differences among districts? How does the allocation of revenue under the current system relate to student needs and district costs? Complete answers to any of these questions would be more extensive than we can provide in this short paper. Accordingly, further analysis supplementing the main points of this paper is available along with this report on the PPIC website.

[2] Instructions for requesting the full model are available along with this report on the PPIC website.

Student Needs

California has established rigorous standards for what students should learn in every grade. It has also implemented a testing program measuring whether students are proficient in the academic content for their grade. The percentage of students who are proficient varies widely from school to school, a variation that is at least partly due to differences in the motivation and abilities of students. Because the state's ultimate goal is to have all students learn the academic content it has outlined in its standards, its school finance system might logically use the proficiency rates in schools as an indicator of need. Under such a system, schools with low proficiency rates would receive additional resources.

Although such a system would be tied directly to the state's goals, it would also create perverse consequences for the most effective schools. Student achievement is not only determined by the motivation and abilities of students; it is also a function of the effectiveness of teachers and schools. If resources were tied to proficiency rates, schools that improved student achievement through more effective teaching or more efficient use of existing resources would be "rewarded" with fewer resources. The likely reward for better teaching would be larger classes.

In designing a school finance system, the challenge is to direct resources to schools with the most need without creating perverse consequences. One response to this challenge is to allocate resources to schools on the basis of indicators of student needs that are not related to the effectiveness of teachers and schools. This section considers two of those indicators: English fluency and poverty. In both cases, we review the relationship between the indicators and student achievement. While there are many measures of student achievement in California, for brevity we focus on the California Standards Test (CST) in English-Language Arts. For the same reason, we examine achievement only in elementary schools. Our analysis is similar for middle and high schools and for the Mathematics CST in elementary, middle, and high schools. For that analysis, see the "Further Analysis" included with this report on the PPIC website.

English Fluency

Many California families have recently emigrated from countries in which English is not the primary language. Students in those families are unlikely to be fluent in English, an obstacle to success in school. California law classifies these students as English learners, "a child who does not speak English or whose native language is not English and who is not currently able to perform ordinary classroom work in English."[3]

It is no surprise that English learners score significantly lower on the state's standardized achievement tests. In the English-Language Arts CST for second graders, only 30 percent of English learners scored at the proficient or advanced level in 2007. In contrast, 58 percent of other students reached that level. Large differences in proficiency are also evident for other grades and other subjects.

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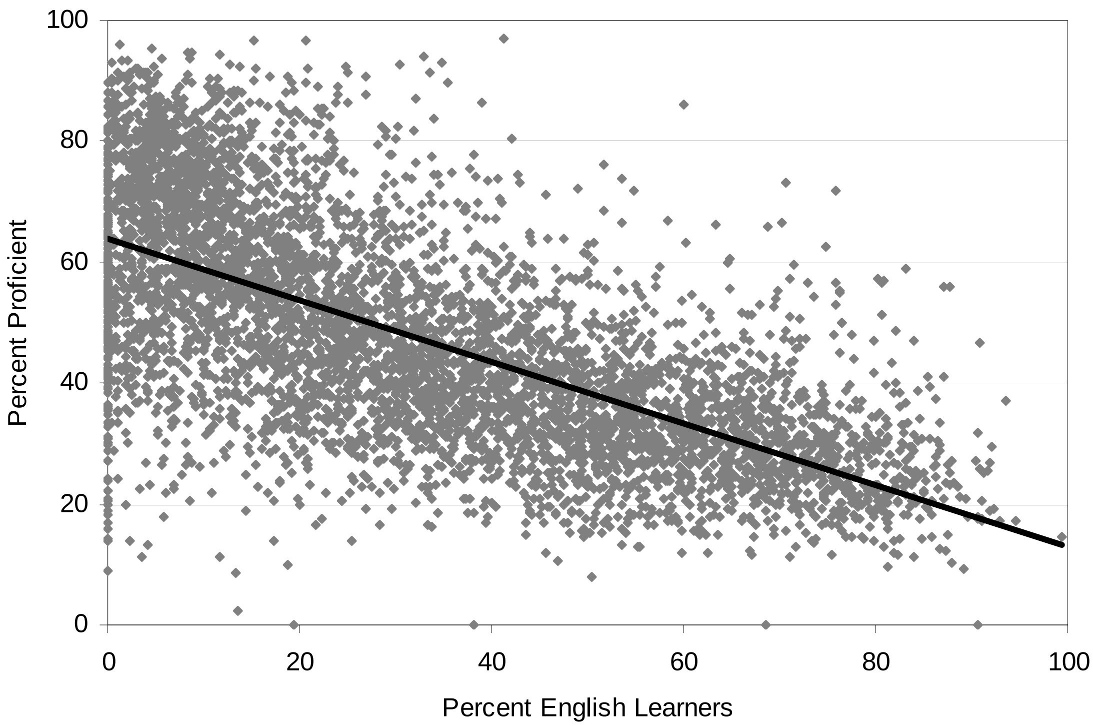
[3] California Education Code Section 306.

English learners are not uniformly distributed across schools in California. In 2007, English learners constituted 5 percent or less of students in 14 percent of the state's elementary schools. On the other hand, in 13 percent of schools 65 percent or more of the students were English learners. Schools with many English learners score significantly lower, on average, on the English-Language Arts CST. In Figure 1, the percentage of a school's students who are proficient in English is plotted against the percent of a school's students who are English learners. (Here and throughout this section, percent proficient is the percentage of students who score proficient or above − that is, proficient or advanced.) The bold line in the figure shows the average relationship between percent proficient in a school and the percent of a school's students who are English learners. According to standard statistical criteria, of all the possible linear relationships between the two variables, the line depicted in the figure best represents the central tendency in the data.[4] If we pick a particular point along the horizontal axis (a particular percentage of English learners), the height of the line at that point is an estimate of the average proficiency rate of schools with that particular percentage of English learners. For example, for schools in which 5 percent of students are English learners, the estimate of the average proficiency rate is 63 percent. That estimate falls to 30 percent for schools in which 65 percent of students are English learners.

Figure 1
English Proficiency and Percent English Learners,
Elementary Schools, 2007



In the remainder of this section, we use lines such as that in Figure 1 to represent central tendencies in the data. We refer to the lines as "average relationships" and to the height of a

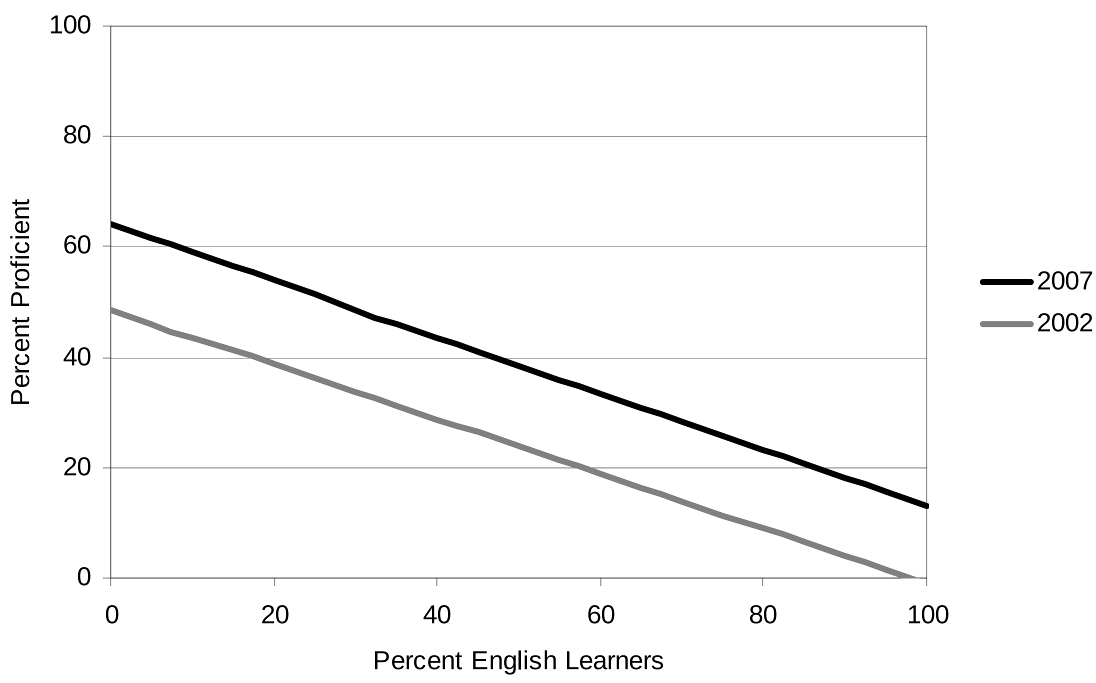
[4] The line is the ordinary least squares regression of percent proficient on percent English learners.

line at any particular point on the horizontal axis as the "average proficiency rate" for schools located at that point.

For schools with many English learners, but also for schools with few such students, average proficiency falls far short of 100 percent, the goal under the federal No Child Left Behind Act of 2001 (NCLB). Nevertheless, schools of both types have posted significant gains since the English CST was introduced in 2002. Figure 2 compares the average relationship between proficiency and fluency in 2007 with the same relationship in 2002. For schools in which 5 percent of students are English learners, average proficiency has increased by 15 percentage points. For schools in which 65 percent are English learners, the increase has been 14 percentage points.

While the percentage of English learners is certainly a measure of student needs, it may not be an indicator that can be usefully employed in a school finance system. It is clearly correlated with student achievement, but it may also be related to the effectiveness of schools and teachers. Under California law, an English learner is reclassified as "fluent English proficient" when he or she is able to compete effectively with English speaking classmates. The decision to reclassify is made by school districts, following four criteria established by the State Board of Education. The criteria are general enough to permit substantial local discretion, a

Figure 2
English Proficiency and Percent English Learners,
Average Relationship for Elementary Schools in 2002 and 2007



source of potential inequity among districts if the percentage of English learners were used as an indicator of resource needs. More importantly, however, if that indicator were used, school districts with the most effective programs for advancing English learners to fluency would receive less revenue than other districts, a perverse consequence for having been successful.

Poverty

Many English learners are also economically disadvantaged, according to the criteria of the California Department of Education (CDE). The Department classifies students as economically disadvantaged if they qualify for free or reduced-price lunch or if neither of their parents is a high school graduate. Students qualify for free or reduced-price lunch based on the income of their family. The threshold for free lunch is 130 percent of the federal poverty guideline. For reduced-price lunch, the threshold is 185 percent of the guideline. The federal poverty guideline dates back to a study by the Social Security Administration in 1963 (Orshansky, 1963). Low-income households with three or more members were found to spend about a third of their income on food. Based on that observation, federal poverty thresholds were defined as three times the cost of the "economy food plan" devised by the U.S. Department of Agriculture. Because that food plan depended on family size, the thresholds also depend on family size. The thresholds do not vary with regional costs, however. They are updated each year for inflation, using the Consumer Price Index; and a simplified version, the guidelines, is used to determine eligibility for many federal programs. Table 1 shows the federal poverty guideline and the school lunch thresholds for a family of four.

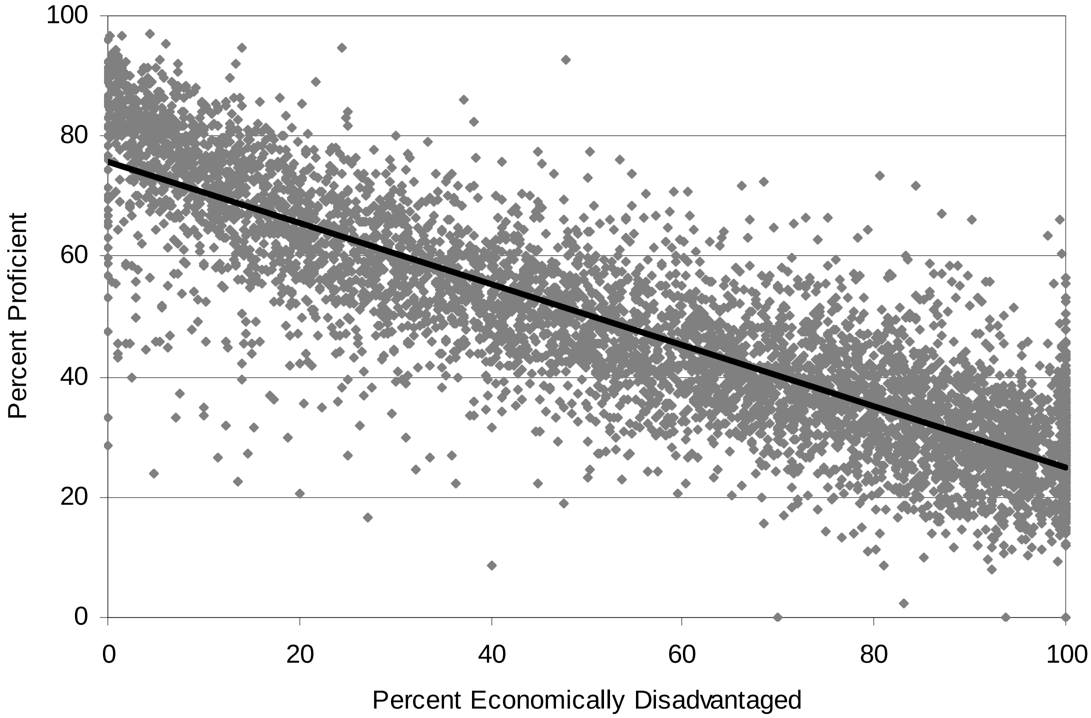
Table 1
Family Income Thresholds
Annual Income ($), Four Person Family

Income Threshold	2004	2007
Federal poverty guideline	18,850	20,650
Free lunch threshold	24,505	26,845
Reduced-price lunch threshold	34,873	38,203

The relationship between family income and student achievement is clearly evident in the results on California Standards Tests. In the English-Language Arts CST, only 35 percent of economically disadvantaged second graders were proficient or advanced. In contrast, 67 percent of other second graders were proficient or advanced. The difference is also large for other grades and for the California Standards Test in Mathematics.

As with English learners, disadvantaged students are not distributed uniformly throughout schools in the state. In 2007, disadvantaged students comprised 10 percent or less of students in 612 elementary schools (11 percent of elementary schools). On the other hand, disadvantaged students constituted 90 percent or more of students in 1,067 schools (19 percent). As Figure 3 shows, English proficiency tends to fall as the percentage of disadvantaged students rises. The bold line in the figure represents the average relationship between proficiency and economic disadvantage. For schools in which 10 percent of students are disadvantaged, the average proficiency rate is 71 percent. With 90 percent of students disadvantaged, that average falls to 30 percent.

Figure 3
English Proficiency and Percent Economically Disadvantaged,
Elementary Schools, 2007



The average relationship between proficiency and poverty depicted in Figure 3 represents a considerable improvement since the California Standards Tests were introduced in 2002. Figure 4 compares that relationship in 2002 and 2007. The comparison reveals significant progress for both high- and low-poverty schools. For schools in which 10 percent of students are disadvantaged, the average proficiency rate has increased by about 14 percentage points. For schools in which 90 percent are disadvantaged, the average rate has increased by 16 percentage points.

Many factors explain the relatively low academic achievement of economically disadvantaged students. One factor is the considerable overlap between English learners and economic disadvantage. Statewide, 85 percent of English learners are also economically disadvantaged.[5] However, the number of economically disadvantaged students is considerably larger than the number of English learners. As a consequence, English learners constitute only 39 percent of economically disadvantaged students. Sixty-one percent of disadvantaged students are fluent in English.

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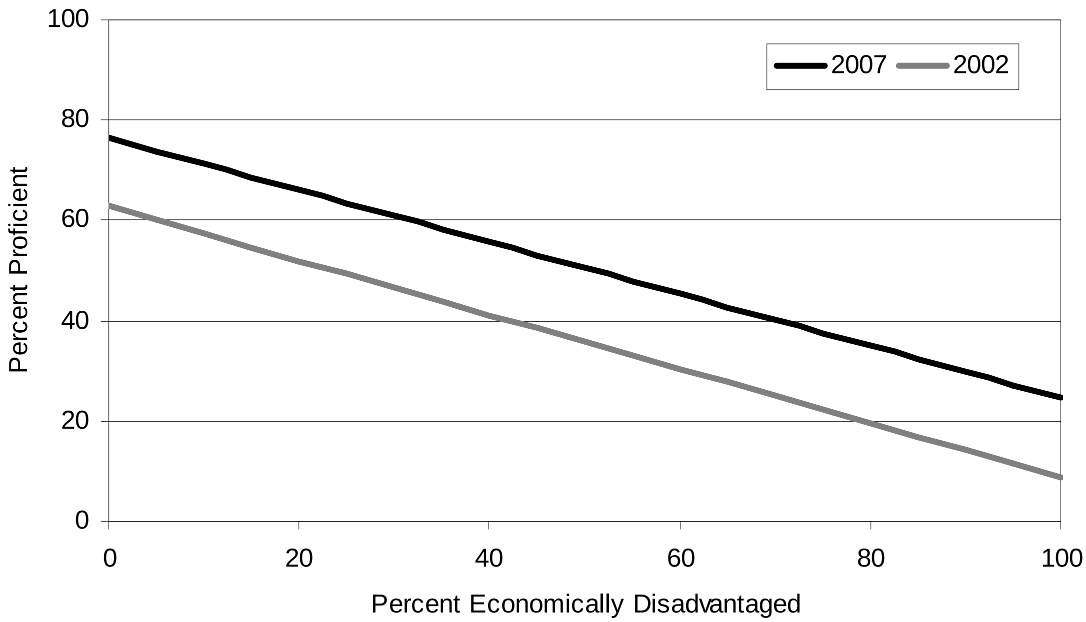
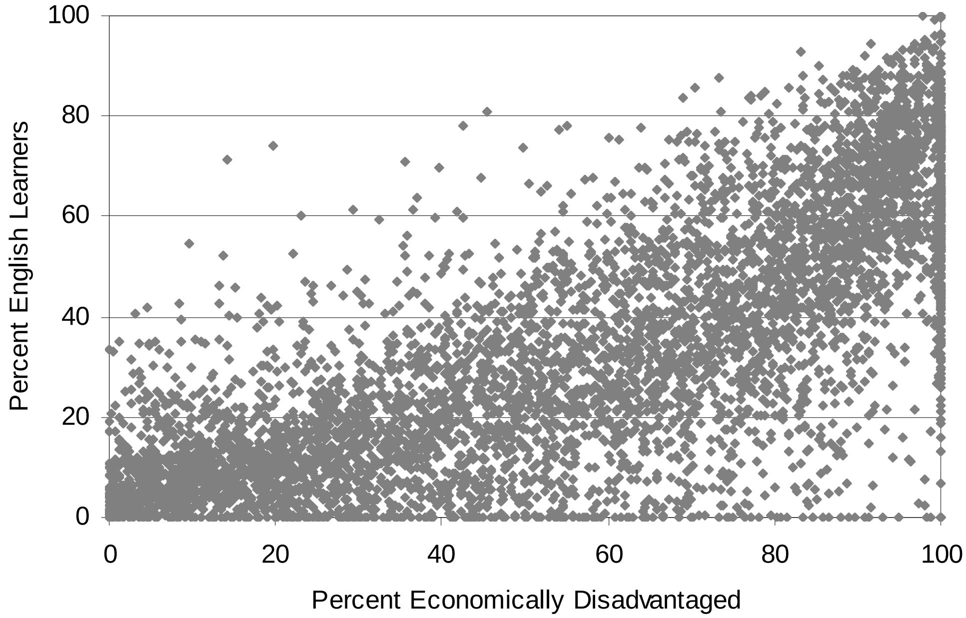
[5] Legislative Analyst's Office (2007).

Figure 4
English Proficiency and Percent Economically Disadvantaged, Average Relationship for Elementary Schools in 2002 and 2007



Even though the majority of disadvantaged students are not English learners, the relatively low achievement of English learners could account for a considerable portion of the negative relationship displayed in Figures 3 and 4. If English learners were distributed across schools in rough proportion to the distribution across schools of economically disadvantaged students, the percentage of a school's students who are disadvantaged would be a very good proxy for the percentage of a school's students who are English learners and thus a very good predictor of the school's proficiency rate. However, as Figure 5 shows, the percentage of English learners is not a good proxy for the percentage of disadvantaged students. Schools with high percentages of English learners also have high percentages of economically disadvantaged students. However, many schools with high percentages of economically disadvantaged students have relatively few English learners.

Figure 5
Percent English Learners and Percent Economically Disadvantaged, Elementary Schools, 2007



The many schools with large percentages of economically disadvantaged students but few English learners raise an interesting question: Are the proficiency rates in those schools higher than in schools with high percentages of both economically disadvantaged students and English learners. To address this question, we employ the statistical technique of multivariate linear regression. Conceptually, the objective of this technique is to find a linear expression using the percentage of English learners and the percentage of disadvantaged students in a school that best predicts the proficiency rate of that school. The results are displayed below for proficiency in both the English-Language Arts CST and Mathematics CST for elementary schools in 2007:

English-Language Arts CST[6] (1)

proficiency rate = 76.7 - 0.501 X (% *disadvantaged*) – 0.009 X (% *English learners*)

Mathematics CST[7]

proficiency rate = 76.4 - 0.440 X (% *disadvantaged*) + 0.110 X (% *English learners*)

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[6] The R-squared is 0.74. The coefficient on percentage English learners is not significantly different from zero.
[7] The R-squared is 0.51. All coefficients are significantly different from zero.

In these equations, the percentage of students who are economically disadvantaged (*% disadvantaged*) and the percentage of students who are English learners (*% English learners*) are measured as numbers between zero and 100, not fractions between zero and unity. The percentage of students who are proficient or advanced in the two tests (*proficiency rate*) is measured in the same scale. The equations allow us to separate the effects of disadvantage from the effects of fluency. For example, if the percentage of disadvantaged students in school A is ten points higher than in school B but the percentage of English learners is the same in the two schools, the equations predict that the proficiency rate in English will be 5 percentage points lower in A than in B and that the proficiency rate in mathematics will be 4.4 percentage points lower. On the other hand, if the percentage of disadvantaged students is the same but the percentage of English learners is 10 points higher in A than in B, the equations predict that the proficiency rate in English will be only 0.1 percentage points lower in A than in B and that the proficiency rate in mathematics will actually be one percentage point higher in A than in B. Similar regressions for middle and high schools produce similar results. Based on those regressions, it appears that economic disadvantage is a far stronger predictor of proficiency than is English fluency.

We regard these results as cautionary, rather than definitive. They are not definitive because they should be tested against more complete data, particularly data on individual students. They are cautionary in that they challenge the common assumption that economic disadvantage and the lack of English fluency are independent indicators of student need. In thinking about the additional resource needs of students, it is convenient to divide them into three groups: first, economically disadvantaged students who are also English learners; second, economically disadvantaged students who are not English learners; and third, English learners who are not economically disadvantaged. Considering students in all three groups together, roughly 37 percent fall into the first group, approximately 57 percent into the second group, and about 6 percent into the third group. Because of the relatively low proficiency rates for each of the three groups, schools with significant numbers of students in any of the groups may need additional resources to meet the state's achievement goals. The important question, however, is whether the additional resource needs are higher for group 1, in which students are both economically disadvantaged and lack English fluency, than in groups 2 or 3, in which students are either economically disadvantaged or lack English fluency but do not have both of these hurdles to overcome. In particular, do schools with large percentages of disadvantaged students who are also English learners (group 1) require more resources than schools with few of such students but large percentages of students who are disadvantaged (group 2). Based on the proficiency rates of the two groups, the answer would appear to be that the first group does not require more resources.

However, proficiency rates alone do not provide a complete answer to the question we have posed. The educational program that is best for English learners may be very different from the best program for economically disadvantaged students who are fluent in English. Different programs may require different resources and thus have different costs. However, the conclusions reached by Gàndara and Rumberger (2006) suggest that this may not be the case. After reviewing several studies on the resource needs of English learners, they reach the following conclusion:

> In sum, English learners and other linguistic minority students do require additional resources, above and beyond those of all other students, but their needs appear to differ more in kind than in quantity from those of poor and low-income students…. (p. 87)

This conclusion, tentative as it is, is quite consistent with the results about proficiency rates presented above.

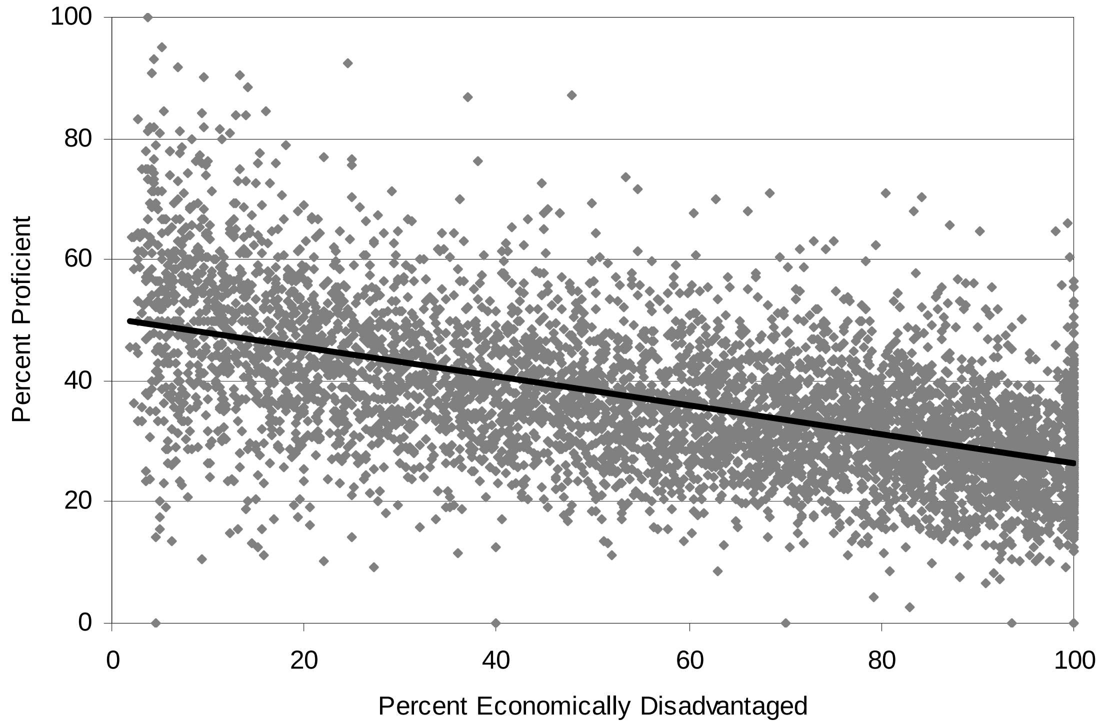
Several factors are typically offered as explanations of the low proficiency rates of economically disadvantaged students who are fluent in English. Income itself is a factor because low-income families are less able to afford the educational resources that supplement the education their children receive in school. Parental education is also a factor. Adults with little formal education are less likely to be economically successful and are also less able to assist in their children's education. They are less able to help with school homework and less knowledgeable about the educational opportunities available to their children. Some of these effects may also be transmitted through peers—an individual student may be less likely to be successful in school if his or her peers are also unsuccessful in school. In that case, the concentration of economic disadvantage may be a factor in addition to the negative effects of economic disadvantage itself.

The effects of the concentration of poverty are shown in Figure 6. The figure plots the proficiency rate for the subgroup of disadvantaged students in a school against the percentage of students in a school who are disadvantaged. For schools in which 10 percent are disadvantaged, the average proficiency rate for disadvantaged students is 48 percent. For schools in which 90 percent are disadvantaged, the rate falls to 29 percent.

Researchers have found it difficult to identify the magnitude of peer group effects. Current research certainly does not rule out the possibility that those effects are strong, however. That possibility is a cautionary note for the "weighted-student" approach to school finance funding formulas. Under that approach, students are classified according to the resource needs associated with them, and weights are assigned to students in each classification. For example, students who are not economically disadvantaged may be assigned a weight of 1.0, and students who are economically disadvantaged assigned a weight of 1.5. For each school district, the weights are then multiplied by the number of students in each classification and the products are summed to yield a weighted student enrollment for the district. Districts then receive revenue in proportion to their weighted enrollment. To continue the example, if district A has 100 students, none of whom are economically disadvantaged, and district B has 100 students, all of whom are disadvantaged, district A has a weighted enrollment of 100, and district B has a weighted enrollment of 150. District B receives 50 percent more revenue than district A.

The main problem with this approach is that it ignores the concentration of disadvantage. Under the weighted student approach, a disadvantaged student has the same weight regardless of how many other disadvantaged students are in his or her school. In other words, the approach assumes that the educational resource needs of a low-income student are the same whether he or she attends schools with 10 percent, 50 percent, or 90 percent low-income students. In contrast to this weighted student approach, the finance proposal evaluated in this paper increases funding more than proportionally to the number of targeted students.

Figure 6
English Proficiency of Economically Disadvantaged Students and Percent Disadvantaged, Elementary Schools, 2007



Taken too literally, the weighted student approach has another problem. Some advocates of this approach describe it as ensuring that "the money follows the student." That is, every student in a targeted group should benefit from the additional resources implied by the weight for that group of students. If, for example, the weight for an economically disadvantaged student is 1.5 and the weight for other students is 1.0, all economically disadvantaged students should benefit from 50 percent more resources than does any student who is not economically disadvantaged. The problem with this construction is that it takes disadvantage too literally as an indicator of student need. In fact, economic disadvantage is correlated with the likelihood that a student will need additional assistance to achieve state academic goals. It does not mean, however, that every disadvantaged student needs additional assistance. Many students from low-income families do succeed in school without additional help. Likewise, many students from wealthy families struggle in school. On average, however, holding the resources of schools constant, students from higher income families are more likely to be successful in school than are students from lower income families. Thus, the percentage of students who are economically disadvantaged can be a good indicator of the additional resources a school may need, even if it is a very imperfect measure of the resource needs of any one student.

In the analysis so far, we have defined economic disadvantage in the same way the CDE defines it when reporting results from standardized tests. As an indicator of need for a school finance formula, this definition has the obvious problem that it depends in part on students to accurately report the education of their parents. However, other measures of disadvantage do not depend on that information − for example, the percentage of a district's students who participate in its free or reduced-price lunch program. This criterion is part of the CDE's definition of economic disadvantage: To the students participating in the subsidized lunch program, the CDE merely adds students who do not have at least one parent who has graduated from high school. Unsurprisingly, the percentage of a school's students who are economically disadvantaged is highly correlated with the percentage of its students who participate in its free or reduced-price lunch program.[8] As a practical matter, the two measures of poverty are essentially interchangeable.

While the subsidized lunch percentage does not involve a self-report of parental education, it does have the disadvantage of depending on whether or not students eligible for the free or reduced-price lunch program actually participate in it. At the district level, the level at which school finance systems typically operate, there is an alternative measure of economic disadvantage that does not depend on either self-reports or participation rates. The alternative is the percentage of children ages 5 through 17 living in households with income below the federal poverty threshold. The decennial Census calculates this statistic for each school district, and the U.S. Census Bureau updates it annually to use in distributing federal Title I aid.

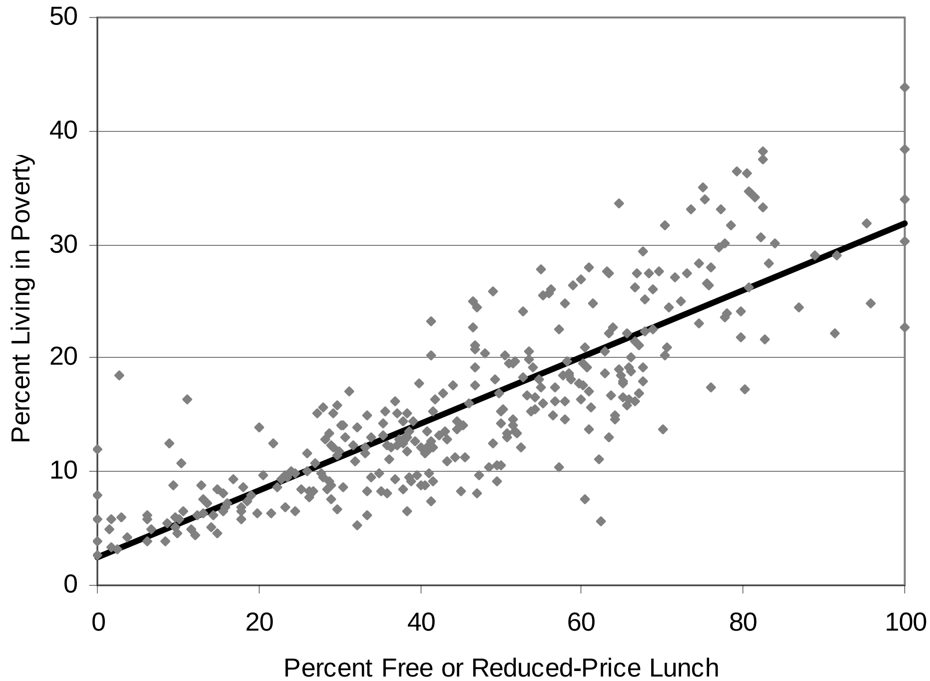
This poverty estimate is closely related to the percentage of a district's students in its subsidized lunch program. Figure 7 shows the relationship between these two variables for unified districts in 2004-2005. The bold line is the average relationship between the two variables. A reasonably good prediction of the percentage of children in a district living in poverty is one-third of the students participating in its subsidized lunch program.

A similar relationship holds for elementary and high school districts. Census poverty estimates are approximately one-third of free or reduced-price lunch counts. As a consequence, Census estimates are a good substitute for subsidized lunch counts as a measure of student need. For example, a finance system that allocated districts an additional $2,000 per student participating in the district's free or reduced price lunch program would have about the same distribution of revenue among districts as a program that allocated districts an additional $6,000 per child living in poverty according to Census estimates.

The negative relationship between poverty and proficiency implies that the schools serving low-income neighborhoods may need additional resources to achieve the state's goals. This implication, in turn, means that school districts with many low-income students may need additional revenue to provide their schools with the resources they need to be successful. In our following discussion, we examine the relationship between the revenue that districts receive under the present system and the percent of their students from low-income families.

[8] For elementary schools in 2006, the correlation coefficient was 0.993. For middle schools, it was 0.989, and for high schools, 0.958.

Figure 7
Percent of Students Living in Poverty and Percent Receiving Free or Reduced Price Lunch, Unified Districts, 2004-2005



To facilitate this comparison, we partition districts into the nine groups listed in Table 2. Districts are separated by the grade spans they serve: elementary, high school, and unified. Within grade spans, they are also partitioned by average daily attendance (ADA). Attendance thresholds were chosen to partition the districts in each grade span into groups of approximately equal numbers of districts.

The table illustrates an important aspect of California's public school system. Although the state has nearly 1,000 districts, 82 percent of students are in 316 of those districts: elementary districts with more than 1,500 students, high school districts with more than 6,000 students, and unified districts with more than 10,000 students.

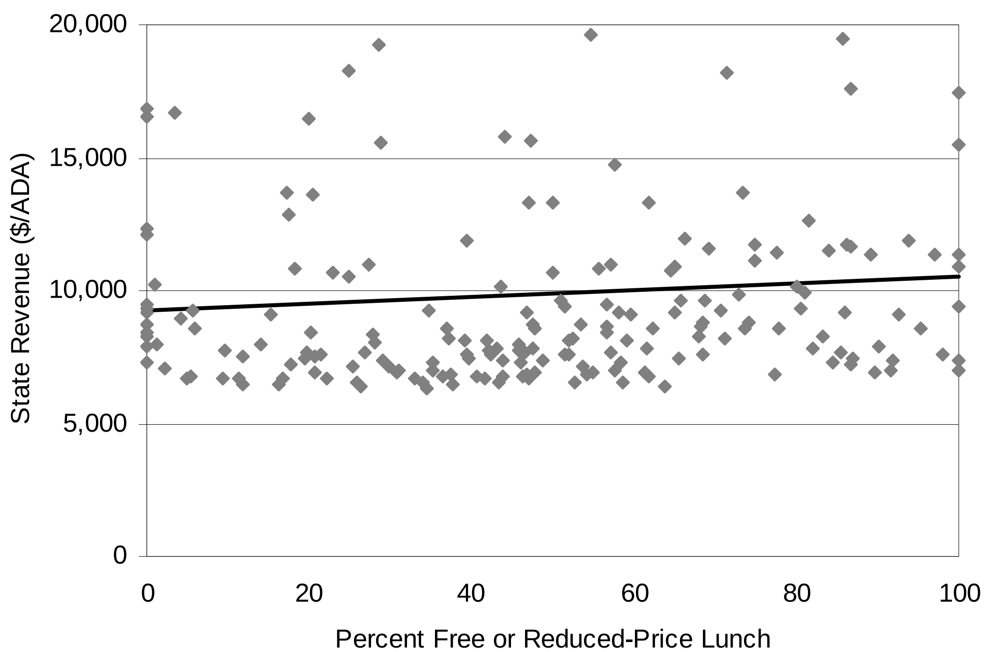
Table 2
California School Districts by Grade Span and Size, 2004-2005*

Type of District	ADA Range	Number	Total ADA
Elementary Districts			
Small	0-250	197	20,751
Medium	251-1,500	180	117,767
Large	1,501 or more	180	995,290
High School Districts			
Small	0-1,500	27	20,537
Medium	1,501-6,000	27	84,545
Large	6,001or more	29	409,579
Unified Districts			
Small	0-3,000	123	162,022
Medium	3,001-10,000	104	631,211
Large	10,001or more	107	3,339,470
Total		974	5,781,171

* Common administration districts are included with unified districts.

Revenue per pupil varies widely among small districts. Figure 8 illustrates this variation for elementary districts with 250 or fewer students. The revenue depicted in Figures 8 and 9

Figure 8
State Revenue per ADA and Percent Free or Reduced-Price Lunch, Small Elementary Districts (0-250 ADA), 2004-2005*



includes revenue limit funds (state aid and property taxes), locally funded charter school revenue, lottery funds, and other state categorical revenue. Because the state's special education program is partly funded by federal local assistance, this local assistance is also included in the revenue depicted in Figures 8 and 9.

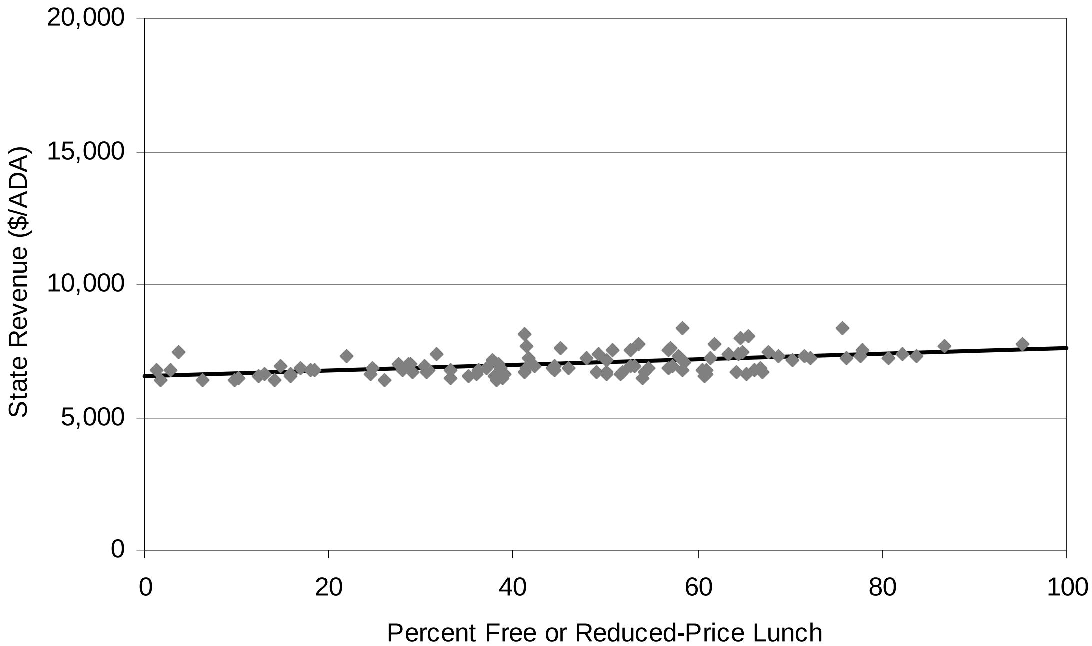
About one-third of small elementary districts (64) had revenue between $6,500 and $8,000 per pupil. On the other hand, another one-third (66) had revenue exceeding $10,000 per pupil. Seven of those districts had revenue exceeding $20,000 per pupil. (Those seven districts are not depicted in Figure 8.)

Although revenue per pupil varies considerably among districts, it is positively related, on average, to the percent of a district's students participating in its subsidized lunch program. The line in the figure represents this average relationship. As above, we use the term "average relationship" to represent the statistical concept of the linear relationship between two variables that best fits the observations of those two variables. In particular, given a point on the horizontal axis, a particular percent of students in free or reduced-price lunch, the height of the line is the "best" prediction of the average revenue per pupil for districts with that particular percentage of students in the free or reduced-price lunch program.

The average relationship in Figure 8 has an intercept of $9,253 per pupil, implying that, on average, a district with no students in subsidized lunch receives $9,253 per pupil. The line's slope is $1,372 per pupil. Thus, a district in which all students participate in the subsidized lunch program would receive $10,625 per pupil ($9,253 + $1,372). Put another way, on average, each student participating in a district's subsidized lunch program adds an additional $1,372 to its revenue, an increase partly reflecting state programs targeting low-income students.

Compared to small elementary districts, the variation in per-pupil revenue is considerably smaller for large unified districts. Among unified districts with more than 10,000 students, revenue per pupil from revenue limits and other state categorical programs ranges from $6,500 per pupil to $9,000 per pupil. As Figure 9 shows, the percentage of low-income students in a district explains a substantial part of that variation. The bold line in the figure is the average relationship between the revenue per pupil in a district and the percentage of its students participating in its subsidized lunch program. The line has an intercept of $6,478 per pupil and a slope of $1,172 per pupil. Eighty-four percent of districts are within $500 per pupil of that average relationship; ninety-eight percent are within $1,000 per pupil.

Figure 9
State Revenue per ADA and Percent Free or Reduced-Price Lunch
Large Unified Districts (10,001 or more ADA), 2004-2005



The average relationship between revenue and poverty varies across types of districts (Table 3). For medium-sized elementary and high school districts, the slope of the average relationship is actually negative. For these two types of districts, revenue per pupil tends to fall as the percentage of low-income students in the district rises. However, only 3 percent of students attend these types of districts. For the large districts – districts with 82 percent of the state's students – revenue per pupil tends to rise with the percentage of low-income students. The slope of the average relationship is quite different across district types, however. For elementary districts, it is $420 per pupil; for high school districts, $932 per pupil; and for unified districts, $1,172 per pupil. The intercepts also differ considerably across groups, although for the two largest groups (large elementary and large unified districts), the intercepts are approximately equal.

These average relationships mask significant variations among districts of the same type. We measure this variation by the percent of districts that have revenue per pupil within $500 of the revenue predicted for them by the average relationship for their type. Essentially, then, for each district type, we establish a band with a width of $1,000 per pupil ($500 above the average relationship and $500 below that relationship) and determine the percentage of districts in the band. The third column of Table 3 reports the results. Eighty-seven percent of large elementary districts, 52 percent of large high school districts, and 85 percent of large unified districts are within this band. However, for small districts of all three grade spans, fewer than 20 percent of districts fall within the band. The fourth column reports these percentages for an even wider band – $1,000 per pupil greater than or less than the average relationship. Less than one-quarter of small elementary and unified districts fall within this wider band.

Table 3
Average Relationship Between State Revenue per ADA and Percent Free or Reduced-Price Lunch, All School Districts, 2004-2005

	Intercept	Slope	Percent of Districts Within $500 of Average Relationship	Percent of Districts Within $1,000 of Average Relationship
Elementary districts				
Small (0-250)	9,253	1,372	8	17
Medium (251-1,500)	7,309	-285	59	90
Large (1,501+)	6,582	420	87	98
High school districts				
Small (0-1,500)	8,431	2,898	15	33
Medium (1,501-6,000)	8,354	-747	37	85
Large (6,001+)	7,685	932	52	93
Unified districts				
Small (0-3,000)	9,134	179	14	23
Medium (3,001-10,000)	6,850	410	88	98
Large (10,001+)	6,478	1,172	85	98

These average relationships change very little when local and federal revenue are added (Table 4). The most important federal program is Title I, which targets disadvantaged students. With the exception of medium-sized high school districts, inclusion of local and federal revenue increases the slopes of the average relationships. For large elementary, high school, and unified districts, the slopes increase by about $1,000 per pupil. The intercepts also increase; although, due to the targeting of federal revenue, this increase is significantly less than for the slopes.

We conclude that, on average, California's current system does allocate more revenue to districts with more low-income students. However, the system gives rise to considerable variation in revenue per pupil among districts serving student populations with similar socioeconomic characteristics.

Table 4
Average Relationship Between Total Revenue per Pupil and Percent Free or Reduced-Price Lunch, All Districts, 2004-2005

	Intercept	Slope	Percent of Districts Within $500 of Average Relationship	Percent of Districts Within $1,000 of Average Relationship
Elementary districts				
Small (0-250)	10,381	2,848	7	15
Medium (251-1,500)	8,250	233	28	64
Large (1,501+)	7,200	1,282	54	88
High school districts				
Small (0-1,500)	9,047	3,664	19	30
Medium (1,501-6,000)	9,316	-986	41	78
Large (6,001+)	8,088	1,754	45	86
Unified districts				
Small (0-3,000)	9,801	1,269	10	20
Medium (3,001-10,000)	7,454	1,065	60	94
Large (10,001+)	6,819	2,394	62	93

A Note on Proficiency and the Academic Performance Index

In this section, we have used the percentage of a school's students who are proficient in English and mathematics as a measure of student achievement for the school. In assessing student learning, proficiency is an appealing concept. The state has established academic content standards describing what students should learn in every grade, and it is natural to ask whether or not students are meeting those standards. The concept of proficiency provides a clear answer to that question. Some students are proficient, others are not, and the progress of schools is measured by the percentage of students who are proficient. The reality, of course, is that proficiency is merely a label assigned to students who answer a certain percentage of questions correctly on a standardized test. A student with a score just above that mark may not have mastered the state's standards any better than a student scoring just below the mark. Moreover, if schools are measured solely by the percentage of students who are proficient, students who can answer very few questions correctly count the same as students who barely fall short of the proficiency mark.

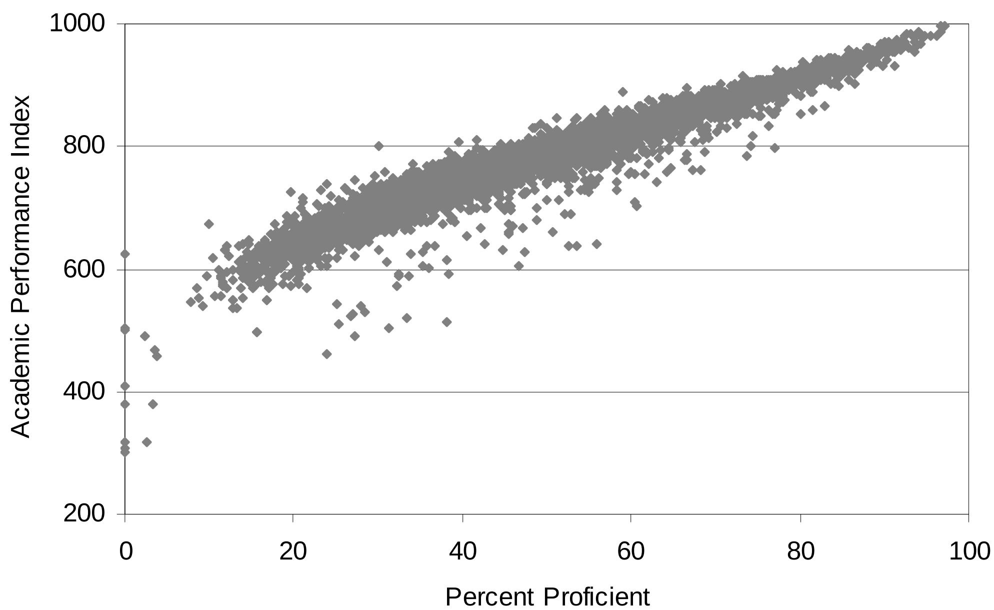
California's Academic Performance Index (API) incorporates these different levels of competence. A school's API consists of the weighted average of its students' scores on a number of tests. For each test, student scores are categorized into five ranges (far below basic, below basic, basic, proficient, and advanced), each range is assigned a number (200, 500, 700, 875, and 1000), and the numbers are averaged across students. In essence, then, the API is the weighted average of an average score on each test. Unlike the percent proficient as a measure of school performance, it does matter for the API whether a student is in the basic range rather than the below basic range. Also, the API incorporates the results on many tests in a single index. On the other hand, of course, the API is more complicated to calculate and thus more difficult to understand than the percent-proficient measure.

As a practical matter, the two measures provide very similar rankings of schools. In Figure 10, the API of elementary schools in 2007 is plotted against the percent of students in each school who scored proficient or advanced in the English-Language Arts CST. As the figure shows, even though the API involves other tests and distinguishes among different levels of performance, the percent proficient is a very good predictor of API. An even better predictor employs both the percent proficient in English and the percent proficient in mathematics, the two measures required by NCLB. The best prediction equation is

$$API = 524 + 2.70 \text{ X } (English\ proficiency\ rate) + 2.14 \text{ X } (math\ proficiency\ rate),^{9} \qquad (2)$$

where *English proficiency rate* is the percentage of a school's students who are proficient or advanced on the English CST, and *math proficiency rate* is the percentage of a school's students who are proficient or advanced on the mathematics CST. Rates are expressed as numbers between 0 and 100 (not fractions between 0 and 1), so, for example, a school in which half of the students are proficient in both English and math would be predicted to have an API of 766. These predicted APIs are quite close to actual APIs. For 90 percent of elementary schools, the difference between the school's actual API and the API predicted for it by the equation above is less than 3 percent of the school's actual API.

Figure 10
Academic Performance Index and English Proficiency
Elementary Schools, 2007



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[9] OLS regression with R-square of 0.97.

While API and percent proficient give similar rankings of schools, each measure is associated with a different goal. According to the prediction equation above, schools in which 57 percent of students are proficient in English and the same percentage are proficient in mathematics will have an API of 800, the goal under the state's accountability program. In contrast, the goal for NCLB is 100 percent proficiency in both English and mathematics. The API corresponding to 100 percent proficiency is difficult to estimate because no elementary school achieved that goal in 2007. As a purely hypothetical case, if all students scored in the proficient range in both English and math and none scored in the advanced range in either subject, a school's API would be 875, the numerical score the CDE assigns to scores in the proficient range in calculating a school's API. This hypothetical case is never observed, however, because there is always a natural distribution in student scores. If most students are at least proficient, many score in the advanced range, which has a numerical score of 1000. For example, in 2007, five elementary schools had proficiency rates of 95 percent or more in both English and mathematics.[10] The average API score for those schools was 988, just short of the maximum of 1000. Almost all students in those schools were in the advanced range of the CST in English and mathematics. As an empirical reality, therefore, the API corresponding to 100 percent proficiency in both English and mathematics must be very close to 1000.

[10] Teach Elementary School in San Luis Coastal Unified School District, Sleepy Hollow Elementary School in Orinda Elementary School District, Murdock-Portal and Faria Elementary Schools in Cupertino Elementary School District, and Millikin Elementary School in Santa Clara Unified School District.

District Costs

Because resource needs differ among students and because students with different needs are not distributed evenly across school districts in the state, some districts may need more resources and thus more revenue than others. In addition, because the conditions in which districts operate vary across the state, some districts may need more revenue than others to provide a given level of educational resources to their students. These variations in district costs are due to at least three factors. First, school districts must compete with other employers to attract employees, so local labor market conditions affect the salaries districts must offer. Second, population density varies dramatically across the state, leading to differential costs of transporting students to schools. Third, the climate of the state ranges from mild to extreme, causing varying utility expenditures.

A school finance system providing similar resources to students with similar resource needs should compensate for these cost differences. One approach is to reimburse districts for unusually high salaries, transportation costs, or utility expenditures. While this approach is simple and direct, it removes incentives districts have to seek the least costly approach to achieve their objectives. An alternative approach is to allocate revenue to districts based on factors related to district costs, but external to districts themselves. For example, population density could be used as an external measure of transportation costs. This section explores the relationship between district costs and external factors in three areas: teacher salaries, transportation, and utilities. Appendix A contains information about our data sources.

Because the environments in which districts operate differ in so many ways, the process of adjusting revenue for cost differences could quickly degenerate into a long series of special cases. To limit this process, we propose two criteria. First, to warrant attention in the state's school finance system, a cost differential should be large enough to have a significant effect on the education students receive. If district A faces a substantially higher cost for a resource than district B and the revenue per pupil in A and B were the same, would the students in A have significantly higher class sizes or substantially less access to some other important educational resource? Second, can the difference in cost be systematically related to some factor or factors external to districts and readily measurable? By external to districts, we mean a factor that a district cannot affect through its own actions. By measurable, we mean a factor that can be quantified with enough precision to include in a funding formula.

The first criterion leads directly to Table 5, a summary of school district expenditures by category. In this table, it is obvious that differences in personnel costs among districts could have serious repercussions for the educational resources provided to students. Personnel costs account for just over 80 percent of total school district operating expenditures; teacher compensation comprises over half of total spending. On the other hand, transportation expenditures comprise less than 5 percent of total spending; and expenditures on maintenance and operations, which include utilities, represent only 10 percent of the total. A relatively low average may hide substantial variation, however, and we explore this issue below.

Table 5
Expenditures per Pupil by Category
All School Districts, 2003-2004

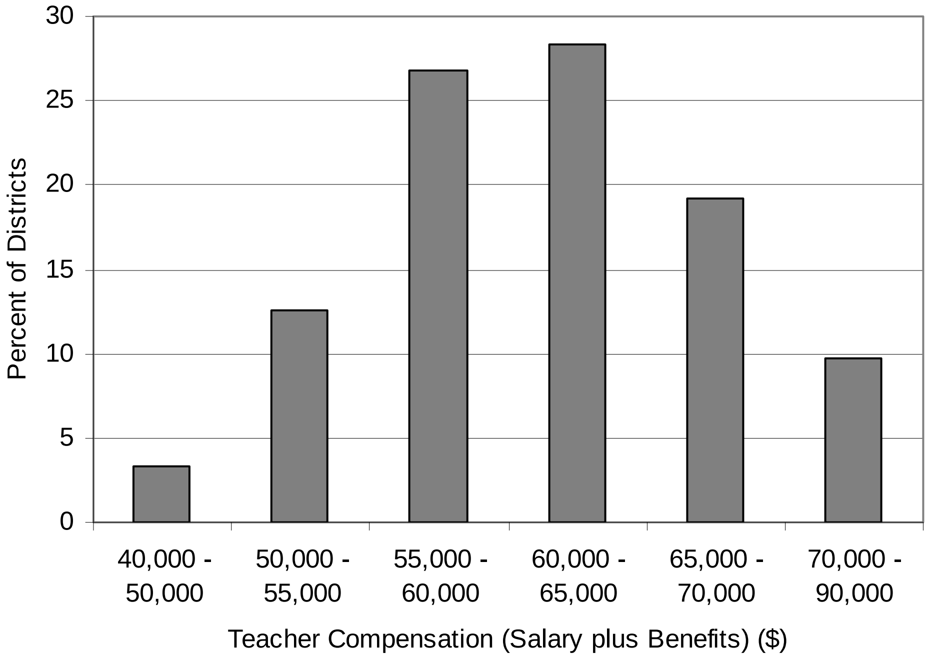
Expenditure Category	Average ($)	Percent of Total
Instruction and pupil services		
Teacher salaries and benefits	3,637	52
Aides and other classified staff	372	5
Pupil service personnel	364	5
Instructional materials	80	1
Other non-labor instructional	400	6
Professional development		
Labor	216	3
Non-labor	68	1
School administration		
Labor	457	7
Non-labor	24	0
District administration		
Labor	256	4
Non-labor	121	2
Transportation		
Labor	107	2
Non-labor	70	1
Maintenance and operations		
Labor	406	6
Non-labor	268	4
Miscellaneous	130	2
Total	6,976	100

Teacher Salaries

Teachers are compensated according to their education and years of experience. However, the salaries and benefits offered to teachers of a given education and experience level vary substantially across California school districts. Figure 11 shows the distribution across districts of compensation (salary plus benefits) of a teacher with 10 years of experience and 60 semester units of education beyond the bachelor's degree. In 16 percent of districts, this compensation is less than $55,000. In 29 percent of districts, it exceeds $65,000.

A large portion of this variation is related to the region of the state in which districts are located. In 2003-2004, districts in Santa Clara County and Orange County offered the highest compensation in the state, on average surpassing $70,000 for a teacher with 10 years of experience and 60 units of education beyond a bachelor's degree. At the other extreme, compensation packages in Yolo County and the North Coast counties fell short of $55,000 per year for teachers at the same position in the salary schedule.

Figure 11
Distribution of Teacher Compensation by Districts
Mid-Career Teachers, 2003-2004*



* Salary plus benefits for a teacher with 10 years of experience and 60 semester units of education beyond a bachelor's degree.

Compensation in other occupations also varies across regions. In some regions, employers must pay a premium to compensate their employees for a higher cost of living or a lack of amenities. Table 6 shows the regional differences in the wages of college-educated workers who are not teachers. The table displays wages for 30 regions. Regions are either a single county or groups of adjoining counties based on the Metropolitan Statistical Areas (MSAs) defined by the U.S. Census. Santa Clara and Orange Counties have some of the highest wages, whereas the Northern Counties and North Coast region have some of the lowest. The second column is a regional wage index, expressing each region's wage as a percentage of the statewide average.[11]

[11] The statewide average is the weighted average of the wages in Table 6. The wage in each region is weighted by the average daily attendance of school districts in the region divided by the average daily attendance of all districts in the state. For the 2004 index, which we use in some subsequent figures, readers are referred to the "Futher Analysis" available with this report on the PPIC website.

Table 6
Wages of Non-teachers by Region, 2003

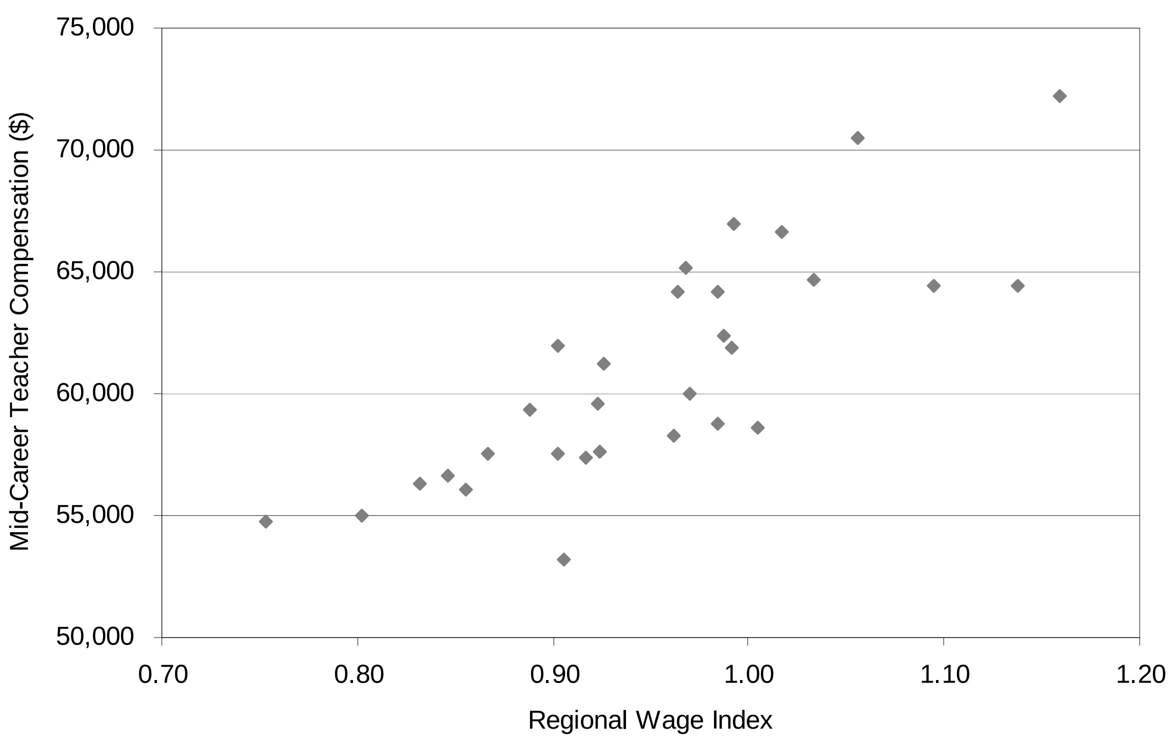
County	Non-teacher Wage ($)	Regional Wage Index
Santa Clara	63,132	1.16
Marin, San Francisco, & San Mateo	61,975	1.14
Alameda & Contra Costa	59,672	1.10
Orange	57,546	1.06
Ventura	56,320	1.03
Los Angeles	55,434	1.02
Santa Cruz	54,759	1.01
Monterey	54,076	0.99
Kings & San Benito	54,033	0.99
Napa & Solano	53,776	0.99
Sonoma	53,654	0.99
Santa Barbara	53,610	0.98
Stanislaus	52,870	0.97
Riverside & San Bernardino	52,759	0.97
San Diego	52,494	0.96
San Joaquin	52,404	0.96
Kern	50,463	0.93
Fresno & Madera	50,322	0.92
Tulare	50,307	0.92
El Dorado, Placer, & Sacramento	49,959	0.92
Yolo	49,352	0.91
San Luis Obispo	49,176	0.90
Imperial	49,165	0.90
Merced	48,386	0.89
Mother Lode Region	47,213	0.87
Butte	46,635	0.86
Sutter & Yuba	46,100	0.85
Shasta	45,352	0.83
Northern Counties Region	43,715	0.80
North Coast Region	41,043	0.75

Note: The Mother Lode region includes Alpine, Amador, Calaveras, Inyo, Mariposa, Mono, and Tuolomne counties. The Northern Counties region includes Colusa, Glenn, Lassen, Modoc, Nevada, Plumas, Sierra, Siskiyou, Tehama, and Trinity counties. The North Coast region includes Del Norte, Humboldt, Lake, and Mendocino counties.

Because school districts must compete with other employers for workers, district salary schedules should reflect local labor market conditions. In particular, we should expect that school districts in high-wage areas tend to provide relatively high compensation to their teachers. This expectation is confirmed by Figure 12. The figure plots the average mid-career teacher compensation for the 30 California regions against the regional wage index. The figure reveals that regions with high non-teacher wages also have high levels of teacher compensation.

Although teacher compensation adjusts to non-teacher wages, the adjustment is not one-for-one. That is, the 54 percent difference in the regional wage index between the North Coast Region and Santa Clara County does not imply that teacher compensation is 54 percent higher in Santa Clara County. In fact, it is 32 percent higher than in the North Coast Region. The partial adjustment exemplified by these two regions is representative of other regions as well. Examining districts in all regions and incorporating other factors that may explain teacher salaries, Rose and Sengupta (2007) find that differences in teacher compensation across regions represent only about 60 percent of the differences in the regional wage index. This general trend holds for base salaries as well, but the adjustment is even less complete (see the "Further Analysis" included with this report on the PPIC website).

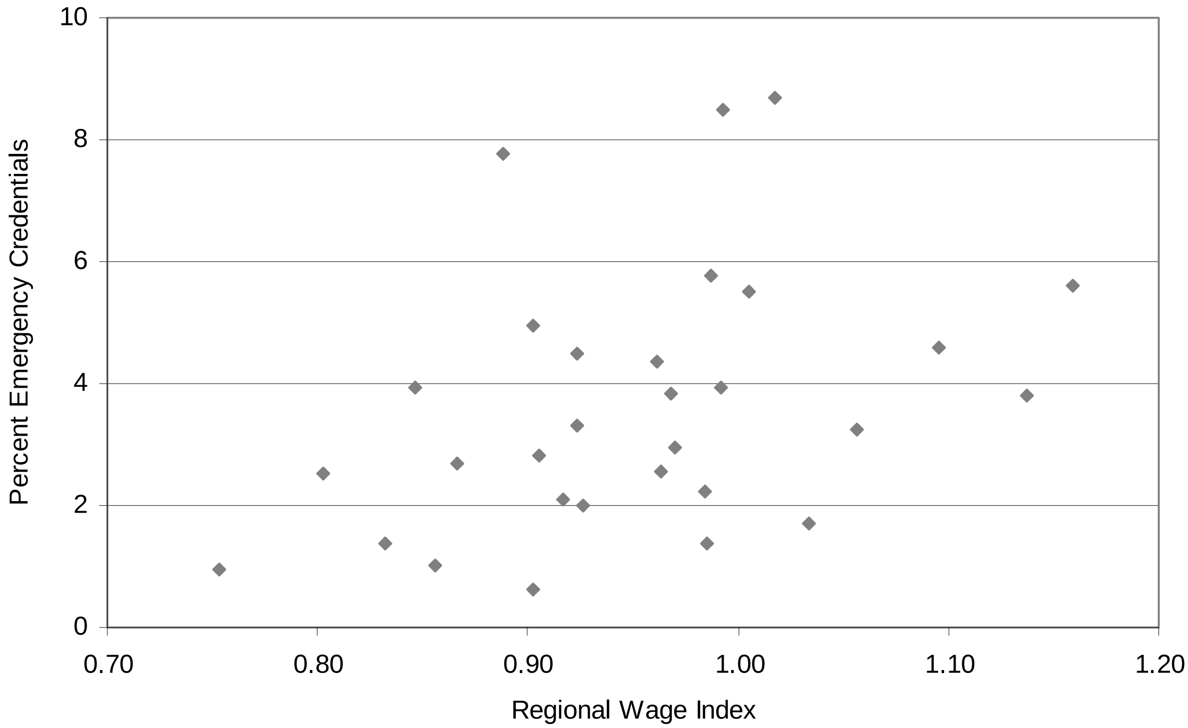
Figure 12
Mid-Career Teacher Compensation and Regional Wage Index, California Regions, 2003-2004



Because districts only partially adjust teacher compensation to regional labor market conditions, districts in high-wage areas are less competitive with other employers than are districts in low-wage areas. One measure of district competitiveness is the percentage of teachers in a district with emergency credentials. Until the practice was discontinued in 2006-2007, school districts could obtain emergency credentials for teachers without full teaching credentials. To obtain emergency credentials, schools districts had to prove to the satisfaction of the California Commission on Teacher Credentialing that they were unable to recruit sufficient numbers of credentialed teachers. Thus, the percentage of a district's teachers with emergency credentials is a measure of how competitive the district is in the market for teachers. As Figure 13 demonstrates, this percentage tends to be higher in high-wage regions than in low-wage regions. This tendency persists even though, on a per-pupil basis, more credentials are awarded in the high-wage regions (see the "Further Analysis" included with this report on the PPIC website).

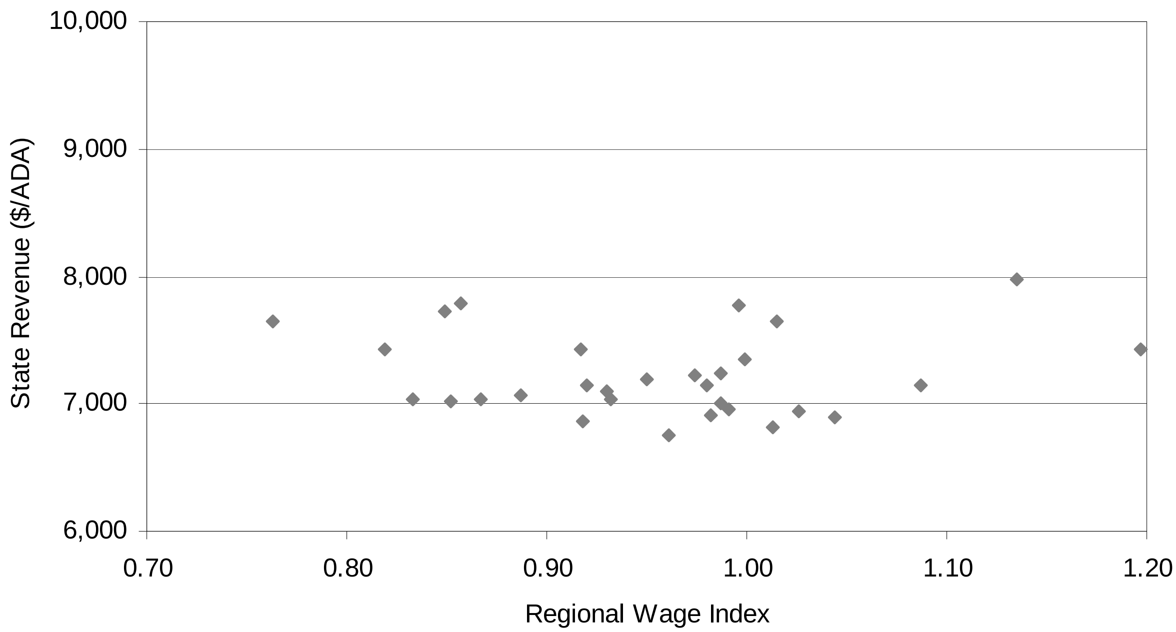
Figure 13 should also be a cautionary note about competitive conditions in isolated, rural areas. In such areas, the market for teachers is surely thin, with few jobs and few applicants in any given year. This thinness of markets does not seem to translate into lower quality, however, at least using emergency credentials as a measure of quality. As Table 6 illustrates, rural areas have the lowest non-teacher wages. As Figure 13 shows, the regions with the lowest non-teacher wages also have the lowest percentages of teachers with emergency credentials.

Figure 13
Percent of Teachers with Emergency Credentials and Regional Wage Index, California Regions, 2003-2004



Districts do not fully adjust their salaries for regional wage differences because their revenue does not reflect the personnel costs they face. This lack of relationship between revenue and personnel costs is shown in Figure 14, which plots state revenue per ADA in each region against the regional wage index. Although revenue per pupil does vary across regions, this variation is not related to variations in the regional wage index. Thus, districts cannot adjust for regional wage differences without sacrificing other resources.

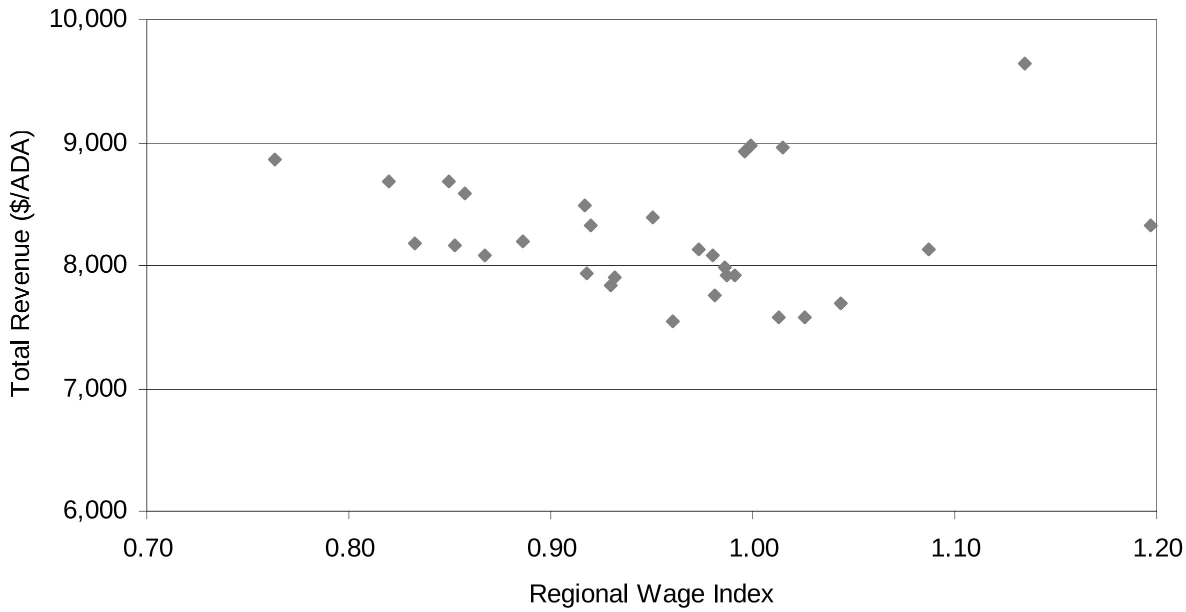
Figure 14
State Revenue and Regional Wage Index,
California Regions, 2004-2005*



* State revenue includes revenue limit funds (state and local), revenue for locally funded charter schools, lottery revenue, all other state categorical revenue, and federal local assistance for special education.

Districts in high-cost regions can supplement state revenue with optional local revenue, particularly the parcel tax. Several districts in the San Francisco Bay Area have exercised this option. However, these sums are relatively small, and adding them does not change the basic conclusion: Revenue per pupil is not systematically related to the regional wage index. Figure 15 illustrates this point by plotting total revenue per pupil in each region against the regional wage index. The total revenue depicted in Figure 15 adds other local and federal revenue to the state revenue depicted in Figure 14.

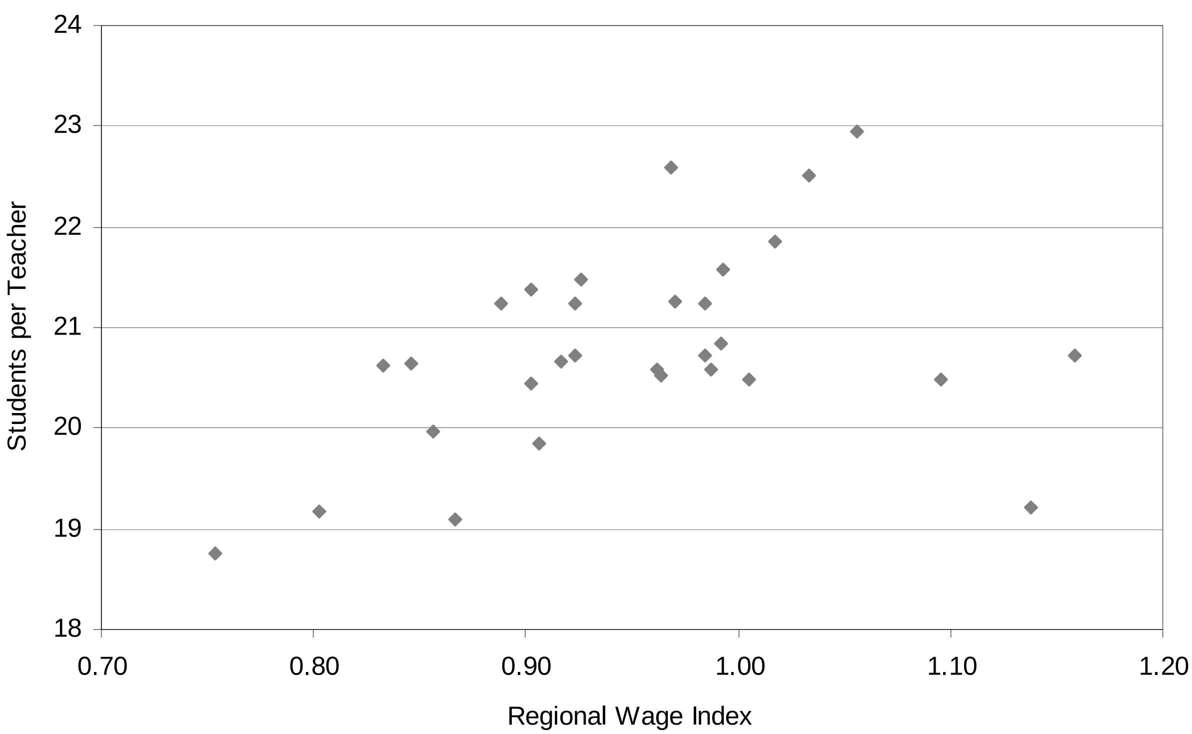
Figure 15
Total Revenue and Regional Wage Index,
California Regions, 2004-2005



A state finance system that does not recognize regional wage differences leads to less competitive districts in high-wage areas, but that is not the only consequence. Districts in high-wage areas pay their teachers more than districts in low-wage areas, but they receive equivalent revenue, requiring districts in high-wage areas to make other adjustments as well. One trade-off is to hire fewer teachers, thereby increasing class sizes. As Figure 16 shows, the student-teacher ratio tends to be higher in high-wage areas. Of course, other factors influence the student-teacher ratio as well. Rose and Sengupta (2007) incorporate these factors in a statistical model of district student-teacher ratios and find that, holding other factors constant, a 10 percent increase in the regional wage index is predicted to increase the student-teacher ratio by 2 percent.

In sum, regional variations in labor market conditions seem to have significant effects on districts. To be competitive with other employers, districts in some regions of the state must pay higher salaries to their teachers than districts in other regions. However, districts in high-wage areas do not receive additional revenue, so they make other accommodations. Although they offer higher salaries than districts in other regions, the wages they offer are not high enough to make them as competitive in the labor market as districts in low-wage regions. And, because they must offer higher wages to be at least somewhat competitive, they have more students per teacher.

Figure 16
Students per Teacher and Regional Wage Index
California Regions, 2003-2004



Pupil Transportation

California school districts operate in a variety of geographic conditions. In some rural districts, many students must travel considerable distances to reach their schools. In more densely populated urban areas, many students may be able to walk to school. The current school finance system acknowledges these cost differences through a categorical program that provides certain districts with additional funds based on their past expenditures.

A new funding formula might take account of these cost differences as well, if the cost differences are large enough and are clearly related to a factor external to districts. Population density is a logical candidate as such a factor. To investigate this possibility, we first calculated each district's density by dividing its enrollment by the square kilometers of inhabited land within its boundaries. Densities varied widely. For example, urban Santa Ana Unified in Orange County had a density of 1,602 students per square kilometer. In contrast, Lone Pine Unified in Inyo County had a density of 0.42 students per square kilometer.

To facilitate comparisons among districts with such a wide range of densities, we measure density by its natural logarithm. This approach has the practical effect of widening differences in densities among districts with low densities and narrowing differences among districts with high densities. For example, the log of 0.10 is -2.3, and the log of 0.4 is -0.9, a difference of 1.4. In contrast, the log of 1,000 is 6.9, and the log of 2,000 is 7.6, a difference of 0.7. Widening the low end of the scale by which densities are measured is useful because we expect that many of the significant differences in expenditures may occur among districts with relatively low densities.

This expectation is borne out in Figure 17. Transportation expenditures are very high in a number of low-density districts. In 14 of these districts, expenditures exceed $1,500 per pupil. Expenditures per pupil tend to fall as density increases. For each of the 315 districts for which the natural log of density exceeds 4 (55 students per square kilometer), transportation expenditures are less than $500 per pupil.

Districts with high transportation expenditures are also quite small, suggesting that economies of scale may also be an issue. Of the 14 districts with expenditures exceeding $1,500 per pupil, 13 have fewer than 100 students. The remaining district has 174 students. On the other hand, of the 50 largest districts (districts with enrollment exceeding 24,000 students), all had densities in excess of 45 students per square kilometer and transportation expenditures less than $300 per pupil.

These factors are summarized in Table 7, which shows average transportation expenditures for various density ranges. The least dense districts spend an average of $769 per pupil, but only 14,834 of the state's six million students attend those districts. Total transportation expenditures in those districts represent less than 1 percent of all transportation expenditures in the state. Districts with a log density of at least 4 spend only $134 per pupil on average. Nearly 80 percent of the state's students are in these districts.

The data in Table 7 suggest that a reasonable and relatively simple way to compensate districts for differences in transportation costs would be to focus on districts with very low densities. For example, the state might provide a grant of $1,000 per pupil for districts in the first range of Table 7, and a grant of $500 per pupil for districts in the second range. The grants could be unrestricted, compensating districts for unusual expenses without sacrificing the incentives districts have to achieve their objectives in the least costly manner.

Figure 17
District Transportation Expenditures and Population Density
All Districts, 2003-2004

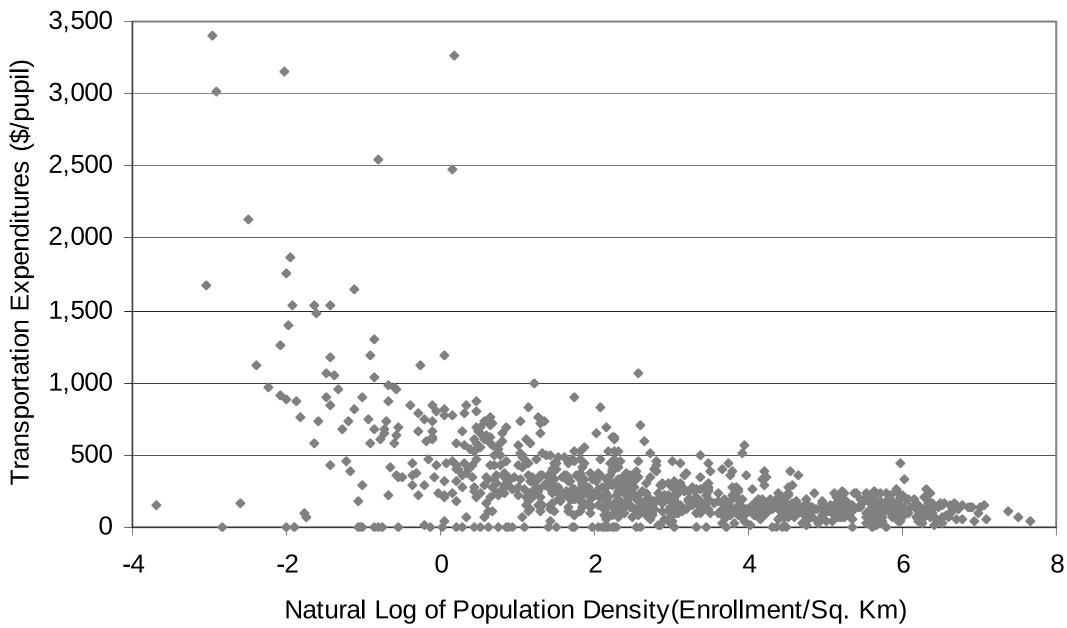


Table 7
District Transportation Expenditures and Population Density
All Districts, 2003-2004

Density (natural log of pupils per square kilometer)	Number of Districts	Average Transportation Expenditures ($/pupil)	Total Enrollment	Percent of Statewide Transportation Expenditures
Less than 0	99	769	14,834	0.01
0 - 2	258	363	232,630	0.09
2 - 4	301	219	1,050,249	0.23
Greater than 4	315	134	4,916,140	0.67

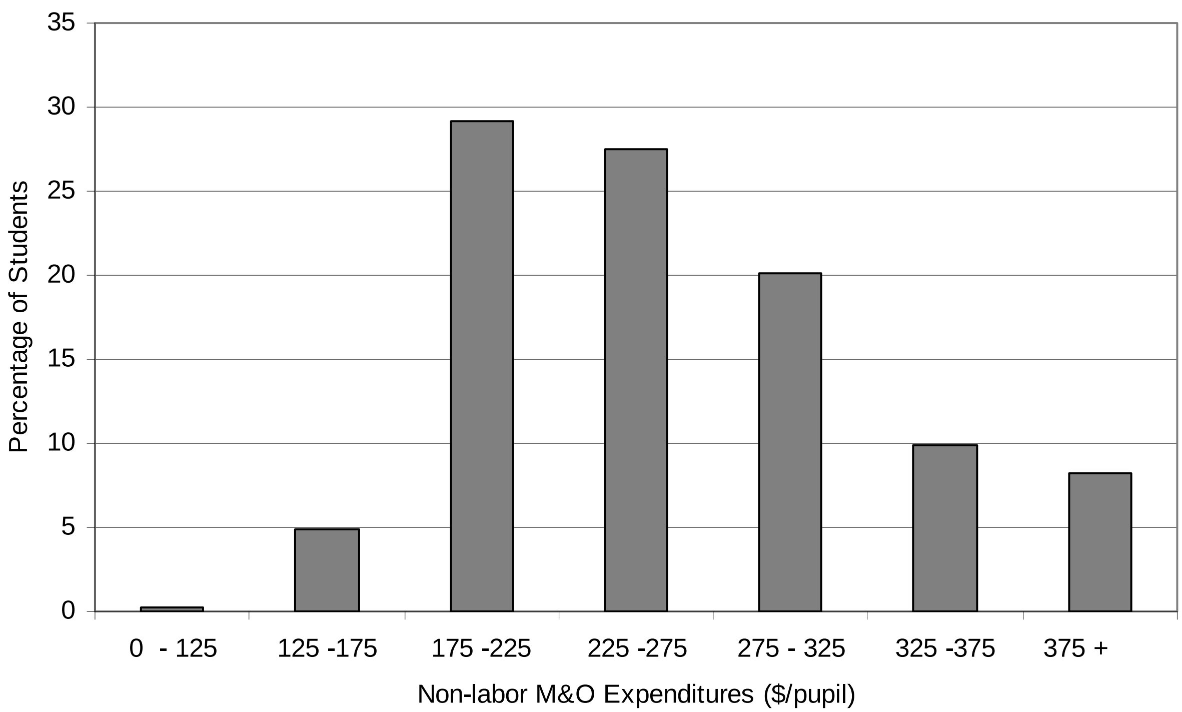
Utilities

Regional climate variations in California may result in different levels of utility use and expenditures. Districts in desert areas may have relatively high air conditioning expenses, districts in mountain areas may have unusually high heating costs.

Utility expenditures come under the category of non-labor maintenance and operations, a category that also includes other materials and supplies used in maintaining and operating schools. Expenditures in this category can vary significantly. In 2003-2004, 23 districts had non-labor maintenance and operations expenditures exceeding $1,500 per student. On the other hand, 632 districts had expenditures of less than $350 per student.

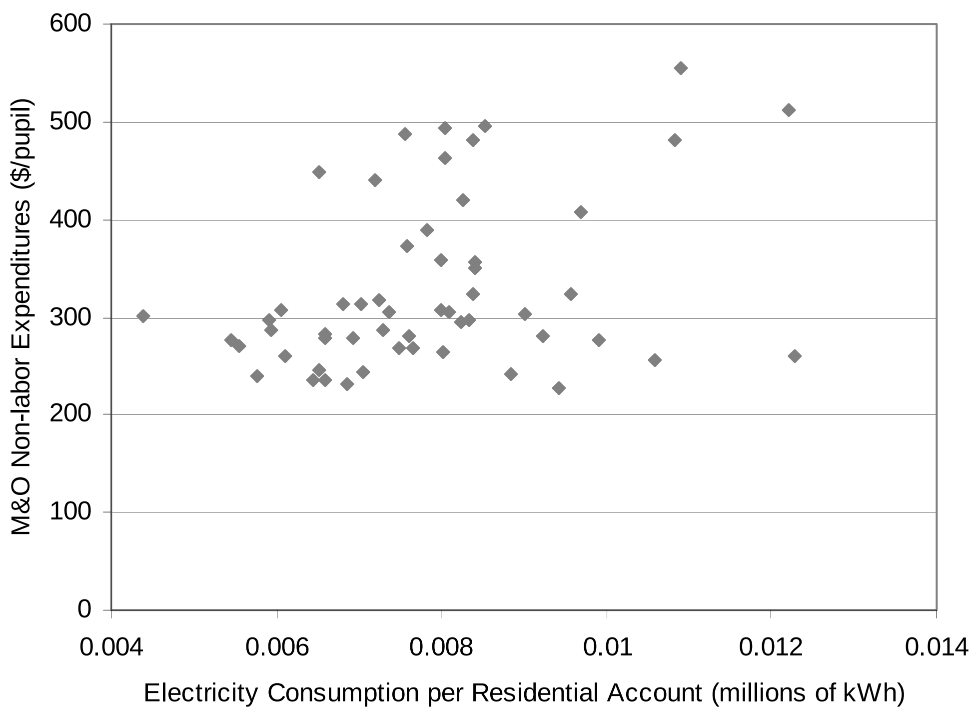
As with transportation, economies of scale seem to be an issue. Of the 23 districts with expenditures exceeding $1,500 per student, the largest had 764 students. In contrast, the 632 districts with expenditures of less than $350 per pupil enrolled 92 percent of California students. Figure 18 shows the percentage of students enrolled in districts with various levels of spending on non-labor maintenance and operations. About 27 percent of students are in districts that spend between $225 and $275 per pupil on non-labor maintenance and operations. Over three-quarters of California students are in districts that spend between $175 and $325 per pupil.

Figure 18
Distribution of Non-labor Maintenance and Operation Expenditures
All Districts, 2003-2004



One possible external measure of the weather-related utility costs faced by districts is the energy consumption of residents in the same area. Residential consumption is likely to be correlated with district expenditures, but it is not affected by the actions of districts. Residential energy use is also a better yardstick than industrial energy use, because industrial use is influenced by the industry mix of different regions and not just climate differences. Figure 19 plots non-labor maintenance and operations expenditures in a county against electricity consumption per household. Electricity consumption data are from 2005, because data for 2003-2004 were not available. Three counties (Alpine, Sierra, and Trinity) are excluded from the figure because expenditures in those counties exceed $1,000 per pupil, a result we attribute to the small size of the districts in those counties (enrollment in the three counties totals fewer than 10,000 students). The differences in expenditures across counties are relatively small. Using the average relationship in Figure 19 as a guide, the difference between high- and low-consumption counties is about $300 per pupil, a difference that may not be large enough to warrant attention in the state's school finance system.

Figure 19
Non-labor Maintenance and Operations Expenditures and Residential Electricity Use Counties, 2003-2004



Simulations

Many of the issues raised in the previous two sections are addressed in the new school finance system proposed by Bersin, Kirst, and Liu (2007). Their system has five basic elements:

- Base Funding. All school districts would receive a grant to cover the basic costs of education. The grant would be proportional to district enrollment (an equal amount per pupil).

- Special Education Funding. All districts would receive a grant for special education. The grant would also be proportional to district enrollment (an equal amount per pupil).

- Targeted Funding. All districts would receive a grant for the additional needs of targeted students, defined as English learners or students participating in the district's free or reduced-price lunch program. The grant would be proportional to the number of targeted students as long as the percentage of those students is less than 50 percent of enrollment. For percentages above 50 percent, the grant would increase more than proportionally to the number of targeted students.

- Regional Cost Adjustments. The funds in each of the three programs noted above would be adjusted for regional wage differences.

- Hold Harmless Condition. No district would receive less revenue from the three programs than it currently receives from state and local programs serving the same purposes as the new programs.

This section presents results from simulating this proposed system using data from 2004-2005. In particular, we compare how much each district received in 2004-2005 under the current system with what it would have received under the proposed system.

Baseline

The starting point for this exercise is to establish the baseline – the revenue each district received in each of the state's nearly 100 revenue programs in 2004-2005.[12] Most of these data were provided by the California Department of Education. The State Controller's Office also provided data on lottery funds and mandates, and the Office of Public School Construction provided data on the state's deferred maintenance program. Our efforts to compile these data were guided by an advisory group with members from the Department of Education, the Legislative Analyst's Office, and the Department of Finance. However, even with that expert guidance, there were still a number of difficult issues in comparing the current system and the proposed alternative.

[12] The programs incorporated in our model are listed in Table A1 in the Appendix. Eighty-seven programs are listed; some small schedules within the same budget item are combined in that list.

Many of these issues revolve around associations of districts. For example, all local education agencies in California belong to one of 124 Special Education Local Plan Areas (SELPAs), which coordinate the provision of special education services among their members. Each SELPA has a governing board composed of representatives from each of its member agencies, and the board allocates special education revenue received by the SELPA among its members. In the case of some small districts, the district may not provide any special education services itself; instead, another unit in the SELPA provides special education services to its students. In other cases, each district provides its own services, and it is the SELPA's revenue that is shared among districts. To represent these sharing arrangements, we have aggregated the special education revenue received by all entities in a SELPA and then prorated that revenue back to the entities in proportion to their ADA in 2004-2005. Thus, in our baseline, every district receives a certain amount of special education revenue per ADA. That amount varies across SELPAs, but is the same for every district in each SELPA.

A similar situation exists with regional occupational centers and programs (ROC/Ps), which provide vocational education to high school students and adults. There are 74 ROC/Ps throughout the state, some operated by county offices with participation by districts, others operated as joint powers agreements among districts, and a few as a separate entity within one large school district. We have treated revenue to these centers and programs similarly to our treatment of SELPA revenue. The revenue received by any ROC/P is allocated among its member agencies in proportion to their enrollment in grades 11 and 12.

A third case is transportation joint powers agreements (JPAs). In this case, a number of school districts cooperate in the provision of pupil transportation. These transportation JPAs receive state funds, and we have prorated the funds each JPA receives to its member districts in proportion to their ADA.

In many respects, county offices of education play the same role as SELPAs, ROC/Ps, and transportation JPAs. They participate directly in SELPAs and ROC/Ps, of course; but for many small districts, county offices also provide administrative services and other services such as professional development that larger districts provide themselves. Some county offices also serve as regional centers for a group of counties, and a few provide services for all districts throughout the state. The range of services provided by county offices is reflected in the revenue they receive from the state. County office revenue per countywide ADA exceeds $1,500 per ADA in twelve counties and is less than $500 per ADA in seven counties. Districts in the first group of counties are undoubtedly receiving services from their county offices that districts in the second group are not receiving. It is not clear to us, however, that all districts in a county benefit equally (or proportionally to enrollment) from those services, and we have not found a reasonable way to allocate the services of county offices to the districts they serve. Thus, we have not attempted to incorporate the revenue county offices receive into our baseline for districts.

The last institutional detail concerns charter schools and charter districts. Some charter schools are funded through the school districts that chartered them, and some are directly funded by the state. Because locally funded charters may benefit from other services provided by districts, we combined their revenue and ADA with the district that chartered them. However, we have set aside directly funded charter schools. In addition, California has seven charter districts, which we have included as distinct school districts.

The Bersin-Kirst-Liu (BKL) proposal would fund its three programs partly through existing funds. In conducting the simulations, we therefore assign existing programs to each of the three proposed programs and apply hold harmless conditions to each program separately. That is, if existing programs A and B fund new program C, we interpret the hold harmless condition to mean that a district cannot receive less revenue in C than it received from the sum of A and B in 2004-2005.

Several of California's current revenue programs could be assigned to the BKL targeted program. Some explicitly target low-income students and English learners and should obviously be assigned to the BKL targeted program. A few other programs provide additional funds to schools and districts in which student outcomes are unsatisfactory. Because these schools and districts tend to have high percentages of students targeted by the BKL proposal, we have also assigned these programs to the BKL targeted program. California's current revenue programs assigned to the BKL targeted program are listed below with total revenue divided by state ADA in parenthesis:

- Targeted Instructional Improvement Grant ($128.02 per ADA)
- Economic Impact Aid ($92.74 per ADA)
- High Priority Schools Program ($33.11 per ADA)
- After School Education and Safety Program ($10.05 per ADA)
- Intermediate Intervention/Underperforming Schools Program ($9.41 per ADA)
- English Learners Student Assistance ($8.99 per ADA)
- Community-Based English Tutoring Program ($8.61 per ADA)
- Dropout Prevention ($3.78 per ADA)
- Corrective Actions ($0.91 per ADA)
- At Risk Youth ($0.10 per ADA)

Bersin, Kirst, and Liu would essentially maintain the current special education program and continue the equalization of revenue under that program. Under the current system, enacted with AB 602 in 1997, each SELPA has a base rate – a dollar amount per ADA that is multiplied by the ADA in its member agencies to yield its base entitlement. Local special education property taxes and local assistance under the federal special education program are subtracted from that entitlement to yield the state's base apportionment to the SELPA. A few other adjustments are made to this base to yield the state's total apportionment. In general, then, a SELPA's total revenue is determined by its base rate. In 2004-2005, these base rates ranged from $538 per ADA to $984 per ADA. The state is equalizing these base rates over time.

These details aside, the revenue a SELPA receives is the sum of its special education apportionment, the special education property taxes it receives, and the local assistance portion of federal special education revenue. We have assigned these three revenue streams to the special education program in the BKL proposal.

With five exceptions, the remaining revenue streams are assigned to the BKL base program. The exceptions are adult education, child care and development, child nutrition, regional occupational centers and programs, and state mandates.[13] These revenue programs are not included in the simulation. In particular base funding includes revenue limit funds (state and local), revenue for locally funded charters (state block grant and in lieu property taxes), lottery funds, and all state categorical programs except the ten targeted programs listed above, special education funds, adult education, child care and development, child nutrition, regional occupation centers and programs, and state mandates. The programs included in the base are detailed in Table A.1 in the Appendix. In 2004-2005, revenue in these base programs averaged $6,019 per ADA.

Parameters

The BKL proposal involves three parameters, which we refer to as the *base rate*, the *special education rate*, and the *target rate*. These rates determine the revenue per student in each of the three programs. The base rate is the revenue per ADA a district receives in base funding, the special education rate is the revenue per ADA it receives for special education, and the target rate is the revenue per targeted student. The formula for the targeted program is more complicated, however, because the amount per targeted student depends on the percentage of students who are targeted. To represent this formula, let *percent targeted* be the percentage of students who are either participating in the district's free or reduced-price lunch program or are English learners. Then, for the targeted program, the BKL proposal determines district revenue as follows:

If *percent targeted* is less than or equal to 50 percent,

Revenue = (*target rate)* X (*percent targeted)* X (*ADA*)

If *percent targeted* is greater than 50 percent,

Revenue = (*target rate)* X 2 X (*percent targeted)* X *(percent targeted)* X (*ADA*)

In these two expressions, *ADA* is the average daily attendance of all students in the district, not just targeted students.

Bersin, Kirst, and Liu bifurcate their funding formula to address the deleterious effects of the concentration of poverty. If the number of targeted students is fewer than 50 percent of all students, each targeted student brings additional revenue to the district equal to the target rate. If the number of targeted students exceeds 50 percent of total enrollment, each targeted student brings additional revenue to the district in excess of the target rate. As a percentage of the target rate, this excess increases linearly from zero percent when the percent targeted is slightly greater than 50 percent to 100 percent when all students are targeted.

[13] State mandates include the special education mandate settlement.

Targeted students are unduplicated counts of English learners and participants in a district's subsidized lunch program. We know that, statewide, 15 percent of English learners do not participate in the subsidized lunch program. However, we do not know this percentage for each district. In the absence of these data, we make the simplifying assumption that 15 percent of English learners in each district do not participate in the district's subsidized lunch program. The number of targeted students is therefore assumed to be the participants in the district's subsidized lunch program plus 15 percent of its English learners. If that number exceeds district ADA, we assume that all students in the district are targeted students.

We simulate the BKL proposal under a number of different parameter values. The first simulation for each program is intended to establish a reference point for subsequent parameter values. For that simulation we do not impose the hold harmless condition, and we do not adjust for regional wage differences. Under these conditions, we then choose a parameter that yields the same cost for the new program as the existing programs assigned to it. For the base and special education programs, this parameter value is merely the revenue per ADA in the existing programs. Essentially, the reference point is the revenue per pupil in the new program that each district would have if the total revenue in the existing programs were allocated to districts in proportion to their ADA. From that reference point, we then impose the hold harmless condition and the regional wage adjustment and determine the additional cost due to those changes.

Adjustments for regional wage differences are made using the wage index compiled by Rose and Sengupta (2007). Because 80 percent of school district expenditures are personnel costs, we adjust 80 percent of the parameter rates for regional wage differences. That is,

adjusted base rate = 0.2 X *(base rate) + 0.8* X *(regional wage index)* X *(base rate)*

The same adjustment is used for the special education and target rates.

Results

The detailed results from our simulation are provided in the "Further Analysis" included with this report on the PPIC website. In the "Further Analysis" we show the revenue each district received in 2004-2005 and the revenue it would have received under the BKL proposal. In this section, we summarize those results starting with the cost to the state of the BKL proposal.

The base program would replace a large collection of state and local revenue programs. In 2004-2005, the revenue in those programs totaled $35 billion. If that revenue were distributed in proportion to each district's ADA, the reference point for the base program, each district would have received $6,019 per ADA. This distribution would reduce the revenue of some districts and increase the revenue of others. If the first group of districts were held harmless, the cost to the state of increasing the revenue of the second group would have been $819 million.

Alternatively, the revenue from existing programs could have been distributed among districts in proportion to the base rate of $6,019 adjusted for regional wage differences. Because the regional wage index is normalized at the statewide average, that distribution would not have required additional state funds. Districts in high-wage regions would receive more than $6,019 per ADA, and districts in low-wage regions would receive less. The total amount of revenue would be the same. If the hold harmless condition were applied to that distribution, the additional cost to the state would be $1,094 million.

These costs are given in the first row of Table 8. The table gives the additional cost of the BKL program for two other parameter values and four different scenarios. Each row is a different value for the base rate, and each column is a different scenario. Scenario 1, the first column, does not impose the hold harmless condition and does not adjust for regional wage differences. Scenario 2, the second column, imposes the hold harmless condition, but does not adjust for regional wage differences. The difference in costs between the first and second column is one measure of the cost of the hold harmless condition. Another measure is the difference between columns 3 and 4. In scenario 3, the base rate is adjusted for regional wage differences, but districts are not held harmless. Regional wage adjustments are also applied in scenario 4, and districts are held harmless. Scenario 4 is, of course, the scenario proposed by Bersin, Kirst, and Liu. We include the other three scenarios only to give a sense of the cost of the hold harmless condition, and how that cost is affected by regional wage adjustments.

Table 8
Additional Cost of BKL Base Program (dollars in millions)

Scenario		#1	#2	#3	#4
Hold Harmless Condition?		No	Yes	No	Yes
Regional Wage Adjustment?		No	No	Yes	Yes
Base rate:	6,019	0	819	0	1,094
	6,200	1,049	1,550	1,049	1,783
	6,400	2,205	2,566	2,205	2,736

Costs for two other parameter values are listed in Table 8. If the base rate is $6,200 instead of $6,019, the additional cost of the BKL program grows from $1.1 billion to $1.8 billion. For a base rate of $6,400 per ADA, the cost is $2.7 billion – an 8 percent increase over the revenue in the base programs in 2004-2005.

The BKL base program, as described above, allocates revenue to districts on the basis of the number of students they serve. Bersin, Kirst, and Liu also raise the possibility of including grade span in the funding formula for the base program. In fact, California's current school finance system does implicitly provide additional funding for some high school students. As Table 3 shows, students in high school districts generate about $1,000 per ADA more in revenue, on average, than students in elementary and unified districts. Using this differential as a guide, consider the following modification of the BKL base program: $6,000 per ADA for students in grades K-8 and $7,000 per ADA for students in grades 9-12. Assuming the hold harmless condition and regional wage adjustments, the additional cost of the BKL program would rise to $4,483 million, a 13 percent increase over the revenue currently devoted to base programs.

Bersin, Kirst, and Liu propose two changes to the current special education program. The first is to adjust special education funding for regional wage differences. The second is to equalize this adjusted funding. In terms of the simulation model, we can think of this objective in the following way. For any value for the special education rate, adjust that rate for regional wage differences and then compare the cost of the special education program with and without the hold harmless condition. The difference between those two costs – the difference between the cost of scenario 4 and the cost of scenario 3 – is the additional cost of the program due to the hold harmless condition. It is the revenue districts receive in excess of the amount they would be provided by the BKL formula; it is a measure of the extent to which districts are "out of formula." As the special education rate is increased, fewer districts are held harmless, and the cost of the hold harmless condition decreases. When the special education rate has been increased enough to make that cost zero, all districts have funding equal to the amount specified by the funding formula. All districts are "in formula." Special education funds, adjusted for regional wage differences, are equalized.

Complete equalization means raising special education funding in every district to the level of the best funded district, an expensive proposition. As Table 9 shows, if the special education rate were $800 per ADA, the cost of the hold harmless condition would be $95 million ($750 million minus $655 million). Raising the rate to $900 per ADA would reduce that cost to $36 million, but it would also increase the cost of the special education program by $519 million ($1,269 million minus $750 million). At the rate of $900 per ADA with regional adjustments and the hold harmless condition, the total revenue for the special education program would be $5,239 million, a 32 percent increase over special education revenue of $3,970 million in 2004-2005. At the lower rate of $800 per ADA, the revenue for the special education program would be 19 percent higher than in 2004-2005.

Table 9
Additional Cost of BKL Special Education Program (dollars in millions)

Scenario		#1	#2	#3	#4
Hold Harmless Condition?		No	Yes	No	Yes
Regional Wage Adjustment?		No	No	Yes	Yes
Special education rate:	687	0	267	0	264
	800	655	765	655	750
	900	1,233	1,286	1,233	1,269

The ten programs assigned to the BKL targeted program had combined revenue of $1,710 million in 2004-2005. The program would target roughly 3.1 million students for additional revenue, yielding an average of $556 per student. However, the BKL targeted program would not allocate funds among districts in proportion to the number of targeted students. Districts with concentrations of these students in excess of 50 percent would receive a more than proportional share of funds. Setting aside regional wage adjustments and the hold harmless conditions, allocating $1,710 million according to the BKL formula would require a target rate of $402. The difference between that rate and $556 is due to the concentration factor. To provide more than proportional funds to high-poverty districts, funds to other districts would have to be reduced by $154 per targeted student.

The revenue provided by the BKL program with a target rate of $402 is substantially lower than three recent estimates of the additional funds necessary for low-income students to meet California's academic standards. Using participation in free or reduced-price lunch as the measure of poverty, Imazeki (2006) estimated that the additional funds necessary for each low-income student is approximately $1,500. Using a different method, Sonstelie (2007) estimated this additional cost to be roughly $2,000. Using a third method, Chambers, Levin, and DeLancey (2006) estimated this cost to be approximately $3,000. All three estimates are considerably higher than the average of $556 targeted for low-income students in 2004-2005.

Table 10 presents estimates of the cost of the BKL formula for two different parameters representing the range of these estimates. If the target rate is $1,500, the BKL program would require an additional $4,657 million. If the rate is $2,500, the program would require an additional $8,874 million.

Table 10
Additional Cost of the BKL Targeted Program (dollars in millions)

Scenario		#1	#2	#3	#4
Hold Harmless Condition?		No	Yes	No	Yes
Regional Wage Adjustment?		No	No	Yes	Yes
Targeted rate:	402	0	518	-8	501
	1,500	4,671	4,695	4,640	4,657
	2,500	8,926	8,930	8,874	8,874

The BKL proposal would not benefit every school district equally. It would favor districts with relatively low revenue under the current school finance system, with relatively high regional wages, and with relatively high concentrations of English learners and low-income students. The precise distribution of benefits depends on the parameter values, although the pattern of benefits is similar across a wide range of parameter values. To illustrate this pattern, we present district gains for a particular set of parameter values: a base rate of $6,200, a special education rate of $800, and a target rate of $1,500. These parameter values are the median values in Tables 8, 9, and 10. With those parameter values, regional wage adjustments, and the hold harmless condition, the BKL proposal would require additional funds of $7.2 billion – an 18 percent increase in revenue over the $40.5 billion provided in the associated programs in 2004-2005.[14]

To represent the distribution of additional revenue under the BKL proposal, we classify districts by type and size as in Table 2. To this classification, we add two other dimensions (Table 11). The first uses the percentage of students in free or reduced-price lunch to divide districts into low-poverty and high-poverty districts. The dividing line is 52.6 percent. About half of students are in districts with free or reduced-price lunch percentages above that line. The second dimension is based on the regional wage index. We classify districts as high-salary districts if the index for their region exceeds 1.0. Otherwise, they are classified as low-salary districts. About half of students are in districts with an index above that dividing line.

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[14] If the hold harmless condition were applied to total revenue, not revenue in each program, the additional cost of the BKL proposal would fall to $6.6 billion.

Among elementary districts, medium and large districts would gain relatively more than small districts. For example, for high-poverty, low-salary districts, the average gain is $1,515 per ADA for small districts, $1,858 for medium districts, and $1,855 for large districts. This pattern is similar for other classifications (Table 11). The differences in gain by district size are due to the distribution of revenue under the current system. Under that system, small districts receive relatively more revenue per pupil and thus gain relatively less from the BKL proposal, which does not differentiate districts by size.

Table 11
Distribution of Gains under BKL Program
Elementary School Districts

	Number of Districts	Average Change ($/ada)	Percent with Revenue More than $500/ADA Above Funding Formula
Small			
Low Poverty			
Low Salary	98	420	76
High Salary	14	460	86
High Poverty			
Low Salary	83	1,515	83
High Salary	2	463	100
Medium			
Low Poverty			
Low Salary	94	537	41
High Salary	16	712	38
High Poverty			
Low Salary	65	1,858	38
High Salary	5	2,654	0
Large			
Low Poverty			
Low Salary	46	711	15
High Salary	46	1,500	4
High Poverty			
Low Salary	55	1,855	5
High Salary	33	2,581	3

This pattern is reflected in the third column of Table 11, which presents the percentage of districts of each type that had at least $500 more revenue per ADA in 2004-2005 than they would have received under the BKL funding formula (without the hold harmless condition). Eighty percent of small districts fall into this category, compared to only 7 percent of large districts. In general, small elementary districts fall into this class because they had larger revenue in their base programs than they would have received under the BKL formula. However, many of these districts would have also benefited from substantial gains in revenue due to the targeted program. Thus, while 80 percent of small districts are held harmless in at least one program, the average gain for them exceeds $400 per ADA.

Table 11 also shows a clear pattern of gain for medium and large districts with respect to regional salary and poverty. For large districts, for example, low-poverty, low-salary districts have an average gain of $711 per ADA, in contrast to low-poverty, high-salary districts which have an average gain of $1,500 per ADA. High-poverty, low-salary districts gain even more on average − $1,855 per ADA. High-poverty, high-salary districts gain the most, $2,581 per ADA. In determining gains, poverty is a more important factor than regional wages. High-poverty, low-salary districts gain more than low-poverty, high-salary districts.

Gains from the BKL proposal are lower on average for high school districts (Table 12) than for elementary districts, reflecting the relatively higher revenue high school districts receive under the current system. In fact, 65 percent of high school districts received more revenue in 2004-05 than they would have received under the BKL funding formula. If that formula were adjusted for grade span, as Bersin, Kirst, and Liu seem to favor, that percentage would decrease.

Despite the relatively lower gains overall, the distribution of gains by wage and poverty is similar to the distribution for elementary districts. Poverty is a more important factor than regional wages. In general, high-poverty districts would gain more than low-poverty districts in either low- or high-salary regions.

Table 12
Distribution of Gains under BKL Program
High School Districts

	Number of Districts	Average Change ($/ADA)	Percent with Revenue More than $500/ADA Above Funding Formula
Small			
Low Poverty			
Low Salary	21	389	100
High Salary	0	NA	NA
High Poverty			
Low Salary	6	1,328	100
High Salary	0	NA	NA
Medium			
Low Poverty			
Low Salary	16	366	69
High Salary	7	603	57
High Poverty			
Low Salary	3	1,263	100
High Salary	1	1,341	0
Large			
Low Poverty			
Low Salary	12	438	33
High Salary	12	702	17
High Poverty			
Low Salary	3	723	67
High Salary	2	1,287	50

Unified districts (Table 13) display the same general pattern of hypothetical gains as do elementary and high school districts. Small districts tend to gain less than medium and large districts. Small districts are also much more likely to have more revenue in 2004-2005 than they would receive from the BKL funding formula. High-salary districts gain more than low-salary districts, and high-poverty districts gain more than low-poverty districts. However, poverty is a more important factor than salary.

Table 13
Distribution of Gains under BKL Program
Unified Districts

	Number of Districts	Average Change ($/ada)	Percent with Revenue More than $500/ADA Above Funding Formula
Small			
Low Poverty			
Low Salary	54	529	63
High Salary	7	652	43
High Poverty			
Low Salary	59	1,406	83
High Salary	3	1,491	100
Medium			
Low Poverty			
Low Salary	36	608	8
High Salary	39	1,085	3
High Poverty			
Low Salary	24	1,625	8
High Salary	5	1,940	0
Large			
Low Poverty			
Low Salary	28	789	0
High Salary	34	1,166	0
High Poverty			
Low Salary	22	1,402	5
High Salary	23	1,801	0

Conclusion

Some criticisms of California's school finance system are surely overblown. Just as surely, however, the system is long overdue for some deep pruning and fundamental reshaping. This work should be guided by the basic purpose of the state's school finance system, which, we believe, is to ensure that schools have the resources their students need to learn the academic content specified by the state. As we have shown in the first two sections of this paper, resource needs vary from school to school, and resource costs vary from district to district. These variations are important realities that a new school finance system must recognize.

School finance reform must also incorporate some simple lessons about the design of government revenue programs. For not only does revenue provide the means to provide public services, it also serves as a system of consequences for the providers of those services. If a school's students perform poorly on standardized tests, the school certainly needs help, including perhaps additional resources. However, if resources are allocated to schools on the basis of student performance, schools that improve performance will suffer the perverse consequence of fewer resources. Similarly, districts that face unusually high costs surely need additional revenue to provide their students the resources they need. However, if the state merely reimburses districts for unusually high expenditures, districts no longer have an incentive to find the least costly ways to achieve their objectives. The answer in both cases is to look for indicators of need that are external to the actions of schools and districts. For example, we observe that student achievement is inversely related to family income, a factor external to schools. A sensible response is to provide more resources to schools with many low-income students. Equivalently, we observe that pupil transportation costs are inversely related to population density, another external factor. A sensible response is to provide more resources to districts with low population densities.

Bersin, Kirst, and Liu have provided a good starting point for the kind of reform effort California urgently needs to undertake. Their proposal is vastly simpler than the current system, exemplifying the kind of pruning that could reasonably be done. More importantly, it directly addresses the issue of differences in student needs and district costs, using indicators of need and cost that are external to districts. We are hopeful that this proposal causes other proposals to emerge, and we look forward to analyzing those proposals, as well.

There are many directions other proposals could take. Our experiences simulating the Bersin, Kirst and Liu proposal suggest two issues that might be addressed. The first concerns small school districts. Most small school districts currently receive more revenue than the funding formula proposed by Bersin, Kirst, and Liu would provide to them. There are surely good reasons to continue funding small districts at these higher rates. However, it would be useful to articulate these reasons and to tie them to particular funding formulas for small school districts. These formulas should provide small school districts with the additional revenue they need, but also give them the incentive to consolidate with other districts when it is economical to do so. A funding formula based on an external factor such as population density would be one possibility.

The issue of small school districts leads naturally to the topic of county offices of education, because those offices provide many services to small districts. This reality is partly reflected in the large share of some categorical revenue that flows to county offices. For example, over 30 percent of funds in the Beginning Teacher Support and Assessment (BTSA) program is allocated to county offices, which presumably provide support to beginning teachers employed by districts in their counties. The proposal by Bersin, Kirst, and Liu would replace this categorical program with unrestricted funds, allowing districts to decide for themselves whether support for beginning teachers is a wise use of those funds. It is less clear how this would work for the funds in the BTSA program that now go to county offices. Could the county offices now treat this money as unrestricted and decide for themselves whether a support program for beginning teachers is a good use of funds? An alternative approach is to allocate the BTSA funds county offices now receive to the districts they serve and let the districts contract with the county offices to provide support services if they decide that such services are a good use of their unrestricted funds.

Appendix: Data Sources

Figures 1, 3, 4, 5, and 6

Data on school-level proficiency rates come from the AYP Data File of the California Department of Education. See http://www.cde.ca.gov/ta/ac/ar/.

Figure 7

Data on percentage of children 5 through 17 living in households with income below the federal poverty line comes from the Small Areas Income and Poverty Estimates of the U. S. Census Bureau. See http://www.census.gov/hhes/www/saipe/.

Tables 2, 3, and 4

Most revenue data for California school districts come from files maintained by the California Department of Education. Data on lottery revenue and state mandates come from the State Controller's Office. Data on the deferred maintenance program are from the Office of Public School Construction.

Table 5

Expenditure data come from the Standardized Account Code Structure data maintained by the California Department of Education. We base the categories on those in Rose and Sengupta (2007) with one exception. To divide the maintenance and operations (M&O) category into labor and non-labor, we use the definition in Sonstelie (2007). To do this we include expenditures from the deferred maintenance fund in the M&O category and exclude them from the miscellaneous category. To compute the district administrative expenditures on labor and non-labor, we apply the proportion of their non-labor expenditures in Table A.1 of Rose and Sengupta to their Table A.2 adjusted expenditures.

Table 6

Rose and Sengupta (2007) documents how the regional wage index is computed. We use U.S. Census data about wages in 1999 and data from the Occupational Employment Survey (OES) to estimate the growth in wages between 1999 and subsequent years. For each MSA region, the OES data provides annual data on average wages and employment levels for 700 occupations. Using the individual level Census data, we compute regional wages while controlling for various demographic characteristics (sex, race, age, and education level) as well as economic factors such as the industry and occupation of the individual. Controlling for these factors means that differences in non-teacher wages are not driven by differences in industry mix or age across the regions. Furthermore, we limit this analysis to those individuals who are college graduates working in non-teaching occupations.

Figure 12

These data come from the Salary and Benefits Schedule for the Certificated Bargaining Unit (Form J-90) that districts use to report their salary schedules to the California Department of Education. In 2003-2004, 812 of California's 977 school districts reported these data. These 812 districts enrolled 98 percent of the 6.2 million public school students. Rose and Sengupta (2007) provides more details about these salary schedules and benefits.

Figure 13

Data on the percentage of teachers with emergency credentials come from the CBEDS files maintained by the California Department of Education.

Figure 19

Data on energy consumption come from the California Energy Commission. See http://www.energy.ca.gov/electricity/electricity_by_county_2005.html.

Table A.1
Current Revenue Programs Allocated to BKL Revenue Programs

Revenue Program	Budget Act Number	Dollars per ADA
Base Program		
District Revenue Limit		
Local Revenue (Including ERAF)		1,820.95
State Aid (net of COE transfers)		3,201.00
Local Funded Charter School Gen. Purpose Entitlement		30.85
Charter School In Lieu of Property Taxes		
Unified Districts		10.18
Elementary and High School Districts		5.79
Charter School Categorical Block Grant	6110-211-0001	3.16
Basic Aid Supplement Charter School Adjustment		0.08
State Lottery Revenue		157.46
Instructional Materials Block Grant	6110-189-0001	61.93
Instructional Materials - Williams Case		23.55
School Library Materials	6110-149-0001	0.71
Deferred Maintenance	6110-189-0001	42.39
School Improvement		
Kindergarten - Grade 6	6110-116-0001(1)	56.57
Grades 7 - 12	6110-116-0001(2)	11.97
Class Size Reduction		
Kindergarten - Grade 3	6110-234-0001	272.86
Grade 9	6110-232-0001	13.96
Tenth Grade Counseling	6110-108-0001	2.04
Supplemental Grants	6110-235-0001	28.79
Year Round Schools	6110-224-0001	14.56
Healthy Start	6110-200-0001	0.35
Charter School Facilities Grants	6110-485	0.12
Tobacco Use Prevention Education (Prop 99)		2.84
Environmental Education		0.00
Home to School Transportation	6110-111-0001	
Pupil Transportation	sch. (1)	83.96
Small School District Bus Replacement	sch. (2)	0.69
School Safety Block Grants	6110-228-0001	
Grades 8-12	sch. (1)	14.87
School Community Policing Partnership Comp. Grant	sch. (5)	1.50

Table A.1 continued

High Risk Youth Education and Public Safety Program	6110-212-0001	0.03
Staff Development Day Buyout	6110-112-0001	36.30
Math and Reading Professional Development Program	6110-137-0001	5.02
Beginning Teacher Support and Assessment	6110-191-0001	9.15
National Board Certification Incentives	6110-195-0001	1.08
Intersegmental Staff Development	6110-197-0001	0.22
Staff Development - Instructional Support	6110-193-0001	
Reader Services for Blind Teachers	sch. (3)	0.04
Teacher Peer Review	sch. (2)	4.30
Supplemental Instruction (Summer School)	6110-104-0001	
Grades 7-12, CAHSEE	sch. (1)	32.97
Grades 2-9, Retained or Recommended for Retention	sch. (2)	12.45
Grades 2-6, Low STAR or At Risk	sch. (3)	4.80
Grades K-12, Core Academic	sch. (4)	16.21
CalSAFE	6110-198-0001	
Child Care	sch. (2)	2.62
Academic and Supportive Services	sch. (1)	1.98
Community Day Schools	6110-190-0001	5.52
Opportunity Classes and Programs	6110-127-0001	0.30
Foster Youth Program	6110-119-0001	0.27
Early Mental Health Initiative		1.60
Basic Aid Choice/Court Ordered Voluntary Pupil Transfer		0.62
American Indian Early Child Education Program	6110-151-0001(2)	0.09
Gifted and Talented Pupil Program	6110-124-0001	8.32
Specialized Secondary Program Grants	6110-122-0001	0.69
Advanced Placement Programs	6110-240-0001	0.43
Student Assessment Testing	6110-113-0001	
STAR Program	sch. (3)	1.93
English Lang Development Assessment	sch. (4)	1.49
High School Exit Exam	sch. (5)	0.35
Partnership Academy Programs	6110-166-0001	3.56
Schools Apportionment - Apprentice Program	6110-103-0001	2.27
Agricultural Vocational Education	6110-167-0001	0.77

Table A.1 continued

Special Education Program		
Special Education Apportionment	6110-161-0001	462.07
Federal Special Education-Local Assistance		168.63
Special Education Property Taxes		55.22
Special Education ROCP Handicapped		0.59
Special Ed DDS Early Intervention Program		0.17
Targeted Program		
Targeted Instructional Improvement Block Grant	6110-132-0001	128.02
Economic Impact Aid	6110-128-0001	92.74
Low Performing Schools	6110-123-0001(2)	33.11
After School Programs	6110-649	10.05
English Learners Student Assistance	6110-125-0001	9.41
Immediate Intervention/Underperforming Schools Program	6110-123-0001(1)	8.99
Community-Based English Tutoring Program	6110-617	8.61
Dropout Prevention	6110-120-0001	3.78
Corrective Actions	6110-123-0001(3)	0.91
At Risk Youth (LAUSD)	6110-280-0001	0.10
Programs Not Included in Simulation		
Adult Education	6110-156-0001	105.48
Adults in Correctional Facilities	6110-158-0001	2.32
Child Care and Development	6110-196-0001	
Preschool Education	sch. (1)	27.78
General Child Development Programs	sch. (1.5a)	30.00
Extended Day Care	sch. (1.5i)	1.83
Alternative Payment Program Stage 2	sch. (1.5e)	0.48
Alternative Payment Program Stage 3 Setaside	sch. (1.5f)	0.34
Alternative Payment Program	sch. (1.5d)	0.18
Migrant Day Care	sch. (1.5c)	0.12
Resource and Referral	sch. (1.5g)	0.07
Child Nutrition	6110-203-0001	12.80
Child Nutrition Breakfast Startup	6110-201-0001	0.17
Child Nutrition, Linking Education, Activity, & Food		0.02
ROC/Ps	6110-105-0001	42.74
State Mandates		24.50
Special Education Annual Mandate Settlement		4.30

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