Occasional Papers

Teacher Compensation and Local Labor Market Conditions in California: Implications for School Funding

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California's current system of school finance ensures that each school district receives an approximately equal level of per-pupil revenue. Given the variation in resource costs across the state, equal revenue per pupil does not necessarily translate into equal resources per pupil. As California assesses the resources necessary to educate students to state academic standards, it must come to grips with regional variations in the cost of key resources. Because spending on teachers accounts for just over half of total spending per pupil, variation in teacher costs will likely play an integral role in a funding model geared toward ensuring adequate resources. More generally, total personnel costs in districts represent about 85 percent of total expenditures, so the variation in labor costs is an important factor for most of the school budget.

This paper examines how teacher compensation varies across California and how the variation is driven by factors beyond the control of school districts. Although we focus on teachers, the main concepts can be extended to all personnel. The paper also presents a formula that would help equalize the purchasing power of California school districts and discusses whether it makes sense to pursue such a goal.

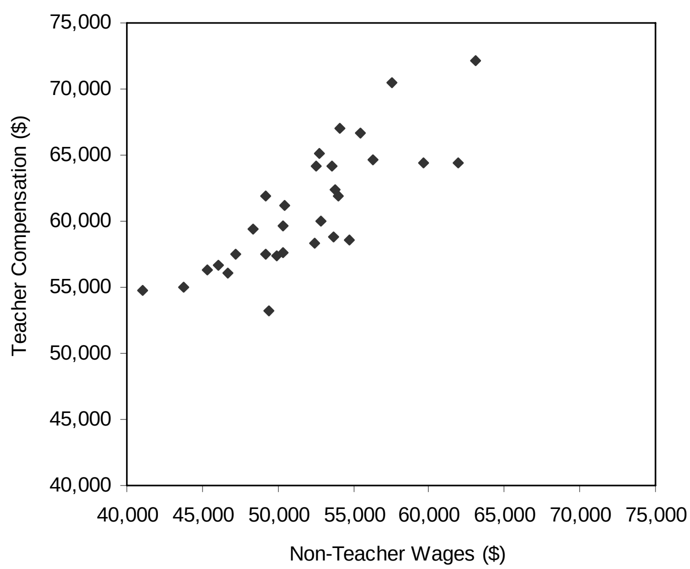
The salaries and benefits offered to teachers of a given education and experience level vary substantially across California school districts. In 2003-2004, districts in Santa Clara County and Orange County offered the highest compensation in the state, on average surpassing $70,000 for a teacher with 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.

Teacher salaries are determined by two key components: the salary schedules that districts adopt and the experience level of teachers within the district. The salary schedules reflect local labor market conditions because school districts must compete with other employers to attract employees. Districts in regions with higher non-teacher salaries must offer teachers relatively higher salaries. Salary schedules may also reflect the local supply of teachers. Regions experiencing teacher shortages may need to offer higher salaries to attract teachers.

Figure S.1 plots the average non-teacher wages for 30 regions throughout California against the average teacher compensation in those regions. The average teacher compensation refers to the average salaries and benefits of a typical teacher during his or her tenth year of teaching. The non-teacher wages tend to be lower than the teacher compensation because benefits are included for the teachers but not for the non-teachers. 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 perfect. Our regression analysis reveals that, relative to the state average teacher's compensation, districts in high-wage regions only increase teacher compensation to about 60 percent of the non-teacher wage difference. Although teacher supply is relatively higher in the high non-teacher wage regions, our analysis reveals that supply affects district compensation very little. In addition to these external pressures, other factors also affect the compensation districts offer. For example, poor working conditions, such as a high percentage of a district's students in poverty, are predicted to increase the beginning compensation districts must offer to attract teachers.

The average experience level in a district also affects total spending on teachers, because it determines where most teachers place on the districts salary schedule. This paper shows that the average experience level of teachers is affected by the general age level of workers in the region and by the recent enrollment growth within the district. Some regions are more attractive to young people, who move on to other regions as they age. Thus, the general age composition within a district's labor market can affect the average experience level of teachers. Enrollment growth also affects the experience level. Growing districts hire more new, inexperienced teachers and therefore tend to have lower average teachers' salaries. In contrast, districts declining in enrollment do not hire many new teachers; thus, average experience and salary increase over time. Working conditions, such as student poverty, also affect the experience level of teachers in the district. Districts with more student poverty tend to have lower experience levels.

Figure S.1
Mid-Career Teacher Compensation and Non-Teacher Wages



Overall, districts cannot fully adjust to external labor market conditions because their revenue is constrained by the state, and furthermore, the state allocates roughly equal amounts of revenue per pupil to all districts. Given the numerous fixed non-teaching resources required to run a school, districts can only cut back in other areas so much before they need to reduce relative teacher compensation or the number of teachers to balance their budgets. Our analysis suggests that as external wage pressures grow, districts not only cut back on the number of teachers they hire but also reduce the ratio of other certificated staff (such as counselors and nurses) to students.

This paper proposes an approach to altering California's school funding system so as to equalize purchasing power across school districts. To implement this proposal, the state could construct a baseline California-wide teacher salary schedule and then use a comparable wage index to scale that baseline schedule appropriately for each district. Non-teacher wages provide a natural comparable wage index. Essentially, such an index would be the ratio of the regional non-teacher wage to the statewide average non-teacher wage. Using the scaled salary schedules, each district would receive sufficient revenue to hire enough teachers to reach some statewide target teacher-pupil ratio. Ultimately districts would have the ability to determine their own salary schedule and their own mix of resources, but the formula would enable them to afford some standard resource set.

Because of the financial opportunities created by growth and the obstacles due to decline, enrollment trends may also become a factor in a new finance formula. Similarly, a formula could account for the age composition of the district's labor supply. Our analysis shows that these factors do affect the experience level and therefore the cost of teachers within a district. To equalize resources, shrinking districts would receive additional revenue, as would districts with an older population.

We view this formula as a starting point for how adjustments for labor costs could be made. Our proposed formula does not include funding adjustments for the possibility that some districts may need more revenue because of the specific challenges of the students in their schools. For example, districts with high shares of poor students, English learners, or special education students may need to hire more teachers to meet the state's academic performance standards. Although our analysis shows that such districts pay beginning teachers more under the current school finance system, these salary premiums may not be necessary if the state addressed working conditions more directly through additional aid to those schools.

The formula we present shows how to equalize purchasing power in the face of different resource costs. However, such a policy may overcompensate some districts if they can substitute away from the high cost labor and toward other resources that will help achieve the same goals. Given that the costs of all district employees likely move together, substituting among different types of labor is unlikely to yield cost savings. Furthermore, given the richly human process that defines education, it is difficult to imagine which non-labor resources could make up for a smaller labor force. Unfortunately, researchers do not have a good idea of the mix of resources required to achieve particular test scores, so the precise nature of potential substitution options is unknown.

The formula may also overcompensate some districts within regions. To the extent that labor costs vary within a given region of the state, the formula we present bestows some districts within a region with too many resources and other districts with too little.

Although providing equal resources to schools has been the goal of past school finance reform efforts, the state's recent focus on academic standards places more emphasis on student outcomes than on educational inputs. Specifically, the state has set an academic goal of an 800 Academic Performance Index (API) for all schools. This standard focuses attention on those schools failing to meet this academic goal and leads naturally to the conclusion that such schools may need additional resources. The formula proposed in this paper does not address that issue.

Our formula provides a computationally straightforward way to equalize purchasing power, enabling districts to afford equal levels of tangible resources. However, our analysis suggests that high regional wages do not depress district API scores and that districts that better adjust to regional wages do not see substantially higher test scores as a result. Moreover, the literature provides little evidence that staffing ratios (i.e., class sizes) affect test scores. Therefore, changing the resource mix may not increase test scores, so the state may want to consider whether it can afford the costs of such a funding formula change under a standards-based system. As more evidence becomes available about the mix of resources needed to meet the state's standards, the funding formula adjustments in this paper could be combined with a formula designed to increase academic performance. Sonstelie (2007) addresses such a hybrid approach to school finance.

Although a funding formula that equalized resources would increase resources in some districts far from the state's academic goals, the formula would also provide additional resources to districts already achieving the state's expectations. Given the limited resources available for education funding and the state's other budget obligations, the legislature must consider whether the costs of changing the school funding formula are worth the benefits of achieving equal resources. In part, this decision will be guided by the views of voters. Residents in affluent school districts where students meet the state expectations compare their schools to those in other states and conclude their schools have larger class sizes and fewer support staff. It would seem that these parents would prefer policies that equalized resources and purchasing power across districts. To the extent this sentiment dominates during legislative elections, the legislature may lean toward policies that equalize resource levels even if those policies do not advance the goals of high test scores for all students.

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1. Introduction

California's current system of school finance ensures that each school district receives an approximately equal level of per-pupil revenue. Given the variation in resource costs across the state, equal revenue per pupil does not necessarily translate into equal resources per pupil. As California assesses the resources necessary to educate students to state academic standards, it must come to grips with regional variations in the cost of key resources. Given that personnel costs make up nearly 85 percent of school spending and are more likely to vary across the state than are other inputs such as materials and supplies, variation in personnel costs may play an integral role in a funding model geared toward ensuring adequate resources.

Teachers comprise the largest share of school personnel. Spending on teachers accounts for just over half of total spending per pupil. This paper examines how teacher compensation varies across California and how the variation is driven by factors beyond the control of the school district. Teacher salaries are determined by two key components: the salary schedules that districts adopt and the experience level of teachers within the district. These two elements are in turn driven by several factors beyond the control of school districts such as local labor market conditions, the general age level in the region, and enrollment growth in the school district. The salary schedules reflect local labor market conditions because school districts must compete with other employers to attract employees. Districts in regions with higher non-teacher salaries must offer teachers relatively higher salaries. Salary schedules may also reflect the local supply of teachers. Regions experiencing teacher shortages may need to offer higher salaries to attract teachers.

The experience level of teachers is affected by the general age level of workers in the region and by the enrollment growth within the district. Some regions are more attractive to young people, who move on to other regions as they age. Therefore, the general age composition within a district's labor market can affect the average experience level of teachers. Enrollment growth also affects the experience level. Growing districts hire more new, inexperienced teachers and therefore tend to have lower average teachers' salaries. In contrast, districts declining in enrollment do not hire many new teachers; thus, average experience and salary increase over time. Because of the financial opportunities created by growth and the obstacles due to decline, enrollment trends may also become a factor in a new finance formula. Similarly, a formula could account for the age composition of a district's labor supply.

This paper demonstrates how the current finance system and differing labor costs constrain districts from adjusting teacher compensation to equalize purchasing power. The next section provides an overview of school budgets in California, highlighting the portion of expenditures going to teachers. Section 3 describes the system of teacher compensation in California and illustrates the regional variation in compensation. Section 4 presents empirical evidence that districts do face external wage pressures. We show the extent to which salary levels are a function of non-teacher wages, teacher supply, and other constraining factors such as working conditions and budgets. We model experience as a function of regional age levels, enrollment growth, and other constraining factors. We then discuss how these current purchasing power differences translate into resource differences such as class size and support staff ratios. After establishing the problem facing districts, Section 5 presents a straightforward method for how a school finance formula could take account of external factors to equalize the purchasing power across districts. This section also discusses whether it makes sense to equalize purchasing power and the role that teacher quality may play in wage differences.

2. An Overview of School Budgets in California

To understand the important role differences in labor costs play in the distribution of school resources, it is essential to understand the budget constraints faced by school districts. Beginning in the 1970s, California moved from a system of local school finance to one in which the state determines how much revenue each district receives and aims to equalize per-pupil funding across districts. Sonstelie, Brunner, and Ardon (2000) describe these reforms in detail. At the heart of the school finance system is the revenue limit, which sets the goal for school revenue. In 2003-2004, the student-weighted median revenue limit funding was $4,507 per pupil. Figure 1 shows the percentage of students enrolled in districts with revenue limits within various ranges of the student-weighted median for their district type. Close to 85 percent of unified school district students were in districts that received within 5 percent of the median revenue limit for unified districts. Similar trends held for students in elementary and high school districts.

Some revenue inequality is introduced by categorical programs that provide additional funds to certain student populations such as special-education or low-income students. Figure 2 shows the distribution of total revenue after accounting for these additional federal, state, and local sources. The student-weighted median total revenue was $6,798 per-pupil. Although total revenue varied more than revenue limit funds, roughly 90 percent of students attended districts receiving within 15 percent of the median total revenue. Although this variation in categorical funds leads to disparities in district revenue, districts often have little discretion over how state and federal categorical funds are spent because of the restrictions placed on the funds. Although districts have discretion over local funds, those only account for about 5 percent of total revenue.

Figure 1
Distribution of Revenue Limit Funds per Pupil, by District Type in 2003-2004

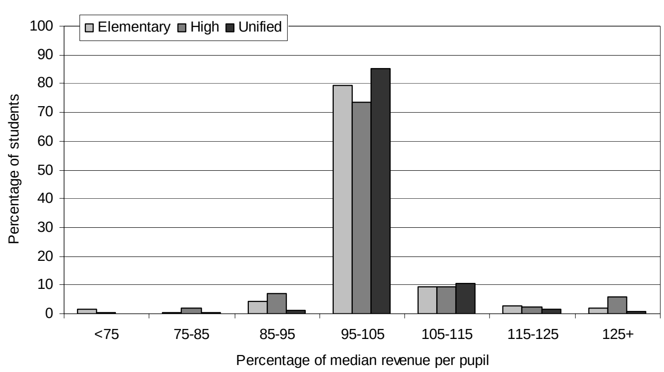
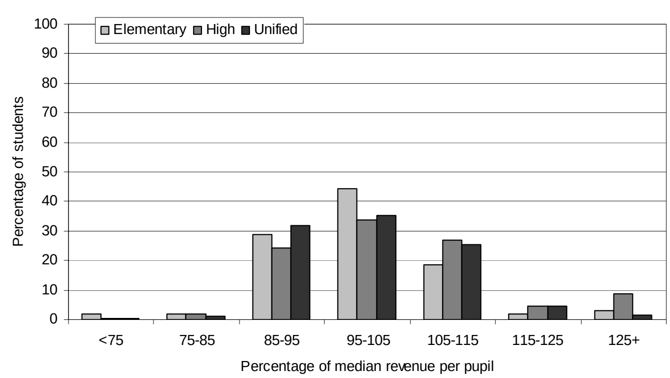


Figure 2
Distribution of Total Revenue per Pupil, by District Type in 2003-2004



Given that revenue is similar across California districts, districts that must pay higher teacher salaries because of external forces will need to cut spending in other areas or reduce the number of teachers they hire. To examine the important role of teacher salaries in school budgets, we divide school district expenditures into 11 categories. These expenditure data are from the Standardized Account Code Structure (SACS) financial data districts report to the California state department of education. These standardized financial data make it possible to make consistent financial comparisons across California districts. Appendix A describes the SACS data and our classification scheme in more detail. We divide expenditures into the following 11 categories: teacher compensation, aides and other classified staff, pupil service personnel, instructional materials, other non-labor instructional expenditures, professional development, district administration, school administration, transportation, maintenance and operations, and miscellaneous other expenditures. We include expenditures from the general fund and the deferred maintenance fund only so that we can capture the daily operating expenses of school districts. Table 1 shows these categories and is discussed in more detail below.

The first five categories relate to functions of student instruction and pupil services. Teacher compensation includes teachers' salaries, health and welfare benefits, and the district's contribution to their retirement benefits. The aides and other classified staff category includes the salaries and benefits of instructional aides as well as other classified staff focused on instruction. Pupil service personnel includes the salaries and benefits for staff such as guidance counselors, nurses, and librarians. The instructional materials category includes spending on textbooks, reference books, and core curricula materials. The category of other non-labor instructional expenditures includes spending on non-textbook supplies, non-capitalized equipment, food, conferences, dues, and insurance if expenditures in those areas are for the purpose of instruction or pupil services.

Table 1
Expenditures per Pupil, 2003-2004

Expenditure Category	Average ($)	% Total
Teacher Compensation	3,637	52
Aides and Other Classified Staff	372	5
Pupil Service Personnel	364	5
Instructional Materials	80	1
Other Non-Labor Instructional Expenditures	400	6
Professional Development	284	4
School Administration	481	7
District Administration	377	5
Transportation	177	3
Maintenance and Operations	654	9
Miscellaneous	149	2
Total	6,976	100

The next three categories focus on teacher support and administration. Professional development includes spending on personnel and supplies for instructional supervision, instruction research, curriculum development, or in-house instructional staff development. School administration includes the salaries and benefits for school principals, clerical office staff, and other supplies and services used for administrative purposes at the school. The district administration category includes the salaries and benefits of the district superintendent, the school board, and other administration staff such as those in fiscal services, human resources, central support, and data processing. This category also includes supplies used for district administration.

The last three categories concern wide-scale student and school services. The transportation category includes spending on personnel, supplies, and services used for student transportation. The maintenance and operations category includes expenditures on personnel, supplies, and services used for maintaining the school facilities. The final category, miscellaneous, includes the remaining expenditures that do not fall into one of the preceding categories. These include expenditures on food services, ancillary services (extra-curricular activities and athletics), community services, enterprise activities, facilities acquisitions and rents, and debt service.

Table 1 shows statewide per-pupil expenditures in each of the budget areas. These per-pupil expenditures are the total statewide spending in a budget area divided by statewide enrollment. Teacher compensation makes up over half of school district expenditures. Compensation for teacher's aides and other classified staff comprises about 5 percent of expenditures. District administration and school administration make up 5 percent and 7 percent of expenditures, respectively. Aside from maintenance and operation expenditures, the remaining categories constitute a very small share of the budget.

Not only does teacher compensation constitute a large share of total spending, personnel costs also constitute a large portion of the expenditures in the non-teaching categories. Appendix Table A.1 provides additional detail about these expenditure categories, including a breakdown by personnel and non-personnel costs. For example, personnel compensation accounts for 65 percent of district administration expenditures and 95 percent of school administration expenditures. Overall, personnel costs account for about 85 percent of total expenditures. To the extent that teacher salaries move hand in hand with those of other personnel, any disparities in purchasing power stemming from differences in teacher salaries will be exacerbated by the disparities in these other salaries.

Because teacher salaries are by far the most important component of a school budget, the remainder of this paper focuses on them. The next section describes institutional features of how they are set.

3. Teacher Compensation in California

A. Salaries

In California, salary schedules dictate what teachers are paid. A salary schedule is a grid in which each column represents a level of education, each row (referred to as a step) represents the years of experience, and each cell contains the salary for a given combination of education and experience. Thus, it is the combination of the schedule itself and where teachers place on it that ultimately determines the district's wage bill for teachers. Table 2 shows an abbreviated salary schedule and is discussed in greater detail below.

Each school district determines its salary schedule, usually through a collective bargaining process in which local union representatives negotiate with district administrators. In 2000, nearly all school districts were unionized (see Rose and Sonstelie, 2006). Unionized districts enrolled over 96 percent of California public school students, yet many non-unionized districts also paid teachers using a salary schedule. With a small number of exceptions, a district's salary schedule applies to all teachers within the district, regardless of their teaching assignment (e.g., grade level or subject). The strict nature of the schedule means pay does not vary depending on a teacher's performance. In addition, the schedules typically cover other certificated staff such as counselors, librarians, and nurses. Loeb and Miller (2006) review state teacher policies, including certification and salary structure policies, which provides a nice background for this paper.

Most districts report their salary schedules to the California Department of Education using the Salary and Benefits Schedule for the Certificated Bargaining Unit (Form J-90). 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 and form the sample for this study.

Table 2
Average Teacher Salaries ($), 2003-2004

	Education Level (Units Beyond a B.A.)			
	30	45	60	Max
Step 1	**37,200**	38,208	39,369	40,558
Step 10	48,590	51,302	**53,540**	55,251
Step 20	51,194	55,773	60,354	**63,864**

In a salary schedule, education is measured as the teacher's highest degree plus the number of academic semester units earned beyond the degree. Districts vary in the number of columns included in their schedules. A common configuration is to have columns for 30, 45, 60, and 75 units beyond a bachelor's degree. Newly credentialed teachers typically have a B.A. and 30 units. About half of the districts in our sample have 75 units as their final column. About 13 percent offer columns for 90 or more units, and about one-quarter of districts have 60 units as their highest. Some districts award higher salaries for the completion of a master's degree. At the other extreme, a handful of districts have a straight line salary schedule in which they include only one column and give no extra salary for additional education. Some districts have separate columns for teachers with emergency credentials, but this paper considers the salaries of fully credentialed teachers. In addition to salary gains for education, teachers advance one step for every year of service within the district. Typically, districts count up to five years of experience in other districts when determining where teachers place on the salary schedule.

Table 2 shows average California teacher salaries for key combinations of education and experience. The first column shows average salaries for teachers with a bachelor's degree and 30 units of additional coursework. Entry-level teachers with a credential are most likely to be placed in the first row of this column. This cell represents the base salary in the school district. In 2003-2004, districts averaged a base salary of $37,200. The cell corresponding to a B.A.+60 units and step 10 represents a mid-career point for teachers. At this point, districts offered an average of $53,540. The final column in Table 2 shows the average salaries for each district's highest column that does not require a master's degree. A teacher might expect to reach this point by his or her twentieth year. The average salary in the maximum column at step 20 was $63,864. In this paper, we study how salaries at these three key points are affected by external factors.

The average salary increase in the first ten years (i.e., from the base year to the mid-career point) was $16,340, for an average annual gain of $1,816. Although this premium also contains gains for education, we refer to it as an experience premium for the sake of simplicity. Similarly, a twenty-year annual experience premium was $1,403. On average, about 60 percent of the 20-year salary increase for teachers occurred in the first 10 years. Nonetheless the ten- and twenty-year premiums are highly correlated across districts (ρ=0.75).

B. Benefits

In addition to salary, most districts offer teachers a substantial benefits package. These include a variety of health and welfare benefits as well as contributions to the state teacher's retirement system (STRS). All districts contribute 8.25 percent of the teacher's earnings to STRS, so these contributions vary across the state in proportion to salaries. However, districts can determine the health and welfare benefits they offer, and these benefits can either exacerbate or mitigate the differences in salaries across the state. Table 3 shows the number of districts providing health, vision, dental, life, and other benefits. The category of other benefits includes such programs as disability insurance, income protection, and mental health insurance.

Of the 812 districts in this study, nearly 97 percent contributed to health insurance for their teachers. Thirteen districts included these health care contributions directly in the salary schedules and left the decision to purchase benefits up to the teachers; 772 districts contributed directly to a health plan. Districts offered a variety of health plans, some for single party, some for two party, and some for families. Appendix B describes how we consolidate these plans to make consistent comparisons across districts. Often, employees were required to contribute to certain benefits. The employee contributions are not included in our measure of benefits. On average, districts contributed $7,274 for health benefits. About 83 percent of districts contributed to dental insurance for their teachers. The average contribution for these dental plans was $985. On average, districts contributed a total of $8,308 toward the various employee benefits.

Table 3
District Contributions to Non-Salary Benefits, 2003-2004

	No. Districts Offering Benefit	Average Benefit	Standard Deviation	10th Percentile	90th Percentile
Total	777	8,308	2,017	5,930	10,877
Health	772	7,274	1,804	4,892	9,529
Vision	603	219	88	112	318
Dental	671	985	320	513	1,361
Life	355	70	41	19	115
Other	108	201	274	33	292

Note: This table considers the 812 districts in our sample. Thirteen districts include health benefits in their salary schedules and are not included in the 772 districts offering health benefits.

Throughout, this paper focuses on total teacher compensation, i.e., the sum of salaries and the districts' contribution toward benefits. Figure 3 shows how this total teacher compensation varied around the state. Essentially, these curves are smoothed histograms in which the area underneath the curve between two compensation levels represents the proportion of districts offering compensation within that range. The dark line shows the distribution of base teacher compensation. The lighter two curves show the distribution of mid-career compensation (step 10 with a B.A.+60 units) and 20-year compensation (step 20 with a B.A.+Max units). Figure 4 plots the distribution of total benefits across the state.

Teacher compensation at years 10 and 20 varied substantially across the state. Base year compensation also varied, but not as much as the compensation for more-experienced teachers. The relative lack of variation in base compensation may stem from the incentives the state gives districts for offering a minimum teacher salary of $34,000. Districts received $6 per pupil if they met the minimum by 2000; otherwise, they received the amount necessary to bring them to the minimum. On average, districts received $34 per pupil (California LAO, 2003).

Figure 3
Distribution of Teacher Compensation, 2003-2004

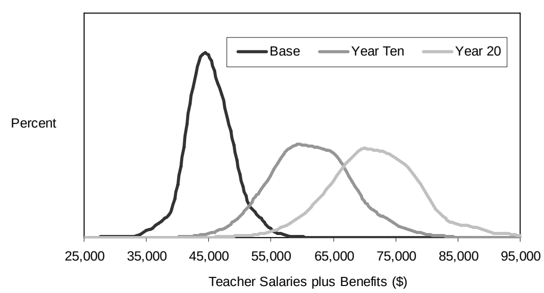
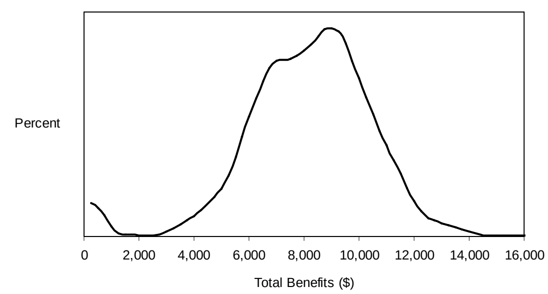


Figure 4
Distribution of Total Benefits, 2003-2004



C. Regional Variation in Teacher Compensation

Teacher salary schedules vary substantially across California. To see this, we divide the state into 30 labor market regions based on the Metropolitan Statistical Areas (MSAs) designated by the U.S. Bureau of the Census.[1] The MSAs are specifically designed by the Census Bureau to be groups of counties that have a high degree of social and economic integration. In other words, an MSA is designed to represent a labor market. Often, an MSA is made up of just one county. However, in cases where there is a high degree of integration, an MSA may consist of more than one county. Table 4 shows the number of school districts in each of the 30 regions, the total enrollment in the region, and the average teacher compensation for a mid-career teacher (i.e., a teacher at step 10 with a B.A.+60 units). The final column shows the average regional compensation as a share of the statewide average compensation level.

[1] Rueben and Herr (2001) examine regional differences in 1997-1998 teacher salaries and benefits across California. They present correlations to show that the differences may be related to regional differences in non-teacher wages, district size, teacher supply and teacher experience.

Table 4
Teacher Compensation by Region, 2003-2004

County	Number of Districts	Total Enrollment	Year 10 Compensation ($)	Share of State Average
Santa Clara	30	248,406	72,186	1.17
Orange	25	441,524	70,514	1.15
Monterey	14	70,494	66,965	1.09
Los Angeles	73	1,700,052	66,642	1.08
Riverside, San Bernardino	56	775,933	65,132	1.06
Ventura	20	144,159	64,683	1.05
Marin, San Francisco, San Mateo	37	166,750	64,462	1.05
Alameda, Contra Costa	33	379,051	64,431	1.05
San Diego	37	492,347	64,193	1.04
Santa Barbara	22	66,570	64,173	1.04
Napa, Solano	10	90,719	62,355	1.01
Imperial	16	34,476	61,960	1.01
Kings, San Benito	14	35,519	61,908	1.01
Kern	37	153,044	61,214	1.00
Stanislaus	20	100,934	59,996	0.98
Tulare	40	87,590	59,614	0.97
Merced	20	53,200	59,378	0.97
Sonoma	30	70,630	58,772	0.96
Santa Cruz	8	37,962	58,586	0.95
San Joaquin	15	128,675	58,314	0.95
Fresno, Madera	30	204,757	57,661	0.94
Mother Lode Region	24	25,279	57,538	0.94
San Luis Obispo	9	35,514	57,511	0.94
El Dorado, Placer, Sacramento	47	323,330	57,377	0.93
Sutter, Yuba	10	26,188	56,628	0.92
Shasta	19	28,779	56,285	0.92
Butte	11	32,520	56,093	0.91
Northern Counties Region	59	45,269	55,011	0.89
North Coast Region	41	45,355	54,755	0.89
Yolo	5	29,024	53,156	0.86
State Average	27	202,468	61,489	1.00

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. State average compensation is the simple average of compensation in the 812 sample districts.

In 2003-2004, the Los Angeles, Riverside and San Bernardino, and San Diego regions had the largest enrollment in the state, whereas the Shasta, Sutter and Yuba, and Mother Lode regions had the lowest levels of enrollment in the state. As the table shows, districts in Santa Clara County and Orange County offered the highest compensation in the state, on average surpassing $70,000. At the other extreme, compensation packages in Yolo County and the North Coast Counties fell short of $55,000 per year.

A district's total bill for teacher compensation is determined not only by the salary schedule, but also by where teachers place on it. Like the salary schedule, the experience level of teachers also varies across school districts in California. In 2003-2004, the median California school district had an average teacher experience level of about 10.6 years. However, in one quarter of districts, teacher experience averaged less than 8.8 years, and in another quarter of districts, average experience exceeded 12.2 years. The difference between these two extremes, 3.4 years, would lead to a difference in teacher compensation of $6,174 per teacher if the two districts had the same salary schedules with the statewide average experience premium. Assuming those districts have the statewide average teacher-pupil ratio, that difference amounts to $310 per pupil, roughly 4 percent of total per-pupil expenditures. In sum, differences in teacher experience can lead to large differences in total district spending.

4. Factors Influencing Teacher Compensation

Salary schedules and average teacher experience levels vary widely across districts, which causes teacher compensation levels to be higher in some districts than others. What explains this variation? Districts may be forced by factors outside their control to pay higher salaries or to hire more-experienced teachers. In this section, we show that local labor market conditions have a large effect on teacher compensation levels. In a competitive labor market, employers must match the wage levels of competing employers. Therefore, the most important factor affecting teacher salary schedules is the wage offered in non-teaching occupations. Salary schedules may also reflect the local supply of teachers. Regions experiencing teacher shortages may need to offer higher salaries to attract teachers. Finally, variable working conditions and budget constraints are mitigating factors that affect a district’s ability to compete in the labor market. In Section 4A, we describe the mechanisms through which these factors affect salary schedules.

The average teacher experience level in a district is determined in part by the age distribution of workers in the local labor market. Some regions may attract younger people on average because of the local geographic and cultural amenities. A second factor influencing the experience level is the enrollment growth rate of the school district. Growing districts are continuously hiring new teachers, who tend to be inexperienced. Shrinking districts do not hire as many teachers and may need to lay off younger teachers, so the average experience level increases over time. Variable working conditions and budget constraints may also affect average experience levels. In Section 4B, we describe the mechanisms through which these factors affect average teacher experience levels.

We use regression analysis in Section 4C to measure the extent to which local labor market conditions and other mitigating factors described in Sections 4A and 4B affect salary schedules and average teacher experience levels. In Section 5, we investigate the implications of these results for school finance, and we suggest a school finance formula that could improve a district’s ability to hire teachers.

A. Factors Influencing the Salary Schedule

Regional Non-Teacher Wages

The regional differences in non-teacher salaries should provide a good benchmark for the required regional differences in teacher salaries for one district to be competitive with another. The intuition behind this relationship is that non-school employers in some regions of the state will need to pay a premium to employees to compensate them for a higher cost of living or a lack of amenities. Because school districts are competing with these employers, the relative wages of teachers would follow the same trend as the relative wages of non-teachers. So, if non-teachers in the Bay Area make 20 percent more than the state average wage for non-teachers, one might expect that school districts in the Bay Area would also need to pay teachers 20 percent more than the state average teacher’s wage. In each region, non-teachers may earn more than teachers, but that occupation premium should be the same from region to region. The approach of using non-teacher regional wage differences as an index of how much extra some districts may need to pay to attract teachers is common in recent literature. For example, see Sonstelie, Brunner, and Ardon (2000), Rueben and Herr (2001), Rose et al. (2003), Stoddard (2005), Imazeki and Reschovsky (2006), and Taylor (2006).

Non-teacher wages vary substantially across California. Table 5 shows the regional differences in non-teacher wages for the 30 MSA regions in California in 2003. These non-teacher wages reflect the wages of occupations that require a similar education level as teachers. To compute these non-teacher wages, we essentially use the method outlined in Taylor (2006). 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 2003. 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.

The Census data provide very detailed earnings in 1999. For each MSA region, the OES data provides annual detailed data on average wages for 700 occupations. We use OES data from 1999 to 2003 to estimate wage growth in each region. As with the Census, we control for the mix of industries in each region, but the data do not allow controls for demographic characteristics. Essentially, within each MSA, we average the wages of the many occupations. In this computation, we weight the wage in each occupation by the share of total state employees in that occupation. The share is determined by the Census data employment shares. We apply the regional OES growth rates to the 1999 Census regional wages to arrive at non-teacher regional wages for 2003. Appendix C provides more details about how we computed the non-teacher wages.

Similar to the ordering of teacher compensation (Table 4), Santa Clara and Orange Counties have some of the highest non-teacher wages, whereas the Northern Counties and North Coast region have some of the lowest wages. In contrast to teacher compensation however, Yolo County does not rank at the bottom of the list of non-teacher wages. The second column of Table 5 shows a comparable wage index (*cwi*). This index measures each region's average wage as a share of the statewide average wage. This statewide average wage is a simple average of the regional wages, so the *cwi* shows the proportion of the statewide wage each region needs to pay to attract employees. For example, San Francisco may need 20 percent more than the state average for its teacher expenditures, whereas the North Coast Region may need to pay 21 percent less than the state average.

Table 5
Wages of Non-Teachers by Region, 2003

County	Non-teacher Wage ($)	Comparable Wage Index
Santa Clara	63,132	1.22
Marin, San Francisco, San Mateo	61,975	1.20
Alameda, Contra Costa	59,672	1.15
Orange	57,546	1.11
Ventura	56,320	1.09
Los Angeles	55,434	1.07
Santa Cruz	54,759	1.06
Monterey	54,076	1.04
Kings, San Benito	54,033	1.04
Napa, Solano	53,776	1.04
Sonoma	53,654	1.03
Santa Barbara	53,610	1.03
Stanislaus	52,870	1.02
Riverside, San Bernardino	52,759	1.02
San Diego	52,494	1.01
San Joaquin	52,404	1.01
Kern	50,463	0.97
Fresno, Madera	50,322	0.97
Tulare	50,307	0.97
El Dorado, Placer, Sacramento	49,959	0.96
Yolo	49,352	0.95
San Luis Obispo	49,176	0.95
Imperial	49,165	0.95
Merced	48,386	0.93
Mother Lode Region	47,213	0.91
Butte	46,635	0.90
Sutter, Yuba	46,100	0.89
Shasta	45,352	0.87
Northern Counties Region	43,715	0.84
North Coast Region	41,043	0.79
State Average	51,857	1.00

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. The state average is a simple average of the regional wages. If the regional wages are weighted by the regional population, the average is $56,328.

To provide a preliminary overview of how teacher compensation and non-teacher wages are related in the current school finance system, Figure 5 plots the average compensation of mid-career teachers in each region against the average non-teacher wage. Teacher compensation tends to be higher in regions with higher non-teacher wages, but the relationship is not exact. First, non-teacher wages are substantially lower than the teacher compensation in each region, partly because our non-teacher wage estimates do not include benefits. To show whether a region's teacher compensation is proportionally higher than the state average teacher compensation in the same way that the region's non-teacher wages are proportionally higher than the non-teacher state average, Figure 6 plots the relative teacher compensation in each region against the relative non-teacher wage. Regions with high non-teacher wages tend to compensate teachers more, but not as much as expected based on the non-teacher wage alone. This shortfall could result from the district's budget constraint; districts in high-wage regions may not have enough revenue in their budgets to provide teachers with more compensation. Alternatively, the shortfall may arise if districts in regions with high non-teacher wages have a greater supply of teachers or better working conditions, reducing the need to offer teachers higher wages and benefits.

Figures 7 and 8 plot the same series of graphs for base compensation. As with mid-career compensation, base compensation is higher in regions with higher non-teacher wages. However, base compensation appears somewhat less responsive than mid-career compensation to regional wages. For example, compared to mid-career compensation, more low-wage regions have base teacher compensation above what would be predicted by the non-teacher wage. This difference could occur if districts in low-wage regions benefit disproportionately from the state's financial incentives for achieving a minimum base pay. This series of figures is meant to illustrate the potential effect of regional non-teacher wages on teacher compensation. The regression analysis in Section 4C examines this relationship more thoroughly.

Figure 5
Mid-Career Teacher Compensation and Non-Teacher Wages

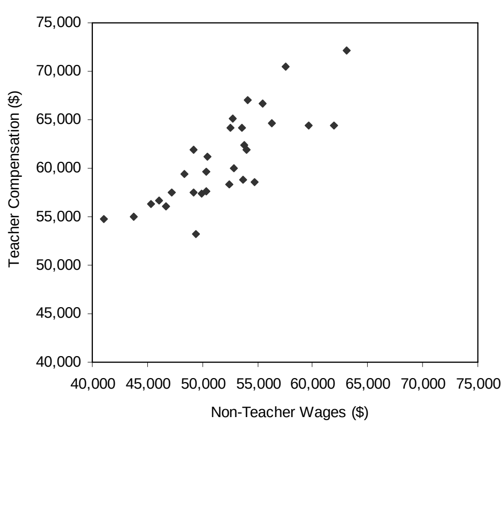


Figure 6
Mid-Career Teacher Compensation and Non-Teacher Wage Index

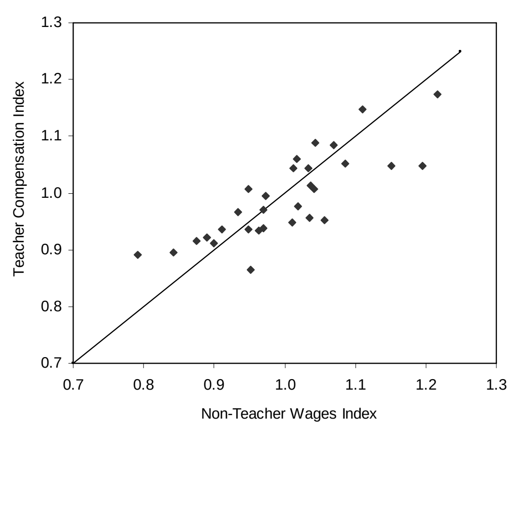


Figure 7
Base Teacher Compensation and Non-Teacher Wages

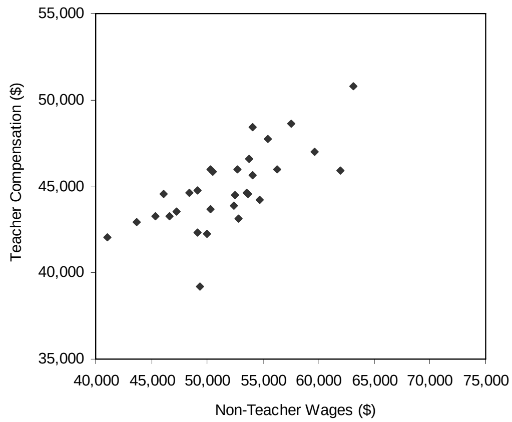
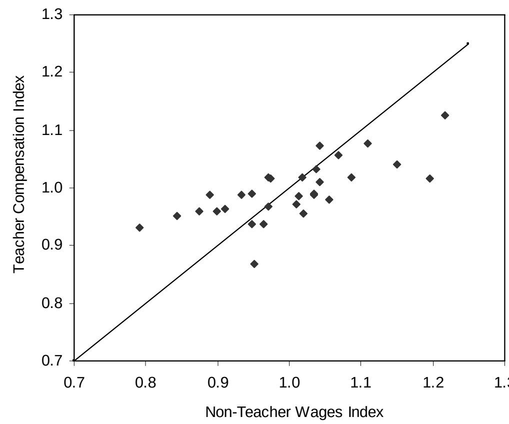


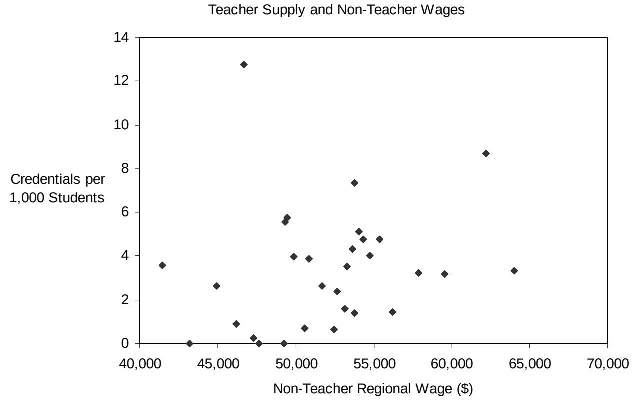
Figure 8
Base Teacher Compensation and Non-Teacher Wage Index



Local Teacher Supply

Some districts may be able to recruit teachers more easily because there are more teachers available in the region. All else equal, regions with an ample supply of new teachers would need to pay their teachers less than areas where teachers are scarce. As Boyd et al. (2005) shows, teachers generally prefer to stay within a short distance of where they grew up and attended college. Therefore, as a measure of teacher supply, we use the number of teachers granted credentials from institutions in an MSA region relative to the number of students enrolled in that region. These regions are defined in the same way as for non-teacher wages. Credentials include single-subject, multiple-subject, and special education teacher credentials awarded from July 2003 through June 2004 at each public and independent institution in the state. These data come from the California Commission on Teacher Credentialing. Figure 9 plots teacher supply against the regional non-teacher wage.

Figure 9
Teacher Supply and Non-Teacher Wages



As Figure 9 shows, California regions with high non-teacher wage also had slightly higher supplies of teachers. Although the correlation is positive, it is small, with a correlation coefficient of only 0.2. Even with the outlier region of Butte County removed (this region contains Chico State University, which credentials many teachers but has a relatively small student enrollment), the correlation is only 0.4. Nonetheless, the positive correlation is consistent with the notion that districts in regions with high non-teacher wages may not need to fully adjust to those wages, because they have a higher level of teacher supply. Therefore, a model of teacher compensation should control for both non-teacher wage and teacher supply.

Working Conditions and Budget Factors

Other student and school district factors may also affect the ability of districts to adapt to local labor market conditions. In this section, we discuss the effect of these factors on a district's ability to adjust to non-teacher regional wages and teacher supply. In Section 4C, we model the effect of non-teacher wages and teacher supply on salary schedules while controlling for these factors.

First, a district's ability to attract teachers may be affected by the district's working conditions. For example, districts with many low-income students may be perceived by teachers as a more challenging assignment than districts with few such students. Therefore, districts with many low-income students may need to offer higher compensation than other districts, even in the same region. In our regression model, we control for family income using the percentage of students in the district who participated in the free or reduced-price lunch program. Participation in this program requires the income of the student's family to be less than 185 percent of the poverty level. On average, districts enroll 44 percent of students in this program, but one-quarter of districts enroll fewer than 25 percent of their students and another quarter enroll more than 65 percent of their students. These data come from the CalWORKS file in the California Basic Educational Data System (CBEDS). Other working conditions, such as the quality of facilities, may also play a role in explaining the variation in teacher salaries. Although the lack of data makes it impossible to include such a factor in our model, this could certainly be a reason for the variation in compensation that our model does not explain.

A district's ability to adapt to local labor market conditions may also be affected by several factors that affect the district's budget. First, a district's revenue may explain some variation in teacher compensation, and therefore may help explain how well districts adjust to external factors. Although revenue is approximately equalized across school districts, there is some variation. To account for this variation, our model includes two types of revenue available to school districts: unrestricted and restricted. Unrestricted revenue includes revenue limit funds and local revenue; these funds can be spent on any legitimate school resource. Restricted revenues include federal and state categorical programs and generally target certain populations, such as low-income students, or particular resources, such as instructional materials. For both categories, we include only the revenue in the general and deferred maintenance funds, because these funds generally support the day-to-day operations in the school district. On average, total revenue per pupil in these two funds is $7,274. Unrestricted resources account for 75 percent of that total. These data come from the California Department of Education's annual financial SACS data. The value reported in this section is higher than that on page 3, because this value is an unweighted average across districts and the previous value ($6,798) is a student-weighted median. The difference arises because California has many small school districts that tend to have higher per–pupil revenue than larger districts.

Second, the size of the school district may affect the compensation districts offer. Larger districts may benefit from economies of scale. In large school districts, fixed costs (such as some administrative costs) are spread across more students than in small districts, essentially freeing up revenue for additional resources. To the extent such economies of scale occur, large districts may be less constrained by their budgets and better able to adapt to local labor market conditions. Rose and Sonstelie (2006) suggest another mechanism through which the size of the school district affects salaries. They develop a public choice model in which larger school districts have more powerful teachers' unions that are able to extract higher salaries. Their empirical analysis supports that hypothesis. With this interpretation, stronger unions may lead to salary schedules that better reflect local labor market conditions. To account for the effect that district size may have on salaries, our model includes the enrollment in the school district. These data come from the 2003-2004 enrollment files in the CBEDS.

Finally, the cost of resources may vary across the different types of California school districts. California contains three types of school districts. Unified districts include all grades from kindergarten through twelfth grade. Elementary school districts generally include kindergarten through eighth grade. High school districts typically include grades 9 through 12. Unified districts make up 38 percent of California's districts and enroll 72 percent of all public school students. Elementary districts constitute 52 percent of districts and enroll 19 percent of students. Only 10 percent of school districts are high school districts, and these enroll 9 percent of students. We include two dummy variables in our model that indicate whether the school district is an elementary or high school district. These data come from the CBEDS.

B. Factors Affecting Average Experience Levels

A teacher's experience and education determine the teacher's placement on the salary schedule. As Table 2 shows, teachers earn about $1,816 for every additional year they remain in a district. Therefore, two districts with the same salary schedule will have very different wage bills depending on the experience level of their teachers.

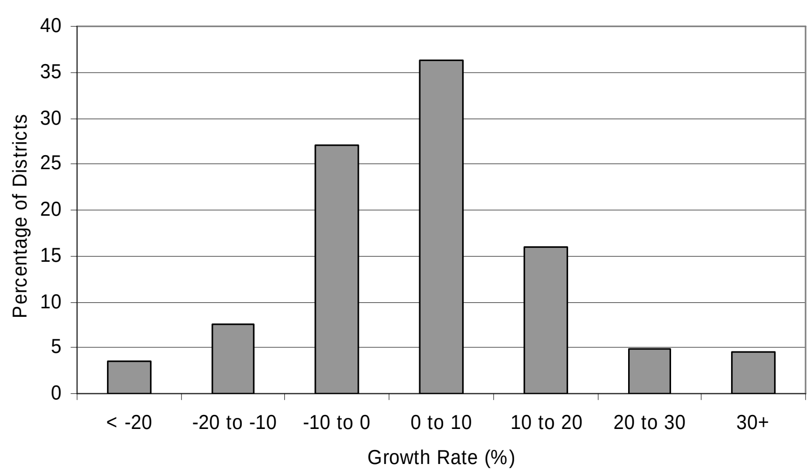
Two main external factors can drive the experience level of teachers in the school district. The first is the general age level of the population in the region. Some regions may attract younger people on average because of the local amenities. This phenomenon may affect the experience level of the pool of local workers available to a school district. A second factor influencing the experience level is the enrollment growth rate of the school district. Growing districts are continuously hiring new teachers, who tend to be inexperienced and thus have lower salaries. Shrinking districts do not hire as many teachers and may need to layoff younger teachers, so the average experience and salary increase over time.

The average age of the non-teacher worker pool varies across the state. Non-teacher workers in Bay Area tended to be the youngest, averaging about 39 years old in Marin, San Francisco, San Mateo, and Santa Clara counties. Northern California regions, however, had an older working force to draw from, averaging 45 years in age. We use the 2000 U.S. Census data to compute the average age within each MSA region. We calculate average age for the same sample used for the non-teacher regional wage. In our regression model, we subtract 23 from the average age so that it better captures the potential work experience of the college-educated population in the region.

The second external factor that drives the district's average teacher experience level is the district's enrollment growth. Enrollment growth between 1999-2000 and 2003-2004 also varied greatly across California school districts (Figure 10). About one-third of districts grew between zero and ten percent. Just over 15 percent of districts grew between 10 and 20 percent, and about 10 percent of districts grew more than 20 percent. In contrast, about 38 percent of districts experienced declining enrollment. Most often, in the latter case, enrollment dropped by less than 10 percent, yet in about 11 percent of California school districts, enrollment fell by more than 10 percent. The enrollment changes during this timeframe may exacerbate or mitigate prior enrollment growth. Like the variation in teacher compensation, there are distinct geographic differences in enrollment growth rates across the regions. On average, districts in Riverside, San Bernardino, Los Angeles, and San Diego Counties experienced the largest recent enrollment gains, whereas district enrollments in Napa, Solano, Marin, San Francisco, and San Mateo Counties declined.

Working conditions and budget factors may also influence teacher experience levels. For example, if teachers are less inclined to work in districts with high rates of student poverty, teacher turnover may be higher in such districts, thus leading to lower average experience levels. Loeb, Darling-Hammond, and Luczak (forthcoming) find evidence that poor working conditions predict higher rates of teacher turnover. The type of school district may also impact a teacher's decision to stay. For example, elementary districts may be easier to work in than high school districts; thus, teachers may stay longer, driving up average experience levels. To understand these effects, our model for experience controls for the same set of additional factors as in the salary schedule regressions.

Figure 10
Enrollment Growth Rate, 1999-2000 to 2003-2004



C. Regression Results

Salary Schedule Results

Table 6 shows regression results for models of various salary schedule components: three salary schedule cells (including benefits) and two measures of the experience premium. Panel A shows results when the salary components are modeled only as a function of the non-teacher wage. The models in Panel B include both the non-teacher wage and the teacher supply. Panel C shows results when working conditions and budget factors are also included in the model. Generally, the variables enter the model in natural logarithms so the coefficients can be interpreted as elasticities. The exceptions are variables that are measured as ratios, percentages, or dummy variables. The models also account for the fact that the non-teacher wage and the teacher supply have the same value for all districts within the same region. As Moulton (1990) shows, correlation among the error terms of observations in a group, such as a region, may bias the standard errors of variables that are constant across observations in a group. To correct for this bias, we assume that the error term has a region-specific component and compute standard errors accordingly.

The results in panel A reinforce the message from Figures 5 through 8. Higher non-teacher wages lead to higher teacher salary schedule components, but the relationship is not one-to-one. A district with 10 percent higher non-teacher wages only has base year teacher compensation that is 3 percent higher and mid- and late-career compensation levels that are 6 percent higher. The two measures of experience premium are much more directly linked to the non-teacher wages. A 10 percent increase in the non-teacher wages leads to a 15 percent increase in the 10 year premium and a 10 percent increase in the 20-year experience premium. This result may arise because districts try to make up for base compensation that is not appropriately adjusted to the regional non-teacher wage.

When simultaneously controlling for non-teacher wages and credentials (panel B), the non-teacher wage is strongly significant in all specifications and rises very slightly in all but one regression. This slightly higher coefficient is consistent with the notion that once the higher levels of teacher supply are accounted for in the high non-teacher wage regions, the district better adjusts to regional wages. However, the increase in coefficients is not significant, nor are the coefficients on the ratio of credentials to students (teacher supply), indicating that teacher supply has little effect on teacher compensation. We estimated alternative specifications of the models in which we measured teacher supply as the number of bachelor's degrees awarded per student in each MSA region. These data are from the California Postsecondary Education Commission. The results from these models are similar to those in Panel B; the coefficients on this alternative measure of teacher supply are not consistently significant and the coefficients on the non-teacher wages are about the same magnitude.

Table 6
Salary Schedule Regressions

	BA+30 Step 1	BA+60 Step 10	BA+Max Step 20	Premium (10 year)	Premium (20 year)
Panel A: Non-Teacher Wage Only					
Non-teacher wage (ln $)	0.343***	0.611***	0.567***	1.469***	0.992***
	(0.059)	(0.077)	(0.045)	(0.176)	(0.077)
Panel B: Add Supply					
Non-teacher wage (ln $)	0.385***	0.647***	0.579***	1.486***	0.952***
	(0.055)	(0.076)	(0.044)	(0.176)	(0.070)
Credentials per 1,000 students	-0.005*	-0.004	-0.001	-0.002	0.004
	(0.002)	(0.003)	(0.002)	(0.008)	(0.003)
Panel C: All Factors					
Non-teacher wage (ln $)	0.282***	0.413***	0.363***	0.834***	0.518***
	(0.063)	(0.075)	(0.045)	(0.146)	(0.067)
Credentials per 1,000 students	-0.005**	-0.005**	-0.003	-0.005	0.001
	(0.002)	(0.002)	(0.002)	(0.005)	(0.004)
% students in lunch program	0.027**	0.019	0.023	-0.008	0.015
	(0.012)	(0.015)	(0.017)	(0.051)	(0.037)
Unrestricted revenue per pupil (ln $)	0.066***	0.098***	0.102***	0.187***	0.163***
	(0.015)	(0.020)	(0.022)	(0.061)	(0.052)
Restricted revenue per pupil (ln $)	0.000	-0.017**	-0.021**	-0.067**	-0.058**
	(0.008)	(0.007)	(0.008)	(0.029)	(0.022)
Enrollment (ln)	0.018***	0.034***	0.031***	0.086***	0.057***
	(0.004)	(0.003)	(0.003)	(0.009)	(0.008)
Elementary school district	0.022**	0.039***	0.038***	0.088***	0.065***
	(0.008)	(0.009)	(0.008)	(0.023)	(0.016)
High school district	0.038***	0.051***	0.043***	0.091***	0.055**
	(0.009)	(0.011)	(0.010)	(0.029)	(0.021)
R-squared panel A	0.189	0.357	0.334	0.281	0.232
R-squared panel B	0.204	0.363	0.335	0.281	0.234
R-squared panel C	0.300	0.541	0.498	0.438	0.360

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%. Robust standard errors in parentheses. The salary schedule components (dependent variables) are measured in natural logs. Regressions also include a constant. The sample size is 812 for panels A and B and 811 for panel C; one observation is lost because of missing data about participation in the lunch program.

As Panel C shows, various other working conditions and budget factors help explain the variation in teacher compensation. The percentage of students in the lunch program only significantly affects the base compensation, indicating that districts offer slightly higher base salaries to attract new teachers to accept jobs perceived as more challenging but offer little or no incentive to more-experienced teachers. The unrestricted revenue coefficient is positive and significant in each regression, which suggests that districts take the opportunity to increase teacher compensation when their budget constraint is relaxed. Restricted revenue has no effect on base compensation but negative effects on the experience premium and compensation at the middle and end of the salary schedule. This negative effect may arise if districts must match some of their restricted funds with unrestricted funds, thus reducing their discretionary revenue.

Adding these additional controls to the model causes the estimated coefficient on the non-teacher wage to drop. These drops suggest that the other factors partially explain the degree to which districts can adjust to non-teacher wage differences. If we add the additional variables sequentially, the largest drop in the non-teacher wage coefficients occurs when the enrollment variable is added to the model. This result suggests that economies of scale may explain part of the district's ability to adjust to regional wages. To the extent that enrollment measures union power, this result indicates that districts with strong unions extract higher compensation for teachers than do districts with weak unions. Given that districts currently do not adjust one-to-one to market wages, it appears that stronger unions may move districts closer to their regional wage. The enrollment variable is strongly significant in all regressions.

The results in Table 6 suggest that under the current school finance system, non-teacher salaries do play a role in setting teacher compensation. However, teacher compensation does not fully adjust to these local labor market conditions, especially for new teachers. The inability to adjust is driven in part by the district's budget constraint. Therefore, adjusting the way schools are financed by including some measure of local labor market conditions may be appropriate. We discuss such adjustments in Section 5.

Experience Results

To examine how regional experience and enrollment growth affect the experience level of teachers within a district, we regress the district's average teacher experience level on the average age in the district's MSA and the district's past enrollment growth rates. We include four prior growth rates spanning nearly 20 years: 1984 to 1989, 1989 to 1994, 1994 to 1999, and 1999 to 2003. We exclude three observations with extreme enrollment growth. The experience and age variables are measured in natural logarithms so that the coefficients are elasticities. As in the previous set of models, the standard errors in these models account for a region-specific error term because the age variable is constant for all districts within the MSA. Table 7 shows the regression results. The first column contains results from a model with just the regional age and enrollment growth variables. The second model also controls for working conditions and budget factors that may affect a district's average experience level.

Table 7
Experience Regressions
Dependent Variable is ln of District Average Teacher Experience

	(1)	(2)
Age-23 (ln)	0.686***	1.195***
	(0.166)	(0.162)
Enrollment growth, 1984-1989	-0.064**	-0.076***
	(0.029)	(0.023)
Enrollment growth, 1989-1994	-0.089*	-0.116**
	(0.047)	(0.051)
Enrollment growth, 1994-1999	-0.254***	-0.356***
	(0.087)	(0.106)
Enrollment growth, 1999-2003	-0.292***	-0.314***
	(0.044)	(0.052)
Percentage of students in lunch program		-0.162**
		(0.060)
Unrestricted revenue per pupil (ln $)		-0.021
		(0.060)
Restricted revenue per pupil (ln $)		-0.004
		(0.031)
Enrollment (ln)		0.062***
		(0.008)
Elementary school district dummy		0.045**
		(0.018)
High school district dummy		0.032
		(0.031)
Observations	808	807
R-squared	0.254	0.346

Note: Regressions also contain a constant. Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

The average age of the region has the expected positive sign. A 10 percent higher regional age is associated with a 7-12 percent higher average teacher experience level, depending on the set of regressors in the model. This result provides evidence that the demographic profile of the pool of available workers affects where teachers will place on the schedule and thus their earnings.

As expected, the enrollment growth rates have a negative effect on teacher experience, with more recent growth rates having a more substantial effect on experience than more distant growth rates. Compared to a district that did not grow at all, a district that grew 10 percent between 1999 and 2003 would have an average experience level nearly 3 percent lower. Similarly, a district that shrunk 10 percent during that time would have an average experience level 3 percent higher, putting upward pressure on the district's wage bill. Enrollment changes between 1994 and 1999 have effects of a similar magnitude. The earlier growth rates have effects that are about one-third of that magnitude.

The main results for age and growth are consistent regardless of the various additional controls; however, some of the additional factors are significantly related to the district's average experience level. Districts with higher shares of students on the free and reduced-price lunch program have lower experience levels, reflecting the difficulty such districts may face in retaining teachers. As Table 6 shows, these districts tend to offer higher beginning compensation to attract teachers; however, they do not offer higher mid-career compensation. Districts with larger enrollments also have more experienced teachers. This higher experience level may arise because teachers have more options to transfer school assignments in large districts. So, if teachers have a bad fit at their first school, they can more easily stay in the district and move to another school. Smaller districts do not have these opportunities, so teachers may transfer districts or leave the profession (see Reed, Rueben, and Barbour, 2006). To the extent that larger districts have more powerful unions and contract outcomes that are more beneficial to teachers, teachers may prefer to stay in large districts.

In sum, the salary and experience regressions show that local labor market conditions affect spending on teachers. Although districts' budget constraints restrict their ability to adapt to these conditions, districts do adjust partially. Given that revenue is approximately the same across California districts, this adjustment means that districts are likely to cut back on spending in other areas to balance their budgets.

One way in which districts cut back is to hire fewer personnel. To examine the effect of these external factors on staffing levels, we estimate two models in which the dependent variables are the teacher-pupil ratio and the ratio of other certificated staff to pupils. The independent variables in each of these models include the non-teacher regional wage, teacher supply, the non-teacher regional age, and enrollment growth. We also include the other working conditions and budget factors from the salary and experience regressions. We estimate each model by ordinary least squares and estimate standard errors that account for a region-specific error term.

The results (available from the authors upon request) suggest that higher non-teacher wages lead to reductions in both types of staffing ratios. A 10 percent increase in the non-teacher regional wage is predicted to lower the teacher-pupil ratio by 2 percent and the ratio of other certificated employees to pupils by 6 percent. Recent enrollment growth counterbalances these effects somewhat. Ten percent higher enrollment growth from 1999 to 2003 leads to a 1 percent higher teacher-pupil ratio and a nearly 2 percent higher ratio of other certificated staff to pupils. The other labor market factors and experience factors have little effect on these staffing ratios. These results highlight the issue that districts face real resource consequences when faced with external wage pressures and the inability to increase their revenue.

5. Implications for School Finance

The previous sections show that California's current finance system allocates to districts roughly equal amounts of revenue per pupil, yet the cost of labor resources varies substantially around the state. This variation leaves districts with disparate levels of purchasing power. To equalize per-pupil spending on teacher compensation, districts facing higher costs must reduce either the teacher-pupil ratio or their average experience level. Because districts cannot fire experienced teachers and replace them with inexperienced teachers, the only viable option for such districts is to adjust their teacher-pupil ratio. If districts do not want to cut back on the number of teachers in the face of higher salaries, they will spend more on teachers than other districts and will be forced to cut back in other areas of the budget. Either way, their purchasing power has diminished in the face of higher salaries. In sum, higher external wage pressures and higher external pressures for experience cause upward pressure on teacher spending. The previous section shows that districts not only tend to decrease their teacher-pupil ratio when labor market conditions dictate higher compensation, they also tend to reduce their ratio of pupil support staff to students.

The state's current method of distributing school revenue does not account for such differences in resource costs. However, a financing formula could be designed that helps equalize purchasing power among school districts. In Section 5A, we present a potential funding formula that accounts for differences in labor costs due to factors beyond the control of school districts. Section 5B discusses some costs and benefits of adopting such a policy. In particular, we focus on whether equalizing resources makes sense given the state's focus on improving student achievement and meeting academic standards. Section 5C addresses the relationship between wages and teacher quality and discusses the implications for a funding formula. The salary schedules allow us to compare teachers of the same experience and education level across districts. Because the salary schedules are not a function of a teacher's effectiveness, it is important to keep in mind that analyzing the cost of hiring an equally credentialed and experienced teacher is not necessarily the same as the cost of hiring equally effective teachers. Throughout Section 5, we assume that the current system of paying teachers based on experience rather than performance will persist. Finally, Section 5D highlights the policies several other states have enacted to address the issue of differences in regional costs.

A. Formula to Equalize Purchasing Power

Total spending on teachers is the sum of the salary in each salary schedule cell multiplied by the number of teachers in that cell. To this amount, the benefits chosen by the teacher must also be added. However, a district's total spending on teachers can be very well approximated using a simple function of three statistics: the base compensation, the experience premium, and the average experience level in the school district. Specifically,

$$TC_i = (base_i * tp_i) + (prem_i * \exp_i * tp_i) \qquad (1)$$

where TC_i is the per-pupil cost of teacher compensation in district i, $base_i$ is the base salary plus benefits, tp_i is the number of teachers per pupil, $prem_i$ is the experience premium, and exp_i is the average experience level. Although this linear approximation to the salary schedule simplifies the formula for teacher spending, the correlation between this estimate and the actual spending on teachers is 0.84, indicating that it is a good representation of the district's wage bill.

In theory, a school finance formula could be adjusted to ensure that districts achieve equal purchasing power. Such a formula would enable districts to afford some targeted teacher-pupil ratio without having to reduce expenditures in other areas. To design such a formula, we begin by allocating districts a foundation level of funding for teachers based on a baseline salary schedule, experience level, and target teacher-pupil ratio. We then adjust this formula based on the extent to which districts are forced to deviate from this baseline because of external pressures. For simplicity, we base our formula on equation (1). The foundation level of teacher funding would then be

$$TC_F = (\overline{base} * \overline{tp}) + (\overline{prem} * \overline{\exp} * \overline{tp}) \qquad (2)$$

where $\overline{base}$ and $\overline{prem}$ represent the baseline base and premium, $\overline{\exp}$ denotes a baseline experience level, and $\overline{tp}$ denotes the target teacher-pupil ratio. These baselines and targets are the same for all districts in the state. A more complicated formula that exploits nonlinearities in the salary schedule could be developed. The actual funding provided to each district would deviate from this foundation level based on the district's external circumstances. Although the following discussion is based on teacher compensation, the main ideas could be extended to other district personnel.

We assume that the base compensation and the experience premium required by districts to equalize purchasing power are proportional to local regional wages. A district facing a higher non-teacher wage than the baseline region will need to offer a proportionally higher teacher compensation relative to the baseline region's teacher compensation. In other words, each district would receive:

$$base_i = cwi_i \times \overline{base} \text{ and} \qquad (3)$$

$$prem_i = cwi_i \times \overline{prem} \qquad (4)$$

where cwi_i is a comparable wage index describing how much more or less it costs to hire labor in region i relative to the baseline, which could be defined as the state average.

The formulas in (3) and (4) represent a one-to-one adjustment for the non-teacher regional wage. The regressions in Table 6 indicate that, under the current system, districts adjust their salary schedules at less than a one-to-one rate. However, districts are currently constrained by their total revenue, and their budget constraint prevents them from fully adjusting to the regional wage. Panel C of Table 6 shows that districts adjust more as their budget constraint is relaxed. For example, the regressions show that districts with additional unrestricted revenue offer teachers higher compensation. This effect shows that even though districts cannot fully adjust to regional wages under current conditions, they do spend more on teacher compensation when additional revenue relaxes their budget constraint.

The negative coefficient on restricted revenue in Table 6 implies that districts with higher restricted revenue tend to offer lower teacher compensation. Higher levels of restricted revenue are generally associated with higher shares of disadvantaged students and therefore the need to provide additional services to those students. If the restricted revenue is not adequate to cover these expenses, unrestricted funds may also need to be used for such programs, therefore leaving less money available for teacher compensation. In effect, such districts face a tighter budget constraint.

The coefficient on enrollment in Table 6 may also reflect aspects of the district's budget constraint and ability to fully adapt to regional wages. The positive coefficient may reflect the economies of scale that benefit larger districts and free up resources. In this case, the positive coefficient means that districts are currently less constrained and better able to compete in the labor market. It does not mean that larger districts need more revenue to be competitive. California's current finance system does grant additional resources to very small districts that encounter severe diseconomies of scale. However, if these districts were fully compensated for regional wage differences, their small-schools funding could be reduced to the extent that it had been helping them achieve purchasing power parity for teachers.

To the extent that the positive coefficient on enrollment in Table 6 reflects union power and the union's ability to obtain higher wages for its constituents, the positive coefficient demonstrates that districts with strong unions have been better able to adjust their compensation to labor market conditions. If districts were fully compensated for their regional wage differences, this positive effect of union power may no longer appear empirically. If districts were fully compensated and large districts continued to pay teachers more than the full adjustment, it would suggest that unions were extracting more salary than dictated by a competitive market.

A finance formula could also adjust funding based on the local supply of teachers. For example, if a shortage of teachers led to the need for 5 percent higher compensation, the funding formula could take that into account. Such an adjustment would only be required if there were a shortage of teachers relative to other professions. If there was a general labor shortage, then the alternative wages and the *cwi* would account for that. However, Table 6 shows that teacher supply does not substantially affect teacher compensation, so it may not belong in a financing formula aimed at equalizing district purchasing power in California. More generally, the difficulty in accurately determining the elasticity of teacher supply could preclude a supply adjustment in a funding formula.

The regressions in Table 6 show that additional factors affecting working conditions also influence teacher compensation. This result raises the question of whether such factors should also be included in a funding formula adjustment. For example, the percentage of students on free and reduced-price lunch led to higher base compensation. Should districts with high percentages of such students be given additional funding for their teacher compensation? On the one hand, it may make sense to provide additional revenue to such districts for them to use for teacher compensation. On the other hand, working conditions reflect much more about a school than just its position in the labor market. Consequently, poor working conditions may be better addressed directly rather than indirectly through the salary schedule. In the case of impoverished students, it would first be important to determine why higher concentrations make it more difficult to teach in these schools. Likely, it is because students from poor families tend to have relatively low levels of parental education and a lack of English language skills. These factors make it difficult for parents to help their children with their homework, to know about the educational opportunities available to their children, to afford additional help for their children when they are struggling in school, and even to have a comfortable enough space at home for the student to do their homework. This lack of support at home places more demands on the child's teacher.

Teachers may not feel so burdened by these demands if additional resources were provided to help those students. If a more general school funding formula supplied enough additional support for disadvantaged students, therefore improving working conditions directly, additional salary may not be necessary to attract teachers to such schools. Furthermore, those direct resources may better help those students than simply obtaining a teacher of a given experience level. Sonstelie (2007) provides a framework for designing an overall weighted student formula for school finance that takes such additional factors into account. In addition to using the wage index we propose above to account for labor cost differences, he constructs an overarching funding formula that adjusts for student needs directly. Although student poverty is beyond the control of school districts, other working conditions are not. Therefore, funding adjustments may not be necessary for general working conditions even if they do affect the compensation districts must pay.

Overall, our paper focuses on how to adjust teacher compensation to local labor market conditions so that purchasing power for teachers is equalized across districts. Inequities from other sources, such as economies of scale or extra revenue, may spillover into teacher compensation, but policies should address those inequities directly rather than through the intermediate vehicle of teacher compensation.

Because a district's wage bill is affected by the experience level of teachers within the district, exogeneous factors affecting experience could also be considered in a funding formula adjustment. As Table 7 shows the experience level of the local workforce affects the employees available to schools and therefore the district's wage bill. Therefore, we adjust the experience component of the funding formula for the experience level of the workforce in the region. Specifically,

$$\exp_i = xi_i \times \overline{\exp} \qquad (5)$$

where xi_i is an index of regional experience, such as the average experience of workers in each region relative to the state average worker experience. This one-to-one funding adjustment may be appropriate given that the regressions in Table 7 show that a 10 percent increase in the average regional experience level leads to an almost equal percentage change in teacher experience.

Some practical concerns may emerge when making adjustments for experience. For example, local work experience levels are difficult to update in years without Census data. Furthermore, who should be included in calculated average regional experience? All workers, or just workers within a certain age bracket – an age bracket most likely to represent teachers?

Given the profound effect that the demographic composition of a region has on the cost of hiring teachers, finding practical solutions to these issues may be a worthwhile endeavor.

Enrollment growth also plays a role in determining a district's average experience level. If a district's enrollment grows by g percent, it must hire new teachers to maintain its teacher-pupil ratio. Let T_0 equal the number of teachers in the base year and let T_N equal the number of new teachers needed to maintain the same teacher-pupil ratio, then $T_N = g^*T_0$. Assuming that the new teachers hired have zero experience, the average experience of teachers in district i after enrollment growth g is:

$$\exp_{ig} = \frac{(T_o \times \exp_{i0}) + (g_i \times T_o \times 0)}{(1+g_i)T_o} = \frac{\exp_{i0}}{1+g_i} \qquad (6)$$

where exp_{i0} is the district i's average experience with zero growth. Therefore, a district that grows at rate g over some time period will adjust its average experience level down by a factor of approximately 1+ g. This one-to-one adjustment factor exceeds the empirical estimate shown in Table 7, which indicates that enrollment growth rates that are 10 percentage points higher over a four-year period lead to average district experience that is about 3 percent lower. Thus, in responding to enrollment growth over a period of time, districts do not instantaneously hire a new crop of zero-experience teachers. Rather, they may hire teachers gradually over time, they may hire some teachers with some experience, or they may seek to retain some experienced teachers. The adjustment factor in equation (6) could be altered to reflect the typical hiring practices of districts.

A finance formula that equalized purchasing power given a district's growth rate and regional experience would then have the goal that all districts could afford the experience level

$$\exp_{ig} = \frac{xi_i \times \overline{\exp}}{1+g_i}. \qquad (7)$$

Policies that provide districts with extra funds because they have higher experience levels may confront political obstacles because of the sentiment that districts with inexperienced teachers should be compensated to attract more experienced teachers. This belief stems from the idea that more-experienced teachers are higher quality teachers. This idea may be somewhat misguided given recent research by Rivkin, Hanushek, and Kain (2005). They find that teachers in their first two years may not be as effective as more experienced teachers at raising student test scores. However, experience beyond three years does not seem to be strongly related to teacher effectiveness. Therefore, a broader school financing formula may want to consider ways to assist districts with many first and second year teachers, but there may be no need to provide salary incentives to induce changes in the experience distribution. The formula in (7) could be adjusted so that districts forced to hire novice teachers because of low regional experience levels or high enrollment growth are given sufficient funds to hire teachers who have at least three years experience.

Adjusting funding for enrollment growth faces other practical obstacles within an overall school financing system. California's school financing formula currently contains provisions that allow districts a one-year transition period if they experience declining enrollment. Essentially, shrinking districts are funded based on their prior year's enrollment, giving them a year to adjust their fixed costs. Although districts can reduce their teaching force if needed, they must eliminate the least experienced teachers first, so the pressures on experience last well after the transition year. Equation (7) provides a mechanism to compensate districts for salary costs of decreasing size. If districts are compensated in this manner, the state's direct provisions for shrinking enrollment should be reduced so that districts are not compensated twice for the same problem. To the extent that shrinking districts become so small that they begin to experience diseconomies of scale, a funding formula may want to address that issue separately. To the extent that the current funding system's adjustment for small districts includes funds for higher salaries, that portion should eliminated from the direct transfer and included in an adjustment such as equation (7). One reason the state may not want to compensate districts with declining enrollment is if families are leaving the district because they consider it a poor-quality district.

In addition to regional experience and district enrollment changes, Table 7 suggests that working conditions also affect the district's average experience levels. In particular, the negative coefficient on the lunch program variable indicates that experience is lower in districts with many impoverished students and higher in districts with many affluent students. This relationship may not persist if the issue of student poverty were targeted directly. If districts received additional funds based on their poverty level to improve working conditions, such districts may be able to retain more teachers, thus increasing their average experience level. Just as we suggested working conditions be treated separately from determining adjustments to salary schedule components, they should be treated separately for how they affect experience.

Combining the formula for experience with the formula for the salary components – substituting equations (3), (4), and (7) back into equation (1) – yields a formula that will equalize the purchasing power across districts:

$$TC_i = (cwi_i \times \overline{base} \times \overline{tp}) + (cwi_i \times \overline{prem} \times \frac{xi_i \times \overline{\exp_i}}{1+g} \times \overline{tp}) . \tag{8}$$

Equation (8) achieves the goal of equalizing purchasing power given the current structure of salary schedules which are based solely on education and experience. Discussions of merit pay or professional pay for teachers have been gaining ground nationwide, but compensating teachers based on their ability to increase test scores has yet to become a widespread practice. Even in states and districts that have experimented with such systems, the merit-pay portion of pay has been a small percentage of the overall compensation. If the structure of compensating teachers were to substantially change to be based on effectiveness rather than experience, then equalizing purchasing power based on experience may no longer be necessary, and formulas to help ensure teachers are of the same quality would be the focus of funding adjustments. Given the difficulties of measuring quality, such a task could be quite difficult. Section 5C discusses teacher quality in more depth.Sub Heading Level 2

B. Does It Make Sense to Equalize Purchasing Power?

Equation (8) describes theoretically how the state could design a formula to allocate revenue in a way that would achieve approximate purchasing power parity for teachers among school districts. Although the goal of resource equity has been at the forefront California's education reforms since the 1970s, the standards and accountability reforms of the late 1990s have introduced additional goals for California schools – namely that schools must achieve certain academic performance targets or face severe consequences. These new reforms raise the question of whether equalizing resources will move the state closer to its academic goals.

To think about this issue, it is important to consider the necessary combination of resources for the state's students to meet the academic standards. Underlying this question is the notion that resources are systematically linked to student achievement by an education production function. This function describes how different levels of resources can be combined to achieve a certain achievement level. If we knew this formula, we could determine the minimal level of expenditures and corresponding optimal mix of resources necessary for some baseline school district to reach the state's achievement goals. This baseline district could be a district with the average characteristics – baseline salaries, teacher-pupil ratio, and experience.

A district that faced higher salaries would not be able to afford the same mix of resources and therefore the target achievement level. Compensating such a district for the full cost of higher salaries would allow them to achieve the same mix of resources as the baseline district. However, there might be a less costly way of getting them to the same level of achievement. If it were possible to substitute a relatively less expensive input for relatively expensive labor, districts may be able to obtain the target achievement level with a different ratio of inputs and only partial compensation for their salaries. In other words, a different resource mix may be optimal when the price structure deviates from the baseline district. In this case, districts may still need additional revenue to meet the target achievement level, but not as much as the *cwi* would suggest.

Is it realistic to substitute other resources for teachers when the cost of teachers rises? Consider first the tradeoff between labor and non-labor resources. Given the richly human process that defines education, it is difficult to imagine which non-labor resources could make up for a smaller teaching force. Could numerous additional computers make up for fewer teachers? Perhaps, but little evidence exists to guide us about the potential tradeoffs possible. If we assume that a viable tradeoff between labor and non-labor goods does not currently exist, a formula that equalizes purchasing power may be in order.

Another consideration is the tradeoff between different types of labor. Could some other form of labor be substituted for teachers if teachers are more expensive? This type of substitution is unlikely to be feasible given that regions with higher teacher costs also experience proportionally higher costs for other school labor. In school districts, labor is generally divided into two categories: certificated staff and classified staff. In addition to teachers, the certificated staff includes employees who require a certificate for their jobs, such as librarians, nurses, counselors, and other pupil service personnel. Many of these occupations are on the same salary schedule as teachers, so their costs move in unison. Classified employees do not require as much education or experience as do certificated staff. Classified employees include occupations such as instructional aides and secretarial and administrative support staff. The correlation between a non-teacher wage index based on salaries in occupations likely to require at least a B.A. and some additional training and experience is correlated with an index of non-teaching jobs requiring much less education and experience with a correlation coefficient of 0.8 (see appendix C for a detailed description of how we computed the latter index). Thus, the relative price differences are unlikely to yield a drastically different optimal resource mix. Furthermore, it may be difficult to substitute classified staff for teachers. More aides may be able to compensate for fewer teachers, but it is unlikely that additional administrative support could make the difference.

This issue of potential substitution among resources arises when the U.S. government calculates the consumer price index. The CPI measures the cost of a fixed basket of goods over time. As the price of certain goods increase, the CPI increases and reflects the new cost of buying the same basket of goods. In other words, it provides a measure of inflation. However, consumers may not be worse off if the cost of just a few of the goods increase, because they may be able to substitute less expensive goods and be just as happy as they were before. Yet, despite this issue, the CPI is used as an inflation adjustment for many government social programs and fixed income programs.

Another concern about fully adjusting salaries to regional wages is that all districts within a region may not be accurately compensated if the region is not homogeneous. Although, the Census Bureau designed the MSA regions to represent single labor markets, salaries may vary within regions. To determine how much variation in teacher compensation is explained by regional differences, we regressed mid-career teacher compensation on regional dummy variables. The R-squared in this regression was 51 percent; it rose to 64 percent when we added the set of working condition and budget factor control variables from Table 6. These regressions reveal a significant amount of within-region variation in teacher compensation, suggesting that a more refined regional wage may be necessary to accurately compensate school districts for cost differences. To our knowledge, within-region data on labor costs are not regularly and accurately reported. However, the availability of such data could further refine the funding formula in (8). Without more detailed data, another option to explore could be for a regional office to disburse funding adjustments to districts based on need in the same way as is currently done for special education local plan areas.

In sum, although fully adjusting school funds for differences in the cost of hiring teachers raises some concerns that districts in high-cost regions may be overcompensated, substitution of less expensive resources in high-wage regions is unlikely to generate large cost savings when trying to meet a certain performance target. Moreover, given the lack of evidence about the form of the education production function, the right adjustment may never be known and it may be better to equalize inputs, which is feasible, than to try to equalize outputs using an imprecise formula.

C. The Relationship Between Wages and Quality

The equalization formula in equation (8) yields enough revenue to hire teachers of the same experience level across different regions, but it does not address teacher quality. Merely having the same experience level does not mean that teachers are of the same quality. Regions with relatively high non-teacher wages may actually be attracting higher quality employees in all occupations. If employees were not of higher quality in those regions, firms in those regions may find in difficult to compete with firms in low-wage regions. They would essentially be producing the same product with higher costs, driving themselves out of business in a competitive market.

Given the potential for teachers in high-wage regions to be of higher quality, a formula that equalizes purchasing power for teachers of a given experience level might overcompensate districts in high-wage regions. If those districts have more effective teachers, they may not need to hire as many teachers to obtain the same targeted achievement level. Alternatively, those districts in high-wage regions could offer lower salaries than suggested by the *cwi,* which may attract lower quality teachers relative to the quality in that region of other occupations, but may lead to teachers of similar quality to teachers in lower-cost regions.

To examine the possibility that higher-wage regions employ higher quality teachers, we estimate the effect of regional wages on district test scores. To measure district test scores, we use the Academic Performance Index (API) scores of schools in the district. The state assigns each school an API score based on its students' test scores on various standardized academic tests. The API ranges from 200 to 1,000. To compute a district API score, we average the API score of the schools in the district, weighting by the number of students in each school.

We regress the district's API score on the natural log of regional non-teacher wage. We control for teacher supply, enrollment growth, regional age, and the other working conditions and budget factors in the previous regressions (i.e., lunch program participation, revenue, enrollment, and district type). We also control for several additional factors including the percentage of English learners in the district, a series of dummy variables indicating the racial composition of the school district, and a series of dummy variables indicating the parental education of students in the district. The coefficient on the regional wage variable is -10.3 with a standard error of 25.3. This insignificant negative result suggests that higher-wage regions do not necessarily have higher quality teachers as measured by their ability to increase student test scores. This lack of a significant test score effect suggests that higher non-teacher wages may not create a problem in attaining targeted test scores. Therefore, it may not be cost effective to adjust the funding formula if the only goal is to attain a targeted test score. The lack of a test score effect may also mean that schools can substitute among inputs easily enough to attain the targeted test score. Finally, the absence of an effect may mean that so many factors beyond the school's control affect test scores so that the actual inputs matter little, at least in the observed input ranges.

If anything, the negative coefficient might suggest that schools facing higher costs are disadvantaged in terms of teacher quality, and we should consider some funding adjustment. To assess the extent to which adjustment to higher wage costs may help schools, we regress the district API on the same factors in the previous regression with one exception. We replace the non-teacher wage with the ratio of the district's mid-career compensation to the regional non-teacher wage. This ratio measures the district's ability to adjust to local wages – the higher the ratio, the better the district has adjusted. In this regression, the coefficient on the wage adjustment ratio is statistically significant, but very small. Increasing the adjustment ratio by 10 percent (which is about one standard deviation), increases the API score by only 3 points. In this model, the overwhelming predictor of API scores is the percentage of students in the free and reduced-price lunch program. A one standard deviation increase in the percentage of students in the lunch program (0.22) leads to a 28 point increase in the district API score. Overall, this regression suggests that the inability of districts to adjust their salary schedule to local labor market conditions has had little effect on teacher quality. Perhaps resources would be better spent combating the effects of student poverty. An overhaul of the school finance system should keep this question in mind. Loeb and Page (2000) find stronger links between relative teacher salaries and student outcomes, which they measure as dropout rates. Our preliminary results deserve further exploration.

In sum, the formula presented in Section 5A equalizes district purchasing power in the face of differences in resource costs, but the preliminary evidence suggests that such a policy would not achieve the type of test score gains envisioned in the state's accountability system. To really answer that question, we need a much better understanding of the education production function.

D. Regional Cost Adjustments in Other States

California would not be alone if it implemented a policy to equalize teacher purchasing power. Several states use regional cost adjustments to determine school funding formulas for teacher salaries. This section highlights these policies. See Sielke et al. (2001) for a complete description of each state's funding formula, including geographically-based adjustments.

In Colorado, the personnel cost portion of per-pupil funding is adjusted by a cost-of-living factor. This factor adjusts for the regional cost differences of housing, goods, and services and is based on a survey conducted by the Colorado Legislative Council every two years. The adjustment factor accounts for cost differences based on the residence of school personnel rather than the location of the school or district (National Conference of State Legislatures [NCSL], 2006).

Florida uses a price level index developed by its Governor's Office with a market basket of items similar to those in the CPI, such as housing, transportation, health care, food, and other goods and services (NCSL, 2006). A district cost differential is calculated by comparing each district's three-year average cost of items to the statewide three-year average. This adjustment is applied to both the salary and non-salary components of the state's finance formula.

In Massachusetts, salary-related items in the baseline budget for a school district are adjusted annually for regional differences in salary expectations and cost-of-living. Wage data used to calculate these differences are from the Massachusetts Department of Employment. The average wage for all occupations in a district's labor market area, compared to the statewide average, is weighted at 80 percent, and the average wage for all occupations in a district's local area, compared to the statewide average, is weighted at 20 percent. This figure is then compared to the statewide figure and divided by 3 to calculate the wage adjustment factor for each district. As of 2000, districts in lower-wage areas (with a wage adjustment factor below state average) are assigned to the statewide average factor. Therefore, only states with above-average wages are affected by this adjustment. (Massachusetts Department of Education, 2006).

In Ohio, the personnel and non-personnel foundation level for each district is adjusted for the relative cost of doing business (CODB) in the county where the district is located. Each district's CODB (calculated using Ohio Department of Labor wage data) is based on the average weekly wage for nine private sector industries in its county and the surrounding counties. Although the CODB factor measures about a 40 percent difference in the cost of doing business around the state, the state legislature has restricted the allowable range to 7.5 percent (NCSL, 2006).

Texas is the only state to currently use a cost-of-education index (CEI) that adjusts for cost factors that are beyond a district's control. Texas's CEI accounts for both regional input price and scale economy differences. Factors in the CEI include beginning average teacher salary in contiguous counties, county population, percentage of low income students, district average daily attendance (ADA), and district density (a measure of ADA total and growth rate compared to county population). Each district's basic allotment from the state is adjusted by this CEI (see Alexander et al., 2000).

Virginia's state funding is augmented by a cost-of-competing adjustment for the nine Northern Virginia districts in the greater Washington, D.C. metropolitan area. This adjustment accounts for higher competitive wages and costs-of-living in the D.C. metro area compared to the rest of Virginia. The state applies a 10 percent increase of funding for instructional positions and a 25 percent increase of funding for support staff positions in the nine districts (Sielke et al., 2001).

Finally, Wyoming's cost-of-living index calculates average costs in 27 regions in the state for several categories such as housing, food, recreation, personal care, and apparel. The data come from Wyoming's Department of Administration and Information and are averaged over three years. The foundation formula is adjusted according to an index that compares the three-year average cost in each region to the Albany and Laramie school district average cost (NCSL, 2006).

In addition to adjustments for cost of living, Wyoming also adjusts for districts with higher costs due to teacher seniority. In each district, the total years of teacher experience are summed (capped at 20 years per teacher). The state pays each district a flat dollar amount for every year of seniority. In other words, the seniority adjustment is the sum of years of teaching experience multiplied by the flat dollar amount, which was $673.09 in 2001 (Smith and Hayward, 2001).

Other states also adjust funding formulas by regional levels of staff training and experience. Georgia adjusts its basic foundation allowance for each district according to the number of teachers whose training and experience exceed the minimum for the state, which is a bachelor's degree and no teaching experience (Sielke et al., 2001). In Oregon, a flat per-pupil dollar amount is added or subtracted to base support for each year's difference between a district's average teaching experience and the statewide average teaching experience (Thompson and Silvernail, 2001).

One factor in determining district educational costs in New Mexico is an index of teacher training and experience. The state assigns a weight for each combination of five levels of teacher training and five levels of teacher experience. For example, a teacher with a bachelor's degree and 0-2 years of experience has a weight of 0.75, and a teacher with a bachelor's degree and 45 credit hours and 6-8 years of experience has a weight of 1.0. Each district's training and experience index is determined by multiplying the number of instructional staff in each training/experience combination by its weight. These values are then summed and divided by the total number of FTE instructional staff in the district. If a district's training and experience index is below 1.0, it is increased to 1.0. This index is among the factors used to calculate each district's minimum state funding guarantee (Sielke et al., 2001). Utah's professional staff cost formula is calculated in a method similar to New Mexico's index, although training and experience categories and weighting values are different (Utah Office of the Legislative Fiscal Analyst, 2004).

Washington also weights state allocations for combinations of teacher training and experience. Each district's average weight value is calculated by multiplying the number of instructional staff in each training-experience combination by its weight value, summing these values, and then dividing this sum by the total number of teachers in the district. The state sets a statewide base salary amount each year and multiplies this amount by the average weight value for each district. This dollar amount is allocated to each district to compensate for differences in teacher training and experience (Thompson and Silvernail, 2001). Finally, West Virginia has a statewide minimum salary schedule based on training and experience. The state first determines the number of necessary personnel in each district according to student enrollment. Then, funds are distributed according to each necessary district employee's step in the salary schedule (Thompson and Silvernail, 2001).

6. Conclusion

Although California's school finance reforms of the 1970s and 1980s succeeded in equalizing revenue per pupil across school districts, the reforms did not equalize tangible resource levels such as personnel. The inequality in resources stems from the difference in resource costs around the state. Because the cost of resources varies but revenues do not, districts facing high costs are forced to economize in some areas of their budgets relative to other districts. Our analysis suggests that as external wage pressures grow, districts not only cut back on the number of teachers they hire but also reduce the ratio of other certificated staff (such as counselors and nurses) to students.

Local labor market conditions beyond the control of school districts are a driving force behind the differences in education labor costs across the state. This paper documents how the local wages of non-teachers influence teacher compensation. In addition, we show that enrollment growth and the general age level in the region affect the experience level of teachers in a district, therefore putting pressure on compensation by affecting where teachers place on the salary schedule.

A new finance formula could alleviate the inequality in resources stemming from these external pressures. This paper proposes a way to alter California's system of funding schools in a way that could help equalize the purchasing power of school districts in the face of external wage pressures. This formula would ensure that, given the local labor market conditions and labor pool, districts would be given enough resources to reach some statewide targeted teacher-pupil ratio.

This formula could extend to other labor areas. Regions that must pay teachers more must also pay higher wages to other certificated staff. The state could set a target ratio of certificated staff to students, and then allocate revenue in a way that all districts could afford that ratio. This type of formula undoes the revenue equality that California reforms have strived to achieve, but it may be more in keeping with the spirit of the equality movement.

An important consideration is how such a formula would be implemented. If additional resources were not added to the education system, a finance formula that equalized purchasing power would require taking away from some districts to give to others. Politically, this approach is not viable. However, the formula could provide a target for the future distribution of resources. Then, as more revenue was added to the system, it could be added in a way that brought every district to its target. Those districts furthest from their target revenue would get a larger share of the increase than those already at or above their target. This process is similar to the one used when revenue limits were set and revenue equalized in the 1970s and 1980s.

The formula in this paper only addresses labor costs. For example, our formula does not account for the possibility that some districts may need more resources because of the specific challenges of the students in their schools. Districts with high shares of poor students, English learners, or special education students may need more revenue to meet the state's goal. Although these factors may also affect the compensation that districts currently need to offer, we argue that those issues may be better addressed with programs directly aimed at improving those working conditions. As such working conditions improve, teachers may not require the salary premium that they currently receive for teaching in challenging districts. Furthermore, our formula does not address inequities from other sources, such as economies of scale or extra revenue. Although those factors may spill over into teacher compensation, policies should address those inequities directly rather than through the intermediate vehicle of teacher compensation.

Although providing equal resources to schools has been the goal of past school finance reform efforts, the state's recent focus on academic standards places more emphasis on student outcomes than on educational inputs. Specifically, the state has set an academic goal of an 800 API for all schools. This standard focuses attention on those schools failing to meet this academic goal and leads naturally to the conclusion that such schools may need additional resources. The formula proposed in this paper does not address that issue.

Our formula provides a computationally straightforward way to equalize purchasing power, enabling districts to afford equal levels of tangible resources. However, our analysis suggests that high regional wages do not depress district API scores and that districts that better adjust to regional wages do not see substantially higher test scores as a result. Moreover, the literature provides little evidence that staffing ratios (i.e., class sizes) affect test scores. Therefore, changing the resource mix may not increase test scores, so the state may want to consider whether it can afford the costs of such a funding formula change under a standards-based system. As more evidence becomes available about the mix of resources needed to meet the state's standards, the funding formula adjustments in this paper could be combined with a formula designed to increase academic performance. Sonstelie (2007) addresses such a hybrid approach to school finance.

Although a funding formula that equalized resources would increase resources in some districts falling far short of the state's academic goals, the formula would also provide additional resources to districts already achieving the state's expectations. Given the limited resources available for education funding and the state's other budget obligations, the legislature must consider whether the costs of changing the school funding formula are worth the benefits of achieving equal resources. In part, this decision will be guided by the views of voters. Residents in affluent school districts where students meet the state expectations compare their schools to those in other states and conclude their schools have larger class sizes and fewer support staff. It would seem that these parents would prefer policies that equalized resources and purchasing power across districts. To the extent this sentiment dominates during legislative elections, the legislature may lean toward policies that equalize resource levels even if those policies do not advance the goals of high test scores for all students.

Appendix A. School Finance Data (SACS)

As of the 2003-2004 school year, California school districts must provide the California Department of Education (CDE) with annual financial reports. In these reports, districts classify their revenue and expenditures using the CDE's Standardized Account Code Structure (SACS). The code identifies the source of the funds, the specific item purchased, and the purpose of the expenditure. Specifically, each SACS code contains seven fields and 22 digits. The fields identify the fund, function, object, goal, resource, project year, and school site.[2] In this paper, we categorize district expenditures using combinations of the function and object codes in the general fund and the deferred maintenance fund.

The fund refers to a self-balancing set of accounts that may be used for general expenditures (as in the case of the General Fund) or that are designated for special purposes (e.g., Cafeteria Fund, Building Fund, Deferred Maintenance Fund). In this paper, we include expenditures from the general fund and the deferred maintenance fund only.

The function and object codes describe the purpose of the expenditure. The function refers to the type of activity associated with the transaction. Examples of functions are instruction, administration, and transportation. The object refers to the specific goods or services purchased, such as salaries, fringe benefits, textbooks, utilities, and equipment. For example, expenditures for the function of instruction can be broken down by whether they are teacher salaries, aide salaries, or instructional materials.

We divide district expenditures into 11 categories based on combinations of function and object codes. To arrive at these 11 categories, we first divide expenditures into eight categories based on their function code. The categories include instruction, pupil services, professional development, district administration, school administration, transportation, maintenance and operations, and miscellaneous expenditures.

For most of the functional areas, we include all expenditures regardless of their object. However, we subdivide the expenditures in the instruction and pupil services categories into five separate categories based on their object codes. In the instruction category, we divide labor expenditures into two categories: (1) teachers' salaries and benefits, and (2) aides' and other classified salaries and benefits. In the pupil services category, we combine all certificated and classified salaries and benefits into one category: pupil service personnel. We also create an instructional materials category that includes expenditures on such materials from both instruction and pupil services functions. Similarly, we construct an "other non-labor instructional expenditures" category that includes those expenditures in the instruction and pupil services category. Table A.1 shows state expenditures per pupil for each combination of function and object. These per-pupil expenditures are the total statewide spending in a category divided by statewide enrollment. The five outlined groupings show the five subdivided instruction and pupil services categories.   The remaining functions form their own categories.

[2] Additional information on SACS is provided in the *California School Accounting Manual, 2003 edition.*

Table A.1
Spending per Pupil by Function and Object Category ($), 2003-2004

		Function Categories and Codes								
		Instruction	Pupil Services	Prof. Dev.	District Admin.	School Admin.	Trans-portation	Main-tenance & Op.	Misc.	TOTAL
Object Categories	Object Codes	1000-1199	2420-2495, 3110-3160, 3900	2100-2149	2200, 7000-7999	2700	3600	8000-8499	3700, 4000-6999, 8500-9100	
Teacher Salaries	1100	2,845	N/A	30	0	N/A	N/A	N/A	12	2,888
Certificated (non-teacher) Salaries	1200, 1300, 1900	N/A	196	107	38	211	0	0	5	557
Certificated Benefits	3101, 3201, 3301, 3401, 3501, 3601, 3701, 3801, 3901	719	46	29	15	45	0	0	4	859
Aide Salaries	2100	213	N/A	N/A	0	N/A	N/A	N/A	5	218
Classified Support Salaries	2200	N/A	36	N/A	9	N/A	65	258	7	376
Classified Supervisors and Admin. Salaries	2300, 2400	N/A	37	27	139	134	8	23	4	371
Other Classified	2900	25	12	9	3	5	N/A	6	11	71
Classified Benefits	3102, 3202, 3302, 3402, 3502, 3602, 3702, 3802, 3902	93	35	13	64	63	32	118	7	426
Instructional Materials	4100, 4200	74	6	2	0	0	0	0	0	81
Other Non-Labor Expenditures	4300, 4400, 4700, 5000-5999, 6000-6999	341	36	66	127	24	68	249	77	990
Debt Service and Financing Uses	7430-7439, 7699	N/A	N/A	N/A	N/A	N/A	N/A	N/A	19	19
	TOTAL	4,312	404	284	396	481	173	655	150	6,855

Notes: N/A means there were no expenditures in the category. The miscellaneous function category includes the functions of: Food, Ancillary & Community Services, Enterprise Activity, Facilities, and Debt Service. The other non-labor expenditures object category includes materials and supplies; non-capitalized equipment; food; services and other operating expenditures; and capital outlay.

Table A.2 summarizes the object and function codes in each of the 11 categories: teachers' salaries and benefits, aides' and other classified salaries and benefits, pupil service personnel salaries and benefits, instructional materials, other non-labor instructional expenditures, professional development, school administration, district administration, transportation, maintenance and operations, and miscellaneous. The table also shows total state expenditures in those categories. The unadjusted values show the raw total state expenditures per pupil in each expenditure category.

Table A.2
Expenditure Categories

Expenditure Category	Function Codes	Object Codes	Unadjusted Per Pupil Expenditures ($)	Adjusted Per Pupil Expenditures ($)
Teacher Salaries and Benefits	1000-1199	1100, 3101, 3201, 3301, 3401, 3501, 3601, 3701, 3801, 3901	3,565	3,637
Aides and Other Classified Salaries and Benefits	1000-1199	2100, 2200, 2900, 3102, 3202, 3302, 3402, 3502, 3602, 3702, 3802, 3902	332	372
Pupil Service Personnel Salaries and Benefits	2420-2495, 3110-3160, 3900	1200, 1300, 1900, 2200, 2300, 2400, 2900, 3101, 3102, 3201, 3202, 3301, 3302, 3401, 3402, 3501, 3502, 3601, 3602, 3701, 3702, 3801, 3802, 3901, 3902	362	364
Instructional Materials	1000-1199, 2420-2495, 3110-3160, 3900	4100, 4200	79	80
Other Non-Labor Instructional Expenditures	1000-1199, 2420-2495, 3110-3160, 3900	4300, 4400, 4700, 5200, 5300, 5400, 5440, 5450, 5500, 5600, 5710, 5750, 5800, 5900, 6100, 6200, 6300, 6400, 6500, 6900	378	400
Professional Development	2100-2199	1100-6900	284	284
School Administration	2700	1100-6900	481	481
District Administration	2200, 7000-7999	1100-6900	396	377
Transportation	3600	1100-6900	173	177
Maintenance and Operations	8000-8499	1100-6900	655	654
Miscellaneous	3700, 4000-6999, 8500-9100	1100-6900, 7430-7439, 7699	150	149
TOTAL			6,855	6,976

We make four changes to the raw expenditure figures to arrive at our final adjusted expenditures. First, we replace special education expenditures with a proportional share of expenditures in each district's special education local plan area (SELPA). Second, we adjust the non-special education instruction and pupil-related expenditures (the first five expenditure categories in Table A.2) by counting transfers from districts to Regional Occupational Center/Program (ROC/P) as expenditures. Third, we subtract interfund transfers of indirect costs and direct support costs from district expenditures. Finally, we add a proportional share of Joint Power Agency (JPA) transportation expenditures to districts that are members of JPAs.

SELPAs are formed to allocate special education funds. They are comprised of multiple school districts and often county offices of education. The state distributes special education revenue to each SELPA based on per-pupil figures. The SELPA then distributes this revenue to its districts and county office of education. Thus, special education expenditures and services are shared among districts and county offices of education. To adjust for this, we sum special education expenditures in each SELPA and allocate a prorated share of these expenditures back to each district based on the district's share of enrollment. Special education teachers' salaries and benefits constitute 11 percent of total unadjusted and adjusted teachers' salaries and benefits. Special education aides' and other classified support salaries and benefits constitute 62 percent of all expenditures in that category. Less than 1 percent of instructional material expenditures are categorized as special education, while 30 percent of non-labor instructional materials are considered so.

Districts allocate funds to run ROC/Ps. We categorize ROC/P expenditures using function, resource, and goal codes. In SACS, the resource code refers to the source of the funds, such as revenue limits, special education, or Economic Impact Aid. The goal code identifies the target population or instructional setting, such as general education, adult education, or vocational education. We identify ROC/P expenditures in two ways: (1) as a combination of the "transfer between agencies" function code (9200) and ROC/P resources codes (6350-6370), and (2) as a combination of the "transfer between agencies" function code (9200), ROC/P goal codes (6000-6999), and unrestricted resource code (0). We allocate a prorated share of these ROC/P expenditures to each non-special education instruction and pupil-related expenditure category in each district, based on the total share of expenditures in each category. For example, if 40 percent of total non-special education instruction and pupil-related expenditures are spent on instructional materials in a district, we add 40 percent of ROC/P expenditures in that district to the instructional materials category.

Interfund transfers, identified by object codes 7350 and 7380, are a transfer from one fund (such as the general fund) to another (such as the adult education fund). In this example, since the transferred money is actually spent in the adult education fund, it should not count as a general fund expenditure. Thus, we reduce the expenditures in each expenditure category by its interfund transfer amounts.

Many districts form Joint Power Agencies (JPAs) for transportation activities. These JPAs appear as separate districts in the SACS data. We allocate a prorated share of JPA transportation expenditures to each district member, based on each district's share of enrollment in the JPA group. We then add this prorated amount to the district's existing transportation expenditures.

Appendix B. Teacher Salaries and Benefits Data

California school districts report their salary schedules to the California Department of Education using the form "Salary and Benefits Schedule for the Certificated Bargaining Unit, Form J-90."

A. Salary

The J-90 salary schedule data is a comprehensive source of complete salary schedule information for nearly all districts in California. One file provides the column number and the heading, or education level, associated with it. A separate file provides the column number, the step number, and the salary associated with that combination of step and column. For each of the column headings, we constructed new variables indicating the degree necessary (e.g., B.A. or M.A.) and the minimum number of units required for that column. Then, for any particular experience level (i.e., additional units) of interest, we simply found the highest possible column that did not exceed our units. Occasionally, judgment calls were necessary. For example, a handful of districts had both an education level of B.A. plus a credential and a level of B.A.+30 units. In these cases, if we were looking for the base salary of a B.A.+30 units, we chose the B.A.+30 rather than the B.A.+credential. Almost always, the B.A.+30 was associated with a higher column number and a higher salary value.

In instances where we were looking for the highest column in the district and step 20, occasionally there were problems because the highest column did not start until step 24. In these cases, we chose an earlier column and step 20. Sub Section of Sub Section of Appendix B

B. Benefits

For each type of benefit (health, vision, etc.), districts offer a variety of plans: single-party, two-party, family plans, and composite plan. Just over half the districts offer only a composite plan, in which case we use that plan. Just over one-third of districts offer single-party, two-party, and family plans. In those districts, we use the family plan. About 6 percent of districts offer a composite plan and some combination of other plans. In these districts, we choose the composite plan. The remaining 6 percent of districts offer a combination of single, two-party, and family plans. In these districts, we choose the family plan if available; if not, we choose the two-party plan. If only the single-party plan is available, we choose that.

Within each type of plan, different types of coverage are available. For example, districts may offer multiple types of family health plans to choose from, such as an HMO plan or a PPO plan. For the type of plan (e.g., composite or family) that we use in each district, we average the contributions from the various coverage options.

The category of other benefits includes such programs as disability insurance, income protection, and mental health insurance. Again, multiple carriers may exist for each of these programs. We average the contributions for the multiple carriers for each type of program. We exclude the other benefits that are described as cash-in-lieu of benefits if they are included in their respective health, vision, or dental benefits.

Appendix C. Non-Teacher Regional Wages

This appendix provides the details about how we compute the regional non-teacher wage. Essentially, this process includes three steps. First, we use the 2000 PUMS Census data to calculate 1999 non-teacher wages for each of California's 30 regions. The Census data are important because they allow us to calculate regional non-teacher wages, controlling for worker characteristics such as educational level and occupation. However, because we use 2003-04 teacher salary data and school finance data, we need 2003 non-teacher wages. Thus, for the second step, we use the OES data provided by the California Employment Development Department (EDD) Labor Market Division to calculate the growth in wages in each region from 1999 to 2003. The OES data do not control for worker characteristics, but they do allow us to determine how wages have changed over time. Finally, we apply the 1999-2003 OES growth rates to the Census data to calculate the 2003 wage data. This method is similar to that used by Taylor (2006). We describe this three-part procedure below.

A. Calculating the 1999 Census Wages

To calculate the 1999 wages for each MSA and for the entire state, we use the 2000 Census PUMS 5% California dataset. We regress the log of salary on the log of hours per week worked in 1999, log of weeks worked in 1999, sex, race, age, education level, industry, occupation, and MSA. We weight this regression by the person weights provided for each observation in the PUMS data, indicating the number of persons each observation represents. To compute the average wage for each MSA, we first multiply the coefficients of the regression by the state-level average value of the independent variables. (The state averages are also weighted by the person weights.) We sum these products, excluding the MSA variables. Then, to get the log of wage for each MSA, we add the coefficient of each MSA to that previous sum. Finally, we take the exponent of that log value to obtain the wage value in dollars. To find a weighted state average wage, we average all the MSA log-wages, weighted by the population of each MSA, and then take the exponent of the resulting average. Our study uses a simple average of the regional wages.

To ensure that our non-teacher sample is appropriate to compare to the teaching profession, we exclude people who (a) are teachers, (b) do not have a college degree, (c) are self-employed, (d) work less than half time, (e) have an annual salary of less than $5,000, or (e) work in the primary or secondary school industry. The total California PUMS person weights sum to 33,884,660. After the exclusions, the person weights sum to 3,348,558; this sample is used for the above-described analysis.

The PUMS data do not assign an MSA category to the 24 counties that fall outside of a metropolitan area. Observations that fall outside of an MSA are assigned as either 9997 (mixed MSA and non-metropolitan territory) or 9999 (not in metropolitan area). For these observations, we look at the combination of the non-MSA value (either 9997 or 9999) and another geographic variable called the PUMA (Public Use Microdata Area) Code to figure out which county each observation came from. Using this county information, we are able to assign each of these observations to one of the five non-MSA regional codes used in the EDD OES data described in the following section.

B. Calculating the Growth in Wages from 1999 to 2003

We use the OES data provided by the California EDD Labor Market Division to calculate the growth in wages from 1999 to 2003. Specifically, we use the OES surveys from 2000 (which is based on data from 1998, 1999, and 2000) and from 2004 (which is based on data from 2001, 2002, and 2003). One advantage of the EDD OES data is that they assign non-MSA regional codes to the 24 counties that fall outside of an MSA. These non-MSA regions are the Mother Lode Region (60001), Northern Counties Region (60002), North Coast Region (60003), Southwest Central Valley Region (60004), and Imperial County (60005).[3] Thus, the EDD OES data contain wages for all counties in the state – those in the 25 MSAs and those in the additional five special regions. The national Bureau of Labor Statistics OES data do not include data for the five special regions, which is why we chose to use the OES data from California's EDD. The OES data give average wages and employment levels for each occupation (SOC code) within each region (MSA or non-MSA). Our sample includes information for nearly 700 occupations and 30 regions. (For simplicity, we refer to all 30 regions as MSAs.)

The earliest OES wage data from the California EDD is a 2001 dataset. The 2001 OES dataset is based on the 2000 OES survey (which collected data in 1998, 1999, and 2000) and is updated to 2001 dollars. The wage updating is done using an Employment Cost Index (ECI) created by the BLS. This index shows the wage growth from one year to the next according to ten broad occupational divisions. We employ this same strategy to find the 1999 OES wages from the 2001 wage data (i.e., dividing the 2001 average wage for each MSA and occupation by the ECI that updates its wages from 1999 to 2001). To obtain 2003 data, we use the EDD's 2004 OES dataset. This dataset is based on the 2003 OES survey (i.e., it contains 2001, 2002, and 2003 wage data) but has updated wages to 2004 using the ECI. We used the ECI to convert those wages back to 2003 values.

To find the average wage for each MSA in a given year with the OES data, we simply average the wages of the occupations within the MSA, weighting by the occupation's employment level. We weight by the statewide level of employment in each occupation based on the Census PUMS data included in our Census regression. We use the statewide employment distribution so that regional wage differences are not driven by differences in occupational mix. Because we are interested in how wages changed between 1999 and 2003, we only include observations that contain both 1999 and 2003 wage and employment data.

Before we weight by the Census employment levels, we make one adjustment because the SOC codes in the PUMS and in the OES are similar, but often not exactly the same. For instance, the PUMS data contain wages for SOC occupation 11-2020, whereas the OES data contain wages for SOC 11-2021 and 11-2022. In other words, the PUMS SOC codes are sometimes measured at a more aggregated level than the OES SOC codes. To get around this, we use the 3-digit Census occupational codes (called Occcen) for employment level weighting rather than the SOC occupational codes. We use a crosswalk between the SOC occupational codes and the Occcen occupational codes provided by the National Crosswalk Service Center to

[3] The Mother Lode region (MSA code 60001) includes Alpine, Amador, Calaveras, Inyo, Mariposa, Mono, and Tuolomne Counties. The Northern Counties region (MSA code 60002) includes Colusa, Glenn, Lassen, Modoc, Nevada, Plumas, Sierra, Siskiyou, Tehama, and Trinity Counties. The North Coast region (MSA code 60003) includes Del Norte, Humboldt, Lake, and Mendocino Counties.

match the two types of occupational codes in the OES data. Usually, several SOC occupation codes comprise one Occcen code. While there are about 700 SOC codes in the OES data, there are about 500 Occcen codes. Thus, before we average OES wages by MSA for each year, we aggregate the OES data by Occcen code. Specifically, within each MSA, we average the wages within each Occcen code, weighted by the employment levels in each SOC. Once we do this, we can average the wages within each MSA weighted by the census-based share of employees in each occupation in the state. To compute a weighted statewide average wage, we average the regional wages weighted by the share of the state's employees in each region. We use the census data to determine the share of employees in each region. We use a simple average in the main text.

C. Applying the OES 1999-2003 Growth Rate to the Census Data

After we calculate the 1999 and 2003 average wages in each MSA and for the entire state using the OES wage data, we are able to calculate the wage growth from 1999 to 2003. We apply each MSA's OES growth rate to our calculated 1999 Census wages to obtain the 2003 wage estimates. We do this for the 25 MSA regions and the five non-MSA regions.[4] Table C.1 shows the individual components making up the final non-teacher wage. The first two columns show the MSA code and counties within the MSA. The next two columns show the 1999 and 2003 non-teacher wages calculated from the EDD OES data. The next column shows the growth rate from 1999 to 2003 based on the OES data. The last two columns show non-teacher wages based on the 2000 Census PUMS data. The first of those columns shows the 1999 non-teacher wages calculated directly from the PUMS data. The second column shows the 2003 wage estimates calculated by applying the OES growth rate to the 1999 Census wage.

[4] We found one discrepancy between the OES and Census datasets regarding the non-MSA regions. This discrepancy concerned observations from Del Norte County. The OES groups Del Norte County into non-MSA regional code 60003 (North Coast Region), and it groups Lassen, Modoc, and Siskiyou Counties into non-MSA regional code 60002 (Northern Counties Region). The Census groups Del Norte and the three other counties (Lassen, Modoc, and Siskiyou) together with a non-MSA code of 9999 and a PUMA code of 100. We cannot separate the Census observations that are from Del Norte County from those that are in the other three counties. Therefore, we assigned all observations with a Census MSA code of 9999 and PUMA code 100 into the 60002 region, although presumably some of the observations (those from Del Norte) should be in the 60003 region. However, the wage results for the 60002 and 60003 regions are very similar, so this discrepancy does not alter our results.

Table C.1
Regional Non-Teacher Wage Components

MSA		OES Wages ($)		Growth (%)	Census Wages ($)	
Code	Counties	1999	2003	1999-2003	1999	2003
7400	Santa Clara	58,093	70,499	0.21	52,022	63,132
7360	Marin, San Francisco, San Mateo	57,612	70,105	0.22	50,931	61,975
5775	Alameda, Contra Costa	54,965	66,635	0.21	49,222	59,672
5945	Orange	51,491	62,478	0.21	47,427	57,546
8735	Ventura	51,291	62,389	0.22	46,302	56,320
4480	Los Angeles	51,691	62,854	0.22	45,590	55,434
7485	Santa Cruz	51,999	63,356	0.22	44,943	54,759
7120	Monterey	48,762	61,514	0.26	42,866	54,076
60004	Kings, San Benito	43,066	53,600	0.24	43,414	54,033
8720	Napa, Solano	45,383	53,469	0.18	45,643	53,776
7500	Sonoma	49,683	61,656	0.24	43,235	53,654
7480	Santa Barbara	48,771	60,234	0.24	43,408	53,610
5170	Stanislaus	44,033	54,313	0.23	42,863	52,870
6780	Riverside, San Bernardino	46,614	56,725	0.22	43,355	52,759
7320	San Diego	49,256	60,301	0.22	42,879	52,494
8120	San Joaquin	45,264	53,709	0.19	44,164	52,404
680	Kern	45,977	54,802	0.19	42,338	50,463
2840	Fresno, Madera	45,607	55,321	0.21	41,486	50,322
8780	Tulare	44,401	53,344	0.20	41,873	50,307
6920	El Dorado, Placer, Sacramento	48,955	56,136	0.15	43,568	49,959
9270	Yolo	47,264	56,322	0.19	41,415	49,352
7460	San Luis Obispo	44,297	53,215	0.20	40,934	49,176
60005	Imperial	41,697	52,342	0.26	39,165	49,165
4940	Merced	45,773	54,476	0.19	40,656	48,386
60001	Mother Lode Region	44,290	51,966	0.17	40,239	47,213
1620	Butte	38,708	48,575	0.25	37,162	46,635
9340	Sutter, Yuba	44,800	52,480	0.17	39,354	46,100
6690	Shasta	39,661	48,302	0.22	37,239	45,352
60002	Northern Counties Region	42,272	51,016	0.21	36,222	43,715
60003	North Coast Region	40,868	47,283	0.16	35,475	41,043
	State Average (employee weighted)	51,941	62,969	0.21	46,342	56,328
	State Average (simple)	47,085	56,981	0.21	42,846	51,857

Note: Table is sorted according to 2003 Census wage. The Mother Lode region (MSA code 60001) includes Alpine, Amador, Calaveras, Inyo, Mariposa, Mono, and Tuolomne Counties. The Northern Counties region (MSA code 60002) includes Colusa, Glenn, Lassen, Modoc, Nevada, Plumas, Sierra, Siskiyou, Tehama, and Trinity Counties. The North Coast region (MSA code 60003) includes Del Norte, Humboldt, Lake, and Mendocino Counties.

D. Alternative Measures of a Wage Index

Although the combination of the Census data and the OES data provides an index with controls for workers' demographic characteristics, using the OES data along with information on job classifications provides nearly the same index. Data from the Occupational Information Network (ONET) provides job classifications for the OES data. These classifications range from one to five depending on the education and experience required for each job. To compute an alternative non-teacher wage index, we assume that professions comparable to teaching have a job classification of 3 through 5 and limit the OES data to this subset. We then assume that each region has the statewide distribution of these occupations and compute an average wage for each region. The correlation between an index using this method and an index using the combination of Census and OES data is 0.92. Similarly, if we assume that job classifications of 4 or 5 are a more appropriate comparison group to teachers and compute an index accordingly, the correlation between this index and the Census-OES combination is 0.85.

Using the OES data in conjunction with the job classification data allows us to compute a regional wage index that might be more appropriate for classified staff. For this purpose, we limit the OES data to those jobs with a classification of 1 or 2 and compute an index using the technique described in the previous paragraph. The correlation between an index based on job classifications 1 through 2 with an index based on job classifications 3 through 5 is 0.8.

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