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Does Raising Teachers' Pay Pay Off? Examining the Effects of Salary Variation on Student Achievement in California

California's education spending has increased drastically over the past decade, with roughly 80 percent of school budgets going toward staff salaries and benefits, making it one of the largest education budgets among all states.¹ Despite these major monetary investments, disparities in teacher pay and student outcomes are common across the state. To what extent do the variations in teacher salaries across California counties correlate with student academic outcomes? Specifically, I examine whether counties that offer higher teacher pay, after adjusting for the local cost of living, also demonstrate stronger student performance on state standardized tests and graduation rates. To answer this question, I will analyze county-level data for the 2021-2022 academic year, including average teacher salaries, cost of living indices, CAASPP Math and ELA test scores, and graduation rates. These measures and control variables allow a quick assessment to determine if the increase in teacher pay is connected with a statistically significant increase in student achievement.

I. CONTEXT AND SIGNIFICANCE

California public education faces continued challenges in improving student achievement while managing its high costs and teacher shortages. Over the course of a decade, the state has dramatically increased the amount spent on education, allocating approximately 80

¹ Lafortune, J., Ugo, I., & Guinan, B. (n.d.). Teacher staffing trends in California: Assessing the impact of recent spending.
<https://www.ppic.org/publication/teacher-staffing-trends-in-california-assessing-the-impact-of-recent-spending/>

percent of school budgets to staff salaries and benefits. Despite this investment, over the last decade, student achievement has been dramatically sliding, with scores for the lowest-achieving 10 percent of students falling significantly farther behind those of the top 10 percent of students. With student literacy & math rates declining across America,² there are many concerns about the effectiveness of education funding and the allocation of resources. This creates a pressing policy question that if increased spending has not led to measurable improvements in student performance, where should the state focus its resources to achieve the highest efficiency of its budget?

Teacher compensation is a key interest in this issue because it directly affects the quality and stability of instruction, which is a known determinant of student performance. Gjefsen (2020) demonstrated that higher salaries can attract more qualified teachers, such as those with master's degrees, leading to better qualified teachers.³ Similarly, Loeb and Page (2000) found that increasing teacher wages by 10 percent reduces the high school dropout rate by 3-4 percent, highlighting the potential impact that pay incentives can have on student retention.⁴ Likely from the more qualified teachers brought in or retained by the pay incentives.

California ranks first in the nation for average teacher salaries and second for starting salaries,⁵ yet even with these higher wages, many teachers in many areas struggle when adjusted for cost of living. These trends raise the question of if higher teacher pay truly translates into measurable improvements in student achievement, or are there additional factors that influence

² NAEP report card: Grade 12 mathematics. The Nation's Report Card. (n.d.). <https://www.nationsreportcard.gov/reports/mathematics/2024/g12/>

³ Gjefsen, H. M. (2020). Wages, teacher recruitment, and student achievement. *Labour Economics*, 65, 101848. <https://doi.org/10.1016/j.labeco.2020.101848>

⁴ Loeb, S., & Page, M. E. (2000). Examining the link between teacher wages and student outcomes: The importance of alternative labor market opportunities and non-pecuniary variation. *Review of Economics and Statistics*, 82(3), 393–408. <https://www.jstor.org/stable/2646800?seq=1>

⁵ Sellery, K. (2025, June 9). California ranks at top of nation for educator salaries. CSBA Blog. <https://blog.csba.org/educator-salaries/>, correlations

declining test scores and graduation rates? Addressing these issues or correlations can assist future state and district level funding decisions, ensuring that the education budget is targeted effectively to improve student outcomes.

II. LITERATURE REVIEW

The relationship between teacher compensation and student achievement is still debated in policy research. Previous research seems to suggest that most scholars agree that teacher quality is a key determinant of student outcomes or performance, but the extent to which salary of the teacher influences that quality and thus student performance is questionable. To determine whether these effects translate into student achievement depends on many contextual factors such as the district wealth, local cost of living, and resource availability.

Previous research by Loeb and Page (2000), examined how teacher wages influence student outcomes with the account for alternative labor market opportunities and school environment. They found that a 10 percent increase in teacher wages was associated with a 3-4 percent reduction in high school dropout rates, thus suggesting that higher salaries can reduce turnover and improve student success indirectly. This study is significant because it provides a framework for how to isolate the effects of salary from other regional or economic factors. It provides a model for controlling outside variables such as cost of living or median income when evaluating the diverse economic environment of California's counties.

A more recent study by Gjefsen (2020) looked at policy reform in Norway. This policy raised teacher salaries for new hires by about 5 percent, where Gjefsen evaluated its effects using a difference in difference design. The results showed a 6-9 percent increase in the hiring of teachers with master's degrees, providing evidence that even modest pay raises can improve the qualification of teachers entering the profession. Although test scores did not show any

noticeable improvements, Gjefsen argues that higher quality teachers are likely to produce better outcomes given more time. Although this research was conducted outside of the United States, it paints a picture of how pay reforms can strengthen teacher recruitment and can serve as a long term investment in student achievement. A pressing issue for California policymakers as they face persistent teacher shortages across the state.

Another study I found that related to my research was by Yontz and Wilson, who examined teacher salary differentials and student performance in the state of Ohio between 2013 and 2019.⁶ Their analysis controlled for factors such as teacher experience, education, and district socioeconomic conditions. They found that higher salaries did correlate with an improved student performance. But they highlighted that this effect was only statistically significant in wealthier districts of the state. Suggesting that economic context does in fact heavily determine the effectiveness of teacher pay as a policy tool for student performance. They concluded that higher pay alone may not overcome the challenges such as larger class sizes with fewer instructional supports, and limited district resources and services that assist with typical classroom learning. For a California context, this is extremely important given the even wider range and variation in income, cost of living, and district wealth between urban and rural counties.

Additionally, a national level study by Eunice S. Han looks into teacher compensation and student performance. By using district-level data and standardized tests from all across the United States, Han found that higher teacher compensation is associated with stronger student test performance, especially in districts that use salary structures that reward teacher experience and longevity.

⁶ Han, E. S. (2021). Teacher compensation and student performance: Evidence from national data on districts' finances and standardized test scores. *Journal of Education Finance*, 47(2), 199–224.
<https://www.jstor.org/stable/48664152?seq=1>

I also viewed a report from the Public Policy Institute of California (PPIC) by Lafortune, Ugo, and Guinan, which provides more localized and very recent insight into teacher staffing and compensation trends within the state.⁷ They found that despite overall increases in education spending, most of the funding has gone toward benefits rather than base salary increases. This results in disparities in pay and staffing across districts, especially between wealthier coastal regions and lower-income rural counties. They argue that increasing starting salaries could help attract and retain qualified teachers, especially in lower-income areas where shortages are most severe. This highlights how pay adjustments targeted directly at base teacher pay can not only assist teachers struggling to keep up with the rising cost of living but also improve education outcomes across the state.

These studies demonstrate that while teacher pay is connected to student achievement, the relationship is complex and has many factors affecting the outcomes. Higher wages can improve teacher recruitment and retention rates, which may in turn improve student performance. But these effects vary across economic conditions and areas. Most of this research also only focuses on international policy or national data, or individual districts, rather than a per-county level focus. This leaves a gap in understanding how salary differences within the state of California can affect student outcomes.

My research question and project seek to complete that gap by looking at the relationship between the average teacher salary and student performance on state standardized tests across California counties in the 2021-2022 school year. And with the inclusion of control factors such as the cost of living and student-to-teacher ratio per district, this research will look to provide an

⁷ Lafortune, J., Ugo, I., & Guinan, B. (n.d.). Teacher staffing trends in California: Assessing the impact of recent spending.
<https://www.ppic.org/publication/teacher-staffing-trends-in-california-assessing-the-impact-of-recent-spending/>

understanding of how pay differences across counties affect teacher effectiveness and student performance across the state's diverse economic landscape.

III. THEORY AND HYPOTHESIS

My conceptual hypothesis is that California counties with higher average teacher salaries will see stronger overall student performance compared to counties with lower average teacher salaries. The operational hypothesis would be that as average teacher salaries increase, controlling for the cost of living, counties will show higher average scores on the CAASPP English Language Arts (ELA) and Math assessments during the 2021-2022 school year. My theory is based on the human capital framework, which claims that investments in human resources such as better compensation, enhanced productivity and performance. When applied to education, the theory suggests that a higher teacher pay would be an investment in the instructional quality and thus student achievement.

Teacher salaries can be an economic leveler applied by policymakers and districts to function both as a recruitment and retention tool and possibly as an outcome lever in improving student performance. As when pay is competitive, it would attract more qualified or experienced teachers, reduce turnover, and improve the overall learning environment for students. On the other hand, counties with lower teacher salaries could experience higher turnover rates, short-staffed, and less skilled educators. This imbalance can lead to a worse learning environment and weaker student outcomes, only widening the already large difference in California district performance and wealth.

The causal mechanism in this shows that improving teacher compensation can indirectly improve student achievement through a more stable and higher-quality teaching workforce. A well-compensated teacher is more likely to remain longterm, and bring higher

quality instruction, which contributes highly to an improvement in student performance. My theory predicts that improving teacher compensation will strengthen local educational systems and benefit students' achievement. In contrast, counties that don't offer competitive or livable pay will face staffing shortages and lower teacher experience thus leading to lower academic performance among students.

IV. RESEARCH DESIGN

My independent variable in this study is the average teacher salary for each county in California for the 2021-22 school year. I operationalize this as the county level mean annual teacher salary in U.S. dollars because it directly captures monetary compensation that teachers receive and is comparable across counties. I obtained this salary data from the California Legislative Analyst's Office (LAO).

My primary dependent variables are the county level student performance measures for the same 2021-22 school year of 11th graders. Specifically, I use the average CAASPP scores for Mathematics and English Language Arts at the county level and the county graduation rates as a secondary outcome. I selected CAASPP Math and ELA because they are standardized statewide exams that allow for cross-county comparisons of student academic achievement. Graduation rates are included to evaluate whether pay differences relate to longer term schooling outcomes. CAASPP and graduation data will be sourced from the California Department of Education's CAASPP and cohort graduation reports from CDE DataQuest, which publishes county-level scores and percentages.

My control variables are the cost of living per county and student-to-teacher ratio. By comparing the average teacher salary with the cost of living in the county, we can control for local economic factors that might affect the true pay a teacher receives. We can have an adjusted

salary, given the local context, to more accurately estimate the purchasing power of the teacher. This data would come from MIT's living wage calculator, and it looks at the required annual income before taxes for an adult with no children in the county for the year 2021. The student-teacher ratio would control district differences since staffing and other resource allocations can affect student outcomes and are separate from teacher pay.

The unit of analysis for this study is the county, as I analyze all 58 California counties for the 2021-22 school year. The design would be a cross-sectional, as the data and the N for most regressions will be 58 for each county. This paper will also only focus on the 2021-22 school year, given time frame and lack of data for other years.

V. RESULTS

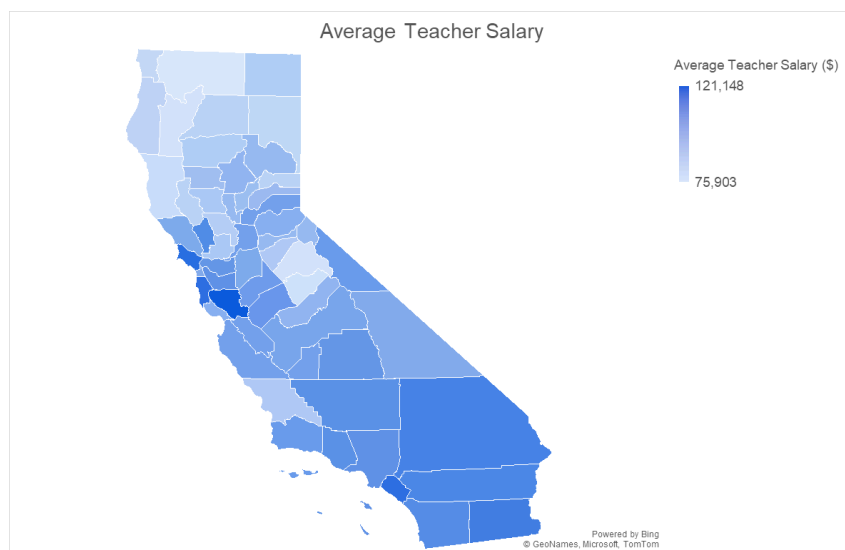


Figure 1: Map of California counties displaying Average Teacher Salary by county, 2021-22

In this map, we can visualize that there is a very clear variation of average teacher salaries across all California counties. Higher salaries are shown in the Bay Area, coastal counties, and certain urban regions such as Los Angeles and Orange County. In contrast, counties in the Central Valley, and parts of the Eastern Sierra are in the lower salary ranges.

While this map visualizes the drastic geographical differences in teacher compensation, these patterns don't translate into consistent differences in student achievement.

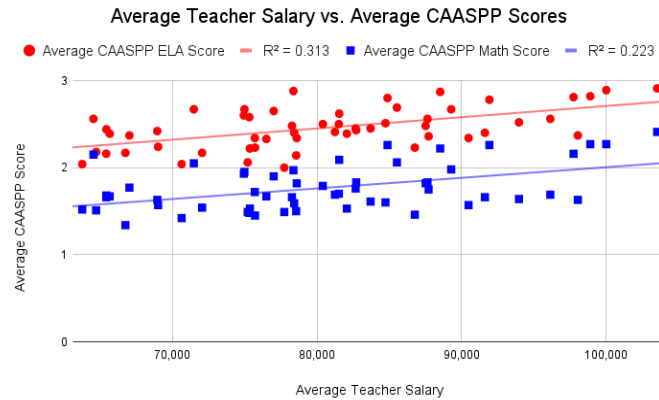


Figure 2: Scatterplot of Average Teacher Salary vs. CAASPP Math and ELA Scores, 2021-22

Figure 2 is a scatterplot comparing county-level average teacher salaries with CAASPP Math and ELA scores for the 2021-22 school year (excluding Alpine County due to missing data). In both subjects, we can see a slight positive correlation, as higher salaries are loosely associated with higher CAASPP performance. However, the relationships are fairly weak, with Math displaying an R^2 of 0.223 ($r = 0.47$) and ELA with an R^2 of 0.313 ($r = 0.56$). These correlations indicate that teacher salary explains only a small portion of the data and variation across counties. Additionally, there remains significant vertical spread at each salary level, showing that many counties with similar salaries produce very different student outcomes, suggesting the presence of other and possibly stronger factors other than compensation.

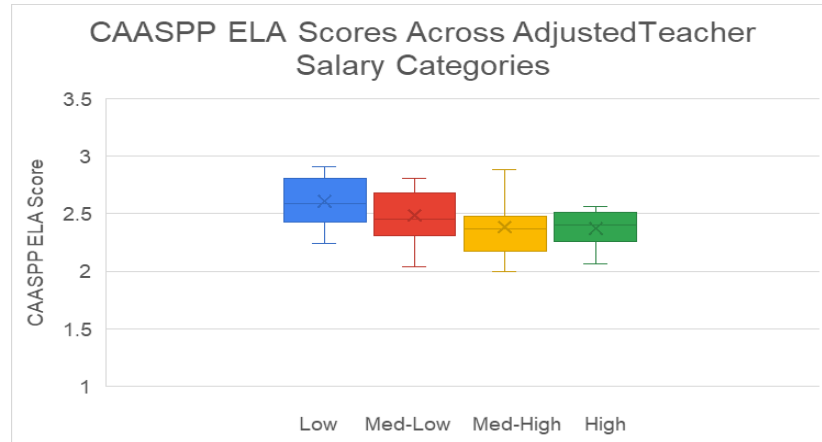


Figure 3: Box-and-Whisker Plot of Adjusted Salary Groups and CAASPP ELA Scores, 2021–22

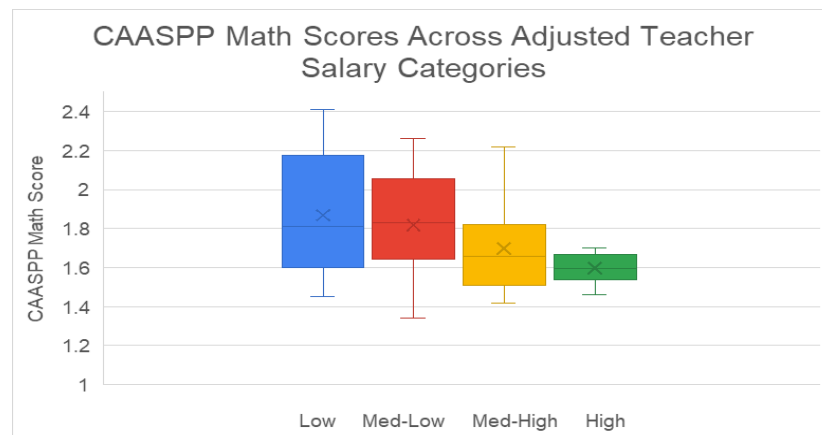


Figure 4: Box-and-Whisker Plot of Adjusted Salary Groups and CAASPP Math Scores, 2021–22

Lastly, in Figures 3 and 4 which are box-and-whisker plots comparing county CAASPP outcomes across four categories of cost of living adjusted teacher salaries. I calculated the adjusted salary by dividing the average county salary by the required annual income before taxes for an adult with no children provided by MIT's Living Wage Calculator. With the groups of Low, Med-Low, Med-High, and High salary quartiles. For Math, the distribution shows a slight decline in median scores as the adjusted salary levels rise, along with decreasing variation in the higher salary groups. For ELA, the distributions are more stable, with an even slighter decline in medians. These patterns are supported by ANOVA results, which show statistically significant

but modest differences between groups for both Math ($F = 3.517$, $p = 0.021$) and ELA ($F = 3.287$, $p = 0.027$) Overall, the adjusted salary quartiles show that salary advantages do not necessarily correspond to improved student outcomes and in this case correlate with slightly lower performances.

VI. DISCUSSION AND RESEARCH IMPLICATIONS

The results I produced only partially support my original hypothesis that improved or higher teacher salaries would lead to improved student performance through the form of CAASPP assessments. While the data revealed a weak positive correlation between salary and CAASPP scores at the county level, the relationships were not strong enough to conclude that a salary alone is a major lever of student achievement. This outcome suggests that other factors likely play a larger or even a supporting role in the shaping of academic performance than just teacher salary. Variables such as county socioeconomic status, district funding, student demographics, teacher experience levels, and class sizes are all contributors that could outdrive that of teacher salary. For example, counties like Marin and Santa Clara both score relatively high on the CAASPP assessment despite their differing salary levels, while some counties with relatively high salaries still experience middle or lower student performances.

When comparing base salary to cost-of-living-adjusted salary ratios, the results seemed to contradict my original slightly positive correlation by showing higher salary quartiles of this adjusted compensation lead to slight decreases in student scores. This was very unexpected as I expected adjusted salary to follow a similar pattern as base pay. Rather it highlights how complex this relationship truly is, and how educational outcomes are influenced by a wide range of factors. For these results, I noticed that some lower required income counties such as in the Central Valley held a higher income ratio than that of say the Bay Area or more dense urban

areas such as Los Angeles. Thus playing numerically lower income wages in the higher or upper end of the quartiles while higher cost of living counties were placed near the lower ends. And while lower cost of living counties still struggled with achievement gaps even when their salaries were competitive relative to their regional conditions. These findings reflect larger inequities in educational opportunity across the state that salary adjustments alone cannot address.

In the context of policy and decisions for districts, while teacher salaries remain an important tool for recruitment and retention, especially in understaffed districts. Policy makers should look for a more rounded approach as increased salaries combined with other supports such as investments in district resources, targeted funding for higher need communities, and support systems for socioeconomic barriers could provide strong returns in academic achievement in an effective use of our educational budget.

VII. LIMITATIONS

My research faced a few limitations throughout data collection and overall scope and size of the research. With limited available data on average county level teacher salaries over large time spans, there was a lack of a core variable in order to do a multi-year dataset in a longitudinal design. An opportunity to have been able to observe changes over time for example 2016 through 2024 would have provided more context into the dynamics of the relationship and how Covid and school closers could have affected not only student performance but salaries as well. A study in that design could have the potential to catch important lag effects or longer term patterns in these changes.

A second limitation involves an absence of key control variables. As mentioned, there are a wide range of factors that influence student performance, and it's difficult to effectively manage all of these at one time. I focused on county level cost of living adjusted salaries for my research

as it was effective to manage all my variables as county units. I originally wanted to look at other units such as district level characteristics like district wealth, student-teacher ratios, teacher experience levels, and district spending per pupil were not included due to time constraints and the differences in units of measure. These variables, if included, could have been effective at isolating the sole effect of teacher salary on performance.

Additionally, I focused exclusively on public school districts, which are very appropriate for California's statewide education system. An interesting addition to my research would have been to compare public schools outcomes with private or charter schools, especially in counties where private schools could attract a large share of the local teacher supply. These comparisons could help determine if compensation structures in private schools lead to a statistically significant difference in academic results.

I believe a look into a more detailed analysis of this project and finding district level data to allow for a finer grained analysis of this relationship. Or other studies could look into whether salary impacts teacher retention and how the teacher performs over time. I believe also separating by subject we could find differences, for example if higher pay attracts more qualified STEM teachers, how much higher or if any would math scores differ from ELA scores.

VIII. CONCLUSIONS

This project and research found that the relationship between teacher salary, cost of living, and academic performance at the county level in California is complex and hard to truly compare. While higher base salaries do tend to correlate with a higher CAASPP score, the effect weakens slightly once county-level cost of living adjustments are used. Many counties that appear well compensated on paper tend to fall behind after adjusting for local economic conditions. Leading to the suggestion that salary alone is not a sufficient predictor of student

performance on state tests. I also found that structural factors such as county or district wealth, demographic differences, teacher experience, and student-teacher ratios are important factors that shape students overall performance. Compensation matters, but it operates with a wide range of variables and other factors that this project could not measure in its entirety. Despite the limitations, I believe this research is valuable insight into policy debates about teacher pay, school funding equity, and the challenges of educating students in one of the most economically and geographically diverse states in the nation. All together, these findings show the need for a more nuanced and regional responsive approach to teacher educational budgets in California. As state leaders and district officials face constant student achievement gaps and shortages, analyses like this can support more targeted strategies to better reflect the local issues across the state.

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