Examining the Effect of the Number of Arts Teachers on the Number of 2-Year and 4-Year Arts Degree Completions Across California Counties

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ABSTRACT

I examine if changes in ninth-grade full-time equivalent arts teachers result in a decrease in 2-year and 4-year arts degree completions. I identify a period when the number of arts teachers significantly decreased across several California counties following 1998. I perform a differences-in-differences regression on data segmented by 2-year and 4-year degree completions. I find a statistically significant treatment effect for 2-year arts degrees, but it is independent of the pre-treat and post-treat period. This indicates no causal relationship between the number of degree completions and the number of ninth-grade arts teachers. I do see that the model is a better fit for associate's degrees than bachelor's degrees.

Keywords: Arts Teachers, Degree Completions, California Counties, Major Choice

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I. Introduction

I seek to show if changes in the number of high school arts teachers affect the number of arts majors in colleges and universities. This is an important area of study because several areas intersect where research is limited: arts exposure and continuing with arts in higher education, the effects of the total number of teachers in a certain subject (beyond class size studies), and the effect of high school teachers on college major choice.

I examine the decline in grade nine arts teachers across California counties during the 1999 school year and compare the number of arts teachers and associate's and bachelor's degree completions before and after 1999. The completions are year-adjusted to correspond with those same ninth-grade students[1]. I identify counties with no decline in arts teachers as the control group and counties that experienced a decline in teachers as the treatment group. I then perform a classic differences-in-differences regression to see if changes in arts major completions in counties can be explained by changes in the number of grade nine arts teachers.

II. Literature Review

Course choice in high school influences college major choice, achievement levels in college, and earnings (Rose, 2004). Effects vary by race, gender, and subject, among other factors (Riegle-Crumb, 2006). Math course-taking patterns, for example, accompany strong racial and ethnic disparities (Ladson-Billings,1997).

Teachers in high school and higher education are also important to understanding college major choices. For example, first-course university teachers in a certain subject may account for

[1] This is explained in more detail in the data discussion, but each grade nine student cannot be tracked. Segmenting data by county, I year-adjust completions to the same ninth-grade year. However, these completions are not from the same students. A student would have to attend a 2-year or 4-year college or university that reports degree completion statistics in the same county as grade nine education for them to be quasi-"tracked." I realize students are likely to leave their county for higher education.

a large probability of choosing to major in that same subject (Karnani, 2016). Existing literature also shows that teachers are important for student outcomes (Rockoff, 2004). Students who have high-quality teachers in school are more likely to attend colleges or universities, attend a better university, and obtain higher earnings (Chetty et al., 2014). While research exists on how certain factors affect major choice, limited research is available on how the number of high school teachers affects major choice.

The area of interest of this paper is arts education. The effects of arts education, specifically music learning, have been heavily studied for achievement effects. Music learning has been shown to improve academic achievement, cognitive abilities, and early reading and mathematical skills (Morrison, 1994; Babo, 2004; Cabanac, 2013). The focus on high school achievement is motivated by the fact that academic achievement in high school has clear consequences for college attendance and persistence, as well as success in the labor force (Adelman, 1999). However, exposure to the arts seems to counterintuitively predispose students not to participate in the arts in college. Although music learning increases mathematical skills, a higher rank in math increases the likelihood of choosing STEM majors and decreases the likelihood of choosing arts majors in college (Delaney, 2019).

The literature on arts education for the sake of continuing in the arts in higher education and beyond is limited. Furthermore, the impact of high school teachers on college enrollment is also an area that deserves further study.

Karnani provides the motivation for much of this study's methodology. Karnani segments Chilean university freshmen into cohorts depending on their randomly assigned exposure to certain faculty to determine the impact of first-year teachers on major choice. Karnani finds that first-economic-course teachers may account for 15-22% of the probability of choosing economics as a university major. I perform a similar study over a longer time period (school years 1997-2000) and horizon (from ninth grade to higher education) across counties instead of one university.

In this paper, I explore arts for the sake of arts. I seek to understand if exposure to the arts in high school affects the number of associate's and bachelor's degree completions. Because of the significance of teacher effects on student choices and outcomes, I use full-time equivalent arts teachers as a proxy for understanding college major choice.

III. Background

Several metrics are important for understanding the state of the arts in K-12 education: funding, student participation, and the number of teachers.

United States arts funding has seen significant historical and ongoing cuts, resulting in major philanthropic initiatives. The National Endowment for the Arts, a common indicator of United States arts funding sentiment, saw major budget cuts in the 1970s and 1990s in line with decreasing arts funding in schools (National Endowment for the Arts Appropriations History). A recent budget proposal suggested the United States cut all funding to the National Endowment for the Arts.

In addition to funding, student participation is an important metric for understanding arts programs in K-12 education. From the 1999 academic school year through the 2003 school year, K-12 student participation in music declined by 46.5%, the largest of any academic subject area. The number of K-12 music teachers declined by 26.7%, and participation in general music courses declined by 85.8%. Total K-12 arts education enrollment decreased by 24.4%, while total enrollment increased by 5.8%. K-12 arts enrollment as a percentage of total student enrollment declined by 28.6% (Morrison, 2004).

I selected the 1999 school year to impose treatment in this paper because the transition from the 1998 to 1999 school year marked a significant decrease in the number of enrolled arts students and arts faculty in K-12 California schools.

In response to declining participation and teachers, California introduced several pieces of legislation: the Local Control Funding Formula in 2013, Assembly Bill 86 in 2014, Senate Bill 916 in 2016, Assembly Bill 37 in 2017, and the New California Arts Standards in 2019. From 2014 to 2019, the number of teachers across all arts disciplines grew by 17% (Woodworth, 2022).

On November 8, 2022, California voters approved Proposition 28: The Arts and Music in Schools Funding Guarantee and Accountability Act. Proposition 28 dramatically increased arts funding, beginning in the 2023-2024 school year. At least 80 percent of funds expended must be used to employ certificated or classified employees to provide arts education program instruction.

In this paper, I seek to understand if the use of funds in policies similar to Proposition 28 to employ certified employees like full-time teachers in the arts affects the number of arts majors in colleges and universities. It may be that funds can be allocated in ways other than increasing the number of arts teachers.

IV. Data

To explore the effects of high school teachers on college major choice, I need data at the high school, college, and university levels. Data should be separable into multiple treatment and control groups and of sufficient size to observe changes between groups and allow for control variables like gender. Data should also show a significant change in the number of teachers between certain years.

Because of the need for sufficient size, I select data from the state of California. I segment this data by county instead of district because colleges and universities are subject to different district assignments than K-12 districts. Data is from the California Basic Educational Data System (CBEDS) Professional Assignment Information Form (PAIF) for the 1997, 1998, 1999, and 2000 school years to observe the impact of the decrease in arts teachers in the year 1999. The data includes information on student enrollment by gender and approximately 750,000 teaching and administrative staff in California by subject (39 total, including art) and grade taught (K-12), broken down by county and district.

College and university enrollment data is from the National Center for Education Statistics (NCES) Integrated Postsecondary Education Data System (IPEDS), which has data on approximately 6,400 colleges, universities, and technical and vocational institutions since 1980. I look at the number of bachelor's and associate's degree completions in the arts and in all subjects by gender for all California colleges and universities.

These two available data sources are generally reliable. However, data from future years in CBEDS, specifically 2001 and 2003, are excluded because of the significant increase in the total number of full-time equivalent staff, which is assumed to be attributed to a data discrepancy.

I isolate my data to explore only ninth-grade effects across 1997, 1998, 1999, and 2000. I compare single-year changes in high school and corresponding single-year changes in the number of degree completions. I subtract the date of completion of associate's degrees by six years and the completion of bachelor’s degrees by eight years to account for degrees eventually completed by those corresponding ninth-grade students. A student who enrolls in ninth grade in 1997 is a senior in a four-year university in 2004 and completes his degree in the summer of 2005. This is eight years later. A student in a two-year program graduates six years later in the summer of 2003. Therefore, all data on 4-year and 2-year degrees are completions that occur 8 and 6 years later, respectively and are time-adjusted. In summary, a 4-year completion in 1997 tracks the 4-year degree a student in 1997 would get if he pursued the degree in the same county. The same is true for 2-year degree completions.

I have three groups of data listed in Table 1: Group 1, Group 2, and Group 3. Group 1 is data for all counties in California that were complete for the years 1997, 1998, 1999, and 2000. 39 counties have complete information at the grade nine and higher education level. Group 2 and Group 3 data are segmented into treated and control groups for analysis. The pre-treat period includes the years 1997 and 1998, while the post-treat period includes the years 1999 and 2000. The post-treat period began in 1999 because treatment counties saw a significant decline in arts teachers in that year. Control groups are defined as groups that saw little to no change in arts teachers between the pre-treat and post-treat periods. Treatment groups saw a significant decrease in arts teachers.

The main difference between Group 2 and Group 3 is that Group 2 is only comprised of counties with complete 2-year degree data, and Group 3 is only comprised of counties with complete 4-year degree data. Group 2 is data for 16 counties split into 5 control and 11 treated counties. 23 counties are excluded from Group 2 that did not offer 2-year degrees and did not fall into a treated or control group. Group 3 data is for 13 counties split into 4 control and 9 treated counties. 26 counties were excluded from Group 3 that did not offer 4-year degrees and did not fall into a treated or control group. Group 2 and Group 3 are essential for the differences-in-differences regression because I impose treatment and control groups.

Table 2 lists each county that corresponds to each group, along with treatment and control counties for Group 2 and Group 3.

Table 1 displays general summary statistics by the ninth-grade level in addition to 2-year and 4-year degree completions (aggregate and arts-specific). Ninth-grade summary statistics include the number of teachers, teacher education level, number of years a teacher spent teaching, number of years a teacher was in a county, and grade nine enrollment numbers (aggregate and arts-specific). Notice that arts teachers decrease post-treat in the treated group but slightly increase post-treat in the control group for Group 1 and Group 2. Group 1 treated decreases from 21.58751 to 16.86818, while Group 1 control increases from 8.80569 to 9.663. Group 2 treated decreases from 25.97696 to 20.41111, while Group 2 control increases from 8.242863 to 9.0425.

Also, from Group 1, 2-year arts degree completions decrease after treatment from 47.36364 to 40.77273, while 2-year total completions in the treated group increase from 2113.773 to 2285.273. Meanwhile, 2-year control arts degree completions increase from 9.5 to 9.6, and 2-year total control completions increase from 1017 to 1079.5. The same decrease in treated completions is not true for 4-year degrees. In Group 2, 4-year treated art degree completions increase from 131.6667 to 143.5, and 4-year total treated completions increase from 3159.944 to 3303.444. The control group also increases from 85.625 to 110.875 4-year arts degree completions and from 2875.5 to 2913.5 total 4-year degree completions.

V. Empirical Strategy

My initial question is, do changes in the number of high school arts teachers affect the number of arts majors in colleges and universities? I narrow this question to the following: do changes in ninth-grade full-time equivalent arts teachers result in a decrease in 2-year and 4-year degree completions? I identify relevant data needed to test this question: sufficiently large data that could be aggregated and compared across high schools, colleges, and universities that were affected by a quasi-random change in the number of arts teachers. I compare arts teachers by California county and identify a significant decrease in the number of arts teachers in 1999. I assign treatment and control groups based on 2-year and 4-year data availability. These groups are defined in Table 2.

A large portion of the empirical strategy setup—the definition of Groups, the assignment of control and treatment counties, and the determination of the pre- and post-treat period—is explained in the data discussion to understand summary statistics in Table 1.

Evidence in support of an effect by arts teachers in ninth grade on the number of arts completions would be a statistically significant change in the number of 2-year or 4-year degree completions in counties from the pre- to post-treat period in counties that were treated, accompanied by little to no change in 2-year or 4-year degree completions in control counties from the pre- to post-treat period.

This can be determined from a differences-in-differences approach. The classic equation takes the following form:

$$Y_{it} = \beta_0 + \beta_1 Treated_i + \beta_2 Post_t + \beta_3 Treated_i \times Post_t + \varepsilon_{it}$$

The goal is to estimate the interaction between the treatment and the time when treatment occurs. The term ($Treated_i \times Post_t$) estimates that interaction. Treatment starts in 1999 and continues until the year 2000. Data for 1999 or 2000 is indicated by the $Post_t$ variable. $Post_t = 1$ for post-treat periods, and $Post_t = 0$ for pre-treatment periods. Treatment is indicated by the $Treated_t$ variable. $Treated_t = 1$ for treated groups, and $Treated_t = 0$ for control groups. The number of control and treatment groups depends on whether or not I perform an associate's degree (Group 2) or bachelor's degree (Group 3) regression because of data availability. Furthermore, Y_{it} is regressed twice, once as the number of 2-year degree completions (Group 2) and again as the number of 4-year degree completions (Group 3).

Evidence in support of an effect from arts teachers in ninth grade on the number of arts completions would be a statistically significant β_3 coefficient from the classic differences-in-differences regression $Treated_i \times Post_t$ variable. Evidence not in favor of this effect would be a statistically insignificant β_3 coefficient.

In addition to the classic regression, I include several control variables that might make treatment and control counties move in parallel: teachers, teacher education level, teacher number of years teaching, and grade nine enrollment. The same that is true for the β_3 coefficient is true for the β_7 coefficient in the regression with controls. For clarity, I have written all the equations below.

For the associate's degree regression, I regress the following without controls:

$$2YearDegreeArts_{it} = \beta_0 + \beta_1 Treated_i + \beta_2 Post_t + \beta_3 Treated_i \times Post_t + \varepsilon_{it} \qquad (1)$$

For the associate's degree regression, I use a very similar equation with controls:

$$2YearDegreeArts_{it} = \beta_0 + \beta_1 Teachers_{it} + \beta_2 TeacherEducationLevel_{it} + \beta_3 NumYearsTeach_{it}$$
$$+ \beta_4 Grade9Enrollment_{it} + \beta_5 Treated_i + \beta_6 Post_t + \beta_7 Treated_i \times Post_t \qquad (2)$$

For the bachelor's degree regression, I regress the following without controls:

$$4YearDegreeArts_{it} = \beta_0 + \beta_1 Treated_i + \beta_2 Post_t + \beta_3 Treated_i \times Post_t + \varepsilon_{it} \qquad (3)$$

For the bachelor's degree regression, I regress the following with controls:

$$4YearDegreeArts_{it} = \beta_0 + \beta_1 Teachers_{it} + \beta_2 TeacherEducationLevel_{it} + \beta_3 NumYearsTeach_{it}$$
$$+ \beta_4 Grade9Enrollment_{it} + \beta_5 Treated_i + \beta_6 Post_t + \beta_7 Treated_i \times Post_t \qquad (4)$$

VI. Evidence

The 4-year differences-in-differences regression without controls shows a statistically significant effect of the constant term on 4-year arts degrees. No other terms are statistically significant. The model is a poor fit with an R-squared[2] of 0.0297. The low R-squared and only significant constant term indicate that the model does not effectively capture the variations in the number of 4-year arts degrees based on the grade nine changes in the number of arts teachers. The same is true for the 4-year differences-in-differences regression with controls. No term is statistically significant, and the model has an R-squared of 0.2078. This suggests the model is a better fit with controls but holds poor explanatory power for the variations in the number of 4-year arts degrees.

[2] I realize that a differences-in-differences regression is used for inference rather than prediction. Therefore, while a higher R-squared indicates a better fit, the focus of the regression is the significance and direction of the treatment effects.

The 2-year differences-in-differences regression without controls shows a statistically significant treated effect (p = 0.007) but a poor fit with an R-squared value of 0.1811. The 2-year regression with controls still shows a statistically significant treated effect (at a lower level of p = 0.087) but with a much stronger fit (R-squared = 0.6152). Given positive coefficients for the 2-year regression without and with controls (37.86364 and 17.71319, respectively), this is evidence that the decrease in arts teachers in grade nine (the treatment) is positively correlated with 2-year arts degrees. In other words, the number of arts teachers in grade nine is negatively correlated with the number of 2-year arts degree completions. This relationship is not causal, as there was no statistically significant interaction between treatment and the pre- and post-treat periods. Furthermore, the regression with controls is marginally statistically significant.

In no regression is the $\beta_7 Treated_i \times Post_t$ coefficient statistically significant, suggesting the differences-in-differences approach does not identify a causal relationship between the number of arts teachers in ninth grade and the corresponding completions of 2-year and 4-year arts degrees. Furthermore, the evidence does not confirm that there is no general causal relationship between arts teachers and the number of 2-year and 4-year arts degrees. The evidence does show a better fit for the 2-year model with a statistically significant negative correlation between the number of arts teachers in grade nine and the number of two-year arts degree completions.

I reiterate that there is no causal evidence in support of my research question. Complete regression results are displayed in Table 3.

VII. Conclusions

I seek to explain if changes in ninth-grade full-time equivalent arts teachers result in a decrease in 2-year and 4-year degree completions. I perform a differences-in-differences regression on several groups of data segmented by 2-year and 4-year degree completions. Data compares ninth-grade treatment identified by a decrease in the number of arts teachers in 1999 to the number of higher education degree completions.

I find a statistically significant treatment effect for 2-year arts degrees, but it is independent of the pre-treat and post-treat period, indicating that the study design does not provide causal evidence that the number of high school arts teachers affects the number of arts majors in colleges and universities. I do see that the model is a better fit for associate's degrees than bachelor's degrees based on R-squared values, with a statistically significant negative correlation between grade nine arts teachers and 2-year arts completions. Ultimately, there is no causal evidence in support of my research question.

This study has several limitations. One methodology limitation is that the number of arts teachers for each student was not tracked in grades 10, 11, and 12. Also, the effects of the first year of a 2-year degree and the first, second, and third years of a 4-year degree were not controlled. Furthermore, relevant control variables such as ethnicity, student wealth, and high school funding were not included.

One fundamental methodology limitation is the inability to track ninth-grade students' college major choices. Instead, the total number of completions was used, which assumes students who attend high school in a certain county remain in that county for higher education (if those students even attend a college or university). This assumption may hold for a larger fraction of students who attend 2-year degree programs, given the 2-year regression was a better fit (R-squared = 0.1811 without controls, and R-squared = 0.6152 with controls) than the 4-year regression (R-squared = 0.0297 without controls, and R-squared = 0.2078 with controls). It makes intuitive sense that associate's degree-granting colleges may enroll more students from their own county. However, this is another area for study.

To improve this study, one might explore the number of arts teachers in grades 9, 10, 11, and 12 and track major choice by what students report in their senior year of high school.

A future study might examine if causal effects are possible by county aggregation for 4-year and 2-year degrees without student tracking. It may be that the more effective link between high school and higher education major choice is what students report in their senior year of high school rather than actual higher education enrollment statistics. I suggest a study that compares college major choices reported by high school seniors and the number of completions at 2-year and 4-year colleges and universities by county to explore if county-aggregated high school to higher education comparisons are possible and effective.

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Table 1
Summary Statistics

	Group 1	Group 2				Group 3			
	All years, all counties	**Pre-treat, control, 2-year**	**Post-treat, control, 2-year**	**Pre-treat, treated, 2-year**	**Post-treat, treated, 2-year**	**Pre-treat, control, 4-year**	**Post-treat, control, 4-year**	**Pre-treat, treated, 4-year**	**Post-treat, treated, 4-year**
Teachers	527.5651 (936.7999)	292.7459 (192.5299)	309.976 (203.5512)	514.5632 (363.5613)	567.53 (405.5162)	307.7601 (198.3048)	323.0913 (207.375)	610.5076 (330.6524)	675.1472 (367.7369)
Teachers, arts	17.15813 (29.60769)	8.80569 (5.062245)	9.663 (5.959325)	21.58751 (17.24388)	16.86818 (14.23167)	8.242863 (5.159193)	9.0425 (5.882123)	25.97696 (15.97196)	20.41111 (13.30685)
Teacher education level	3.675394 (.1597933)	3.707769 (.1751746)	3.777555 (.1661641)	3.628908 (.1456161)	3.670935 (.1392041)	3.725099 (.1511734)	3.777654 (.1734512)	3.599711 (.1409881)	3.655724 (.1468156)
Teacher education level, arts	3.635398 (.3470577)	3.575261 (.4092321)	3.636849 (.38704)	3.485377 (.3582249)	3.653409 (.2712671)	3.79123 (.3062191)	3.756592 (.3515212)	3.560222 (.2209077)	3.599217 (.2645876)
Teacher #yrs teaching	13.83538 (1.436938)	13.98713 (1.091662)	13.86367 (1.676995)	13.44444 (.9877416)	12.90691 (1.237951)	13.48261 (.8459879)	13.22472 (1.349071)	13.43428 (.9336765)	12.66743 (.7855325)
Teacher #yrs teaching, arts	16.86954 (3.447763)	18.05805 (4.375348)	17.09819 (3.788748)	16.70852 (3.18284)	15.9466 (3.023166)	17.19473 (2.211139)	16.09272 (1.853294)	15.86876 (1.948369)	15.37098 (1.808904)
Teacher #yrs in county	10.90832 (1.350774)	11.26622 (.806475)	10.71914 (.8155304)	10.46306 (1.101152)	9.950903 (1.097734)	10.82206 (.7038146)	10.50556 (.8828019)	10.54115 (1.173436)	9.823898 (.9760237)
Teacher #yrs in county, arts	14.43282 (3.588635)	15.26303 (4.119357)	13.81938 (3.303316)	14.30396 (2.960911)	13.60724 (3.030042)	14.85855 (2.846166)	13.15341 (1.696828)	13.58595 (1.919134)	13.15206 (1.332034)

Grade 9 enrollment	73787.2 (136943)		40864 (25377.08)	39984.8 (25695.22)	75864.45 (54868.39)	75566.05 (56403.54)		42058.63 (26091.67)	41080 (26379.38)	90466.22 (49712.03)	90247.06 (51657.32)
Grade 9 enrollment, arts	2766.154 (5017.009)		1392.1 (819.8664)	1520.8 (968.4667)	3428.727 (2823.488)	2692.5 (2396.867)		1292.875 (853.2388)	1416.75 (975.4024)	4140.944 (2625.54)	3266.722 (2275.115)
4-year degrees	3692.635 (7208.592)		1136.8 (1433.582)	1150.8 (1405.466)	2585.409 (2879.43)	2702.818 (2966.519)		2875.5 (2170.7)	2913.5 (2163.331)	3159.944 (2884.385)	3303.444 (2961.424)
4-year degrees, arts	261.5897 (610.5029)		21.9 (21.70228)	33.1 (38.67945)	107.7273 (123.3675)	117.4091 (128.7677)		85.625 (91.78225)	110.875 (107.6322)	131.6667 (124.351)	143.5 (128.5234)
2-year degrees	2077.314 (3349.441)		1017 (603.1068)	1079.5 (627.827)	2113.773 (1276.982)	2285.273 (1392.565)		925.5 (724.3636)	950.25 (746.4426)	2524.056 (1015.832)	2738.667 (1094.274)
2-year degrees, arts	65.94231 (205.0783)		9.5 (7.090682)	9.6 (7.336363)	47.36364 (49.11846)	40.77273 (34.25942)		7.375 (8.83075)	7.125 (8.822658)	57.33333 (48.9994)	49 (32.46718)
Number of observations	39 counties * 4 years = 156		5 counties * 2 cohorts of 2 years = 10	5 counties * 2 cohorts of 2 years = 10	11 counties * 2 cohorts of 2 years = 22	11 counties * 2 cohorts of 2 years = 22		4 counties * 2 cohorts of 2 years = 8	4 counties * 2 cohorts of 2 years = 8	9 counties * 2 cohorts of 2 years = 18	9 counties * 2 cohorts of years = 18

*Note: This table provides the mean and standard deviation (in parentheses) for ninth-grade, college, and university statistics. Data is segmented into three groups. Group 1 is data for all 39 counties. Group 2 is data for 16 counties split into 5 control and 11 treated counties. Notice that 23 counties are excluded from Group 2 that did not offer 2-year degrees and did not fall into a treated or control group. Group 3 data is for 13 counties split into 4 control and 9 treated counties. 26 counties were excluded from Group 3 that did not offer 4-year degrees and did not fall into a treated or control group. Ninth-grade statistics include the number of teachers, teacher education level, number of years a teacher spent teaching, number of years a teacher was in a county, and grade nine enrollment numbers (aggregate and arts-specific). Higher education statistics include the total number of 4-year degrees and 2-year degrees (aggregate and arts-specific) that would be completed by those corresponding ninth-grade students. The pre-treatment period includes the years 1997 and 1998, and the post-treat period includes 1999 and 2000. Notice the decline in arts teachers in the treated counties during the post-treat period but not for control counties.

Table 2
Counties in Group 1, Group 2, and Group 3

Group 1: Alameda, Butte, Contra Costa, El Dorado, Fresno, Humboldt, Imperial, Kern, Lassen, Los Angeles, Marin, Merced, Mendocino, Monterey, Napa, Orange, Placer, Plumas, Riverside, Sacramento, San Bernardino, San Diego, San Francisco, San Joaquin, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Shasta, Siskiyou, Solano, Sonoma, Stanislaus, Tulare, Tuolumne, Ventura, Yolo, and Yuba County

Group 2: Alameda, Fresno, Imperial, Kern, Placer, Riverside, Sacramento, San Bernardino, San Joaquin, San Luis Obispo, San Mateo, Siskiyou, Stanislaus, Tulare, Tuolumne, Ventura

- **Treated:** Alameda, Fresno, Imperial, Placer, Riverside, Sacramento, San Bernardino, San Mateo, Siskiyou, Stanislaus, and Ventura County
- **Control:** Kern, San Joaquin, San Luis Obispo, Tulare, Tuolumne

Group 3: Alameda, Fresno, Kern, Placer, Riverside, Sacramento, San Bernardino, San Joaquin, San Luis Obispo, San Mateo, Stanislaus, Ventura, Yolo

- **Treated:** Alameda, Fresno, Placer, Riverside, Sacramento, San Bernardino, San Mateo, Stanislaus, Ventura
- **Control:** Kern, San Joaquin, San Luis Obispo, Yolo

*Note: This table provides the names of all counties included in each group of Table 1 (Group 1, Group 2, and Group 3).

Table 3
Differences-in-Differences Regression Results for 2-Year and 4-Year Degrees

	Outcome Variables			
	2-year arts degrees (1)	**2-year arts degrees (2)**	**4-year arts degrees (3)**	**4-year arts degrees (4)**
Constant	9.5 (11.27311)	-38.79944 (100.4098)	85.625*** (42.197)	746.4703 (527.1234)
Post	.1 (15.94259)	3.432011 (11.50735)	25.25 (59.67557)	29.42349 (57.07427)
Treated	37.86364*** (13.59589)	17.71319** (10.17945)	46.04167 (50.71448)	-15.68215 (54.12436)
Post * Treated	-6.690909 (19.22749)	-2.939967 (13.90365)	-13.41667 (71.7211)	-27.02323 (69.7067)
Controls		Yes, includes controls		Yes, includes controls
R-squared	0.1811	0.6152	0.0297	0.2078
Number of observations	16 counties * 4 years = 64	16 counties * 4 years = 64	13 counties * 4 years = 52	13 counties * 4 years = 52

*Note: This table provides data on the differences-in-differences regressions referenced in equations (1), (2), (3), and (4) in the empirical strategy discussion. 2-year arts degrees and 4-year arts degrees are regressed using treatment, post-treat, and interactive treatment and post-treat variables. Two regressions are done without controls, and two regressions are done with controls. Control variables used include teachers, teacher education level, teacher number of years teaching, and grade nine enrollment. * is the multiplication symbol, ** indicates a p-value < 0.1, and *** indicates a p-value < 0.05. For Treated, 2-year arts degrees, $p = 0.007$. For Treated, 2-year arts degrees with controls, $p = 0.087$. For Constant, 4-year arts degrees, $p = 0.048$.