

Association Between Fail Rates and Executive Order Status for CSUMB Students (2011-2018)

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Introduction

California State University (CSU) has 23 campuses in the higher public education system. The Chancellor of the CSU system decided to change the general education (GE) requirements for students starting in the 2018 academic year. The changes to the GE requirements were called Executive Order (EO) 1100R and EO 1110. EO 1100R states that all GE requirement courses must be changed from four units to three units. EO 1110 states that students who are under-prepared for GE courses will be placed in the GE course along with a supporting course, rather than being placed in a lower prerequisite course that is not at the college level. For example, if you would normally be placed in Math 99 to prepare you for college level math, EO 1110 places these students directly into the college level math course (eg: Math 130 - Precalculus) and gives the option of a supporting corequisite course for extra academic support in the class.

This topic is important to research because it impacts the success of college students. The classes, course load, and unit requirements will all affect whether a student will succeed and graduate, or drop out of college.

The calstate.edu website states that one in four students that were placed in a course that was lower than college level (eg: Math 99) would not return for their second year and only ten percent of these students would graduate within four years. These low success rates were the driving force to put these executive orders in place. Researching and analyzing the outcomes of these orders will give the CSU system better knowledge of how helpful, or harmful, the orders are.

Objective

Our objective for this project is to investigate if the pass rates for the GE courses increased or decreased after the executive orders were put into place. We will also be quantifying the estimated change in pass rates, whether it is an increase or decrease.

Method

The original dataset for this study contains 516 observations of 7 variables from 2018 and before. The variables include campus (California State University Campus), year (academic year), course code, enrollment, DFW (percentage of students who did not pass the class with a D, F, or W grade), and impact (number of students who did not pass the class with a D, F, or W grade).

Campus	Year	Course.Code	Enrollment	DFW	Impact	Cour.Code.num	Campus.num	Exec
San Jose	2017	MATH30P	267	37	100	36	13	0
San Jose	2012	MATH31	878	29	253	37	13	0
Humboldt	2015	MATH105	353	34	120	4	6	0
San Diego	2017	MATH245	362	33	120	31	11	0
Humboldt	2011	STAT109	381	19	71	47	6	0

For our study, we choose the response variable to be “DFW,” which is the percentage of students who did not pass a math or statistics course and had a grade of D, F, or W. Our chosen explanatory variable is “Exec,” a binary variable created by us. “Exec” represents whether or not the executive orders were implemented, either yes (1) or no (0). We considered the following multiple regression model:

$$\text{DFW} = \gamma_0 + \gamma_1 \text{Exec} + \gamma_2 \text{Course Code} + \gamma_3 \text{Enrollment} + \gamma_4 \text{Campus} + \epsilon.$$

Course code and campus were originally categorical variables, such as “MATH101” and “Monterey Bay”, respectively. Both of these variables were changed to numerical variables for easier analysis, with a unique number assigned to each course and campus.

γ_1 is interpreted as the average difference in the percentage of students who did not pass the course when we compare the status of the executive order (yes or no), conditioning on course code, enrollment, and campus. The test we conducted to answer the research question was $H_0: \gamma_1 = 0$ and $H_1: \gamma_1 \neq 0$ at the significance level of $\alpha = 0.05$.

Result

The sample size of this data set is 516. Each of the 13 campuses collected data from 2011 to 2018. The DFW mean = 25.76, which shows that an average of 25.76% of students do not pass their classes. The Enrollment mean = 811.9, which shows an average of 812 students enrolled for this data set.

Our parameter of interest, γ_1 , is estimated to be -2.272331 . Our 95% confidence interval is $(-4.167, -0.377)$. The p-value for our fitted model is 0.0189. The adjusted R-squared value = 0.08075.

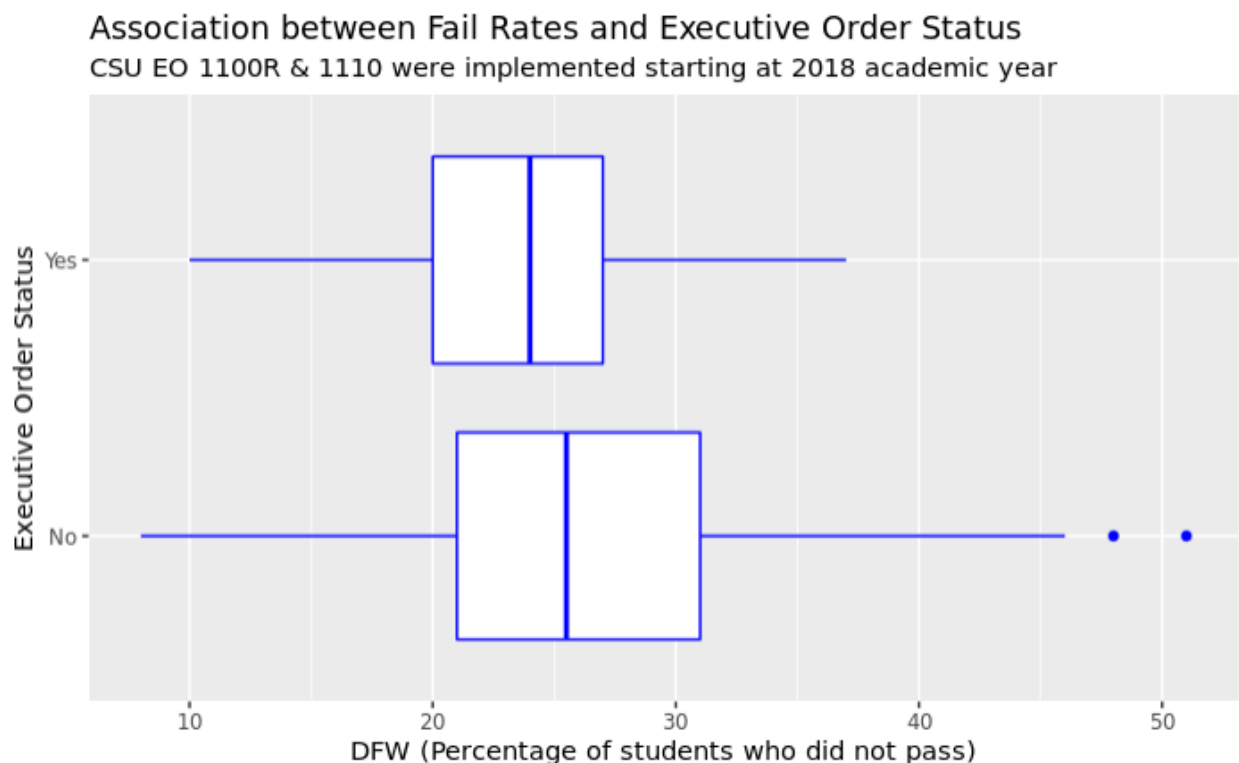
Discussion

We decided to build our model by testing the importance of all possible third variables. Our strategy showed that $\text{DFW} = \gamma_0 + \gamma_1 \text{Exec} + \gamma_2 \text{Course Code} + \gamma_3 \text{Enrollment} + \gamma_4 \text{Campus} + \epsilon$ is the best model to use. From this model we were able to test our hypothesis that there is an average difference in the percentage of students who did not pass the course when we compare the status of the executive order, conditioning on course code, enrollment and campus. The parameter of interest, executive order, is estimated at -2.272331 with a p-value of 0.0189. The 95% confidence interval showed that the estimated parameter will be a value between $-4.167, -0.377$.

When we condition on course, enrollment, and campus, the difference in the average percentage of students who did not pass the course when we compare the status of the executive order (yes or no) is -2.272331 with a 95% confidence interval of $(-4.167, -0.377)$.

There is statistical evidence ($p\text{-value} = 0.0189$) to reject the null hypothesis. There is a difference in the average percentage of students who did not pass the course when we compare the status of the executive order. This difference is estimated at -2.272331 , therefore the fail rates decreased after the executive order was implemented. A decrease in fail rates can be associated with an increase in pass rates.

Limitations for this data analysis are that only 13 of the 23 CSU campuses had data and the data stopped in 2018. If data from more of the campuses were available, along with the most current year (2019), we could have a more accurate representation of the effects of the Executive Orders.



References

“California State University Office of the Chancellor.” The California State University, www2.calstate.edu/.