

EVALUATION OF THE CCCCO FINANCIAL LITERACY PILOT INTERIM REPORT



RAY MARSHALL CENTER FOR THE STUDY OF HUMAN RESOURCES
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Ashweeta Patnaik

Cynthia Juniper

Greg Cumpton

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3001 Lake Austin Blvd., Suite 3.200
Austin, TX 78703 (512) 471-7891
www.raymarshallcenter.org

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INTRODUCTION

BACKGROUND

The California Community College Chancellor's office' (CCCCO) has a financial literacy initiative whose focus for the past six years has been to provide financial literacy training and certification for California community college staff. In 2018, John Pierson and CJ Juleff, the CCCCCO's financial wellness consultants, reviewed a number of benchmarking efforts implemented in various states. Their primary goal was to assess what a "different" and "effective" intervention would look like and could be successfully implemented at California community colleges.

The CCCCCO's consultants identified a model implemented at Austin Community College (ACC) in Austin, Texas. This model views financial wellness as a tool to increase institutional student success and retention efforts by using current technology (texting) to deliver selected financial literacy messages to a selected group of students. The model has been very successful at ACC, where 4,000 first-year students have participated in the pushed-text effort over three years and data shows a thirteen percent increase in fall-to-fall persistence of participating students (Patnaik et al. 2018, Patnaik et al. 2019).

OVERVIEW OF THE FL PILOT

Financial wellness and financial literacy are important when it comes to the success of California community college students. With this in mind, the CCCCCO brought together fifteen California community colleges to pilot a unique financial literacy messaging intervention (FL Pilot) in 2019. The goal of the pilot was to increase student retention and success by delivering useful financial literacy material, focusing on much-needed information about budgeting and credit, and specifically targeting first-year, first-time students, via a texting/email platform. The CCCCCO provided the colleges with all necessary tools and training. Colleges were able to implement the pilot in a manner which best reflected their institutional resources.

Participating colleges used a variety of strategies to implement the FL pilot, including choosing diverse student settings and including the delivery of materials to as few as two group settings and as many as five. Colleges identified a target population for the intervention, made an introductory financial literacy presentation to the target population, and recruited students to participate in the pilot. Students who

opted in to participate in the pilot received ten messages related to budgets and ten messages related to credit (see Appendix A).

OVERVIEW OF THE EVALUATION

The CCCCO partnered with the Ray Marshall Center for the Study of Human Resources (RMC), the LBJ School of Public Affairs, The University of Texas at Austin to conduct a comprehensive evaluation of the FL pilot. RMC is nationally and internationally recognized for its policy and program evaluation in human resources and education. For the last five years, RMC has been evaluating and monitoring the federally-funded ‘pushed’ financial literacy initiative at Austin Community College, the effort that is the model for the CCCCO’s pilot.

The goal of this evaluation of the FL pilot was to determine if this ‘low investment/high return’ approach to delivering financial literacy to California community college students would generate the kind of outcomes already observed in Texas. RMC’s evaluation included an outcome evaluation for each college and a rigorous impact evaluation for the pilot as a whole. RMC tracked and evaluated the academic and retention outcomes of students participating in the FL pilot.¹

Of the fifteen colleges that implemented the pilot in 2019, ten colleges chose to participate in the evaluation. RMC developed a self-evaluation toolkit for the five colleges that selected not to participate in the evaluation. RMC also offered technical assistance to help these colleges conduct an internal evaluation of their pilot’s outcomes and impacts.

At the time of this report, RMC had received evaluation data from seven of the ten colleges participating in the evaluation. This interim report synthesizes findings across these seven colleges: Fullerton College, Merced College, Mission College, Moorpark College, Mt. San Antonio College, West Valley College and Yuba College. This interim analysis includes 618 participating students from the seven colleges, representing 66 percent of all participating students across the ten participating colleges.

¹ The 2019 ‘cohort’ of pilot schools are now preparing for a second year in this pilot effort. RMC will continue to track and measure data for the 2019 cohort of colleges through the implementation of a second successive effort in the Summer and Fall of 2020.

EVALUATION DESIGN

In designing the FL pilot, the CCCC's working hypothesis was that the additional financial literacy support provided to these first year/first time students, particularly focused on topics related to budgeting and credit, would improve academic and retention outcomes for these students. As the cost of community colleges is relatively low from semester to semester, knowledge of budgeting and accessing credit and subsequent financially literate behaviors might play a role in whether individuals have enough money to continue to the next semester. Even if college is completely paid for (as might be the case for those receiving Pell grants), other costs likely still play a role in the decisions around re-enrolling.

Research has suggested that financial wellness and financial literacy are important when it comes to the success of students in higher education. Robb et al. evaluated the perception of debt and student persistence at two major universities and found that financial factors play a significant role in student persistence. Eichelberger et al. utilized comparative data to demonstrate that students who completed a personal finance course had a significantly higher probability of year to year retention and successful degree completion.

The Ohio State University conducted a national survey in 2017 (Survey of Collegiate Financial Wellness: "Making Ends Meet") in which fifteen California community colleges participated. That survey indicated that: 40 percent of California community college students consider dropping out of school because of financial challenges; financial challenges caused 47 percent to neglect academic work; and, 51 percent considered taking a break from school because of financial challenges. Survey data also suggests that the greatest challenges for these community college students were related to successful management of budgeting and understanding how credit works.

Thus, the research questions guiding this evaluation included:

- Did students who received the financial literacy messages have better academic outcomes than similar students who did not receive the messages, measured in terms of GPA, credit hour accumulation, and academic standing?
- Did students who received the financial literacy messages have higher persistence rates than similar students who did not receive the messages, measured in terms of fall-to-spring persistence and fall-to-fall persistence?

The impact analysis was designed to address the question: what impact did the FL pilot have on key student outcomes? The main goal of the impact analysis was attribution – isolating the effect of the FL pilot from other factors and potential selection bias. The main challenge of any impact analysis is to determine what would have happened to program participants if the program had not existed (i.e. the counterfactual). While a program’s impact can truly be assessed only by comparing the actual and counterfactual outcomes, the counterfactual is not observed. Without information on the counterfactual, the next best alternative is to compare outcomes of program participants with those of a comparison group of non-participants. Successful impact analyses hinge on finding a good comparison group (Khandker et al. 2009).

The Ray Marshall Center used a quasi-experimental evaluation methodology to estimate the impacts of the FL pilot on key student outcomes. A quasi-experimental design was appropriate since the program did not easily lend itself to a random assignment evaluation. Recent research has demonstrated that, when carried out under the right conditions, quasi-experimental estimation produces impact estimates that are similar in direction and magnitude to those resulting from more expensive and intrusive experimental evaluation methods (Greenberg et al. 2006).

Propensity score matching (PSM) was used to create a statistically matched comparison group of non-participants who were as similar to pilot participants as possible on a wide range of observed characteristics — age, gender, race, disability status, first-time college student status, first-generation college student status, and financial aid status etc. Using PSM, estimated impacts can help capture the incremental value of the pilot over and above services traditionally delivered by the college.

Selection of the comparison group pool

At the beginning of this pilot, RMC considered the use of two potential comparison group pools: (1) students in colleges that did not participate in the FL pilot and (2) students from colleges that did participate in the pilot but were not recruited for participation. However, we found that colleges were unwilling to participate in the evaluation and share individual level student data for students who were not directly involved with the pilot. As a result, the comparison group pool in our final analysis design was made up of all students who attended the Financial Literacy presentation, opted-out, and did not receive the financial literacy messages at the seven colleges participating in the FL pilot evaluation.

While presenting a challenge, this setup also offered an advantage. Individuals targeted by colleges for this intervention often participated in specific programs that were already providing supports to increase academic performance and retention. Thus, both opt-out as well as opt-in participants received these traditional supports absent the intervention. Had other students at the colleges potentially been selected as part of a comparison group, they might not have participated in these programs and impact results could have been confounded between traditionally offered supports and the FL Pilot.

DATA SOURCES

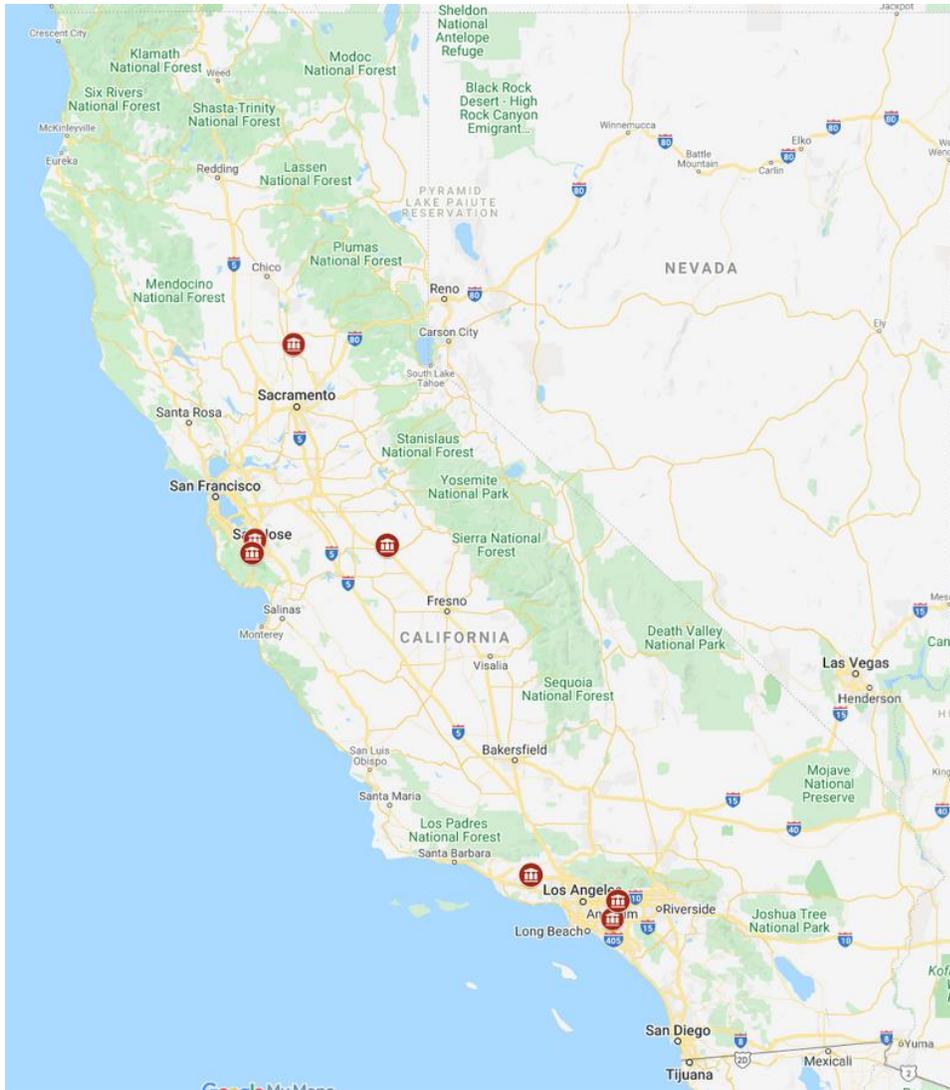
All colleges implementing the FL Pilot maintained a student tracking worksheet (see Appendix B). The student tracking worksheet documented the students targeted for the intervention, their opt-in status, and other metrics related to the pilot. Data on student characteristics and key outcomes was pulled from colleges' instructional research data systems. Data was pulled for both opt-out and opt-in students. Colleges already regularly report these data elements to the California Community Colleges Management Information System. Appendix C and Appendix D list the data elements that were pulled.

REPORT ORGANIZATION

The following chapter describes the local context at the colleges participating in the pilot and how the pilot was implemented. The next chapter describes characteristics of the pilot participants, followed by a chapter describing key outcomes for pilot participants. The penultimate chapter describes the impact analysis and results, while the final chapter discusses key findings and next steps for the evaluation.

PROGRAM DESCRIPTION

Figure 1. Geographic location of FL Pilot colleges

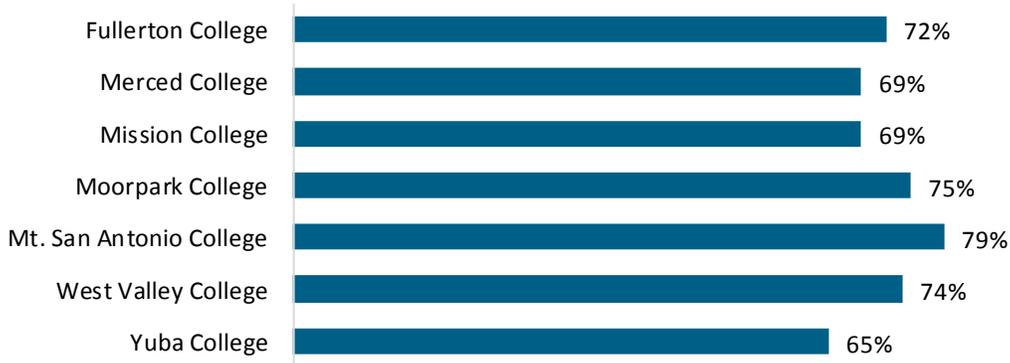


The seven colleges included in this interim report are geographically spread out across the state of California and include both large and medium size colleges, as well as city and suburban colleges. Colleges had relatively high fall-to-fall persistence rates,² ranging from 65 percent at Yuba College to 79

² The U.S. Department of Education's College Scorecard defines fall-to-fall persistence rates as the proportion of full-time, first-time undergraduates from one year's fall term that re-enrolled during the following year's fall term.

percent at Mount San Antonio College. The following sections describe each college and draw information from the college websites and the U.S. Department of Education’s College Scorecard.

Figure 2. Fall-to-fall persistence rates at participating colleges



Fullerton College

Fullerton College serves residents of Orange County, CA, located southeast of Los Angeles. The college offers associate degrees in 68 areas of study and over 90 certifications. Fullerton College is a large, suburban campus that served 20,260 students in Fall 2019. The majority of these students identified as Hispanic (56 percent) while 19 percent identified as White, 14 percent identified as Asian and only 3 percent identified as Black. Just over one third of the students enrolled full-time and 45 percent received Pell grants. The college had a 72 percent first year retention rate and a 27 percent graduation rate. Fullerton College costs on average \$5,289 annually.

Merced College

Merced College has two campuses: Merced Main located in the city of Merced, and Los Banos located approximately 40 miles from the main campus on the west side of Merced County. Merced County is approximately 120 miles east of San Jose. The college offers associate degrees in 47 areas of study and 32 certifications requiring 30 or more units of study. In Fall 2019, 9,873 students enrolled. The majority of these students identified as Hispanic (55 percent) while 19 percent identified as White, 8 percent identified as Asian and only 3 percent identified as Black. Nearly half of the students enrolled full-time studies and 65 percent received Pell grants. The college had a 69 percent first year retention rate and a 27 percent graduation rate. Merced College costs on average \$8,486 annually.

Mission College

Mission College is located in the City of Santa Clara in the heart of the Silicon Valley. Mission College is a medium size campus offering associate degrees in 25 areas of study and 39 certifications. In Fall 2019, 6,452 students enrolled. The majority of these students identified as Asian (42 percent) while 29 percent identified as Hispanic, 16 percent identified as White and only 4 percent identified as Black. Just over one fourth of the students enrolled full-time and 22 percent received Pell grants. The college had a 69 percent first year retention rate and a 21 percent graduation rate. Mission College costs on average \$7,590 annually.

Moorpark College

Moorpark College, a suburban, medium sized college, is located at the eastern edge of the city of Moorpark, northwest of Los Angeles by about 45 miles. The college offers associate degrees in 65 areas of study and 34 certifications. In Fall 2019, 13,282 students enrolled. The majority of these students identified as White (47 percent) while 36 percent identified as Hispanic, 8 percent identified as Asian and only 2 percent identified as Black. Over 40 percent of the students enrolled full-time and 28 percent received Pell grants. The college had a 75 percent first year retention rate and a 29 percent graduation rate. Moorpark College costs on average \$1,272 annually.

Mount San Antonio College

Mt. San Antonio College (Mt. SAC) is one of the largest California community colleges located in Walnut, CA, on the eastern edge of the Greater Los Angeles Area. Mt. SAC offers associate degrees in 14 areas of study and over 100 certifications. In Fall 2019, 26,702 students enrolled. The majority of these students identified as Hispanic (63 percent) while 18 percent identified as Asian, 10 percent identified as White and only 4 percent identified as Black. Thirty-eight percent of the students enrolled full-time and 47 percent received Pell grants. The college had a 79 percent first year retention rate and a 32 percent graduation rate. Mount San Antonio College costs on average \$2,570 annually.

West Valley College

West Valley College is a suburban, medium sized campus located at the southwest border of Silicon Valley offering associate degrees in 35 areas of study and 50 certifications. In Fall 2019, 6,719 students

enrolled. The majority of these students identified as White (40 percent) while 30 percent identified as Hispanic, 19 percent identified as Asian and only 2 percent identified as Black. Thirty-eight percent of the students enrolled full-time and 25 percent received Pell grants. The college had a 74 percent first year retention rate and a 21 percent graduation rate. West Valley College costs on average \$6,720 annually.

Yuba College

Yuba College, a medium size suburban campus, is located in Marysville, approximately 40 miles north of Sacramento. The college offers associate degrees in 32 areas of study and 43 achievement and training certifications. In addition to the main campus, the college operates two remote education centers and served a total of 4,901 students in Fall 2019. The majority of these students identified as either White or Hispanic (36 percent and 34 percent respectively), while 15 percent identified as Asian and only 4 percent identified as Black. Nearly 45 percent of the students enrolled full-time and 48 percent received Pell grants. The college had a 65 percent first year retention rate and a 26 percent graduation rate. Yuba community college costs on average \$2,724 annually.

IMPLEMENTATION

Colleges chose to implement their pilots in many different ways. The choice of target population, size of the pilot, and method of communication varied quite a bit across the colleges. Three colleges used texting as their mode of communication, while two colleges used email as their mode of communication, and two colleges used both email and texting.

Fullerton College

All first-time college students were recruited to participate in the FL Pilot. These students were sent an email inviting them to attend a Financial Literacy presentation. Anaheim Pledge program³ students were also recruited to participate. The financial aid office used the Mongoose Cadence texting platform to

³ Recent graduates of the Anaheim Union High School district have the opportunity to enroll in the Anaheim Pledge program to receive a tuition-free first-year of college. Students receive outreach services and support as they transition from high school to full-time college students. In addition, counseling and mentoring services are also available to ensure they have a successful first year.

send the financial literacy messages to students; this platform provides the opportunity for students to respond to text messages with questions and comments.

Merced College

Extended Opportunity Programs and Services⁴ (EOPS) students were recruited to participate in the FL Pilot. The financial aid office used the Regroup software to send the financial literacy messages to students. The Regroup software configuration used by Merced College only allows for one-way communication - students did not have an opportunity to respond with questions or comments.

Mission College

First-time and continuing students receiving support services through a number of programs were recruited for the FL Pilot. Recruited students received services from the following programs: TRIO⁵ (Upward Bound, Talent Search and Student Support Service programs), EOPS, Puente⁶ and the California College Promise.⁷ In addition, the general student population was also recruited to participate. The school marketing department used the SlickText platform to send the financial literacy messages to students. Students received one-way text messages without the opportunity to respond.

Moorpark College

Students were recruited for the FL Pilot from a number of different venues including new student orientation, college strategies courses, and students receiving support services through the following programs: First Year Experience⁸ (FYE), EOPS, and Collaborative for Hispanics in Higher Education and

⁴ The EOPS program is designed to encourage the enrollment, retention, and transfer to four-year institutions for eligible students challenged by language, social, economic and educational disadvantages. The program offers students a number of support services including academic, career and transfer counseling; financial aid; and other support services.

⁵ The federal TRIO programs provide services to increasing retention, graduation, and transfer rates of students that are first generation college, low income, and/or students with disabilities.

⁶ The Puente program typically provides support services to improve graduation and transfer rates to four-year colleges for low income, first generation Hispanic students.

⁷ The California Promise provides tuition assistance for qualifying students

⁸ The FYE program provides academic, career, and personal counseling; priority registration and transfer assistance; and access to special activities and workshops.

Student Success⁹ (Project CHES). The students receiving support services included both first-year and continuing students. The financial aid office used the Regroup texting platform to send the financial literacy messages to students. The Regroup software configuration only allowed for one-way communication; students did not have an opportunity to respond with questions or comments.

Mount San Antonio College

The financial aid office worked with the campus counseling office to recruit new students enrolled in Counseling 1¹⁰ for the FL Pilot. Emails were sent using each student's official Mt. SAC email address, allowing for two way communication.

West Valley College

First-time and continuing students receiving services through a number of support service programs were recruited for the FL Pilot. Recruited students received services from the following TRIO programs: Upward Bound, Talent Search and Student Support Service. Freshmen students were also recruited from the FYE Program College Success Counseling classes.¹¹ The financial aid office used email messages allowing for two-way communication.

Yuba College

Two groups of students receiving Student Services support were targeted for the FL Pilot to receive the text messages: Umoja¹² and Puente participants. The financial aid office used Remind 101 which allows for two-way communication between students and financial aid staff sending the messages.

⁹ Project CHES is designed to support the transition of Hispanic students to four-year programs.

¹⁰ Counseling 1 is an introduction to college course providing an orientation to college life and educational resources along with education and degrees planning.

¹¹ The FYE Program participants enroll in at least one FYE-designated English and/or Math course as well as a College Success Counseling class. The program is designed to offer students support and guidance to reach transfer, graduation, and career goals.

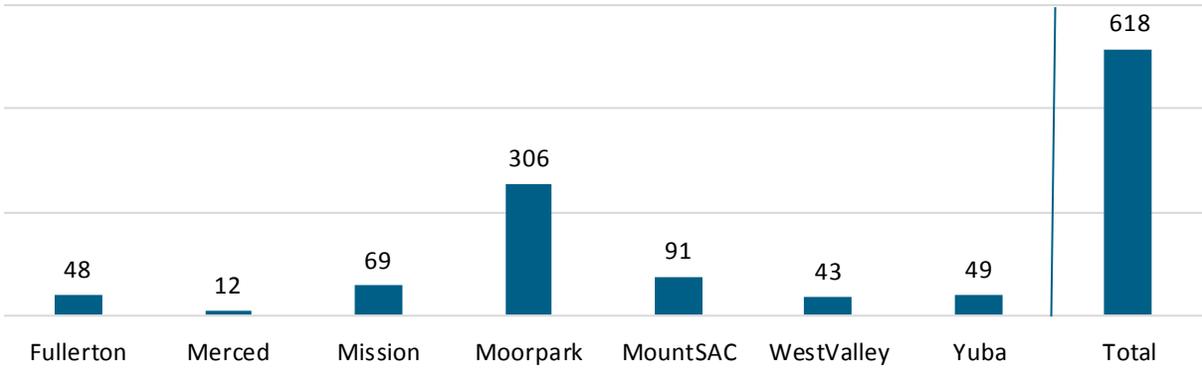
¹² The Umoja program typically provides support services to improve graduation and transfer rates to four-year colleges for low income, first generation students of African ancestry.

PARTICIPANT CHARACTERISTICS

RECRUITMENT

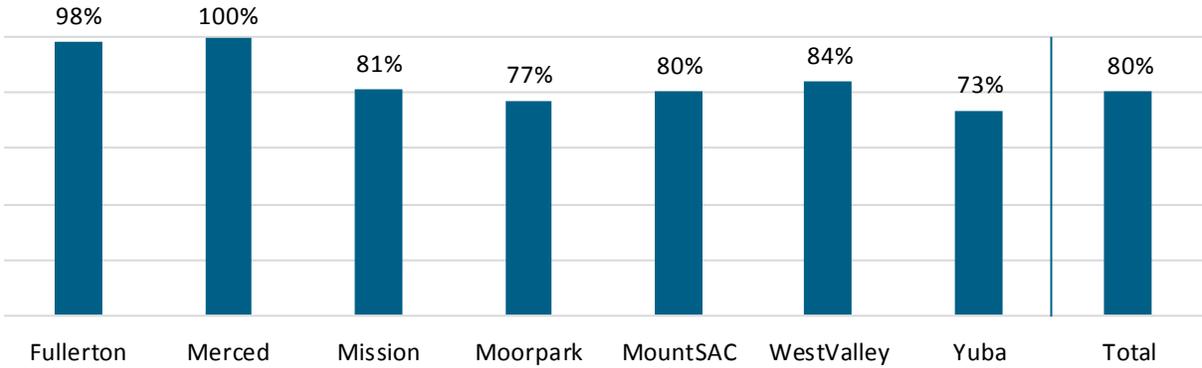
The FL pilot at the seven participating colleges targeted a total of 618 students. The pilots at the colleges varied considerably by size, ranging from 12 students at Merced College to 306 students at Moorpark College.

Figure 3. Pilot size by college



Of the 618 targeted students, 80 percent opted-in to the pilot. Opt-in rates across the colleges were high but varied, ranging from a low of 73 percent at Yuba College to a high of 100 percent at Merced College. Of the 496 students who opted in to the pilot, a total of 22 students provided inaccurate contact information and hence did not receive the financial literacy messages. Thus, our analysis includes 474 students in the treatment group who opted-in and received messages and 144 students in the comparison group who did not receive messages.

Figure 4. Opt-in rates by college



DEMOGRAPHIC CHARACTERISTICS

Table 1 lists student characteristics for the 618 students included in our analysis. Only a tenth of students were aged 21 or older. A little over half of all students were female. A third of all students were White while over half were Hispanic. Three quarters of students were attending college for the first time, while a third reported being the first in their family to attend college. More than half of students were financial aid recipients, while a fifth of students received EOPS services.¹³

Table 1. Target population characteristics

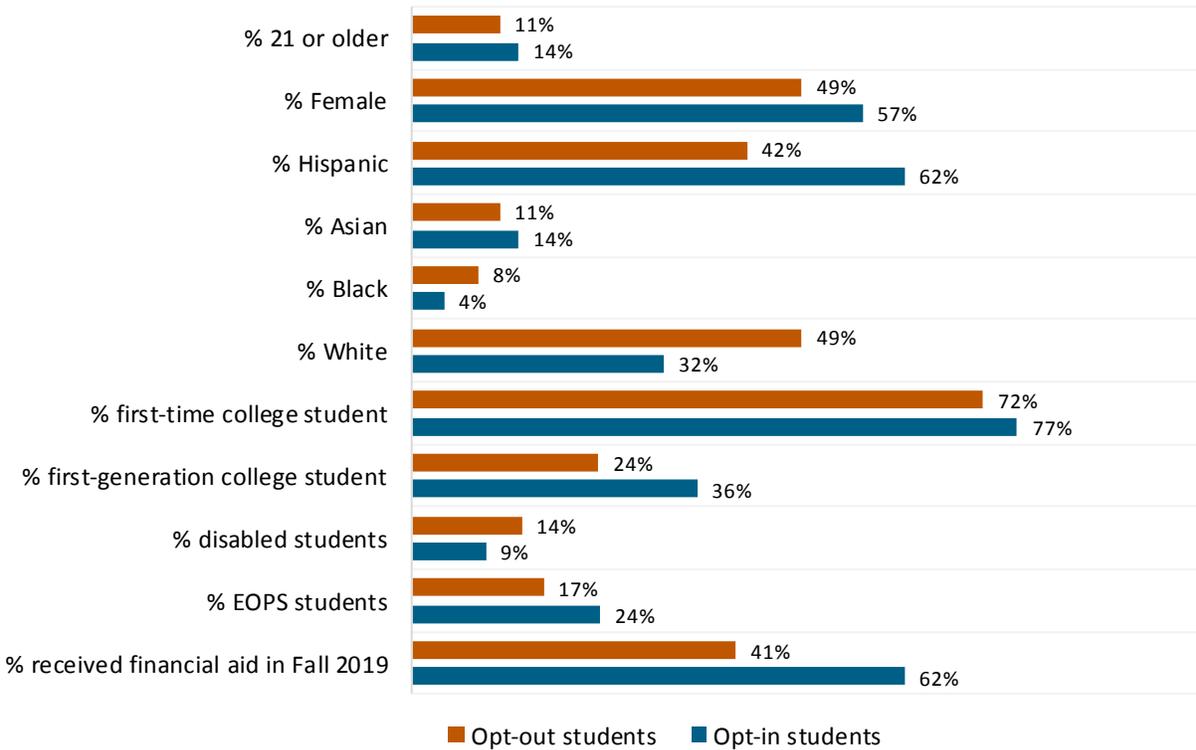
All CCCCO FL Pilot colleges	All students N = 618	Opt-out students N = 144	Opt-in students N = 474
% 21 or older	13%	11%	14%
% Female	55%	49%	57%
% Hispanic	58%	42%	62%
% Asian	13%	11%	14%
% Black	5%	8%	4%
% White	36%	49%	32%
% first-time college student	76%	72%	77%
% first-generation college student	33%	24%	36%
% disabled students	10%	14%	9%
% EOPS students	22%	17%	24%
% received financial aid in Fall 2019	57%	41%	62%

Figure 1 illustrates demographic characteristics for opt-out and opt-in students. In some ways, opt-in students appeared to be relatively similar to opt-out students. Both the groups were young with about 90 percent of student under the age of 21. About half of all students in both groups were female. About

¹³ Student data made available to the evaluation team only identified students receiving EOPS and financial aid. Unfortunately, the evaluation team does not have information about student participation in students support programs such as TRIO programs, FYE programs, Project CHES, student success courses.

a tenth of students in both groups were Asian. About three-quarters of both groups were first-time college students. Only about a tenth of students in both groups were disabled.

Figure 5. Demographic characteristics by opt-in status



There are, however, major differences worth noting. The opt-in students had a significantly higher proportion of Hispanic students and significantly lower proportions of Black and White students, compared to the opt-out students. The opt-in students also had a significantly higher proportion of first-generation college students, EOPS students, and financial aid students. Given the differences documented between the opt-in students and the opt-out students on these observable characteristics, it is necessary to account for them as well as possible in order to attribute any differences in outcomes to the FL pilot.

PROGRAM OUTCOMES

In this interim report, we examine short-term outcomes for students including first-semester GPA, first-semester credit accumulation, first-semester academic standing and fall-to-spring persistence.

Outcomes for the opt-in students are compared with outcomes for the opt-out students in Table 2.

Overall, opt-in students who received the financial literacy messages appeared to have slightly better academic outcomes, compared to opt-out students who did not receive the messages. Opt-in students earned an average GPA of 2.9 and accumulated an average of 12.5 credits in the Fall 2019 semester; in contrast, opt-out students earned an average GPA of 2.6 and accumulated an average of 11 credits in the Fall 2019 semester. Eighty-five percent of opt-in students were in good standing at the end of the Fall 2019 semester, compared to seventy-eight percent of opt-out students. Ninety-two percent of opt-in students persisted and enrolled in the Spring 2020 semester, compared to eighty-five percent of opt-out students.

Table 2. Overall outcomes

All CCCCO FL Pilot colleges	Opt-out students N=144	Opt-in Students N=474
Average GPA in Fall 2019	2.6	2.9
Average number of credits earned in Fall 2019	11.0	12.5
% in good academic standing at end of Fall 2019	78%	85%
% enrolled in Spring 2020	85%	92%

However, these results are descriptive in nature and do not control for differences among individuals in the two groups. Given the demographic differences documented in Table 1 and Figure 5 between the opt-in students and the opt-out students, it is necessary to account for them as well as possible in order to attribute any differences in outcomes to the FL pilot. The impact analysis in the next chapter accounts for these differences.

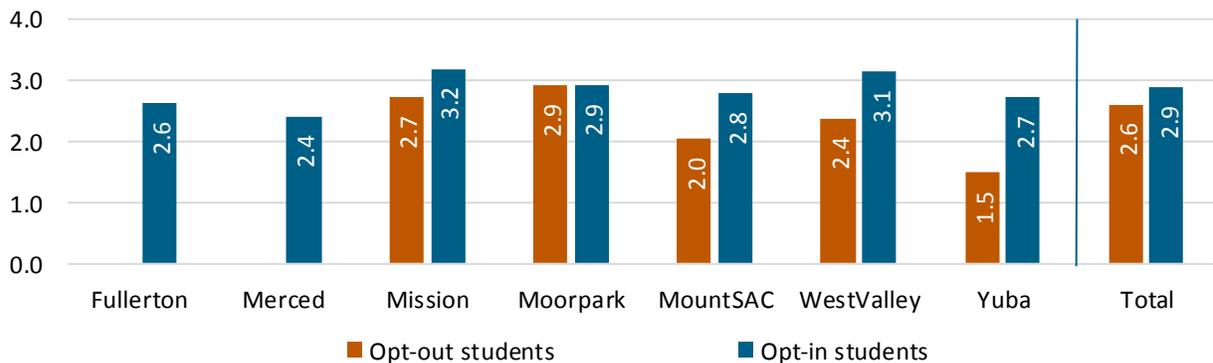
OUTCOMES BY COLLEGE

Outcomes varied by college. Across all colleges, the opt-in students who received the financial literacy messages appeared to have slightly better academic outcomes, compared to opt-out students who did not receive the messages; however, not all differences were statistically significant.¹⁴ Due to the small sample sizes at individual colleges, as well as the documented demographic differences between the opt-in and opt-out groups, differences in outcomes between the opt-in and opt-out students at individual colleges described below should be interpreted carefully.

GPA

At Mt. San Antonio College, West Valley College and Yuba College, opt-in students had a significantly higher average GPA in the Fall 2019 semester, compared to opt-out students. At Mission College, opt-in students appeared to have a slightly higher average GPA in the Fall 2019 semester than opt-out students; however, this difference was not statistically significant. At Moorpark college, opt-in and opt-out students had the same average GPA in the Fall 2019 semester.

Figure 6. Average GPA in Fall 2019, by college and opt-in status



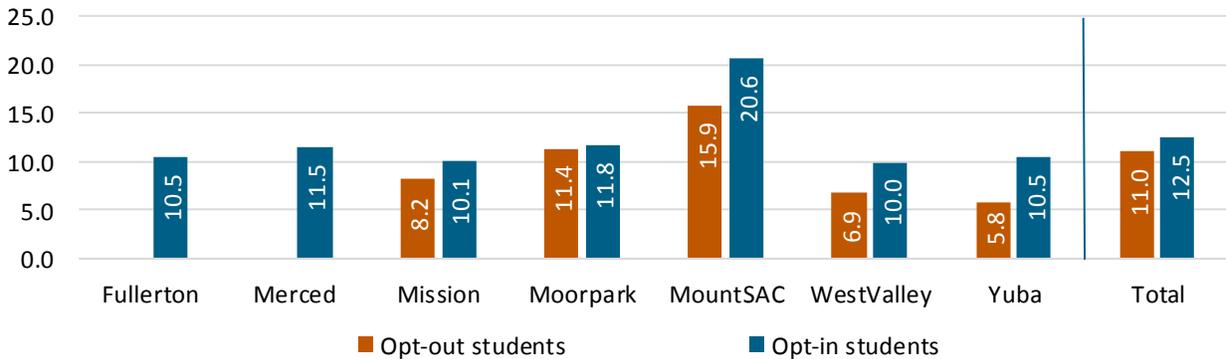
Credit accumulation

The average number of credits earned by students varied considerably by college, likely reflecting the college structure and programs offered. At Yuba College and West Valley College, opt-in students earned a significantly higher number of credits on average in the Fall 2019 semester, compared to opt-

¹⁴ T-tests were used to identify statistically significant differences between opt-in students and opt-out students.

out students. At Mission College, Moorpark College, and Mt. San Antonio College, opt-in students appeared to earn on average more credits in the Fall 2019 semester than opt-out students; however, these differences were not statistically significant.

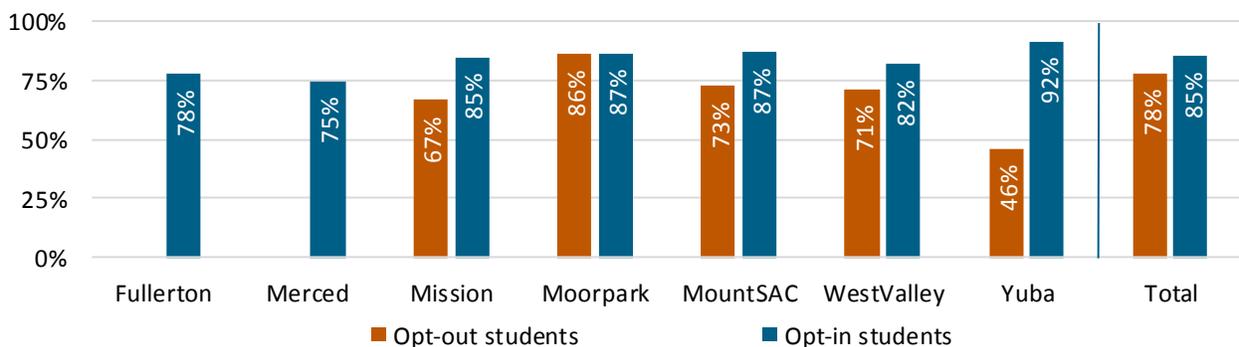
Figure 7. Credit hour accumulation in Fall 2019, by college and opt-in status



Academic standing

Overall, the proportions of students in good academic standing at the end of the Fall 2019 semester were high for both groups across most colleges. However, at Yuba College, 92 percent of opt-in students were in good academic standing at the end of the Fall 2019, compared to 46 percent of opt-out students – a statistically significant difference. At Mission College, Mt. San Antonio College, and West Valley College, opt-in students appeared to have higher proportions of students in good academic standing at the end of the Fall 2019 semester, compared to the opt-out students; however, these differences were not statistically significant. At Moorpark College, there was little to no difference between opt-in and opt-out students for this outcome.

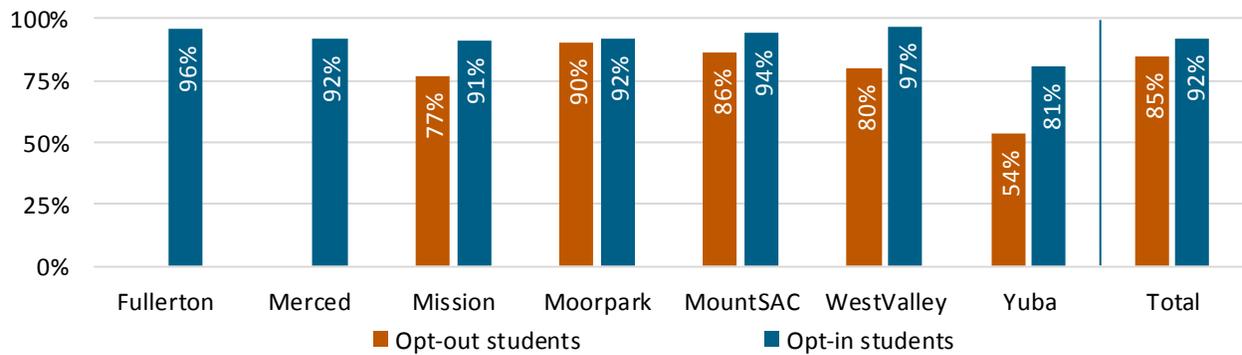
Figure 8. Percent in good academic standing at the end of Fall 2019, by college and opt-in status



Fall-to-spring persistence

Overall, fall-to-spring persistence rates were high for both groups across all colleges. At West Valley College and Yuba College, opt-in students had significantly higher fall-to-spring persistence rates, compared to opt-out students. At Mission College and Mt. San Antonio College, opt-in students appeared to have higher fall-to-spring persistence rates than opt-out students; however, these differences were not statistically significant. At Moorpark College, there was little to no difference in the fall-to-spring persistence rate between opt-in and opt-out students.

Figure 9. Fall-to-spring persistence rates, by college and opt-in status



PROGRAM IMPACTS

IMPACT ANALYSIS METHODOLOGY

The treatment group included all students who opted-in to receive the financial literacy messages at the seven colleges participating in the FL pilot evaluation. The comparison group pool included all students who opted-out and did not receive the financial literacy messages at the seven colleges participating in the FL pilot evaluation.

The evaluation team used the propensity score matching (PSM) approach to account for differences on the observable characteristics between the treatment group and the comparison group pool. See Appendix E for a detailed description of the application of this method. For subgroup analyses, the study sample was first limited to the sub-group and then the propensity score matching approach was utilized.

Opt-in students in the treatment group were matched to individuals from the comparison group pool of opt-out students. Students were matched on a wide range of observed characteristics: age, gender, race, disability status, first-time college student status, first-generation college student status, and EOPS status. The single nearest-neighbor technique was used; this technique involves finding for each treated individual that non-treated individual with the most similar propensity score and so, the most similar characteristics. The evaluation team assessed and confirmed that this matching approach achieved satisfactory balance in all observables characteristics (See Appendix F). Thus, the evaluation team can be confident that genuinely similar individuals are being compared in the estimates of the causal impact of the FL pilot on student outcomes

IMPACT FINDINGS

Overall impacts

After matching, the evaluation team estimated the impacts of participation in the FL pilot on key outcomes for all student (see Table 3). PSM models found that the FL pilot had a small but significant positive impact on GPA: the treatment group had an average GPA of 2.9, compared to an average GPA of 2.4 for the matched comparison group – a significant 0.5 point difference. PSM models indicate that the FL pilot had no significant impacts on credit hour accumulation, academic standing, and fall-to-spring persistence.

Table 3. Program impacts

College	Matched Comparison Group Mean	Treatment Group Mean	Difference	S.E.	P> z
Average GPA in Fall 2019	2.4	2.9	0.5	0.17	0.002 *
Average number of credits earned in Fall 2019	11.1	12.5	1.5	0.75	0.051
% in good academic standing at end of Fall 2019	77%	85%	8%	6%	0.127
% enrolled in Spring 2020	85%	92%	7%	5%	0.115

Note. * indicates statistically significant impact

Sub-group impacts

Next, the evaluation team estimated the impacts of participation in the FL pilot on key outcomes for subgroups. Due to small sample sizes for most sub-groups, we could only examine impacts for first-time college students at this time. Table 4 describes the impacts of participation in the FL pilot on key outcomes for first-time college students.

Table 4. Program impacts for first-time college students

First-time students	Matched Comparison Group Mean	Treatment Group Mean	Difference	S.E.	P> z
Average GPA in Fall 2019	2.4	2.8	0.5	0.18	0.009 *
Average number of credits earned in Fall 2019	10.8	12.0	1.2	0.66	0.072
% in good academic standing at end of Fall 2019	80%	85%	4%	6%	0.479
% enrolled in Spring 2020	81%	94%	13%	5%	0.015 *

Note. * indicates statistically significant impact

In addition to significant positive impact on GPA, PSM models also found that the FL pilot had a significant positive impact on fall-to-spring persistence for first-time college students: 94 percent of first-time college students in the treatment group persisted to the Spring semester, compared to 81 percent of first-time students in the matched comparison group— a significant 13 percentage point difference. PSM models indicate that the FL pilot had no significant impacts on credit hour accumulation and academic standing for first-time college students.

DISCUSSION

KEY FINDINGS

The findings in this interim report are preliminary. We expect to capture a more comprehensive picture of the pilot's impacts in our annual report later this year, when we will have longer-term outcomes like fall-to-spring persistence, additional student characteristics like financial aid receipt, as well as a larger sample size due to the inclusion of additional colleges. Our preliminary analysis suggests that the financial literacy messaging campaign had a small but positive impact on first-semester GPA, but no impact on first-semester credit accumulation, first-semester academic standing, and fall-to-spring persistence for all students. Sub-group analyses suggest fairly large positive impacts on fall-to-spring persistence for first-time college students.

Research in the last decade has found that low-cost, technological solutions such as text-based outreach show promise for supporting students in overcoming barriers that hinder college enrollment, persistence and completion (Castleman & Page, 2015; Castleman & Page, 2016; Bird & Castleman, 2016; Castleman & Page, 2017). However, such interventions usually focus on behavioral nudging, message framing, and logistical guidance, such as reminding students about important college and financial aid tasks as well as offering students the opportunity to connect one-on-one with a financial aid counselor for assistance.

The messages in the FL pilot were aimed at boosting financial literacy, with a specific focus on providing information about improving credit and utilizing budgets. More recent research has found that informational and remote advising interventions delivered at scale did not significantly impact academic outcomes (Oreopoulos & Petronijevic, 2019; Page et al., 2019; Bird et al., 2019). Researchers have posited that the salience and value of the messaging campaign may be diluted when an intervention is delivered broadly. Another potential limitation of a global approach to scale is that messages are primarily generic and one-way, so students lack a more direct relationship with the sender.

LIMITATIONS

Quasi-experimental design

The impact analysis is limited by its non-experimental design. While propensity score matching (PSM) controls for observed differences between the treatment group and the comparison group, it cannot control for selection bias that may be due to unobserved differences between the groups. As with all PSM approaches, the degree to which unmeasured sources of bias affect the comparability of groups is unknown. The limitation of any PSM approach is that, unlike an experiment, it is unable to ensure that the only difference between treatment and comparison group members is that the former received the treatment and the latter did not. In quasi-experimental designs, it is possible that individuals who have identical observable characteristics may differ on unobservable characteristics, such as their motivation to succeed. It is important to note that the limitations discussed here are common in quasi-experimental studies, and the design that the evaluation team used sought to mitigate them to the greatest extent possible.

The evaluation team made efforts to incorporate all available and important characteristics such as age, gender, race, first-time college student status, first-generation college student status, disability status, and EOPS status. However, some important characteristics such as marital status and number of dependents could not be included in the analysis, since data on these characteristics was not available for all students. Most importantly, financial aid status could not be used in matching because not all colleges were able to pull financial aid data in time for this interim report. However, we anticipate having this data later this year so we can address this limitation in the annual report.

Student data available to the evaluation team only identified students receiving EOPS and financial aid. Unfortunately, the evaluation team does not have information about student participation in other student support programs such as TRIO programs, FYE programs, Project CHES, student success courses etc. Receipt of such support services would have better informed the impact analysis.

Sample size

A limitation of this pilot study is the modest size of the overall comparison group. Because of the overall modest size of the comparison group pool (N=144), subgroup analyses could not be conducted for male

students, female students, Hispanic students, Black students, Asian students, first-generation students, and EOPS students.

Another limitation is our inability to match by blocking on college, due the small size of the comparison group at most colleges (only one college had a comparison group with more than 25 students). Blocking on colleges would ensure that we were comparing opt-in participants from a college only to opt-out participants from the same college.

Comparison group selection

Due to difficulties encountered in establishing data sharing agreement with participating colleges, our comparison group was made up of students who opted-out of the pilot. Although the comparison group of opt-out students did not receive the financial literacy messages over the Fall semester, they still received some financial literacy information during the hour-long financial literacy presentation in the recruitment phase.

NEXT STEPS

RMC will continue to receive and analyze follow up data for pilot participants. Our next report in late Fall 2020 will focus on fall-to-fall persistence, first-year GPA, first-year credit accumulation and first-year academic standing. Our final report in Spring 2020 will also examine credential attainment.

We expect to add three more colleges to the evaluation: East Los Angeles College, Lake Tahoe Community College and College of the Canyons. East Los Angeles College agreed to participate in the evaluation but is still in the process of establishing a data sharing agreement with RMC. Lake Tahoe Community College and College of the Canyons agreed to participate in the evaluation and established data sharing agreements with RMC; however, the two colleges were unable to share evaluation data with RMC in time to be included in this interim report. With the addition of these three colleges, our study sample size will increase and we hope to be able to examine program impacts for additional subgroups of interest, such as first-generation students. The CCCCO and RMC are also continuing to work on recruiting the five colleges that implemented the pilot in Fall 2019 but did not participate in this evaluation.

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APPENDIX A. MESSAGES SENT TO STUDENTS

Text 1

Hi _____ (insert first name). It was great to have you in the workshop last week. Have you created your Spending Plan? Check out mint.com!

[Mint.com is a good app for students to consider. The ability to track expenses is the key to managing money. You can connect your banks, bills and credit cards to get insights into your spending. Mint even allows accounts like PayPal and Venmo. Creating a Spending Plan is easy with Mint. If your community college has online budgeting templates on your website, you may want to highlight those tools in subsequent correspondence.]

Text 2

_____ (insert first name), it's _____ (insert sender's name). In the workshop we spent some time talking about credit reports. Make a point of checking your credit report at annualcreditreport.com.

[Identity theft is a significant issue for individuals in the age group 18-24 because this age group tends to share a great deal of personal information via social media. In addition, individuals are meeting new people on campus and are not always considering the true character of strangers because of the social settings. Checking your credit report three times a year (you are eligible for one free credit report per agency in a 12-month period versus a calendar year) enables you to discover any accounts that do not belong to you. We recommend setting a tickler system to remind you to access one of your three credit reports during a 12-month period. For example, mark your calendar for July to celebrate your financial independence; mark your calendar for November in gratitude for having the skills to manage your money; mark your calendar for February because you'll love knowing everything is fine.]

Text 3

Hello _____ (insert first name). What kind of shopper are you —impulsive, cautious, comparison, coupon, sale? Because spending is such a big part of our financial and social life, it pays to put some thought into our purchases.

[Most people make purchase every week, if not every day. Amazon makes it easy and appealing to buy items with a 1-Click option. Groupon encourages you to get a great deal on things you might otherwise never purchase. Buying things is an important part of our economy and it's important to put some thought into not only WHAT we are purchasing, but WHERE we're buying, and HOW MUCH we are paying. In addition, it's worth some thought about WHY we are buying. It's easy to turn a need into a want—but if you take the time to really think about your needs AND wants (short-term and long-term) before you shop, you may find it easier to stay on track with your Spending Plan.]

Text 4

_____ (insert first name), have you checked your credit lately? Remember you can get a good idea where you stand at creditkarma.com.

[Credit Karma offers a snapshot of creditworthiness. It's a great place to start and can give you a good idea of what your credit looks like. However, most lenders and other entities that check credit rely on the universal credit scoring corporation, Fair Isaac Corporation. FICO® scores range from 300 to 850; the higher the number, the better.]

Each creditor decides what credit score range it considers a good risk or a poor risk. Most lenders consider a score below 640 to be a poor risk.

If you are turned down for a loan or are offered a higher interest rate than you were expecting, there are steps you can take. First, under the law, you have the right to request a written explanation from the lender and the lender is obligated to provide your credit score. Then, you can make an action plan to begin to address the situation.

Keep in mind that the lender, not your credit score, makes the final decision to approve a loan application. A credit score is simply a tool used by the lender. The lender may take into consideration any special reasons for your past credit problems. In addition, the lender will consider the value of the property you own, your job history, income, savings, and the type of loan you want—before making a final decision.]

Text 5

Hi, _____ (insert first name). Credit cards are the most widely used form of credit. Here's a tip: Before you use your credit card, be sure you can pay off the balance in full on the items you purchase.

[Alert: A \$1,000 credit limit on your credit card is not \$1,000 in additional income. Instead, consider it as a different way to spend the money you already have. The smart way to build a good credit history is to save up for the item you want to buy and then use the convenience of your credit card to make the purchase. When your statement arrives, immediately pay off the item (balance) with the money you saved in your bank account. Not only will you pay your bill on time, you will not pay MORE for the item because you will not incur interest or late fees.

People who carry a balance on their credit cards month to month are paying more for the items than if they paid cash. Who want to do that?]

Text 6

_____ (insert first name), have you checked your spending leaks lately? Grab a notebook or use your phone to list every purchase and the amount for one week. You may be shocked!

[Spending leaks are simply expenses than can drain money from your weekly budget without you really noticing. They're often incidental items which may seem small in themselves, but which nonetheless add up over time. Just to name a few:

- *a daily stop at Starbucks (instead of making coffee at home)*
- *grabbing lunch to go (instead of brown-bagging it)*
- *incurring avoidable bank fees (overdraft fees, fees for using "other bank" ATMs)*
- *bottled water (instead of investing in a reusable bottle and filling it up)*
- *Groupons that sound good in the moment and then expire before use*
- *Impulse buying from the end displays at the checkout counter*

Identifying the culprits is half the battle when it comes to plugging the holes in your spending plan once and for all and converting a spending leak into a savings windfall.]

Text 7

It's _____ (insert sender's name) again! Have you written down a short-term or a long-term financial goal? Smartypig.com is a great tool for establishing savings goals and then setting \$\$ aside to reach your goals.

[It's possible that we think we can achieve success by carrying our financial goals and our spending plan in our head. The truth is that goals that are not written down are just unrealized dreams and spending plans in our head are too many numbers flying around. The best technique for establishing goals that are achievable is the SMART model.]

- *S = specific: What do you want to do?*
- *M = measurable: How will you know when you've reached it?*
- *A = achievable: Is it within your power to accomplish it?*
- *R = relevant: Is it important to YOU?*
- *T = Time bound: When exactly do you want to accomplish it?*

The most important money management goal is to have enough money to live on!]

Text 8

Hello _____ (insert first name). Did you realize that borrowing federal student loans for higher education expenses is an investment in yourself? But, only borrow as much as you need for school and basic living expenses.

[It's important to think about the return on your investment —or what you'll get for the money you're borrowing and the interest you're paying. A good rule of thumb is to borrow no more than you think your first year's salary will be after graduation.]

Federal student loans come in two types: Subsidized and unsubsidized. Subsidized loans do not accrue interest while you are in school. Unsubsidized loans do. If you have unsubsidized loans, consider making interest payments while you are in school – it will save you money in the long run.

To figure out what you can expect as a monthly payment, visit Federal Student Aid's Repayment Estimator to find out: bitly/2Repay.]

Text 9

_____ (insert first name), are you worried about financial fragility? Take a breath and open a savings account! Start saving \$10 today and keep up the habit.

[If you do not currently have a savings account, banks and credit unions will be happy to help you open an account so you can begin saving today. You can trust that your money will be safe in a savings account because the Federal Deposit Insurance Corporation (FDIC) and the National Credit Union Association (NCUA) insure bank or credit union deposits up to \$250,000 per account.]

If you have an open savings account, the key is to make regular deposits. You can set up automatic transfers from your checking account to your savings account—you determine the amount and day of the month. You can also set aside some money each week to deposit. Whatever you decide to do, just be sure to make a habit out of saving!

Remember, your spending plan should have a line item: PYF (pay yourself first)!]

Text 10

Hi _____ (insert first name). Is peer pressure taking a bite out of your wallet?

Instead of following your friends into debt, take the lead and manage your money.

[Peer pressure is a very powerful influence in many areas of our lives, especially in how we spend our money. One of the biggest problems with peer pressure is that the group of people we see as our “peers” is much bigger than in the past. Thanks to social media, we’re comparing ourselves to people with very different financial situations—like celebrities and famous athletes. Being your own person and making spending decisions that are right for you, not other people, takes discipline and courage.]

Text 11

_____ (insert first name) are you struggling with creating your budget? The 50-30-20 method may be the answer! Try out the FREE budget calculator app from NerdWallet.

[The 50-30-20 Rule helps you build a budget by using three spending categories:



NerdWallet (nerdwallet.com) provides a free budget worksheet and allows you to check the boxes for college student, parent, homeowner and more and then enter your income and expenses. It breaks expenses into necessities and wants. In addition, it provides the opportunity to consider savings and debt repayments. Then it provides the 50/30/20 comparison and recommendation.

This budget method was first mentioned in Elizabeth Warren and Amelia Warren Tyagi’s 2005 book, “All Your Worth: The Ultimate Lifetime Money Plan.” The rule is easy to remember and contains sound financial advice. However, the 50/30/20 budget assumes you bring home roughly the same amount of money every month. If your income fluctuates significantly each month, you may need to find a budgeting method that fits your situation better.]

Text 12

Hello, _____ (insert first name). Do you want to be a millionaire? Here’s a secret that millionaires know: live within (or below) your means. Check out The Millionaire Next Door, Thomas J Stanley.

[Authors Thomas J Stanley, Ph.D. and William D Danko, Ph.D. researched millionaires and identified seven common traits that show up again and again among those who have accumulated wealth. According to the authors, most of the truly wealthy in the USA don’t live in Beverly Hills or on Park Avenue – they live next door. Dr. Stanley has written several other books that are easy reads, including The Millionaire Mind, Stop Acting Rich...and Start Living Like a Millionaire, and Millionaire Women Next Door.]

Text 13

Hi, _____ (insert first name). Interested in a simple, systematic way of saving money and paying bills? The Envelope Budgeting Method is it! YouTube has several fun videos – watch today.

[Envelope budgeting is a simple, systematic way of saving money and paying bills. The envelope budgeting method started back when pills were paid with cash, and people could separate physical cash bills into different envelopes, each representing a different purpose. The envelope system is an excellent way to track exactly how much money

you have in each budget category for the month by keeping your cash tucked away in separate envelopes labeled with the budget categories. At the end of the month, you can see exactly how much cash is left by peeking in your envelope.

If you frequently go overboard in a certain category (hello, eating out!), then “cash out” the amount you’ve budgeted for and stick to it. When the money is gone, you get to be creative and stay home.

Here’s how it works:

1. Think of the budget categories that need a cash envelope. (groceries, gas....).
2. Figure out your budget amount.
3. Create and fill cash envelopes for the budget categories on payday.
4. Spend only what you’ve put in the cash envelope – when your cash is gone, it’s gone!
5. Do not borrow from other cash envelopes.

Remember, the whole purpose of the envelope system is to help you stick to your budget and control your spending.]

Text 14

_____ (insert first name), have you been paying yourself first? The first bill you pay each month should be to yourself. This habit can help you build tremendous wealth.

[To pay yourself first means simply this: Before you pay your bills, before you buy groceries, before you do anything else, set aside a portion of your income to save. Do not worry as much about the amount, as establishing a savings habit. If you need to start out small, you can always increase the amount as your income increases or your expenses decrease.

If you’re just getting started in the “real world,” saving can seem impossible. You may have rent, a car payment, groceries, and maybe student loans. You’d like to save, but at the end of the month there’s no money left. That’s the problem! Most people save what’s left over – left over at the end of the month – which is often zero. Paying yourself first means that you can develop a savings habit early and continue to build on it.

When you pay yourself first, you are mentally and physically establishing saving as a priority. You’re telling yourself that you worth the effort. Nobody tells themselves, “Saving was a mistake.” Don’t delay, begin saving today.]

Text 15

Hi, _____ (insert first name). Looking for ways to stretch a dollar? Check out special discounts for students on and around campus as well as www.giftcardgranny.com.

[College students should become pros at exploring the ways their educational status can save them money. Local venues, vendors, restaurants and services on or near college campuses often provide student discounts that could save students big money. What’s more, by keeping a lookout for discounts, students learn the value of comparison shopping and hunting down deals.

Retailers understand that college students don’t have a lot of money, so many of them offer discounts to gain their business. Gift Card Granny lists more than 100 retailers that offer such discounts as, including Apple, Amazon, Microsoft, movie theaters, and more.]

Text 16

Hello, _____ (insert first name). Did you know you have to complete the FAFSA application every year? Be sure to visit www.fafsa.gov.

[The FAFSA is the first step to getting financial assistance for college. The FAFSA is the link between ink between you and your financial aid. It helps the financial aid office understand your family's financial picture. Plan to fill it out every year you want to be considered for aid. Once you get the hand of it, it's not that bad. FAFSA is FREE and is the universal application for financial aid at all eligible colleges and universities. It is available to complete online in English and Spanish. The only legitimate website to complete your FAFSA is www.fasfa.gov. Beware of scams that ask you to pay to complete a FAFSA.]

Text 17

_____, remember that a credit card doesn't equal free money. Research which card makes the most sense based on your spending habits and ability to repay.

[Credit cards are the most widely used form of credit. A credit card allows you to borrow money from your bank or credit union to make purchases. Before applying for a credit card, read the fine print. Pay attention to interest rates, annual fees, and penalties associated with credit cards. All credit cards are NOT created equal.

Remember that paying with a credit card is a different way to spend money you already have. Before you use your credit card, ensure you can pay off the balance in full on the items you purchase.]

Text 18

Hi, _____ (insert first name). Before you spend more than \$50 on something, ask yourself if you really need it. Use the \$50 limit to keep spending in check.

[Being able to manage your money effectively depends on being able to distinguish between "needs" and "wants." Needs are things you must have and wants are things that would be nice to have. We put needs on the top of our financial priorities because needs are necessary for our survival. Wants are a lower priority because they are not necessary for survival. However, it's OK sometimes to spend money on a want, if we realize we are choosing to give up something else.]

Text 19

_____ (insert first name), are you aware of your financial risks? Take a moment to list your risks so you can start managing them.

[Many people don't realize they have financial risk. But almost everyone carries some risk. Consider these questions:

- *Am I a licensed driver?*
- *Do I have a job?*
- *Am I in good health?*
- *Will I be able to take care of myself financially if I am injured or sick?*
- *Do I own valuable personal property, such as a computer?*
- *Do I rent an apartment?*

If your answer to any of these questions is "yes," you have financial risks.

Risk management and insurance can protect your financial worth if something goes wrong. If you choose to ignore risks or potential benefits from managing risk, time bombs could be waiting to explode your wallet and potentially cause consequences that impact you for a long time.]

Text 20

Hello, _____ (insert first name). Managing your money reduces stress and creates opportunities. Keep up the good work!

[Consider using this last text to link to a survey that students can complete to evaluate the effectiveness of the texting initiative. You might also want to ask students if they want to continue receiving texts.]

APPENDIX B. STUDENT TRACKING WORKSHEET

BEFORE MESSAGING BEGINS					AFTER MESSAGING ENDS						
Student ID	First Name	Middle Name	Last Name	Opted in	IF RECEIVING TEXTS: Cellphone number	IF RECEIVING EMAILS: Email address	Incorrect cellphone number or email address	Opted out after messaging began	Total number of BUDGET related messages sent TO the student	Total number of CREDIT related messages sent TO the student	Total number of messages sent BY the student

APPENDIX C. STUDENT CHARACTERISTICS

Data element	Corresponding CCCCO Datamart data element
Date of birth	SB03
Gender	SB04
Race/ethnicity	SB29
Student's family status	SF07
Student's highest education level	SB11
Student's enrollment status	SB15
Student's parent/guardian's education level	SB33
Student's disability status	SD01
Student's veteran status	SG01
Student's foster youth status	SG03
Student's economically disadvantaged status	SG14
Student's ex-offender status	SG15
Student's homeless status	SG16
Student's long-term unemployed status	SG17
Student's seasonal farm worker status	SG19
Student's low-level literacy status	SG20
Student's EOPS status	SE01
Student received services from the Puente program	SG06
Student received services from the Umoja program	SG08
Received financial aid	SF01
Type of financial aid received	SF21
Estimated family contribution (EFC)	SF17

APPENDIX D. STUDENT OUTCOMES

Data element	Corresponding CCCCO Datamart data element
First-semester GPA	SX03
First-semester credits	SX04
Enrolled in second semester	GI03
Second-semester credits	SX04
Second-semester GPA	SX03
Enrolled in second year	GI03
Second-year credits	SX04
Second-year GPA	SX03

APPENDIX E. PROPENSITY SCORE MATCHING

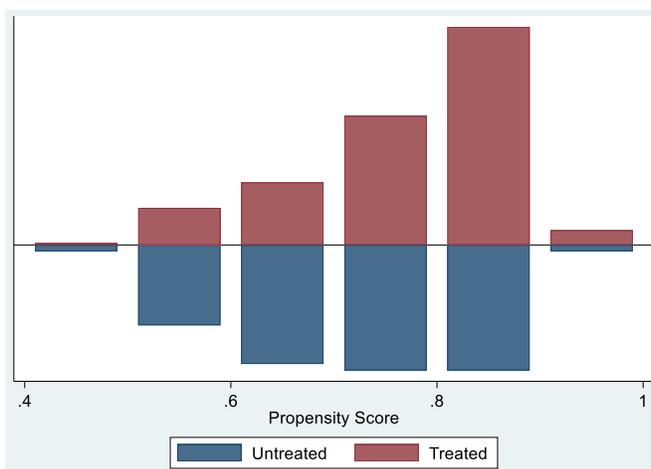
The Ray Marshall Center used the propensity score matching approach to account for differences on the observable characteristics between the treatment group and the comparison group pool. The aim of propensity score matching is to construct a balanced sample of treatment and comparison students who both attended the college, but are distinct only in their participation in the FL pilot. The PSCORE, PSMATCH2 and TEFFECTS modules in the Stata software package were utilized (Garrido, Kelley et al. 2014).

STEP 1: PROPENSITY SCORE ESTIMATION

First, a propensity score was constructed for each individual (in both the treatment group and the comparison group pool) that estimated the likelihood of participating in the FL pilot, using all the observable characteristics. This was done by using the *p_score* procedure in Stata (Becker and Ichino 2002) to perform a probit regression of the treatment dummy variable on all available covariates that, in the evaluation team’s judgment, had the potential to influence the chances of being treated.

Overlap in the range of propensity scores across the treatment and comparison groups, called “common support”, was ensured. This is important because no inferences about treatment effects can be made for a treated individual for whom there is not a comparison individual with a similar propensity score. Common support was subjectively assessed by examining a graph of propensity scores across treatment and comparison groups (see Figure D-1).

Figure D-1. Common Support



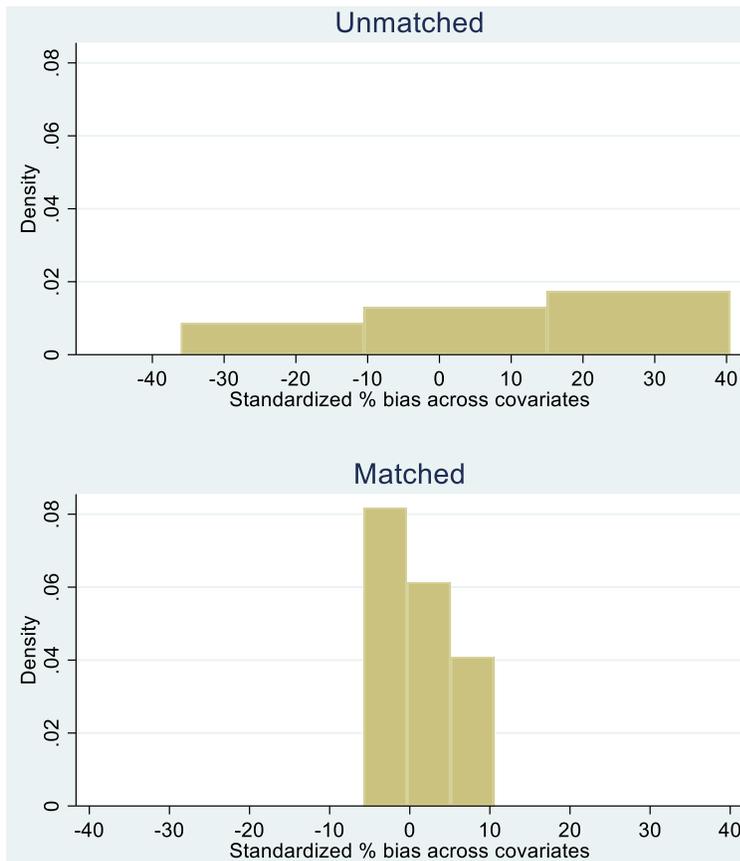
STEP 2: MATCHING

Next, individuals in the treatment group were matched to individuals from the comparison group pool, using the *psmatch2* procedure in Stata (Leuven and Sianesi 2014). Each treatment group individual can be matched to one or many comparison group individuals. When matching at the individual level, the first match is always best and will lead to the least biased estimates, but the decrease in bias from fewer matches needs to be weighed against the lower efficiency of the estimate that will occur with fewer observations. A broader one-to-many match will increase sample size and efficiency but can also result in greater bias from matches that are not as close as the initial match (Caliendo and Kopeinig 2008). The evaluation team selected to use the single nearest-neighbor technique; this technique involves finding for each treated individual that non-treated individual with the most similar propensity score and so, the most similar characteristics.

Matching with replacement was also used, which allows each comparison group individual to be used as a match more than once; matching with replacement improves the performance of the match and produces matches of higher quality than matching without replacement by increasing the set of possible matches (Dehejia and Wahba 1998, Abadie and Imbens 2006). Matching with replacement is also less demanding of the data than permitting comparison group individuals to be used only once. “Essentially, it avoids the problem of the non-treatment group being ‘used up’. Should a certain type of individual be common in the treatment group but relatively uncommon in the comparator group, the pool of comparators able to provide a close match would become exhausted were non treatment group members used only once” (Bryson, Dorsett et al. 2002). Also, if two or more observations had the same propensity score and were thus tied for "nearest neighbor", all ties were used for the match; including all the ties provides a more precise estimator (Abadie, Drukker et al. 2004).

Next, the evaluation team assessed if balance in the observable characteristics had been achieved, using the *pstest* procedure in Stata. Propensity score matching can only lead to viable estimates of the causal effects of treatment, if the desired balancing of observable covariates is achieved. The evaluation team found that covariate balance had been successfully achieved (see Appendix F).

Figure D-2. Overall Covariate Balance



After matching, the measures indicate good covariate balance: (1) standardized bias¹⁵ for all covariates is less than 5%, (2) t-tests for all covariates are non-significant, (3) the pseudo-R² is very low¹⁶, (4) the likelihood-ratio test¹⁷ is non-significant, (5) the mean and median absolute bias are less than 5%, (6) Rubin's B¹⁸ is close to 0, and (7) Rubin's R¹⁹ is close to 1. Figure D-2 shows the distribution of the

¹⁵ The standardized bias is the % difference of the sample means in the treated and non-treated (full or matched) sub-samples as a percentage of the square root of the average of the sample variances in the treated and non-treated groups Rosenbaum, P. R. and D. B. Rubin (1985). "Constructing a control group using multivariate matched sampling methods that incorporate the propensity score." *The American Statistician* 39(1): 33-38..

¹⁶ The pseudo-R² indicates how well the regressors X explain the participation probability.

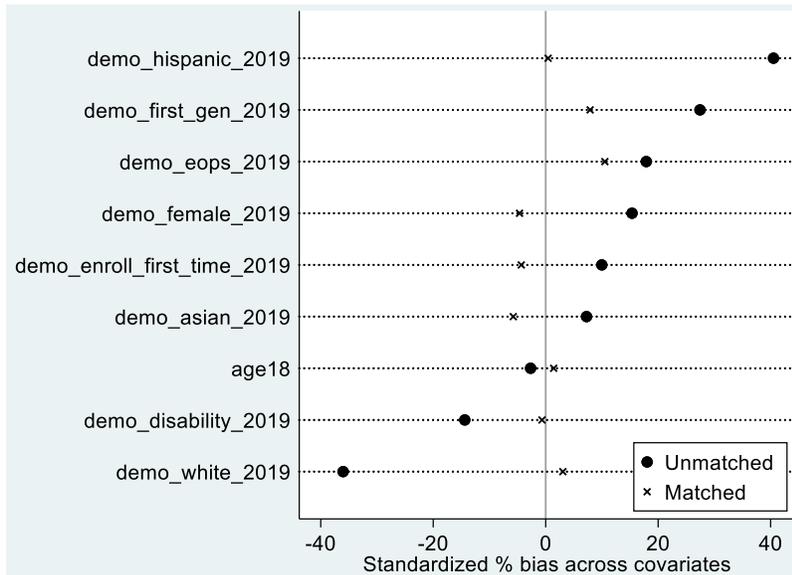
¹⁷ the likelihood-ratio test of the joint insignificance of all the regressors

¹⁸ Rubin's B is the standardized difference in mean of the linear prediction of the propensity score before and after matching

¹⁹ Rubin's R is the ratio of variance of the treated and comparison group for the linear prediction of the propensity score.

standardized percentage bias across covariates using a histogram. Figure D-3 shows the standardized percentage bias for each covariate using a dot chart.

Figure D-3. Individual Covariate Balance



Thus, while the differences between the treatment group and the comparison group pool in observable characteristics were documented to be substantial in the unmatched sample, the evaluation team’s matching approach (nearest neighbor matching with replacement) achieved satisfactory balance in all observable characteristics. The evaluation team can be quite confident that in the estimates of the causal impact of the FL pilot on outcomes, genuinely similar students are being compared.

STEP 3: TREATMENT EFFECT ESTIMATION

Finally, the average treatment effect on the treated (ATT) is estimated, which is the average difference on an outcome of interest between the matched treated and untreated observations. The ATT is the average effect of the treatment on the sort of person who participates in the program. The effectiveness of PSM is, in part, a function of having enough relevant information about the cases to accurately estimate the propensity score, and thus accurately estimate the ATT using the matching process that uses this score. The *teffects psmatch* procedure in Stata (StataCorp) calculates the treatment effect along with the Abadie Imbens corrected standard error calculation (Abadie and Imbens 2012).

APPENDIX F. COVARIATE BALANCE AFTER PSM

Table E-1. Covariate balance for all students

Variable		Mean		% bias	% reduct bias	t-test	t p>t	V(T)/V(C)
		Treated	Control					
Age	Unmatched	0.266	0.278	-2.7	47.1	-0.28	0.78	.
	Matched	0.266	0.259	1.4		0.22	0.83	.
Gender	Unmatched	0.570	0.493	15.4	69.7	1.62	0.11	.
	Matched	0.570	0.593	-4.7		-0.72	0.47	.
Hispanic	Unmatched	0.622	0.424	40.5	98.9	4.28	0.00	.
	Matched	0.622	0.620	0.4		0.07	0.95	.
Asian	Unmatched	0.135	0.111	7.3	20.6	0.75	0.46	.
	Matched	0.135	0.154	-5.8		-0.83	0.41	.
White	Unmatched	0.319	0.493	-36.0	91.5	-3.86	0.00	.
	Matched	0.319	0.304	3.0		0.49	0.62	.
First-time college student	Unmatched	0.766	0.722	10.0	56.5	1.07	0.29	.
	Matched	0.766	0.785	-4.3		-0.7	0.48	.
First-generation college student	Unmatched	0.361	0.236	27.4	71.2	2.8	0.01	.
	Matched	0.361	0.325	7.9		1.16	0.25	.
Disabled student	Unmatched	0.093	0.139	-14.4	95.4	-1.59	0.11	.
	Matched	0.093	0.095	-0.7		-0.11	0.91	.
EOPS student	Unmatched	0.238	0.167	17.9	41.2	1.82	0.07	.
	Matched	0.238	0.196	10.5		1.58	0.12	.
Sample	Ps R2	LR chi2	p>chi2	MeanBias	MedBias	B	R	%Var
Unmatched	0.05	33.6	0	19.1	15.4	55.8*	0.86	.
Matched	0.005	6.11	0.728	4.3	4.3	16.1	1.15	.

Table E-2. Covariate balance for first-time college students

		Treated	Control					V(C)
Age	Unmatched	0.110	0.115	-1.6	-6.1	-0.15	0.88	.
	Matched	0.110	0.116	-1.7		-0.23	0.82	.
Gender	Unmatched	0.559	0.423	27.4	83.8	2.46	0.01	.
	Matched	0.559	0.537	4.4		0.6	0.55	.
Hispanic	Unmatched	0.636	0.481	31.6	91.1	2.88	0.00	.
	Matched	0.636	0.623	2.8		0.38	0.70	.
Asian	Unmatched	0.118	0.087	10.5	22.3	0.91	0.36	.
	Matched	0.118	0.143	-8.2		-0.99	0.32	.
White	Unmatched	0.336	0.519	-37.5	83.5	-3.43	0.00	.
	Matched	0.336	0.306	6.2		0.87	0.38	.
First-generation college student	Unmatched	0.358	0.221	30.5	71.8	2.64	0.01	.
	Matched	0.358	0.320	8.6		1.1	0.27	.
Disabled student	Unmatched	0.058	0.144	-28.9	87.2	-2.93	0.00	.
	Matched	0.058	0.047	3.7		0.67	0.51	.
EOPS student	Unmatched	0.179	0.106	21.0	100	1.79	0.08	.
	Matched	0.179	0.179	0.0		0	1.00	.
Sample	Ps R2	LR chi2	p>chi2	MeanBias	MedBias	B	R	%Var
Unmatched	0.056	27.57	0.001	23.6	28.1	58.6*	0.77	.
Matched	0.004	3.93	0.863	4.5	4.1	14.7	0.99	.