Increasing Community College Completion Rates among Low-Income Students: Evidence from a Randomized Controlled Trial Evaluation of a Case Management Intervention

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William N. Evans
University of Notre Dame, NBER, J-PAL and Wilson Sheehan Lab for Economic Opportunities

Melissa S. Kearney
University of Maryland, NBER, J-PAL and Wilson Sheehan Lab for Economic Opportunities

Brendan Perry
University of Notre Dame and Wilson Sheehan Lab for Economic Opportunities

James X. Sullivan
University of Notre Dame and Wilson Sheehan Lab for Economic Opportunities

Abstract

Community colleges are an important part of the higher education landscape in the United States, but completion rates are extremely low, especially among low-income students. Much of the existing policy and research attention to this issue has focused on addressing academic and financial challenges. However, there is ample reason to think that non-academic obstacles might be key drivers of dropout rates for students living with the burden of poverty. This study focuses on the role of "life barriers" and demonstrates that wrap-around case management services can be an effective way to increase completion rates among low-income students. We evaluate the impact of the *Stay the Course* case management program through a multi-armed randomized controlled trial evaluation (RCT) conducted between 2013 and 2016 in Fort Worth, Texas. Data from school administrative records indicate that the comprehensive case management program significantly increased persistence and degree completion, especially for women. Estimates for the full sample are imprecise, but the estimates for women imply that the case management intervention tripled associate degree receipt (31 percentage point increase). We find no difference in outcomes between students in an emergency financial assistance only treatment arm and the control group. A rough calculation using the direct *STC* program costs of $4,343 and estimated treatment effects, implies a cost of $27,140 per additional associate's degree. This study complements existing evidence on financial and information programs designed to increase enrollment rates and is most closely related to the small set of studies examining coaching and mentoring interventions to help students.

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I. INTRODUCTION

Community college is a crucial component of the United States' education system, offering millions of students the opportunity to earn a low-cost, two-year associate's degree, gain career and technical credentials, or embark on a path to a four-year institution. Low tuition rates and open-access policies at community colleges make them accessible to students who might face significant barriers to attending four-year selective schools. Federal grants and loans mean that many low-income students are paying little if any out-of-pocket for a community college education.[1] Nearly half of all undergraduate students in the U.S. in 2014-15 were enrolled in a two-year institution (U.S. Department of Education, 2016) and half of all bachelor's recipients were at one point enrolled at a community college before transferring to a four-year institution (National Student Clearinghouse (NSC) Research Center, 2017). Many studies find employment and earnings benefits associated with community college degree completion and credits earned (e.g., Kane and Rouse, 1995; Marcotte et al., 2005; Jepsen et al., 2014; Dadgar and Trimble, 2015; Stevens et al., 2015). A recent estimate suggests that for the cohort of students who attended college in the mid-2000s, an associate's degree yields an earnings premium of about 30 percent over a high school degree (Marcotte, 2016).

Despite low tuition costs and the expected economic returns, a large fraction of community college students drop out before earning a credential or degree. The National Student Clearinghouse (2017) notes that among students who first enrolled full-time at a two-year public institution in 2010, nearly 42 percent had not received any degree or were no longer enrolled in school six-years later. Many observers argue that there is a "completion crisis" at all type of colleges. Not completing can be financially crippling for a community college student as they incur debt but do not obtain a degree.

[1] Data from the 2011/12 National Postsecondary Student Aid Study indicates that 38 percent of community college students have zero out of pocket expenses for tuition and fees.
https://www.usnews.com/news/articles/2015/02/17/how-many-already-attend-community-college-for-free

Although only 40 percent of community college students acquire education-related debt,[2] 90 percent of community college students who have defaulted on debt left college with no degree or certificate.[3] Furthermore, the federal government spends billions of dollars a year subsidizing community college attendance. In 2015, the Pell Grant program provided $30 billion in aid for low-income individuals to attend college. More than a third of Pell recipients attend community college (Baime and Mullin, 2011). States and local governments often provide financial aid and need-based scholarships as well. Identifying successful ways to better realize the potential of the community college investment, both for students themselves and for society more generally, is of paramount research and policy importance.[4]

The intervention we study in this paper departs from much of the existing literature by focusing on potential *non-academic* barriers to completion. Many low-income community college students must balance the demands of work and family life with their school life, leading to myriad challenges.[5] In addition, many students report having trouble navigating the complex community college system, particularly first generation college students and new immigrants who may have limited knowledge about how colleges function (Bailey, Jenkins, and Leinbach, 2005; Scott-Clayton, 2011). Students might also lack the necessary commitment and/or planning and time management skills necessary to set out a path to graduation and stay committed to that plan. Students who lack clear goals and a genuine understanding of why college is important often become derailed by relatively minor challenges and setbacks (Grubb, 2006).

[2] https://trends.collegeboard.org/sites/default/files/trends-in-community-colleges-research-brief.pdf
[3] https://www.insidehighered.com/news/2015/09/28/four-surprising-findings-debt-and-default-among-community-college-students
[4] Improving persistence in community college was an explicit priority of the Obama administration, which launched the *American Graduation Initiative* with a goal of producing 5 million more community college graduates by 2020. http://www.whitehouse.gov/blog/Investing-in-Education-The-American-Graduation-Initiative.
[5] Another common reason reported was not having enough time to spend with family (41 percent.) The reason that ranked the lowest was "some classes were too difficult" (10 percent reported this as a primary reason and an additional 24 percent noted it as a secondary reason.) The survey is based on telephone interviews conducted in 2009 with 614 young adults aged 22 to 30 years old who have experience with some post-secondary education.

We report the results from a randomized controlled trial (RCT) investigation of a comprehensive case management intervention designed to help enrolled low-income students overcome the myriad obstacles that might threaten their persistence in community college. The demonstration program, *Stay the Course* (STC), was rolled out in the fall of 2013 at the Trinity River Campus of Tarrant County College (TCC) in Fort Worth, Texas. Eligible students were randomly assigned to one of two treatment groups or a control group. Treatment group 1 was offered STC comprehensive case management. Each STC student is paired with a trained social service provider, called a navigator, who offers students coaching, mentoring, and referral services. Navigators work with students to help them overcome their individual barriers to college completion. The STC case management students also have access to emergency financial assistance (EFA). Treatment group 2 was offered access to EFA only. Students randomly assigned to the control group received no special services, but had access to the full range of college advising and other services.

Using student-level administrative records, we find that the full STC comprehensive case management program significantly increased persistence and degree completion through six semesters, especially for female students.[6] Estimated effects are imprecise for the full sample, but intention-to-treat estimates for females show a 7.4 percentage point (3.3 percentage point standard error) increase in the likelihood of earning an associate's degree off a control group mean of 15.7 percent. This translates into a treatment-on-the-treated effect of 31.5 percentage points (14.1 percentage point standard error). Based on the estimated earnings premium for individuals with community college credentials, we estimate that the earnings gains associated with the program (for the full sample) exceed program costs in just over four years. We find no difference in outcomes between the EFA-only treatment group and the control group.

[6] We focus on results six semesters after enrollment in the study because many community colleges emphasize graduation rates after 150 percent of the standard time to completion, as this is the rate that schools must disclose under the Student Right-to-Know Act. See https://nces.ed.gov/pubs2017/2017046.pdf

There is an existing body of evidence on interventions designed to address the issue of academic under-preparation among community college students, which generally shows disappointing results (Long, 2014; Martorell and McFarlin, 2011).[7] There are also many studies reporting on interventions aimed at helping students through the transition and application process from high school to college, many of which are focused on help completing college and financial aid applications, for example, Barr and Castleman (2017), Gurantz (2019), Oreopoulos and Ford (2019), Bird et al. (2017), Castleman and Page (2015), Page and Gehlbach (2017), and Carrell and Sacerdote (2017). Page and Scott-Clayton (2016) provide a comprehensive review of the economics literature on policies to improve college access, considering studies of the impact of financial aid, as well as evidence on informational and behavioral nudges. Our study is quite different from these studies in that we focus on addressing the non-academic struggles of already enrolled low-income students. The intervention we study provides non-academic, non-tuition help with the explicit goal of advancing student persistence through degree completion. [8]

The set of existing studies most closely related to this paper investigate whether enhanced student support services and/or mentoring lead to improved educational outcomes for college students. The evidence from these existing interventions is mixed. The MDRC's "Opening Doors" demonstration included two community college sites that offered enhanced student services consisting of two semesters of access to counselors with much smaller caseloads than the traditional caseload of 1000 students per counselor. The evaluation found no improvements in ultimate academic outcomes (Scrivener and Weiss, 2009). Bettinger and Baker (2014) found that college students randomly assigned

[7] About 60 percent of students entering community college are referred to at least one remedial education class (Bailey, 2009; Attewell et al., 2006). Community colleges devote upwards of $2 billion annually towards these developmental education programs (Strong American Schools, 2008).

[8] Barr and Castleman (2017) evaluate the Bottom Line college advising program offered to low-income students beginning in high school and find positive effects on early college persistence. While Bottom Line provides some social supports, such as helping students acclimate to college, the intervention focuses on advising students, the bulk of whom attend 4-year college, through the college and financial aid application process and offering some academic advising while in college, making it very different from the STC intervention.

to student coaches with the InsideTrack program have higher persistence and completion rates, but this program did not focus on low-income students or a community college setting.[9]

The comprehensive Accelerated Study in Associates Program (ASAP) at the City University of New York shows the most promising results to date in terms of improved associate's degree completion rates. The evaluation of ASAP found that this three-year program nearly doubled associates degree graduation rates (Scrivener et al., 2015). But this program offers much more than just comprehensive advising. From the program's website: "CUNY's Accelerated Study in Associate Programs (ASAP) helps students earn associate degrees within three years by providing a range of financial, academic, and personal supports including comprehensive and personalized advisement, career counseling, tutoring, waivers for tuition and mandatory fees, MTA MetroCards, and additional financial assistance to defray the cost of textbooks. ASAP also offers special class scheduling options to ensure that ASAP students get the classes they need, are in classes with other ASAP students, and attend classes in convenient blocks of time to accommodate their work schedules. As students approach graduation, they receive special supports to help them transfer to 4-year colleges or transition into the workforce, depending on their goals."[10] The multi-faceted nature of the program means that it is difficult to know from the ASAP evaluation what elements of the program are crucial or effective, and raises questions about scalability.

Our study complements existing evidence on college completion interventions by investigating whether a comprehensive case management program delivered by a social service provider can lead to increased completion rates for very low-income students in a community college. The social service providers who provide the case management in *Stay the Course* have a very different orientation from the

[9] Angrist, Lang, and Oreopoulos (2009) examine a peer mentoring program in a four-year university setting. They find that first-year female students (but not males) at a large 4-year public school in Canada demonstrated improved academic outcomes in terms of GPA and credits earned when they had access to peer advising and organized study groups as part of the Project STAR intervention, but only when those services were combined with merit-based financial incentives.
[10] https://www1.cuny.edu/sites/asap/, last accessed 11/12/19.

typical community college academic or career adviser. Furthermore, the caseloads of the STC case managers are much smaller than the caseload of the typical college counselor and the explicit intent is to develop personal relationships of trust. Our study provides a "proof of concept" that enhanced student services – beyond the kind that have been typically tried on campuses and without additional tuition subsidies or academic tutoring programs – can be an effective programmatic response to low rates of community college completion. As we discuss below, having established this proof of concept, more research needs to be done to explore what about case management is particularly effective and for whom, and how colleges can work with their own in-house services and community non-profits to deliver this kind of service to more students.

Evidence from this paper and the CUNY-ASAP evaluation make the case for enhanced student supports as a promising approach to increasing rates of community college completion, and to bringing rates of community college completion closer to those of four-year institutions.[11] Many scholars have noted that a lack of resources and student supports might be responsible for the relatively worse outcomes at less selective institutions, including community colleges. Deming (2017) puts it succinctly: "less-selective public institutions often have large classes and provide little in the way of academic counseling, mentoring, and other student supports (page 6.)" Bound, Lovenheim, and Turner (2010) find that shifts in the types of institutions students attend toward lower-ranked, public schools along with declines in institutional resources per student are more important than shifts in student characteristics in explaining the decline in college completion rates between the 1970s and 1990s. Deming and Walters (2017) find that spending increases are more effective per-dollar than price cuts in

[11] This issue is especially important in light of recent calls by policy makers for free community college and other related efforts to get more students into college. There is potentially reason to worry that sending more students to schools that are already stretched in terms of the services they can provide to students could exacerbate the completion crisis, especially if they are drawn into free community college or public universities away from more selective, highly resourced universities. Cohodes and Goodman (2014) find evidence of this in the case of Massachusetts, where increased subsidies to in-state public colleges induced enrollment shifts away from private institutions, ultimately decreasing rates of degree completion. Gurantz (2019) also finds evidence of institutional shifting in the case of the first year of the Oregon Promise program, which subsidized community college enrollment; though he finds that in year two, when income limits were in place, overall enrollment in post-secondary schooling increased.

terms of increasing completion rates at US public postsecondary institutions. This finding is consistent with a view that institutional resources are a critical component to driving student completion rates. It is also the case that over recent decades, colleges and universities have experienced declining state appropriations alongside rising enrollment, leading to fewer resources per student.

Furthermore, recent work casts doubt on the efficacy of enhanced financial aid in increasing rates of college completion among low-income students. For instance, Denning (2017) finds an elasticity of zero for the effect of community college tuition on Associates Degree completion, though he does find evidence of induced community college enrollment.[12] In addition, there is recent evidence showing that light-touch interventions might not be sufficient to improve college outcomes. Oreopolous and Petronijevic (2019) present evidence from a multi-year effort of testing various online and text-message interventions to improve college achievement. Their study draws on a sample of nearly 25,000 students and though they find some improvement from coaching-based interventions on mental health and study time, they find that none of the interventions significantly alters student academic outcomes. They conclude that "More comprehensive but expensive programs appear more promising for helping college students outside the classroom." Another recent example is Phillips and Reber (2019) who examine a low-intensity intervention—virtual college counseling—and find little evidence of impact. As we report below, we also find that the less intensive, less expensive approach of providing students with emergency financial assistance without case management is not effective. This is another reason why it is important to investigate the effectiveness of a heavier touch intervention like *Stay the Course*.

[12] Deming (2017) exploits quasi-experimental variation in community college tuition discounts coming from boundary changes in which areas qualify for in-district tuition discounts; the setting is Texas in the years 1994 to 2005. In a recent comprehensive study, Avery, Howell, Pender, and Sacerdote (2019) analyze state policies to increase four-year college completion rates, concluding that increased spending at all public colleges and targeted elimination of tuition and fees at four-year public colleges for income-eligible students are the most cost-effective options, while free community college is the least effective, as it actually appears to reduce four-year degree completion rates and provides the least benefit to low-income students.

II. THE "STAY THE COURSE" INTERVENTION

Stay the Course is a comprehensive case management intervention that was designed by Catholic Charities, Diocese of Fort Worth, Inc. (CCFW) to help low-income community college students address personal obstacles so they can persist in school and complete their intended degree. CCFW is a large nonprofit social service provider with a mission to improve outcomes for low-income families and individuals. They provide services to over 100,000 unduplicated clients each year.

A. Features of the intervention

Upon enrollment in STC, a student is assigned to a trained social worker called a "navigator" who serves as their case manager. The navigator meets with the student initially to conduct a client assessment that identifies the client's long-term goals, likely barriers to these goals, and their strengths and weaknesses. The student and navigator then collaboratively develop and implement a comprehensive service plan that sets out the steps necessary for the student to accomplish their educational goals. The service plan is tailored to devise intermediate goals for the student to accomplish along the way, discuss the action steps necessary to accomplish these goals within established timeframes, and address potential barriers through a range of available services. Action steps are developed for each specified goal in the service plan. For example, if a participant has a goal of earning a grade of at least a "B" in a specific course, the action steps for that goal might include attending all classes for the course or meeting once a week with a tutor. The service plan is reviewed and updated every 90 days. The construction of the service plan is a time-consuming but important process in that it helps build trust between the navigator and the client. The service provider's view is that for case management to work students must feel comfortable coming to the navigator to help solve intimate and personal problems, e.g., domestic violence, substance abuse, mental illness, etc.

Participation in the program involves comprehensive case management services for the student on an ongoing basis. There are four main components to these services: referrals, mentoring, coaching,

and emergency financial assistance. The navigators refer STC participants to a variety of resources within the TCC system such as access to tutors, financial aid, etc., as well as to external resources outside the college such as employment and child-care services, health services, government programs and benefits such as SNAP, and other social services (Ybarra, 2016).[13] Mentoring involves the process of navigators developing a personal relationship of trust with each of their student clients. This sort of personal relationship is likely different from the typical relationship that academic advisors at community colleges have with their students, as college advisors tend to have caseloads that are in the hundreds or thousands of students (as compared to 34 for STC navigators) and have a different professional orientation toward educational and academic counseling, as opposed to social work.[14] To establish this mentoring relationship, navigators encourage open communication and build trust so that students are engaged in the program and they continue to seek the navigator's advice on educational and personal issues that affect their progress in school.

In the coaching component of comprehensive case management, the navigator and student have ongoing meetings to work on resolving unforeseen problems that might threaten the ability of the student to complete their degree. Students might encounter situations along many dimensions that could derail their education, such as problems with housing, child-care arrangements, transportation, or work schedules. Students are encouraged from the outset to meet with their navigator for help addressing such circumstances. The thought behind the implementing agency's approach is that the stronger is the trust between the navigator and the student, the more likely it is that the student will come to the navigator to discuss personal issues that might inhibit success in school. Another feature of the coaching component is helping students navigate the community college system. Navigators remind

[13] As part of the RCT evaluation, we collaborated with an independent, qualitative researcher to conduct an implementation study of *Stay the Course* at the Trinity River Campus, which is available as Ybarra (2016). This study drew from interviews of STC staff in the spring of 2015 and 60 hours of observations of all aspects of STC staff work in the fall of 2015, about two years after the launch of the evaluation.

[14] STC navigators received 8 days of dedicated program training: three days at CCFW covering general topics and five days at the college campus to cover detailed campus topics and program issues.

students to register for the necessary and appropriate classes. Depending on student need, navigators may also assist students in finding campus-provided tutors and help students avail themselves of campus-provided services.

The implementing agency emphasizes that personal interactions, as opposed to emails or phone calls, are at the heart of their approach to comprehensive case management. Program guidelines recommend that navigators and students meet in person at least once per month.[15] However, case notes data reveal that the frequency of in-person interactions varied widely. Table 1 reports summary statistics of all navigator/student interactions as reported in the navigator case notes. On average, navigators interacted with their clients about 34 times each semester. About half of these interactions were via text or email and about a third were over the phone. There were an average of 4.1 in-person meetings per semester, with a typical duration of 41 minutes. The frequency and type of navigator-student interactions did not differ noticeably by gender.

Figure 1 shows the frequency of discussion topics covered during navigator-student interactions based on these electronic case notes, separately for females and males. We include as navigator-student interactions in-person meetings, phone calls, or individualized emails/texts, but not general administrative communication regarding scheduling meetings with navigators. Academic discussion topics such as class registration and gaining access to tutors were the most popular; they were discussed in over a third of the interactions between navigators and students. Ten of the next 11 most frequent topics have little to do with academics but rather, are aspects about the student's life outside of school, such as work, transportation, health, child care, etc. Work/employment issues were discussed in nearly a quarter of all interactions, which is consistent with the evidence that this issue is one that often leads

[15] At the launch of the study in fall 2013 there were no explicit benchmarks in place requiring navigators to meet with students a certain number of times per week or month. The frequency of meetings was at the discretion of the navigator and student. In the spring of 2015, the program supervisor set explicit benchmarks for navigator-student interactions to ensure fidelity of program implementation. These benchmarks included reciprocal contact (email, text, phone) at least once per week, in-person meetings every two weeks, and completion of a service planning goal once every three weeks (Ybarra 2016).

low-income students to drop out of community college (Johnson et al., 2011). Students discussed referrals to other specialized service programs in almost 17 percent of their interactions with their navigators. Housing, finances, and transportation were each mentioned in at least 12 percent of interactions. The one other academic issue included among the 12 most frequent topics is transferring to a four-year college, which was discussed in 11 percent of interactions.

The fourth component of comprehensive case management is access to emergency financial assistance (EFA). Students in the STC program are eligible to apply for EFA for non-academic expenses or income shortfalls that could negatively impact a student's persistence in college. EFA is not meant to constitute an academic grant or scholarship, but rather, to provide the buffer resources that a low-income student might need to address personal issues and stay in school. The motivation for this assistance is that for many low-income community college students, small negative shocks like a family emergency, higher than expected child-care costs, a necessary vehicle repair, or not having a security deposit for a new apartment, can sometimes have lasting impacts on academic outcomes. It is widely recognized in other contexts many low-income families live perpetually on the brink of crisis and deep hardship (Barr and Blank 2009; Shipler 2008). Bertrand et al., (2004) describe this aspect of poverty in terms of some families having "narrow margins for error." The EFA is designed to reduce the vulnerability to negative shocks that many low-income families experience.

To receive EFA, students must successfully demonstrate both that they have an imminent financial need and that not meeting this need would be detrimental to their academic progress. Additional factors that determine whether the event would qualify for assistance include the extent to which the event is foreseeable, controllable, and temporary. Examples of qualified costs include a car repair, rent and utilities, a bus pass, or emergency medical care. Eligibility for EFA is restricted to those students with a cumulative GPA of a 2.0 or higher at TCC (unless they are in their first semester) and those enrolled in at least 9 credits the semester in which they apply. An individual student could apply to receive up to $500 per semester, capped at $1,500 total over a three-year period. A program Funds

Coordinator makes determinations for all EFA applications, subject to a supervisor's review. Navigators may assist clients in completing the financial assistance application, but they do not attend the student's meeting with the Funds Coordinator nor do they intercede with the Funds Coordinator on behalf of the student. This separation is designed to keep navigators from having to deny financial assistance from their own clients.

Based on Funds Coordinator records, over a three-year period, students enrolled into the STC treatment group (N = 94) submitted 126 requests for EFA, of which 82 percent were approved, with an average payout of $276. As shown in Figure 2, 29 percent of the requests granted were for transportation needs, 23 percent for housing, 33 percent for utilities, and 15 percent for other (school supplies, child care, etc.). Ultimately 47 of the 94 enrolled STA case management clients received EFA funds; fewer than 10 percent of students collected more than $1,000 over the three-year period. After six semesters, only one STC student had collected the max amount of $1,500. By way of comparison, in the EFA treatment arm, 21 of the 126 students (17 percent) received funds.

B. Comparisons to similar interventions

STC differs from existing interventions designed to increase college completion. The STC intervention differs from these other programs in several important ways. Table 2 facilitates a comparison of features across programs by highlighting the key aspects of four other interventions evaluated with RCTs alongside STC. We highlight a few unique characteristics of the STC case management approach here. First, STC comprehensive case management services are more involved and intensive than those typically available at community colleges, as well as those that have been offered in previous demonstration projects.[16] The services extend beyond academic counseling as navigators work with each student to develop a personal relationship of trust and help them address their unique social, financial, academic, and personal impediments to college success. Second, the case

[16] A study conducted by the American College Counseling Association found that over half of community colleges have counselor to student ratios between 1:1500 and 1:3500 (Gallagher, 2010).

management services provided by STC are provided by trained social service providers working for a non-profit agency outside the community college system. Third, the caseloads for STC navigators are much lower than those of the typical community college guidance counselor, and are even considerably smaller than those found in the other highlighted demonstration projects. Fourth, the STC case management services also include access to emergency financial assistance for non-tuition financial impediments.[17]

By way of contrast, the coaching provided as part of the InsideTrack program is limited to telephone-based coaching. Though coaches also work to help students overcome non-academic "real life" barriers, it is unlikely that they develop the type of personal mentoring relationships that the STC navigators work to build. The enhanced student counseling services implemented as part of the "Open Doors" demonstration were short-term, limited to two semesters, and delivered by college counselors who did not necessarily have the expertise in dealing with the non-academic issues that trained social workers help clients address. The enhanced student services in the ASAP program were provided by community college counselors, who may or may not have offered as much dedicated attention to life barriers and outside referrals as the STC case managers, but more importantly, in the ASAP program, those services are embedded in a much larger set of intervention features, including tuition waivers, blocked classes, and special courses and registration access on campus.

III. THE RANDOMIZED CONTROL TRIAL

A. The Research Design

To determine the impact of this comprehensive case management program on persistence and degree completion, we implemented a randomized controlled trial (RCT) evaluation at Tarrant County College (TCC), a large community college in Fort Worth, Texas enrolling more than 50,000 students in

[17] Ultimately, our results suggest that providing EFA alone does not improve academic outcomes. However, this evidence does not imply that EFA, offered as part of case management services, is ineffective.

associate degree and technical programs across five campuses. TCC students typically come from disadvantaged backgrounds and have very high dropout rates. Among first-time, degree-seeking students who entered in fall 2011, only 14.8 percent earned a degree in four years and only 2.6 percent graduated in two years. The leadership at TCC is aware of this challenge and readily agreed to partner with the research team and service provider on this intervention and evaluation. TCC provided dedicated space for the navigators to meet privately with students and provided us with the necessary administrative data to evaluate the program and to perform the randomization.

The universe for the sample consisted of the 8,849 students currently enrolled at the Trinity River campus of TCC in the fall semester of 2013.[18] The research demonstration project took place at a single campus because it was more feasible for CCFW to implement this new intervention on a single campus. RCT eligibility was limited to students who met the following criteria: 1) enrolled in at least 9 credit hours at TCC; 2) degree seeking; 3) age 18 years or older; 4) satisfied at least 1 Texas Success Initiative (TSI) standard;[19] 5) newly enrolled or have earned a Cumulative GPA of at least 2.0 at TCC to date; 6) accumulated less than 30 credit hours at TCC to date; and 7) Pell eligible or fall below 200% of the poverty line (based on reported income on the FASFA). Eligibility criteria (1) through (5) are intended to target students who may feasibly complete a degree in three years. The credit cap in eligibility criteria (6) is meant to target students who might be at risk of dropping out; a student with more than 30 credits is perceived to be successfully on a path to graduation. The final eligibility rule is to target the sample to low-income students. Imposing these eligibility criteria left us with a final study sample of 1,168 students.

[18] The Trinity River campus, located in downtown Fort Worth, Texas, enrolls nearly 9,000 students each year. It offers primarily Associate of Arts (AA) degrees, which requires 60 credit hours to complete. Some of the larger programs housed at the Trinity River campus include Nursing, Surgical Technology, Physical Health Information Technology, Sign Language, and Service Learning.

[19] TCC students are given placement examines (TSIs) in three subjects: math, reading and writing. Failure to pass the TSI in a subject means that a student starts their community college career in a remedial version of that subject.

Table 3 reports summary statistics on all community college students at the national and state level, all TCC Trinity River Campus students, and finally, STC study participants. Overall, TCC students are similar to other community college students around the nation, with the exception of TCC enrolling considerably more Hispanic and part-time students. STC participants differ from typical TCC students and the average community college student in a few important ways. STC students are more likely to be female, and are on average more than two years younger than other TCC students. Students in the study are much more likely to be full time when compared to the rest of the TCC campus and much more likely to receive Pell grants when compared to the national average, differences driven by the eligibility criteria described above.

At the close of the academic enrollment period on August 20, 2013, the Office of Institutional Intelligence and Research (OIIR) at TCC extracted data necessary to identify the eligible sample (N = 1,168). The research team used these data to randomly assign eligible students into one of three groups. The randomization procedure is displayed in Figure 3. 430 students were offered the STC treatment, which included case management and EFA. Another 299 students were assigned to an EFA-only treatment, while 439 students were assigned to a control group. Students in this final group received no additional services, but still had full access to any existing college or community services, just as they would in the absence of this intervention. The study includes two treatment arms to help determine how much of the effectiveness of the fully implemented program could be achieved with only the financial assistance feature.[20] The EFA treatment group is smaller because the provider had limited resources to provide this separate treatment arm.

[20] The EF-only treatment is most comparable to the "Dreamkeepers" program created by Scholarship America (https://scholarshipamerica.org/dreamkeepers/). That program provides monetary assistance to students who face short-term financial emergencies. A descriptive review conducted by MDRC examined the outcomes of recipients of Dreamkeepers funds from 11 different schools in the 2004-2006 period and found that recipients have "disproportionate need" and were "more academically challenged" than the average student, but their reenrollment rates were roughly comparable to other students (Geckeler et al., 2008). Though the findings of that report are consistent with the notion that limited financial assistance can promote persistence, the MDRC study was not an RCT, and the comparisons reported should not be interpreted as indicative of a causal effect of the program.

After randomly assigning each eligible student to one of the three groups, the research team notified TCC of the results and the college sent specific emails and letters by regular mail, signed by the president of the college, to each student selected for the different treatment groups.[21] These emails and letters introduced the program and explained that the student had been randomly selected to participate. TCC also sent a data file to CCFW containing student IDs, names and contact information. In these communications, selected students were directed to a web page to electronically sign a consent form for services and enroll in the program (http://www.staythecourse-cc.org/). Of the 430 students offered the STC treatment, 94 students completed the intake process to enroll in STC a take-up rate of 22 percent. The EFA treatment group had 126 students enroll, reflecting a take-up rate of 42 percent.

The low take up rate of the program appears to have been a feature of the way the RCT was rolled out. We randomly assigned a treatment/control group status to all eligible students and then invited them via mailed letters and emails to visit a website and enroll.[22] In a later replication implementation of the program – subsequent to the RCT demonstration reported on here – the implementers reversed the order and invited all eligible students to visit a website and enroll, and then after enrolling in the demonstration project, students were randomly assigned to a treatment or control group. This reversed procedure led to a take-up rate of 87.3 percent. Based on this experience, we do not view the low take-up rate in the RCT to suggest that the program itself does not hold appeal to students. That said, it is likely the case that a new program that is not familiar to students will have a lower take-up rate in early years as compared to an established program with a reputation on campus as a legitimate source of support. Importantly, these issues do not threaten the internal validity of the study in any way, but they are relevant to considerations of how to most effectively roll out such a program and reach the intended population of students.

[21] Copies of these emails and letters are included in the appendix to the paper.
[22] The college would not allow us to text students on mobile devices.

Table 4 provides descriptive information about the students in the study for both treatment groups and the control group for the fall of 2013. As shown by the p-values in columns 4 and 5, in all cases the data fail to reject the hypothesis that the mean characteristics are the same, when comparing either of the treatment groups to the control group, indicating that the randomization procedure generated appropriate balance across groups.[23]

B. Data and Methods

Our empirical analysis relies on student-level administrative school records provided to us from TCC. A few months after the end of each semester, OIIR at TCC sent the research team a file containing the student baseline characteristics that were used to determine eligibility, additional characteristics used in the analyses, and academic outcomes. Through TCC we were able to link these records to data from the National Student Clearinghouse (NSC), which allows us to observe whether a student transfers to a two- or four-year college and completes a degree at another post-secondary institution.[24]

The outcomes we consider include:

- **Enrolled in College**: An indicator for whether a student was enrolled in classes at TCC or any other NSC reporting institution at the start of the relevant semester, which is defined as spring 2016 in six-semester results, spring 2015 in four-semester results, and spring 2014 in two-semester results. For the two- and four-semester results, we will also look at enrollment at TCC as a separate outcome as fewer students have transferred to a different college by that point.
- **Total Credits Earned**: The cumulative number of college credits that a student has earned by the end of the relevant semester. Because we only observe credits earned for students while

[23] Mean characteristics of the treatment group and control group by gender are shown in Appendix Table 2 (females) and Appendix Table 3 (males).
[24] The National Student Clearinghouse is a nonprofit organization that works with more than 3,600 post-secondary institutions to provide data on student enrollment and degree completion. The NSC participating colleges enroll 98% of all post-secondary students in the U.S. (http://www.studentclearinghouse.org/about/).

they are enrolled at TCC, we impute credits for students who are enrolled elsewhere using the average credits earned by students in the study who are still enrolled at TCC in the current semester.

- **Cumulative GPA**: Cumulative TCC GPA by the end of the relevant semester. Because we only observe GPA for students while they are enrolled at TCC, we impute GPA for students who are enrolled elsewhere using their most recent semester GPA observed at TCC.
- **Earned any Degree:** An indicator for whether a student earned a degree (certificate, associate's, or bachelor's) at TCC or any other NSC reporting institution by the end of the relevant semester.
- **Earned an Associate's Degree**: An indicator for whether a student earned an associate's degree at TCC or any other NSC reporting institution by the end of the relevant semester.[25]
- **Earned an Associate's or Bachelor's Degree, or Enrolled in 4-Year College**: An indicator for whether a student 1) earned an associate's degree at TCC or any other NSC reporting institution; 2) earned a bachelor degree at any NSC reporting institution; or 3) was enrolled in classes at a 4-year NSC reporting institution at the start of the relevant semester.

Because we are utilizing random assignment, we measure the impact of STC by comparing outcomes for students in the treatment and control groups. We estimate the differences in outcomes using a standard intent-to-treat (ITT) model:

$$y_i = \beta_0 + T_i\beta_1 + \mathbf{X}_i\beta_2 + \varepsilon_i \quad (1)$$

where y_i is an indicator for one of our outcome measures for student *i* in the semester of interest, T equals 1 if the respondent is in the relevant treatment group and zero otherwise, and ε_i is an individual-

[25] While we also have data on whether a student has completed a certificate or a bachelor's degree, we do not report these outcomes separately because they occur infrequently—after 6 semesters less than 3 percent of the sample had obtained a certificate, and just over 1 percent had obtained a BA degree.

level error term that is assumed to be *i.i.d.* The vector $\mathbf{X}_i$ includes a set of person-level characteristics: age, age squared, gender, whether a student is Black, Asian or a different race, whether the student is Hispanic, the number of basics skills assessments the student has passed at entry, family income, and family income squared from the student's FASFA form. When measuring the effect of the full STC intervention, the estimation sample includes the STC treatment group and the control group; it excludes students in the EFA treatment group. When measuring the effect of EFA, the estimation sample includes the EFA treatment group and the control group; it excludes students in STC treatment group.

Our main results focus on outcome measures six semesters after enrollment in the study, but to examine how any impact of the intervention changes over time, we also report some shorter-term results. Because many students assigned to the treatment groups do not participate in services (the take-up rate was 22 percent for the STC treatment group and 42 percent for the EFA treatment group), we also estimate the effect of the intervention for those who participate, or the treatment-on-the-treated (TOT) effect. Specifically, we estimate:

$$y_i = \gamma_0 + P_i\gamma_1 + \mathbf{X}_i\gamma_2 + \eta_i \qquad (2)$$

where P_i is an indicator for participation in the program. We estimate these effects via an instrumental variable (IV) model, using assignment to treatment (T_i) as an instrument for participation in the program (P_i). Program participation (or take-up) is defined as attending the intake meeting and completing an intake form.

IV. SIX SEMESTER RESULTS

Table 5 reports the six-semester results associated with the STC intervention. We report results for the full sample, as well as separately by gender. For each outcome, we report both ITT and TOT effects. As a benchmark for the magnitude of these effects, we report the mean of each outcome for the control group in the ITT columns and the control complier mean (CCM) in the TOT columns. The

CCM is calculated as the mean of the outcome for the compliers (those who take-up the treatment) in the treatment group less the IV estimate.[26]

STC has a large effect on persistence in school after six semesters, but the estimate is only significant at the 10 percent level. The point estimate indicates that students in the treatment group are 5.6 percentage points more likely to be enrolled in school after six semesters. The TOT estimate indicates that those who participate in STC are 25.1 percentage points more likely to persist, implying an enrollment rate that is more than double the CCM. For the full sample, all the other estimates are positive, indicating improved outcomes for the treatment group, but none of these estimates are statistically significant.

The positive effect of STC is driven by females. Females assigned to the STC treatment group are 8.4 percentage points more likely to still be enrolled in college after six semesters than females in the control group, and this difference is statistically significant. The TOT estimate (35.8 percentage points) indicates that female program participants were nearly four times more likely to persist in college relative to the CCM. Through six semesters, we also see that females in the treatment group have accumulated more total credits, although this effect is only marginally significant.

There is a large and statistically significant effect on completing an associate's degree for females. Three years after enrollment in the study, females in the treatment group are 7.4 percentage points more likely to have completed an associate's degree than females in the control group, corresponding to a TOT effect of 31.5 percentage points. There is little evidence of a positive effect of STC participation for male students; in fact the point estimate is negative. This lack of a positive effect

[26] For binary outcomes, sampling variation can produce negative estimates of the CCM. For these cases we report the CCM as zero, following (Kling et al., 2007). To determine the nature of selection into take-up based on observable characteristics, we examine the mean characteristics of treatment compliers and non-compliers respectively (Appendix Table 1). Students who take up the program tend to be slightly older, but overall the mean characteristics of compliers and non-compliers are very similar. We observe that those who take up the program have a slightly lower propensity score of earning a degree *ex ante*, though the difference is not statistically significant.

may be due to the small sample for males, but at the 10% level, we can reject the hypothesis that the effect is the same for females and males.

Although we focus on six semester results, or 150 percent of the standard time to completion for an associate's degree, we do have information on student outcomes after eight semesters, which we report in Appendix Table 4. The results for the effect of STC on degree completion after eight semesters are similar to those reported after six semesters. We again see a large and statistically significant effect on completing an associate's degree for females, but no evidence of an effect for males. After eight semesters, we no longer see an effect on persistence in school, neither for the full sample nor for females. This finding is consistent with the idea that the program might eventually help move students to degree completion faster. At eight semesters, we also looked at longer-term outcomes such as whether the student has transferred to a four-year college or whether the student has completed a bachelor's degree. While the point estimates for the program effect are positive for these outcomes, the estimates are small and imprecise.

We also investigate whether there are heterogeneous treatment effects by other key student characteristics.[27] Table 6a reports results separately for white and non-white students and separately for those with family income above and below the STC sample median ($18,500). Those in the STC treatment group with family income greater than the median family income of the study sample are 8.3 percentage points (standard error 4.8) more likely to stay enrolled in classes anywhere through their sixth semester (Table 6a, column 3), which implies a TOT effect of 44.1 percentage points. The ITT estimate on this same outcome for students with lower levels of family income implies a much smaller,

[27] Examination of heterogeneous impacts across several groups may raise concerns about multiple hypothesis testing. To address these concerns, we follow the approach of Chetty, Hendren, and Katz (2016) and test the null hypothesis that the treatment effects are zero for all subgroups using a parametric F-test. The results from these tests are provided in Appendix Table 5. In Panel A, we consider just two subgroups (male and female). These results indicate that we can reject the null that STC has no effect on earning an associate's degree for either gender with $p = 0.034$. If we consider 8 different subgroups that we report in the paper (Panel B of Appendix Table 5), then we fail to reject the hypothesis that STC has no effect on earning an associate's degree in all the subgroups ($p = 0.285$).

2.4 percentage point increase (standard error 4.7). Given the standard errors, we cannot reject similar effects across income groups.

The estimated effects for non-white students are generally similar to what we report for the full sample in Table 5, which is not surprising given that about 70 percent of the sample is non-white. The estimated TOT effect for non-white students implies a 31.8 percentage point increase in the likelihood of being enrolled anywhere after six semesters (standard error 18.1). When we limit the sample to whites, the estimated TOT estimate is very small (2.3 percentage points) but with a standard error ten times that size. Given the large standard error associated with that estimate, we cannot reject the null that there are similar effects by race.

In the first four columns of Table 6b, we report estimates based on whether students had more or fewer initial credit hours than the median at enrollment (10 credit hours). Our motivation for looking separately by credit hours was to observe whether students who were further along the education process had a different treatment effect. Perhaps students with more credits when enrolled may not need as much help because they were further along. Alternatively, these same students might be more likely to be on the margin of completing a degree, and comprehensive case management provides the critical support needed to graduate. Point estimates indicate large TOT effects for both groups but neither are statistically significant. Overall, the data do not indicate any persistent differences across students based on this simple cut of the data.

In the second half of the table, we consider whether results vary based on "outcome propensity," or the estimated probability to achieve a particular outcome of interest (i.e. earning a degree) based on baseline characteristics. We implement the repeated split sampling (RSS) method proposed by Abadie et al. (2018).[28] Under RSS, the control group is randomly divided in half and one

[28] This method builds on the practice of testing for heterogeneous treatment effects by propensity score, where the propensity score for the full sample is constructed based on estimated betas from an initial comparison group. Abadie et al. (2018) demonstrate that this approach is systematically biased in favor of finding the largest effects for the lowest probability group.

half of the group is used to generate the prediction equation. These estimates are applied to the treatment group and the other half of the control group. This split sample is repeated multiple times. The estimated treatment effect is the simple average across these iterations. Standard errors are calculated by bootstrap subsamples of the split samples. In Abadie et al. (2018), the first-stage equation is estimated by OLS for the outcome regardless of whether the outcome is continuous or dichotomous. This equation is called the prognosis score. In our work, we use a logit model when the outcome of interest is dichotomous and generate a propensity score, and use the prognosis score when the outcome is continuous. We use 1000 split samples to calculate means and a 100 bootstrap iterations for each split sample to calculate standard errors.

Results for the subsamples indicate that STC is particularly effective for students with higher baseline propensity scores of success. Among those in the top tercile of propensities to be enrolled in school, students assigned to the STC treatment group are 11.8 percentage points more likely to still be enrolled in college after six semesters (TOT estimate 65.7 with a standard error of 29.9). For those in the top tercile, STC also appears to increase total accumulated credits and the likelihood of earning a degree, but these estimates are only statistically significant at the 10 percent level. In general, the results for those in the lower and middle thirds indicate that STC had little effect on academic outcomes for these groups (Table 6b, column 5-8). However, given the large standard errors on the estimated treatment effects these subgroups, we cannot reject the hypotheses that the effects of STC is the same across terciles.

All of the analysis discussed up to this point has focused on the differences in outcomes between the STC treatment group, which was offered comprehensive case management and access to emergency financial assistance, and the control group. Our research design also allows us to directly estimate the effect of providing only emergency financial assistance, by comparing the EFA treatment group to the control group. We report these results in Table 7 for the same outcomes reported above. After six semesters, those who had access to emergency financial assistance earned degrees and

remained enrolled in classes at remarkably similar rates to the control group. We find no statistically significant differences in outcomes in the overall sample or for the male and female subsamples. In nearly all cases, the point estimates are small, and in many cases they are negative. However, given the standard errors we are unable to reject the hypothesis of small positive effects. These results for the EFA-only treatment arm are discussed in more detail in Evans et al. (2019).

Although this evidence suggests that EFA itself does not have a sizeable impact on persistence and degree completion in community college, this does not mean that EFA is not an effective component of comprehensive case management. We have not tested case management with EFA against case management without EFA, which is what would be needed to draw such a conclusion.

V. TWO- AND FOUR-SEMESTER RESULTS

Because we have received outcome data from TCC each semester, we are able to examine how the impact of STC evolves over time. Comparing short- and medium-term outcomes helps us understand whether the intervention has an immediate impact or whether effects appear more gradually. Many community college students drop out after just one or two semesters, so an intervention like STC has the potential to affect outcomes nearly immediately. In our study sample, about 20 percent of students drop out by the end of the second semester.

Table 8 reports two semester results for the same five outcomes as reported after six semesters in Table 5, plus the additional outcome of whether the student is enrolled at TCC. We do not report this outcome with the six-semester results because by six semesters after enrollment in the study many students have transferred to a different school. After just two semesters, however, less than 1.5% of the study sample is enrolled at a post-secondary institution other than TCC, so enrollment at TCC captures college enrollment status for most of the students.

The data indicate that after two semesters not enough time has passed for students to obtain a degree—only 0.7 percent of the control group has completed a degree by this point. It is not surprising

that we find no effect on degree completion for the full sample or for the female and male subsamples. However, the data indicate that two semesters is enough time to observe an effect on intermediate outcomes. The TOT estimate for enrolled in classes at TCC indicates that STC participation leads to a 28.9 percentage point increase (standard error 12.1). In terms of gender comparisons, the data already start to show some indication that the effect is stronger for females. When looking at whether the student is enrolled anywhere, however, we do not see a noticeable difference between the treatment and control groups after two-semesters. It appears that after only two semesters, STC is effective at keeping students from transferring from TCC, but not necessarily at increasing overall persistence in community college. We also find that the treatment group has accumulated more credits. STC participants have nearly 5 more credit hours (the equivalent of 1.66 additional classes), but this difference is marginally significant.

Table 9 reports four-semester results, which includes the summer between years one and two, a time during which many community college students drop out. This is evident in our four-semester results, by which point more than half the sample is no longer at TCC, and only about three-fifths of the sample is still enrolled in school. After four semesters, we still see the positive effect on credit hours that was evident after two semesters. However, we still see no effect of STC on degree completion or enrollment at any college, and we no longer see an effect of STC on enrollment at TCC.

Together, our results after two, four, and six semesters indicate that the intervention did not have a meaningful impact on enrollment in college or degree completion until after six semesters. This suggests that the STC intervention is more effective at keeping students in school after they have been enrolled for several semesters than it is at preventing dropouts in the short-run. Perhaps this is because it takes time for the navigators and students to develop the relationship that allows comprehensive coaching and mentoring to have a substantive impact on persistence and completion, so the impact of these efforts on success in school is not evident until after a few years.

VI. DISCUSSION

A. Estimated benefit-to-cost ratio

Because STC is a "heavy touch" intervention with relatively high per-student costs, it is important to consider the positive effects of the program alongside the costs. The average cost per student over three years of STC case management (including access to EFA) is $4,343.[29] This cost includes STC staff salary (manager, navigators, and an EFA coordinator), fringe benefits, training, and EFA payouts.

We calculate the cost per additional associate's degree, along the lines of what Weiss et al. (2019) do in their evaluation of ASAP and what Carrell and Sacerdote (2017) do in their evaluation of a college application intervention. The calculations in those studies use the marginal cost of providing the intervention to the treatment group, and we aim to do the same. In the case of STC, the service provider (CCFW) expended around $4,343 in program costs per participating student over the course of 3 years to induce 16 percentage points more students to graduate within 3 years of program enrollment. This translates to a cost of roughly $27,140 per additional associate degree ($4,343/0.16). By way of comparison, Weiss et al. (2019) note that ASAP spent around $14,100 in marginal services per treated student to induce 18 percentage points more students to graduate within 3 years. This translates into an ASAP program cost of roughly $78,000 ($14,100/0.18) per additional associate degree.

To measure the program benefits in terms of additional earnings, we conduct a back-of-the-envelope calculation using average earnings differences between individuals with and without an associate's degree observed in national survey data. The TOT estimate for the full sample from Table 5 indicates that STC increased the probability an enrolled client received an associate's degrees by 16 percentage

[29] This cost estimate assumes that each navigator has a caseload of 34. The average cost per year is $1,880, which translates into $5,640 over three years of enrollment (as we report in Table 2). However, students do not always stay in the program for three years. Over the period of this study, about 70% of the STC participants remained in the program in the second year and about 61% in the third year. So the average cost over three years was (1+0.70+0.61)(1,880) = $4,343.

points. Data from the 2015 five-year American Communities Survey (ACS) for individuals age 21-35 indicate that those with an associate's degree earn about $5,830/year more than those with some college, but no degree and not currently enrolled.[30] In addition, the TOT estimate suggests that STC participation increases enrollment in school after six semesters by 25 percentage points. Some of this increase is the result of students who persist in order to obtain a degree, so we net out the additional persistence that comes from degree completion (i.e. 0.25 – 0.16 = 0.09), and assume greater persistence means enrolling in college beyond one year. This implies that for each additional treated student who does not earn an associate's degree, 0.09 more students persist in school beyond one year. The same ACS data used above suggest that an additional year of post-secondary schooling increases earnings by $2,610.[31] Combining these estimated returns to community college with our estimates of the impact of STC from the full sample indicates that treating an additional student increases annual earnings by 0.16*$5,830 + 0.09*$2,610 = $1,168.

This increase in annual earnings indicates that the direct costs of the program ($4,343) are offset by increased earnings in about 3.7 years. This pay-back period would increase if we were to include indirect costs such as the opportunity cost of lost wages while in school. Using ACS data, we estimate the opportunity cost of the program due to lost wages as $1,325 for those that spend an additional year in college but don't complete a degree, and $4,712 for those that graduate with an associate's degree. Comparing both the direct costs and the opportunity costs of lost earnings to the earnings gains from the program, the breakeven point is 8.9 years. These estimates overstate the pay-back period as they do

[30] We use the IPUMS.org version of the ACS (Ruggles et al., 2015). With the ACS we observe whether someone is enrolled in college, but we do not observe whether that college is 2-year or 4-year. For the sample of those with some college, we include both those with some college but less than 1 year of college (IPUMS code 65) and those with 1 or more years of college credit but no degree (IPUMS code 71). The average earnings of those with some college but no associate's degree (codes 65 and 71), and currently not attending school (i.e college dropouts) is $23,662. The average earnings of those with an associate's degree who are currently not in school is $29,492. So the difference generated by getting an associate's degree is $5830 ($29,492 – $23,662).

[31] The average earnings of those with less than 1 year of college, with no degree, and not in school is $22,016. The average earnings of those with 1+ years of college, with no degree, and currently not in school is $24,626. The difference between these two suggests that the returns to one more year of schooling increases earnings by $2,610.

not allow for the possibility that those with an associate's degree eventually earn a bachelor's degree. Nor does it consider societal benefits to college degree attainment beyond the direct earnings benefits to the college graduate themself.[32] On the other hand, this simple calculation only accounts for direct program costs and the opportunity cost of foregone wages, and does not attempt to consider other indirect costs, such as the costs borne by the community college in terms of office space, additional services taken up by treated students, or the additional tuition subsidies granted to students whose persistence was increased. A scaled up version of STC may be more or less costly on a per student basis due to factors such as economies of scale, capacity constraints, etc. Nevertheless, the main takeaway will remain, which is that the costs of this program are fairly small as compared to a reasonable assumption about lifetime earnings increases associated with higher educational attainment.

B. Additional interpretation issues

The results for STC raise three critical questions. First, why is there strong evidence of a positive effect for females, but not for males? Second, why did the EFA program not yield any discernible benefits? Third, are these results replicable? We offer some speculative observations here.

The finding of sizable positive effects of this intervention for females but no statistically significant effects for males is consistent with findings from other similar types of interventions. Angrist et al. (2009) found a larger positive effect of the Project STAR intervention for females. Carroll and Sacerdote (2017) implemented a college-going mentoring programs for high school students, focusing on helping more students enroll in college, and found that the program leads to large increases in college enrollment rates among female students, but much smaller effects for males. Like those authors, we can only speculate as to what might be driving the difference. One obvious issue in the

[32] Levin and Garcia (2017) attempt a thorough net social benefit accounting of the ASAP program. To do so, they attempt to monetize and project financial and social benefits associated with associate degree receipt, which include greater student earnings, increased tax revenues, reduced public health spending, reduced use of the criminal justice system, and reduced use of public assistance. Their resulting estimate is that the taxpayer benefit per additional associate's degree is $205,500. This estimate is based on a large number of assumptions and has a wide degree of uncertainty. In regard to this exercise, Weiss et al. (2019) observe that "projecting the net monetary benefits to the taxpayer require a number of assumptions and the estimates are imprecise."

STC evaluation is that all case managers in the program were female. This was not by design, but rather a consequence of the social work profession, from which STC navigators are drawn, being overwhelmingly dominated by females. Perhaps a program that so heavily relies on personal connection is more effective when the mentor/mentee pair is of the same gender.[33]

We conjectured that perhaps females would be more likely to meet with their case managers, both because they would be more comfortable talking with a female and because they would have been more likely to have participated in safety net programs and interacted with a case manager previously. Females are slightly more likely than males to take-up the offer of participating in STC (23.3% versus 19.3%), but case notes on student/navigator interactions reveal little difference in these interactions by gender. Male students appear no less likely to have met with their navigator than female students. Furthermore, they discussed an overlapping set of issues with a similar frequency distribution, as shown in Figure 1. Still, perhaps females were more likely to take navigator's advice to heart, even if they received advice in roughly equal measure. Future implementations of the program would benefit from the recruitment of male caseworkers to the navigator role so that this hypothesis could be explored. However, all this should be considered with the caveat that the results for males are statistically imprecise. There may, in fact, have been a positive effect for some males. A large sample size of treated male students would likely yield better insight into whether this type of a program tends to be effective for male students.

The finding of no discernible benefit associated with access to EFA without associated case management raises the possibility that such an intervention is only effective if it is offered in conjunction with additional services. These results suggest that giving very low income students access to cash aid without the requirement or benefit of having a case manager to help address the causes of

[33] Interestingly, the ASAP program yielded similar benefits for men and women. But as described above, that program is not just a case management program, but also includes tuition benefits and academic and classroom features. The contrast between the gender similarity in the ASAP program and the gender differences in the mentoring programs suggests that the greater effect for females is specific for mentoring programs.

the underlying financial distress is not sufficient. Perhaps with a less disadvantaged population, a one-time infusion of cash could help, but for students in our low-income sample, we found no evidence that having access to up to $1,500 to cover non-tuition financial shocks increased either enrollment persistence or degree attainment. We also stress that our study is not able to shed light on whether EFA is a critical aspect of case management. There might be important interactions between the coaching and mentoring aspects of STC and the ability of case managers to offer limited financial help. This is something future work should investigate.

Replicability is a key concern with any successful but small scale RCT. STC was designed with the goal of subsequent replication. The research team has worked closely with our implementing partners over the past three years to document the key aspects of the program such as how to train navigators and how much to expect to pay for EFA so the program can be replicated. We are collaborating with the implementing agency partner, CCFW, to roll out the replication of STC in an RCT context on other college campuses in partnership with other social service agencies. It will be instructive to investigate whether the results are reproduced with a different implementing agency, with a different student population, and in a different community college setting.

A related replication question is whether it is fundamental to the effectiveness of the intervention that the program is implemented by a third-party non-profit rather than community college counselors. We offer the observation that the implementing agency, CCFW, considers individualized case management to be their comparative advantage. To the best of our understanding, this tends not to be the particular focus or training of community college counselors. Perhaps that dedicated focus is what makes this application of the program so effective. If individuals without a background in social work, or with a different background in social work, were to serve as navigators, the results might be different. Again, this points to a need for replication to learn under what contexts specifically such a program can be expected to generate beneficial effects for students.

VII. CONCLUSION

This paper has investigated whether a case-management intervention could increase the rates of enrollment persistence and degree completion among low-income community college students. To study this question, we conducted an RCT evaluation of the STC intervention. The main elements of this program are comprehensive case management – including mentoring, coaching, referrals, and limited access to emergency financial assistance – conducted by a trained social worker with a caseload of no more than 34 students at a time. The paper has described an RCT evaluation of this program implemented by the research team in partnership with a local social service agency at a community college campus in Fort Worth, Texas.

The results indicate sizable increases in school persistence and degree completion through six semesters, driven by female students. Intention-to-treat estimates based on regression-adjusted differences between females randomly assigned to case management services and those randomly assigned to a control group show a 7.4 percentage point increase in the likelihood of earning an associate's degree (standard error of 3.3), off a control group mean of 15.7 percent. This translates into a treatment-on-the-treated effect of 31.5 percentage points (standard error of 14.1).

Point estimates for the full sample of females and males combined are positive, but not statistically significant. We report a back-of-the-envelope calculation that takes as program benefits the point estimates for the full sample combined with projected earnings increases. This simple calculation suggests that the benefits of the program, as captured by increased earnings, exceeds the per-student costs ($5,640 total for three years of enrollment) after only 4.25 years in the workforce post schooling. There is no evidence of a positive effect of a limited version of the program that only offered access to emergency financial assistance (EFA) without associated case management services. We offer speculative explanations above for why the program was particularly effective for females and why the EFA-only treatment did not lead to positive outcomes.

This paper contributes to multiple literatures. First, it contributes to the literature on college completion, in particular, the sets of studies focusing on ways to increase college completion rates among low-income students. As noted in the introduction, income gaps in college completion have widened despite expansions to the Pell Grant program that have made financial aid more generous for low-income families. Research and policy attention to this challenge has tended to focus on interventions run through community colleges themselves, in particular, academic programs and enhanced school counseling. The research demonstration project studied in this paper is novel in that it is an comprehensive case-management program run by a third party non-profit with a particular expertise in case management.

The paper contributes more generally to the literature on anti-poverty strategies and ways to effectively help individuals achieve economic self-sufficiency. This paper has demonstrated that case management can be a cost-effective way to increase rates of educational persistence and degree completion among poor and near poor students. Future work will follow these same students to investigate longer term effects on earnings. A supplementary project being conducted by a subset of the research team is investigating the effectiveness of case management in improving a wide variety of economic outcomes for a non-student population in the same community. Together, this body of research will contribute to our collective knowledge about the types of barriers facing low-income individuals and the most cost-effective ways of helping them achieve economic security.

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Appendix: Correspondence used to enroll study participants into treatment

The following letters and emails were sent to eligible students who were assigned to one of the two treatment arms. The letters were printed on Trinity River letterhead and mailed in TCC marked envelopes. The emails were sent via the college's mass communication system and therefore appeared to the students as emails from TCC. The initial letters and emails are below. Similar emails reminding eligible students about the opportunity to participate were sent periodically throughout the enrollment window.

Solicitation Emails

Email 1 (Sent to the students assigned to the full Stay the Course treatment):

> Dear Student,
>
> You have been selected to participate in an exciting new opportunity at Trinity River Campus called *Stay the Course*. Designed to help students persist in school and attain their degrees, this program is being offered at no cost to you through a partnership with Catholic Charities Fort Worth, a major non-profit in the Fort Worth community. *Stay the Course* is part of a research project, and due to limited funding, only a small number of Trinity River students have been selected to participate. Through a lottery, you were chosen to participate. Eligibility for this program cannot be transferred to another student.
>
> As a participant in *Stay the Course*, you will have the opportunity to work with a Navigator on campus to assist you in dealing with the many obstacles that students often face as they progress through college. The Navigator will also work with you to develop a personalized *Path to Graduation*.
>
> Another tremendous benefit of *Stay the Course* is access to financial assistance to assist you in overcoming unexpected financial hardships that threaten your ability to stay enrolled in school. If you enroll in the program, you will be eligible for up to $500 of assistance per semester, with a cap of $1500 that you can receive over the next three years of enrollment at TCC.
>
> To sign up, please visit the *Stay the Course* website at staythecourse-cc.org. Your unique login information for the site is as follows:
>
> USERNAME: Student ID #
> PASSWORD: […]
>
> To participate in *Stay the Course*, you must sign up by **September 9, 2013**. If you would like to remove yourself from our contact list, you can opt-out of the program at any time by logging into the *Stay the Course* website and selecting "opt out."
>
> To learn more, please attend one of the *Stay the Course* information sessions in the Speed Room (TRTR 4207, 4th Floor) on the Trinity River Campus on **August 28th at 9am** or **August 29th at 4pm.** Light refreshments will be served. *Stay the Course* staff will be there to explain how the

program works and to help you enroll. In the meantime, if you have any questions about the program, please contact the *Stay the Course* staff at [#].

We at Trinity River Campus are excited to be the first TCC campus participating in this program and encourage you to take full advantage of this unique opportunity.

Sincerely,

[College President]

Email 2 (Sent to the students assigned to the Emergency Financial Assistance only treatment):

Dear Student,

You have been selected to participate in an exciting new opportunity at Trinity River Campus called *Stay the Course Fund*. The program is designed to assist students in overcoming unexpected financial hardships that threaten their ability to stay enrolled in school. It is being offered at no cost to you through a partnership with Catholic Charities Fort Worth, a major non-profit in the Fort Worth community. *Stay the Course Fund* is part of a research project, and due to limited funding, only a small number of Trinity River students have been selected to participate. Through a lottery, you were chosen to participate. Eligibility for this program cannot be transferred to another student**.**

As a participant in *Stay the Course Fund*, you will have access to financial assistance to help you overcome unexpected financial hardships that threaten your ability to stay enrolled in school. If you enroll in the program, you will be eligible for up to $500 of assistance per semester, with a cap of $1500 that you can receive over the next three years of enrollment at TCC. If you would like to be eligible for this $1500 of financial assistance, you must enroll in *Stay the Course Fund* by **September 9, 2013.**

To sign up, first visit the *Stay the Course Fund* website at staythecourse-cc.org. Your unique login information for the site is as follows:

USERNAME: Student ID #
PASSWORD: […]

To complete the enrollment process, you must pick up a *Stay the Course Fund* welcome packet. These packets are available on the Trinity River Campus in room TREF 6402 during normal business hours. If you would like to remove yourself from our contact list, you can opt-out of the program at any time by logging into *Stay the Course Fund* website and selecting "opt out."

To learn more, please attend one of the *Stay the Course Fund* information sessions in the Speed Room (TRTR 4207, 4th floor) on the Trinity River Campus on **August 28th at 4pm** or **August 29th at 9am**. Light refreshments will be served. *Stay the Course Fund* staff will be there to explain how the program works and to help you enroll. You may also pick up your welcome packet at this event. In the meantime, if you have any questions about the program, please contact the *Stay the Course Fund* staff at [#].

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Letter 1 (Sent to the students assigned to the full Stay the Course treatment):

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To participate in Stay the Course, you must enroll by **September 9, 2013**. If you would like to remove yourself from our contact list, you can opt-out of the program at any time by logging into the *Stay the Course* website and selecting "opt out."

To learn more, please attend one of the *Stay the Course* information sessions in the Speed Room (TRTR 4207, 4th Floor) on the Trinity River Campus on **August 28th at 9am** or **August 29th at 4pm.** Light refreshments will be served. *Stay the Course* staff will be there to explain how the program works and to help you enroll. In the meantime, if you have any questions about the program, please contact the *Stay the Course* staff at [#].

We at Trinity River Campus are excited to be the first TCC campus participating in this program and encourage you to take full advantage of this unique opportunity.

Sincerely,

[TCC President]

Letter 2 (Sent to the students assigned to the Emergency Financial Assistance only treatment):

Dear Student,

This letter is to follow up on an email you recently received regarding your eligibility to participate in an exciting new opportunity at Trinity River Campus called *Stay the Course Fund.* This program is designed to assist students overcome financial hardships they may face during their college careers. It is being offered at no cost to you through a partnership with Catholic Charities Fort Worth, a major non-profit in the Fort Worth community. *Stay the Course Fund* is part of a research project, and due to limited funding, only a small number of Trinity River students have been selected to participate. Through a lottery, you were chosen to participate. Eligibility for this program cannot be transferred to another student**.**

As a participant in *Stay the Course Fund*, you will have access to financial assistance to help you overcome unexpected financial hardships that threaten your ability to stay enrolled in school. If you enroll in the program, you will be eligible for up to $500 of assistance per semester, with a cap of $1500 that you can receive over the next three years of enrollment at TCC. If you would like to be eligible for this $1500 of financial assistance, you must enroll in *Stay the Course Fund* by **September 9, 2013.**

To enroll, first visit the *Stay the Course Fund* website at staythecourse-cc.org. Your unique login information for the site is as follows:

USERNAME: Student ID #
PASSWORD: enrollme

Further, you must pick up a *Stay the Course Fund* welcome packet. These packets are available on the Trinity River campus in room TREF 6402 during normal business hours. If you would like to remove yourself from our contact list, you can opt-out of the program at any time by logging into the *Stay the Course Fund* website and selecting "opt out."

To learn more, please attend one of the *Stay the Course Fund* information sessions in the Speed Room (TRTR 4207, 4th floor) on the Trinity River Campus on **August 28th at 4pm** or **August 29th at 9am**. Light refreshments will be served. *Stay the Course Fund* staff will be there to explain how the program works and to help you enroll. You may also pick up your welcome packet at this event. In the meantime, if you have any questions about the program, please contact the *Stay the Course Fund* staff at [#].

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Sincerely,

[College President]

Table 1
Summary of Navigator-Student Interactions for the STC Program

	Mean per Student		
Variable	Overall	Females	Males
Total Interactions per Semester	33.81	33.61	34.17
	(16.39)	(16.04)	(17.11)
In-Person Meetings per Semester	4.13	3.75	4.85
	(3.65)	(3.18)	(4.33)
Duration of In-Person Meeting (Minutes)	41.25	43.19	38.44
	(25.96)	(25.90)	(25.43)
Text/Email Interactions per Semester	17.08	17.81	15.71
	(9.99)	(10.15)	(9.56)
Phone Interactions per Semester	9.70	9.23	10.59
	(11.64)	(11.49)	(11.91)
Duration of Phone Meeting (Minutes)	12.35	11.57	13.76
	(20.35)	(19.78)	(21.27)
Number of Students	94	63	31

Notes: Calculations were made using CCFW case note data from Fall 2013 through Spring 2016 for the 94 treatment compliers in semesters where they were still active in the program, so these means are conditional on students meeting in-person with a Navigator at least once in the semester. Standard deviations are in parentheses.

Table 2
Characteristics of Select RCT Interventions Promoting College Persistence or Completion

	Stay the Course	**Inside Track**	**Opening Doors - Ohio**	**Opening Doors - Louisiana**	**ASAP**	**Project STAR**
Reference	-	Bettinger & Baker, 2014	Scrivener & Weiss, 2009	Barrow et al., 2014; Richburg-Hayes et al., 2009	Scrivener et al., 2015	Angrist, Lang, Oreopoulis, 2009.
RCT Demonstration	Fort Worth, TX. 2013 -2016 (N = 869)	Multiple anonymous locations. 2003-2004, 2007-2008 (N = 13,555)	Multiple sites. 2003-2006 (N = 2,139)	New Orleans, LA. 2004-2005 (N= 1,019)	New York, NY. 2010-2013 (N=896)	Canada. 2005-2006 (N= 1,656)
Type of Institution	Community college (one campus)	Private, public, two-year, and four-year	Community college (two campuses)	Community college (two campuses)	Community college (three campuses)	Public 4-year university (one campus)
Cost per Student	$5,640 total for three years of enrollment	$500 per semester	Cost analysis not included	$1,100 in scholarships plus unknown administrative costs	$16,284 in additional services above control group for three year program	$739 for one year program
Primary Finding	31.5 pp increase in associate's degree completion among enrolled women, nearly 3 times the graduation rate of females in the control group	Coached students 3 to 4 pp more likely to persist after 18 mos, 24 mos; 4 pp more likely to graduate	No sig. increase in credits ended or over the 3-year follow-up period	Program eligible students 15 – 18 pp (6.5 pp) more like to persist in second (fourth) semester post random assignment	18 pp increase in degree completion, nearly 2 times the graduation rate of students in the control group	GPA improvement & increase in credits earned for first-year female students (but not males) in the full SFSP program
Eligible student population	-Pell eligible or below 200% FPL -Must be enrolled in at least 9 credit hours at baseline - 30 or fewer accumulated credits at baseline	None	-Below 250% FPL -Full-time or part-time - 12 or fewer accumulated credits at baseline	-Parents of at least one dependent child under 19 with household income below 200% FPL. - Full-time or part-time - No students with degrees or occupational	-Pell eligible or below 200% FPL. -Restricted to all majors except: allied Health Sciences, Pre-Clinical Nursing, Forensic Science, and Engineering Science - Full-time only	- No income restrictions - Full-time only - Entering first-year

				certificate from accredited college or university	- 12 or fewer accumulated credits at baseline	
Case management						
Coaching, Mentoring, Referrals	Intensive case management, involving, coaching, mentoring, and referrals for all aspects of the student's life. Emphasis on in-person meetings	Coaching by phone to help student develop time management, self-advocacy, and study skills	Counselor assists with personal and academic issues. Counselor refers students to services on and off campus	Coaching and referral services available but underutilized	-Comprehensive coaching from an ASAP-dedicated adviser. -Career information from an ASAP-dedicated career and employment services staff member	-Peer mentoring from upper-class students in the same field of study at the University. -Peer Advisors were trained to identify circumstances that called for more professional help and to make appropriate referrals
Student:Counselor Ratio	34:1	Not reported	Lorain Campus: 81:1; Owens Campus: 157:1	Varied, but rarely exceed 100:1	Between 80:1 and 60:1	Not reported
Educational Planning/Advising	Navigator helps student identify goals and steps necessary to achieve those goals	The coach works with the student to develop a clear vision of his/her goals and set up steps necessary to achieve those goals	Counselor helps with work-based, learning efforts, juggling school and work, and career aspirations	Available but underutilized	Students enroll in an ASAP seminar covering topics such as goal-setting, study skills, and academic planning	Peer advisors e-mailed advisees at least biweekly to solicit questions about university assimilation, scheduling, studying, and time management
Financial Supports						
Non-tuition Financial Assistance	Students with a GPA of 2.0 or above are eligible up $500 of emergency financial assistance a semester, capped at $1,500	No	Students are eligible for a $150 stipend per semester for two semesters, usable for any purpose	No	Students receive free use of textbooks and free MetroCards for use on public transportation, contingent on participation in the program.	No

Tuition Waivers	No	No	No	No	3-11 percent of students received waiver in a given semester	No
Grade Bonus	No	No	No	$250 after midterms contingent on staying enrolled at least halftime & earning passing grades; $500 upon completion of courses with a C average or better. Extended for two semesters; students can earn up to $2,000.	No	Substantial cash awards, up to $5,000, for meeting a target GPA.
Academic						
Enrollment Assistance	Advised on course enrollment.	No	Yes	No	Yes	No
Tutoring	Referrals to tutoring	No	Referrals to tutoring	No	Students receive ASAP dedicated tutoring services separate from the usual college tutoring services	No
Learning Communities/ Block Classes	No	No	No	No	Students enroll in blocked or linked courses in their first year. Students can register for courses early so that they can create convenient schedules and get seats in the courses they need	No

Table 3

Descriptive Characteristics of Community College Students

Variable	U.S. (1)	Texas (2)	TCC (3)	Full *Stay the Course* Sample (4)
Age	28.00		26.92	24.21
Under 30 years old	0.71	0.719	0.750	0.833
30 years old and over	0.28	0.280	0.251	0.167
Female	0.57	0.558	0.579	0.655
Male	0.43	0.442	0.421	0.345
White, non-Hispanic	0.51	0.342	0.389	0.273
Black, non-Hispanic	0.14	0.132	0.181	0.198
Asian/Pacific Islander	0.06	0.044	0.044	0.031
Other Race	0.09	0.062	0.033	0.030
Hispanic	0.19	0.420	0.354	0.468
Part Time	0.60	0.748	0.869	0.446
Full Time	0.40	0.252	0.131	0.554
Receive Pell Grants	0.33			0.986
First Generation College Student	0.36			0.583
N	7.3 million	700,963	8,849	869

Notes: National statistics are taken from the American Association of Community Colleges (AACC) 2014 Fact Sheet. Texas statewide statistics were collected from txhighereddata.org. The TCC statistics represent averages from the Trinity River Campus in Fall 2013. Due to the limited age data available, the age ranges for the TCC column are under 31 and 31 and over. For students in the *Stay the Course* sample, full time students are defined as students who are enrolled in 12 or more credits at the Fall 2013 census date.

Table 4

Mean Characteristics of Treatment Groups and Control Group, Fall 2013

	Means by Group Assignment			*P-value on Test that Means are the Same Across Groups*	
Variable	STC Treatment (1)	EFA Treatment (2)	Control (3)	STC & Control (4)	EFA & Control (5)
Age at Entry	24.09	24.865	24.33	0.664	0.388
Female	0.628	0.642	0.681	0.099	0.272
TSI's Remaining at Entry	0.537	0.525	0.572	0.477	0.382
Dependent	0.516	0.552	0.519	0.928	0.386
Cumulative Hours Earned Prior to Entry	11.34	11.505	11.15	0.795	0.660
Family Income	$22,576	$22,906	$20,756	0.111	0.098
Between 0% and 50% of FPL	0.228	0.264	0.262	0.244	0.946
Between 50% and 100% of FPL	0.291	0.241	0.294	0.919	0.112
Between 100% and 150% of FPL	0.216	0.221	0.198	0.511	0.459
Between 150% and 200% of FPL	0.158	0.167	0.15	0.751	0.537
Above 200% of FPL	0.107	0.107	0.096	0.581	0.615
Estimated Family Contribution (FAFSA)	$768	$761	$650	0.242	0.292
Age < 20	0.449	0.421	0.405	0.197	0.666
Age 20 - 25	0.256	0.274	0.301	0.140	0.438
Age 26+	0.295	0.304	0.294	0.961	0.760
Black	0.184	0.241	0.216	0.229	0.437
White	0.405	0.418	0.408	0.926	0.780
Asian	0.027	0.037	0.035	0.522	0.469
Other Race	0.377	0.304	0.349	0.387	0.211
Hispanic	0.477	0.438	0.460	0.624	0.556
Declared Intention to Earn Associate's Degree	0.677	0.679	0.690	0.690	0.746
N	430	299	439		

Notes: Means are from TCC administrative data for Fall 2013 for subgroups of the full STC study sample (N = 1,168). See Section V of the text for more details.

Table 5

The Effect of STC on Outcomes after Six Semesters for Main Sample and by Gender

(Standard error) [P-value] {Control group mean in odd columns} {Control complier mean in even columns}

	Full Sample		Female Sample		Male Sample	
	ITT	TOT	ITT	TOT	ITT	TOT
Outcomes	(1)	(2)	(3)	(4)	(5)	(6)
Enrolled in College	0.056	0.251	0.084	0.358	-0.003	-0.014
	(0.033)	(0.152)	(0.041)	(0.178)	(0.058)	(0.293)
	[0.097]	[0.097]	[0.042]	[0.045]	[0.963]	[0.963]
	{0.440}	{0.238}	{0.425}	{0.134}	{0.471}	{0.498}
Total Credits Earned	1.764	7.717	2.846	11.793	-0.307	-1.526
	(1.314)	(5.697)	(1.682)	(6.931)	(2.117)	(10.361)
	[0.180]	[0.176]	[0.091]	[0.089]	[0.885]	[0.883]
	{26.829}	{24.171}	{26.414}	{20.269}	{27.725}	{33.083}
Cumulative GPA	0.026	0.116	0.046	0.195	-0.005	-0.025
	(0.067)	(0.295)	(0.084)	(0.352)	(0.112)	(0.552)
	[0.697]	[0.695]	[0.584]	[0.580]	[0.965]	[0.964]
	{2.495}	{2.520}	{2.490}	{2.428}	{2.504}	{2.686}
Earned any Degree	0.037	0.165	0.065	0.278	-0.009	-0.046
	(0.026)	(0.119)	(0.034)	(0.146)	(0.042)	(0.212)
	[0.167]	[0.167]	[0.055]	[0.057]	[0.831]	[0.828]
	{0.182}	{0.058}	{0.187}	{0.000}	{0.171}	{0.207}
Earned an Associate's Degree	0.036	0.162	0.074	0.315	-0.025	-0.129
	(0.025)	(0.115)	(0.033)	(0.141)	(0.040)	(0.205)
	[0.158]	[0.158]	[0.023]	[0.026]	[0.534]	[0.529]
	{0.159}	{0.029}	{0.157}	{0.000}	{0.164}	{0.258}
Earned an Associate's or Bachelor's Degree, or Enrolled in 4-Year College	0.039	0.175	0.083	0.354	-0.029	-0.149
	(0.030)	(0.135)	(0.037)	(0.162)	(0.050)	(0.256)
	[0.197]	[0.197]	[0.026]	[0.029]	[0.568]	[0.561]
	{0.267}	{0.112}	{0.244}	{0.000}	{0.314}	{0.407}
N	869	869	569	569	300	300

Notes: The Main Sample includes students assigned to the full STC treatment and those assigned to the control group. ITT estimates (β_1 from equation 1) are from OLS regressions of the outcomes listed in each row on assignment to treatment age, age squared, income, income squared, an indicator for female, and a set of race dummies. TOT estimates (γ_1 from equation 2) are from 2SLS regressions using assignment to treatment as an instrument for program participation. Take up = 1 if client completes an intake form. 20 observations are lost when analyzing cumulative GPA (11 females, 9 males) due to missing data. Because we do not observe GPA and total credits for students who are no longer enrolled at TCC, we impute these outcomes for students who are enrolled elsewhere--See Section III.B of the text for more details. In instances in which the Control Complier Mean (CCM) is negative, it is reported as zero--see Section V of the text for more details.

Table 6a

The Effect of STC on Outcomes after Six Semesters by Subsamples

(Standard error) [P-value] {Control group mean in odd columns} {Control complier mean in even columns}

	Income				*Race / Ethnicity*			
	≤ Median Income		> Median Income		White, Non-Hispanic		Non-White	
	ITT	TOT	ITT	TOT	ITT	TOT	ITT	TOT
Outcomes	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Enrolled in College	0.024	0.091	0.083	0.441	0.005	0.023	0.069	0.318
	(0.047)	(0.178)	(0.048)	(0.259)	(0.066)	(0.284)	(0.039)	(0.181)
	[0.616]	[0.611]	[0.083]	[0.089]	[0.936]	[0.935]	[0.076]	[0.080]
	{0.413}	{0.371}	{0.469}	{0.083}	{0.424}	{0.533}	{0.445}	{0.145}
Total Credits Earned	0.459	1.720	2.817	14.203	2.403	9.965	1.615	7.233
	(1.831)	(6.754)	(1.885)	(9.439)	(2.604)	(10.441)	(1.520)	(6.760)
	[0.802]	[0.799]	[0.136]	[0.132]	[0.357]	[0.340]	[0.288]	[0.285]
	{23.785}	{26.281}	{30.214}	{22.544}	{28.336}	{28.449}	{26.270}	{21.858}
Cumulative GPA	0.009	0.033	0.031	0.166	-0.039	-0.168	0.053	0.238
	(0.101)	(0.374)	(0.088)	(0.461)	(0.125)	(0.528)	(0.079)	(0.356)
	[0.931]	[0.930]	[0.722]	[0.719]	[0.755]	[0.751]	[0.507]	[0.503]
	{2.354}	{2.496}	{2.647}	{2.599}	{2.803}	{2.962}	{2.382}	{2.333}
Earned any Degree	0.024	0.092	0.050	0.267	0.035	0.155	0.041	0.189
	(0.036)	(0.135)	(0.039)	(0.210)	(0.051)	(0.224)	(0.031)	(0.142)
	[0.502]	[0.497]	[0.205]	[0.204]	[0.497]	[0.490]	[0.181]	[0.181]
	{0.161}	{0.100}	{0.206}	{0.000}	{0.203}	{0.104}	{0.174}	{0.020}
Earned an Associate's Degree	0.029	0.109	0.045	0.240	0.065	0.289	0.028	0.127
	(0.034)	(0.128)	(0.038)	(0.204)	(0.048)	(0.217)	(0.030)	(0.136)
	[0.399]	[0.394]	[0.240]	[0.239]	[0.179]	[0.184]	[0.353]	[0.350]
	{0.135}	{0.045}	{0.187}	{0.000}	{0.153}	{0.000}	{0.162}	{0.067}
Earned an Associate's Degree or Bachelor's Degree, or Enrolled in 4-Year College	-0.010	-0.038	0.088	0.469	0.014	0.060	0.049	0.225
	(0.041)	(0.156)	(0.044)	(0.242)	(0.059)	(0.258)	(0.035)	(0.160)
	[0.810]	[0.807]	[0.046]	[0.053]	[0.820]	[0.817]	[0.159]	[0.159]
	{0.257}	{0.288}	{0.278}	{0.000}	{0.288}	{0.199}	{0.259}	{0.074}
N	435	435	434	434	237	237	632	632

Notes: Results are for subgroups of the Main Sample that includes students assigned to the full STC treatment and those assigned to the control group. See notes to Table 5 for more details.

Table 6b

The Effect of STC on Outcomes after Six Semesters by Subsamples

(Standard error) [P-value] {Control group mean in odd columns} {Control complier mean in even columns}

	Initial Credit Hours				*Outcome Propensity*					
	> Median Hours		≤ Median Hours		Lower Third		Middle Third		Upper Third	
	ITT	TOT	ITT	TOT	ITT	TOT	ITT	TOT	ITT	TOT
Outcomes	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Enrolled in College	0.068	0.310	0.051	0.228	0.008	0.034	0.027	0.134	0.118	0.657
	(0.048)	(0.217)	(0.047)	(0.211)	(0.054)	(0.210)	(0.049)	(0.233)	(0.053)	(0.299)
	[0.154]	[0.154]	[0.284]	[0.279]	[0.874]	[0.870]	[0.579]	[0.564]	[0.027]	[0.028]
	{0.478}	{0.222}	{0.399}	{0.219}	{0.411}	{0.320}	{0.464}	{0.417}	{0.448}	{0.000}
Total Credits Earned	0.886	3.904	2.604	11.304	0.404	1.603	-0.246	-1.106	4.066	21.048
	(1.751)	(7.601)	(1.973)	(8.394)	(2.245)	(9.447)	(1.759)	(7.617)	(2.146)	(11.290)
	[0.613]	[0.608]	[0.188]	[0.178]	[0.857]	[0.865]	[0.889]	[0.885]	[0.058]	[0.063]
	{27.373}	{26.223}	{26.279}	{22.269}	{21.764}	{23.975}	{28.741}	{33.689}	{31.164}	{17.996}
Cumulative GPA	-0.055	-0.251	0.129	0.569	-0.053	-0.237	0.061	0.308	0.050	0.214
	(0.084)	(0.377)	(0.104)	(0.455)	(0.131)	(0.663)	(0.088)	(0.449)	(0.103)	(0.457)
	[0.510]	[0.505]	[0.217]	[0.211]	[0.688]	[0.720]	[0.493]	[0.493]	[0.627]	[0.639]
	{2.710}	{2.989}	{2.258}	{1.962}	{2.177}	{2.702}	{2.581}	{2.288}	{2.757}	{2.614}
Earned any Degree	0.010	0.047	0.056	0.251	0.008	0.037	-0.002	-0.016	0.094	0.419
	(0.040)	(0.182)	(0.034)	(0.153)	(0.035)	(0.162)	(0.042)	(0.209)	(0.054)	(0.255)
	[0.799]	[0.796]	[0.099]	[0.101]	[0.813]	[0.819]	[0.959]	[0.938]	[0.083]	[0.100]
	{0.239}	{0.230}	{0.122}	{0.000}	{0.096}	{0.067}	{0.205}	{0.218}	{0.251}	{0.000}
Earned an Associate's Degree	0.018	0.080	0.047	0.214	0.012	0.053	0.023	0.098	0.068	0.334
	(0.039)	(0.176)	(0.032)	(0.144)	(0.030)	(0.141)	(0.035)	(0.163)	(0.049)	(0.244)
	[0.655]	[0.651]	[0.138]	[0.138]	[0.700]	[0.708]	[0.515]	[0.550]	[0.165]	[0.171]
	{0.208}	{0.154}	{0.108}	{0.000}	{0.095}	{0.031}	{0.163}	{0.089}	{0.223}	{0.000}
Earned an Associate's or Bachelor's Degree, or Enrolled in 4-Year College	0.038	0.175	0.038	0.171	-0.022	-0.097	0.029	0.126	0.100	0.487
	(0.044)	(0.201)	(0.040)	(0.178)	(0.042)	(0.191)	(0.044)	(0.219)	(0.051)	(0.268)
	[0.388]	[0.385]	[0.341]	[0.337]	[0.605]	[0.613]	[0.503]	[0.565]	[0.050]	[0.070]
	{0.323}	{0.165}	{0.207}	{0.063}	{0.193}	{0.220}	{0.298}	{0.170}	{0.320}	{0.000}
N	444	444	425	425	290	290	289	289	290	290

Notes: Results are for subgroups of the Main Sample that includes students assigned to the full STC treatment and those assigned to the control group. Degree propensity is the predicted probability of earning a degree after six semesters, which is estimated on the control group using a probit model that includes as controls observable characteristics at baseline. See Section V of the text for more details.

Table 7

The Effect of EFA on Outcomes after Six Semesters for the Full EFA Sample and by Gender

(Standard error) [P-value] {Control group mean in odd columns} {Control complier mean in even columns}

	Full Sample		Female Sample		Male Sample	
	ITT	TOT	ITT	TOT	ITT	TOT
Outcomes	(1)	(2)	(3)	(4)	(5)	(6)
Enrolled in College	0.015	0.036	0.010	0.024	0.027	0.073
	(0.037)	(0.088)	(0.046)	(0.104)	(0.065)	(0.168)
	[0.686]	[0.683]	[0.820]	[0.817]	[0.671]	[0.664]
	{0.440}	{0.456}	{0.425}	{0.505}	{0.471}	{0.342}
Total Credits Earned	-0.443	-1.080	-1.068	-2.508	0.706	1.883
	(1.448)	(3.509)	(1.761)	(4.110)	(2.615)	(6.803)
	[0.760]	[0.758]	[0.545]	[0.542]	[0.787]	[0.782]
	{26.829}	{29.756}	{26.414}	{31.548}	{27.725}	{26.057}
Cumulative GPA	-0.108	-0.259	-0.089	-0.206	-0.131	-0.348
	(0.079)	(0.190)	(0.097)	(0.223)	(0.139)	(0.363)
	[0.173]	[0.172]	[0.358]	[0.356]	[0.347]	[0.338]
	{2.495}	{2.784}	{2.490}	{2.825}	{2.504}	{2.678}
Earned any Degree	-0.014	-0.034	-0.032	-0.073	0.017	0.045
	(0.029)	(0.068)	(0.035)	(0.080)	(0.050)	(0.130)
	[0.620]	[0.618]	[0.368]	[0.365]	[0.733]	[0.727]
	{0.182}	{0.248}	{0.187}	{0.285}	{0.171}	{0.175}
Earned an Associate's Degree	-0.012	-0.028	-0.014	-0.032	-0.007	-0.018
	(0.027)	(0.065)	(0.033)	(0.076)	(0.048)	(0.126)
	[0.674]	[0.671]	[0.674]	[0.670]	[0.886]	[0.884]
	{0.159}	{0.218}	{0.157}	{0.208}	{0.164}	{0.238}
Earned an Associate's or Bachelor's Degree, or Enrolled in 4-Year College	-0.031	-0.075	-0.021	-0.048	-0.047	-0.126
	(0.032)	(0.077)	(0.039)	(0.089)	(0.059)	(0.156)
	[0.332]	[0.330]	[0.595]	[0.592]	[0.423]	[0.418]
	{0.267}	{0.369}	{0.244}	{0.319}	{0.314}	{0.467}
N	738	738	491	491	247	247

Notes: Results are for the EFA Sample (N = 738) that includes students assigned to the EFA only treatment and those assigned to the control group. See notes to Table 5 for more details.

Table 8

The Effect of STC on Outcomes after Two Semesters for the Main Sample and by Gender

(Standard error) [P-value] {Control group mean in odd columns} {Control complier mean in even columns}

	Full Sample		Female Sample		Male Sample	
	ITT	TOT	ITT	TOT	ITT	TOT
Outcomes	(1)	(2)	(3)	(4)	(5)	(6)
Enrolled in Classes at TCC	0.064	0.289	0.075	0.319	0.040	0.206
	(0.027)	(0.121)	(0.034)	(0.143)	(0.045)	(0.225)
	[0.017]	[0.016]	[0.027]	[0.026]	[0.374]	[0.360]
	{0.759}	{0.637}	{0.749}	{0.586}	{0.779}	{0.762}
Enrolled in College	0.016	0.072	0.036	0.153	-0.027	-0.140
	(0.026)	(0.117)	(0.033)	(0.140)	(0.042)	(0.218)
	[0.544]	[0.540]	[0.280]	[0.275]	[0.521]	[0.520]
	{0.797}	{0.811}	{0.783}	{0.720}	{0.829}	{1.043}
Total Credits Earned	1.030	4.635	1.258	5.343	0.625	3.218
	(0.551)	(2.464)	(0.690)	(2.911)	(0.928)	(4.682)
	[0.062]	[0.060]	[0.069]	[0.066]	[0.501]	[0.492]
	{13.888}	{11.904}	{13.696}	{11.324}	{14.301}	{13.061}
Cumulative GPA	0.055	0.243	0.063	0.266	0.054	0.271
	(0.070)	(0.309)	(0.088)	(0.369)	(0.118)	(0.577)
	[0.436]	[0.432]	[0.476]	[0.472]	[0.647]	[0.638]
	{2.468}	{2.442}	{2.469}	{2.365}	{2.465}	{2.522}
Earned any Degree	0.012	0.054	0.011	0.047	0.012	0.064
	(0.008)	(0.035)	(0.010)	(0.041)	(0.013)	(0.069)
	[0.128]	[0.130]	[0.251]	[0.250]	[0.349]	[0.348]
	{0.007}	{0.000}	{0.007}	{0.000}	{0.007}	{0.000}
Earned an Associate's Degree	0.008	0.035	0.009	0.038	0.006	0.029
	(0.006)	(0.029)	(0.008)	(0.033)	(0.012)	(0.059)
	[0.233]	[0.233]	[0.253]	[0.251]	[0.627]	[0.622]
	{0.005}	{0.000}	{0.003}	{0.000}	{0.007}	{0.000}
Earned an Associate's or Bachelor's Degree, or Enrolled in 4-Year College	0.012	0.052	0.014	0.060	0.003	0.018
	(0.011)	(0.050)	(0.012)	(0.051)	(0.023)	(0.116)
	[0.300]	[0.299]	[0.244]	[0.244]	[0.878]	[0.876]
	{0.021}	{0.000}	{0.013}	{0.000}	{0.036}	{0.014}
N	869	869	569	569	300	300

Notes: Results are for the Main Sample that includes students assigned to the full STC treatment and those assigned to the control group.

Table 9

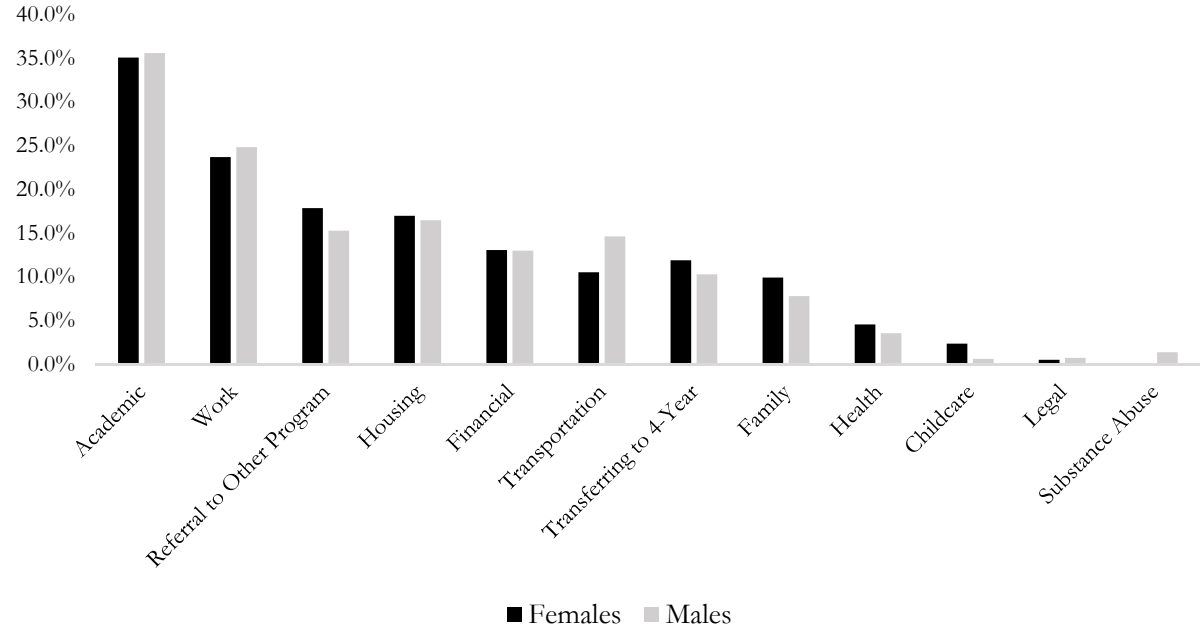
The Effect of STC on Outcomes after Four Semesters for the Main Sample and by Gender

(Standard error) [P-value] {Control group mean in odd columns} {Control complier mean in even columns}

	Full Sample		Female Sample		Male Sample	
	ITT	TOT	ITT	TOT	ITT	TOT
Outcomes	(1)	(2)	(3)	(4)	(5)	(6)
Enrolled in Classes at TCC	-0.008	-0.037	-0.008	-0.034	0.009	0.047
	(0.034)	(0.152)	(0.042)	(0.176)	(0.057)	(0.290)
	[0.810]	[0.809]	[0.849]	[0.848]	[0.874]	[0.872]
	{0.456}	{0.473}	{0.468}	{0.463}	{0.429}	{0.405}
Enrolled in College	-0.017	-0.077	-0.005	-0.020	-0.030	-0.155
	(0.032)	(0.145)	(0.041)	(0.172)	(0.054)	(0.276)
	[0.601]	[0.598]	[0.907]	[0.906]	[0.580]	[0.574]
	{0.604}	{0.609}	{0.582}	{0.528}	{0.650}	{0.736}
Total Credits Earned	1.097	4.914	1.895	8.016	-0.155	-0.794
	(1.031)	(4.579)	(1.309)	(5.506)	(1.670)	(8.380)
	[0.288]	[0.283]	[0.148]	[0.145]	[0.926]	[0.925]
	{23.138}	{21.449}	{22.756}	{18.428}	{23.962}	{26.996}
Cumulative GPA	0.022	0.097	0.033	0.141	0.012	0.061
	(0.068)	(0.299)	(0.085)	(0.357)	(0.114)	(0.558)
	[0.749]	[0.747]	[0.695]	[0.692]	[0.915]	[0.913]
	{2.476}	{2.544}	{2.482}	{2.460}	{2.463}	{2.661}
Earned any Degree	-0.013	-0.061	-0.012	-0.050	-0.010	-0.053
	(0.020)	(0.087)	(0.026)	(0.108)	(0.029)	(0.146)
	[0.490]	[0.486]	[0.649]	[0.645]	[0.723]	[0.717]
	{0.100}	{0.114}	{0.110}	{0.129}	{0.079}	{0.053}
Earned an Associate's Degree	-0.004	-0.020	0.002	0.008	-0.007	-0.037
	(0.019)	(0.084)	(0.025)	(0.103)	(0.027)	(0.139)
	[0.815]	[0.813]	[0.935]	[0.935]	[0.792]	[0.788]
	{0.087}	{0.063}	{0.094}	{0.055}	{0.071}	{0.037}
Earned an Associate's or Bachelor's Degree, or Enrolled in 4-Year College	-0.001	-0.003	0.012	0.050	-0.014	-0.075
	(0.024)	(0.109)	(0.029)	(0.124)	(0.043)	(0.221)
	[0.975]	[0.975]	[0.692]	[0.690]	[0.741]	[0.735]
	{0.157}	{0.088}	{0.140}	{0.045}	{0.193}	{0.140}
N	869	869	569	569	300	300

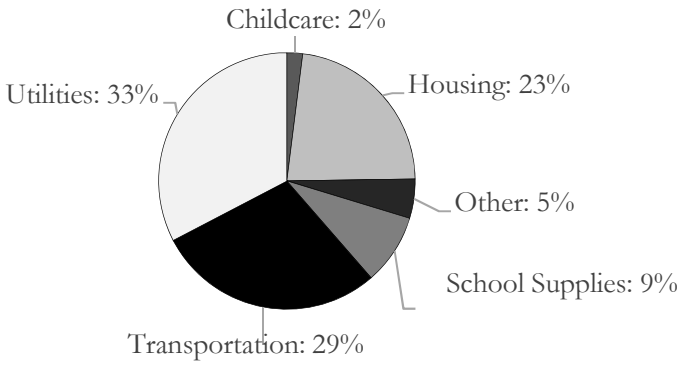
Notes: Results are for the Main Sample that includes students assigned to the full STC treatment and those assigned to the control group.

Figure 1
Frequency of Discussion Topics During Student-Navigator Meetings by Gender



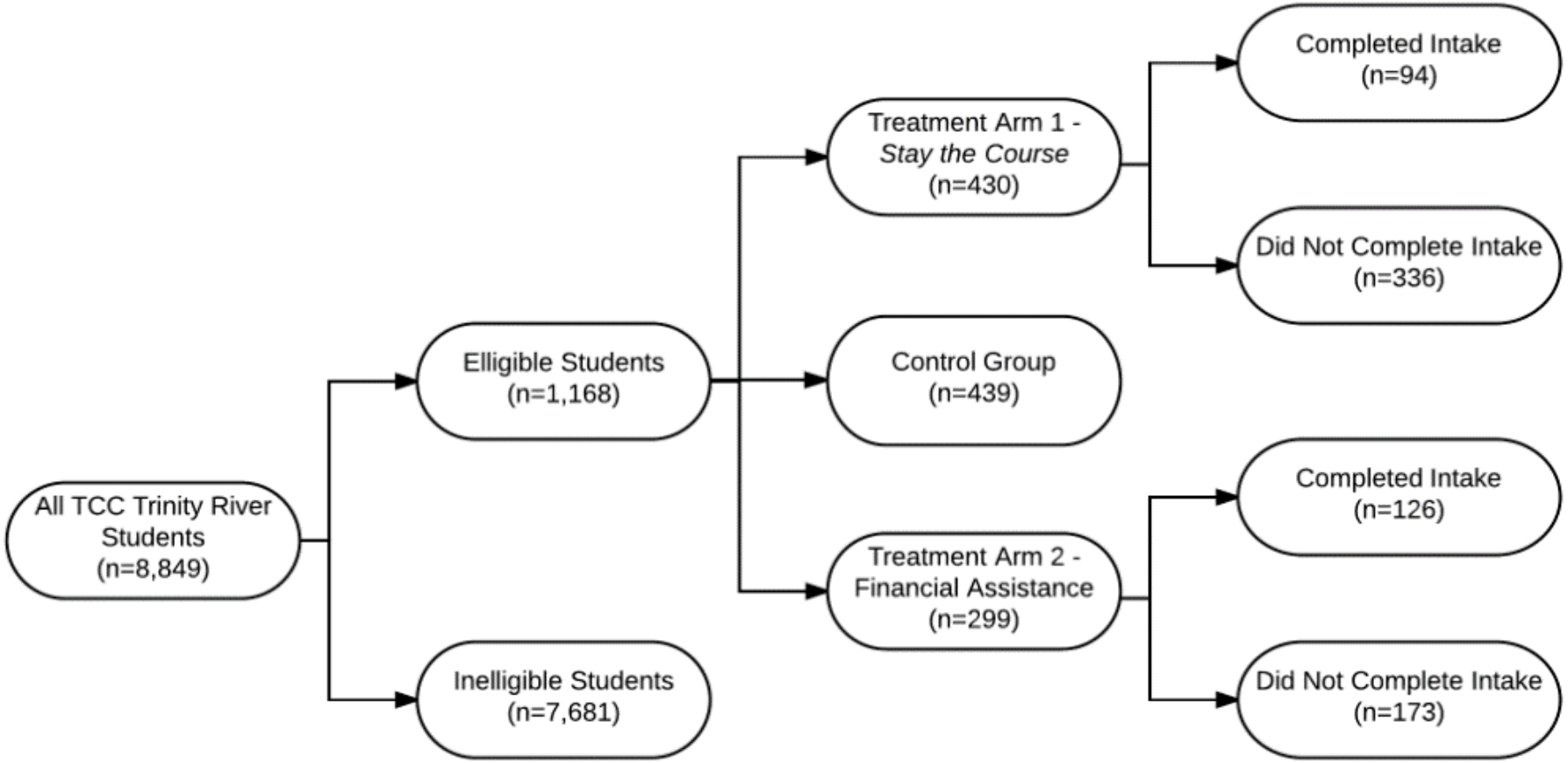
Notes: Topics such as academic, work, and health are an aggregate of several, more specific categories. Interactions solely focused on scheduling an in-person meeting have been excluded (meaningful interactions only, N=2,382). All data are for the Main Sample split by gender (1,460 interactions with females; 922 interactions with males). Topic discussion data is only available for meetings that occurred between 8/23/13 - 7/14/15.

Figure 2
Breakdown of EFA for STC Participants by Payment Type



Notes: Data are from CCFW case notes. Sample includes all EFA payments to STC participants (N = 94).

Figure 3
Consort Diagram for RCT Research Design



Appendix Table 1
Baseline Descriptive Statistics by Compliance Status

	STC Treatment Group			*EFA Treatment Group*		
Varaible	Compliers (1)	Non-compliers (2)	P-value on Test that Means are the same Across Groups (3)	Compliers (4)	Non-compliers (5)	P-value on Test that Means are the same Across Groups (6)
Age at Entry	25.78	23.62	0.017	26.751	23.491	0.001
Female	0.67	0.616	0.338	0.675	0.618	0.319
TSI's Remaining at Entry	0.574	0.527	0.571	0.587	0.480	0.197
Dependent	0.457	0.533	0.197	0.484	0.601	0.045
Cumulative Hours Earned Prior to Entry	10.69	11.52	0.52	11.817	11.277	0.676
Family Income	$20,121	$23,263	0.116	$23,812	$22,246	0.467
Between 0% and 50% of FPL	0.287	0.211	0.121	0.262	0.266	0.939
Between 50% and 100% of FPL	0.309	0.286	0.668	0.230	0.249	0.714
Between 100% and 150% of FPL	0.181	0.226	0.346	0.214	0.225	0.819
Between 150% and 200% of FPL	0.138	0.164	0.552	0.175	0.162	0.771
Above 200% of FPL	0.085	0.113	0.439	0.119	0.098	0.568
Estimated Family Contribution (FAFSA)	$730	$779	0.793	$801	$732	0.677
Under 20 Years Old	0.372	0.47	0.092	0.365	0.462	0.093
Between 20 and 25 Years Old	0.266	0.253	0.799	0.262	0.283	0.684
Above 25 Years Old	0.362	0.277	0.111	0.373	0.254	0.028
Black	0.181	0.185	0.935	0.262	0.225	0.468
White	0.415	0.402	0.819	0.421	0.416	0.939
Asian	0.036	0.032	0.86	0.040	0.035	0.821
Other Race	0.372	0.378	0.921	0.278	0.324	0.396
Hispanic	0.436	0.488	0.374	0.413	0.457	0.451
Declared Intention to Earn Associate's Degree	0.723	0.664	0.275	0.722	0.647	0.172
N	94	336		126	173	

Notes: Table includes all students that were randomized into either the STC treatment group or the EFA treatment group. Compliance (or take-up) equals 1 if client signed an intake form at their first meeting with the service providers.

Appendix Table 2
Mean Characteristics of Females in the Treatment Groups and Control Group, Fall 2013

	Means by Group Assignment			*P-value on Test that Means are the Same Across Groups*	
Variable	STC Treatment (1)	EFA Treatment (2)	Control (3)	STC & Control (4)	EFA & Control (5)
Age at Entry	24.312	25.352	24.323	0.987	0.177
TSI's Remaining at Entry	0.552	0.505	0.609	0.347	0.115
Dependent	0.493	0.484	0.488	0.919	0.933
Cumulative Hours Earned Prior to Entry	11.963	12.417	11.381	0.524	0.301
Family Income	$23,860	$22,536	$21,273	0.069	0.429
Between 0% and 50% of FPL	0.204	0.260	0.247	0.214	0.748
Between 50% and 100% of FPL	0.315	0.281	0.314	0.991	0.436
Between 100% and 150% of FPL	0.200	0.193	0.197	0.936	0.900
Between 150% and 200% of FPL	0.141	0.172	0.147	0.828	0.463
Above 200% of FPL	0.141	0.094	0.094	0.080	0.997
Estimated Family Contribution (FAFSA)	$806	$733	$543	0.028	0.108
Age < 20	0.459	0.406	0.395	0.120	0.798
Age 20 - 25	0.230	0.260	0.301	0.055	0.332
Age 26+	0.311	0.333	0.304	0.862	0.501
Black	0.196	0.234	0.217	0.536	0.660
White	0.381	0.432	0.428	0.259	0.927
Asian	0.041	0.026	0.027	0.355	0.962
Other Race	0.381	0.307	0.328	0.181	0.636
Hispanic	0.489	0.458	0.448	0.332	0.826
Declared Intention to Earn Associate's Degree	0.696	0.698	0.706	0.807	0.855
N	270	192	299		

Notes: Means are from TCC administrative data for Fall 2013 for subgroups of the female STC study sample (N = 761). See Section V of the text for more details.

Appendix Table 3

Mean Characteristics of Males in the Treatment Groups and Control Group, Fall 2013

	Means by Group Assignment			*P-value on Test that Means are the Same Across Groups*	
Variable	STC Treatment (1)	EFA Treatment (2)	Control (3)	STC & Control (4)	EFA & Control (5)
Age at Entry	23.723	23.990	24.331	0.511	0.756
TSI's Remaining at Entry	0.512	0.561	0.493	0.810	0.461
Dependent	0.556	0.673	0.586	0.608	0.162
Cumulative Hours Earned Prior to Entry	10.288	9.869	10.650	0.771	0.572
Family Income	$20,410	$23,569	$19,652	0.692	0.081
Between 0% and 50% of FPL	0.269	0.271	0.293	0.644	0.707
Between 50% and 100% of FPL	0.250	0.168	0.250	1.000	0.122
Between 100% and 150% of FPL	0.244	0.271	0.200	0.366	0.191
Between 150% and 200% of FPL	0.188	0.159	0.157	0.490	0.971
Above 200% of FPL	0.050	0.131	0.100	0.098	0.451
Estimated Family Contribution (FAFSA)	$704	$810	$878	0.345	0.744
Age < 20	0.431	0.449	0.429	0.963	0.754
Age 20 - 25	0.300	0.299	0.300	1.000	0.987
Age 26+	0.269	0.252	0.271	0.959	0.737
Black	0.163	0.252	0.214	0.252	0.484
White	0.444	0.393	0.364	0.163	0.652
Asian	0.025	0.056	0.029	0.849	0.279
Other Race	0.369	0.299	0.393	0.669	0.127
Hispanic	0.456	0.402	0.486	0.611	0.191
Declared Intention to Earn Associate's Degree	0.644	0.645	0.657	0.809	0.842
N	160	107	140		

Notes: Means are from TCC administrative data for Fall 2013 for subgroups of the male STC study sample (N = 407). See Section V of the text for more details.

Appendix Table 4

The Effect of STC on Outcomes after Eight Semesters for the Main Sample and by Gender

(Standard error) [P-value] {Control group mean in odd columns} {Control complier mean in even columns}

	Full Sample		Female Sample		Male Sample	
	ITT	TOT	ITT	TOT	ITT	TOT
Outcomes	(1)	(2)	(3)	(4)	(5)	(6)
Enrolled in College	-0.034	-0.154	-0.043	-0.182	-0.024	-0.125
	(0.033)	(0.147)	(0.041)	(0.172)	(0.056)	(0.287)
	[0.296]	[0.295]	[0.291]	[0.289]	[0.668]	[0.663]
	{0.390}	{0.516}	{0.398}	{0.547}	{0.371}	{0.480}
Total Credits Earned	1.633	6.984	2.492	10.037	-0.085	-0.418
	(1.492)	(6.306)	(1.912)	(7.604)	(2.395)	(11.525)
	[0.274]	[0.268]	[0.193]	[0.187]	[0.972]	[0.971]
	{28.294}	{26.907}	{27.920}	{24.291}	{29.119}	{33.493}
Cumulative GPA	0.039	0.172	0.066	0.281	-0.008	-0.038
	(0.067)	(0.295)	(0.083)	(0.351)	(0.112)	(0.551)
	[0.563]	[0.560]	[0.428]	[0.424]	[0.946]	[0.945]
	{2.495}	{2.497}	{2.488}	{2.395}	{2.510}	{2.692}
Earned any Degree	0.014	0.061	0.058	0.246	-0.068	-0.351
	(0.030)	(0.136)	(0.039)	(0.164)	(0.049)	(0.256)
	[0.655]	[0.653]	[0.135]	[0.135]	[0.167]	[0.171]
	{0.294}	{0.258}	{0.298}	{0.119}	{0.286}	{0.577}
Earned an Associate's Degree	0.036	0.161	0.082	0.346	-0.047	-0.242
	(0.028)	(0.128)	(0.037)	(0.159)	(0.044)	(0.226)
	[0.211]	[0.211]	[0.027]	[0.030]	[0.289]	[0.285]
	{0.228}	{0.094}	{0.234}	{0.000}	{0.214}	{0.371}
Earned an Associate's or Bachelor's Degree, or Enrolled in 4-Year College	0.018	0.083	0.056	0.239	-0.050	-0.260
	(0.032)	(0.142)	(0.040)	(0.169)	(0.054)	(0.276)
	[0.561]	[0.558]	[0.156]	[0.156]	[0.349]	[0.345]
	{0.355}	{0.279}	{0.351}	{0.158}	{0.364}	{0.550}
N	869	869	569	569	300	300

Notes: Results are for the Main Sample that includes students assigned to the full STC treatment and those assigned to the control group.

Appendix Table 5
Multiple Hypothesis Testing: *F*-Tests for Subgroup Heterogeneity

	Enrolled in College	Total Credits Earned	Cumulative GPA	Earned any Degree	Earned an Associate's Degree	Earned an Associate's or Bachelor's Degree, or Enrolled in 4-Year College
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: p-values for comparison by gender						
STC treatment versus control	0.082	0.145	0.582	0.096	0.034	0.039
Panel B: p-values for comparison by gender, race, above/below median income, above/below 9 credit hours at entry						
STC treatment versus control	0.428	0.607	0.627	0.467	0.285	0.186

Notes: Following Chetty et al. (2016), this table reports p-values from a parametric F-test of the null hypothesis that the treatment effects are zero for all subgroups for select outcomes analyzed in Tables 5 - 6b. In panel A, we regress the outcome on the STC treatment indicator interacted with an indicator for being female. In panel B, we regress the outcomes on the STC treatment indicator interacted with an indicator for being female; an indicator for being white, non Hispanic; an indicator for being above median income; and an indicator for having earned more than nine credit hours at program entry.