College Summer School: Educational Benefits and Enrollment Preferences

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Abstract

We experimentally examine whether a policy targeting college summer school enrollment can accelerate degree progress and completion. We randomly assign summer scholarships to community college students and find a large impact on degree acceleration, increasing graduation within one year of the intervention by 32% and transfers to four-year colleges by 58%. We elicit preferences for the scholarships and find substantial treatment effects on enrollment, graduation, and transfer among students with a preference *against* summer school. These results suggest that many more students could benefit from summer school than the minority who currently enroll.

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1 Introduction

There is a pressing need to accelerate college students' degree progress. This is particularly true at community colleges, which serve about forty percent of all undergraduates. Earning a two-year Associate degree from a community college takes over three years, on average (Shapiro et al., 2016). And while over eighty percent of community college students intend to transfer to a four-year college, only about a quarter do so within five years (Jenkins and Fink, 2016). Long delays en route to graduation or transfer are costly because they increase the time paying tuition and accumulating debt, and decrease the time taking advantage of the increased earnings that result from a degree. The opportunity cost of foregone earnings is substantial—depending on the field of study, Associate degrees increase earnings by an estimated 15 - 47% per year (Stevens et al., 2019).

A potential tool for decreasing time to degree is to expand enrollment in summer courses. Credit hours accumulated in summer terms are equivalent to those in the fall and spring. Yet, only about 30 percent of students at two-year colleges and 21 percent at four-year colleges enroll in summer courses (Attewell and Jang, 2013). Correlational data show that students who attend in the summer are significantly more likely to persist into subsequent semesters and graduate on time (Adelman, 2006; Attewell and Jang, 2013).[1] However, there is little causal evidence on the impact of summer school.

In this paper, we implement a field experiment with 398 community college students testing a policy that targets summer school. We then estimate the effects of this policy on subsequent educational outcomes. Over the summers of 2016 and 2017, we randomly assigned scholarships to students for a single summer course (worth $405). Prior to assignment, we elicited students' preferences for the summer scholarships relative to fall scholarships. We then tracked enrollment, credit accumulation, degree receipt, and transfer to a four-year college both one and two years after the intervention ended.

The summer scholarship offer has large impacts on summer enrollment and degree acceleration. Scholarships increase summer enrollment by 20 percentage points, an almost 60% increase over the no scholarship control group ($p < 0.001$). Treated students are 7.3 percentage points ($p = 0.055$) more likely to graduate with an Associate degree in the next year, a 32% increase above the control group. Transfer rates to four-year colleges increase by an estimated 7.6 percentage points ($p = 0.050$), a 58% increase. The impact on transfer rates persists two years after the program ends while the effect on Associate degree attainment fades in the second year post-program.

[1] Attewell and Jang (2013) estimate that summer enrollment is associated with 26 percent and 10 percent increases in on-time graduation for two-year and four-year college students, respectively.

We find that our treatment impacts are largely mechanical. The scholarships induce students to enroll in summer school and accumulate credits that then carry forward into the subsequent fall and spring terms, thus accelerating when students can graduate and/or transfer. Taken together, we estimate that about eight percent of students graduate or transfer a year earlier than they otherwise would due to the one-time scholarship.

Finally, we explore heterogeneity by preferences for summer school, comparing students who prefer a summer scholarship to those who prefer a fall scholarship of the same value. This analysis allows us to examine potential reasons for persistently low summer enrollment despite the large benefits of summer school that we estimate. We find that preferences strongly predict differences in baseline summer enrollment. In the absence of the scholarship, students who prefer summer are over three times more likely to attend summer school than those who prefer fall. We then explore the extent to which differences across students in summer enrollment preferences reflect either heterogeneous benefits or heterogeneous costs of summer enrollment.

We first examine the relationship between preferences and costs of summer enrollment. In a survey of barriers to summer enrollment, students who prefer fall are not more likely to cite direct financial costs of being able to afford summer courses. However, they are significantly more likely to report other costs such as needing to work during the summer, not having time for summer courses, and disliking summer courses. If such costs are high enough, the scholarships could have a limited ability to induce this group into summer enrollment. This is not what we find. Our scholarship offer nearly doubles summer enrollment among students who prefer fall, an effect that is as large if not larger than the effect on students who prefer summer. Self-reports indicating any barriers to summer enrollment do not dampen the impact of the scholarships. This suggests that, at the margin, whatever summer enrollment barriers students may face, there is a meaningful share of students for whom the costs are overcome by a $405 scholarship.

We next examine the relationship between preferences and benefits of summer school. We find that students who dislike summer school benefit substantially when induced to enroll. Indeed, the impact of our intervention is driven by students who have a preference *against* the summer scholarships. Among these students, we estimate an increase in one-year graduation and transfer rates of over fifty percent. We also conduct heterogeneity and selection tests, which estimate that the vast majority of our sample would experience positive impacts from attending summer school. These results suggest that preferences against summer school enrollment do not reflect low educational benefits to enrollment.

While there is a large literature on general financial aid, it offers little evidence on financial aid targeting summer.[2] Prior work focused on summer financial aid uses policy changes to estimate the impact of expanding the availability of federal Pell Grants in summer terms. These studies find positive effects on summer credit completion (Bannister and Kramer, 2015; Friedmann, 2016) and increases in graduation rates, but decreases in transfer rates for community college students (Liu, 2017). The limited work on interventions targeting summer enrollment focuses on short term impacts. Franke and Bicknell (2019) examine summer enrollment after the introduction of a community college initiative that, like our intervention, funds a single summer course. They estimate increases in summer enrollment as well as persistence into the fall semester. Headlam et al. (2018) experimentally test informational and financial aid interventions aimed at promoting summer enrollment and find an increase in summer enrollment and summer credits, but no impact on fall enrollment. Neither study tracks subsequent graduation or transfer.[3]

Our analysis suggests that targeting summer school is potentially attractive from a cost-effectiveness perspective. Schools have unused capacity in the summer and so the marginal cost of expanding enrollment is low relative to other terms. Low baseline enrollment also means that there are fewer inframarginal students who would receive subsidies without changing their enrollment behavior, and there is greater potential to influence the extensive margin compared to fall and spring terms. In our study, scholarships increase summer enrollment by 20 percentage points, from about a third in the control group to over half in the treatment group. Such increases are difficult if not impossible in non-summer terms. In our sample, about three-quarters of control group students enroll in the fall, so a 20 percentage point enrollment increase would require nearly full enrollment. Finally, targeting summer is much lower cost than providing full year financial aid.

Our study provides promising evidence for interventions targeting summer. We demonstrate that a relatively low-cost intervention can help overcome the barriers to summer enrollment and accelerate long-run student success. More broadly, our findings suggest that many more students could benefit from summer school than the minority

[2] See e.g., Carlson et al. (2019); Anderson et al. (2020); Anderson and Goldrick-Rab (2018); Angrist et al. (2016); Denning (2019); Denning et al. (2019); Carruthers et al. (2020); Angrist et al. (2020) for a discussion of the broader literature on financial aid and free community college. Nguyen et al. (2019) provide a recent review and meta-analysis.

[3] A related literature examines interventions targeting the summer between high school and college with a focus on increasing fall enrollment rates (e.g., Barnett et al., 2012; Castleman et al., 2014; Castleman and Page, 2015).

who currently enroll.

2 Experiment

Community college partner: We implemented our experiment in partnership with Ivy Tech Community College (Ivy Tech) of Indiana, which serves over 170,000 students statewide. Community colleges like Ivy Tech currently serve almost forty percent of all undergraduates and half of those who will eventually earn a four-year degree (Snyder et al., 2018; McFarland et al., 2018). They also facilitate year-round enrollment by offering a variety of daytime, nighttime, weekend, and online courses to accommodate part-time and non-traditional students, such as those who work or have children.

Like many two-year colleges, Ivy Tech struggles with low retention and graduation rates. At the time of our experiment, their performance on these outcomes was slightly better than the bottom 10 percent of community colleges. About 40 percent of fall term students were retained through the following fall term and fewer than one quarter of full-time, first-time students graduated or transferred to a four-year institution within three years (NCCBP, 2014).

Our students were recruited from two of Ivy Tech's fourteen regions: East Central and Richmond. These regions included campuses in Anderson, Connorsville, Marion, Muncie and New Castle.[4] The Ivy Tech East Central region serves a community in the 4th percentile of national median income, poorer than about 90 percent of community colleges. Over 60 percent of their student body is eligible for need-based federal Pell Grants, a higher rate than about 90 percent of community colleges (NCCBP, 2014).

Ivy Tech enrollment during the Summer term is lower than the Fall and Spring terms, however the majority of courses are still available.[5] Participants in our study enrolled in summer courses spanning 66 unique departments. No single department represents more than 10 percent of the courses taken.

Recruitment: Figure A.1 presents a visual summary of the eligibility, enrollment, and random assignment procedures that we used. We conducted the study in two waves: 2016 and 2017. During the Spring 2016 and Spring 2017 terms, our partners

[4]Since the conclusion of our intervention, the regional structure of Ivy Tech has changed. Additionally, retention and completion rates have risen.

[5]Technical programs, such as nursing, with strictly ordered curricula are an exception—enrollment is more continuous through the summer and course options are limited. With fewer sections of each course in the summer term, a given section is more likely to be taught by a full-time faculty member, rather than an adjunct instructor. See Brownback and Sadoff (2020) for a discussion of the heterogeneous impact of instructors on student outcomes in the same community college context.

identified any currently-enrolled students who were eligible to participate in our study (see Appendix Figure B.1 for our recruitment email). A student was considered eligible if they were (1) currently enrolled at Ivy Tech, (2) not scheduled to graduate at the end of the current semester, (3) not currently enrolled in the summer semester, and (4) not included in any existing study incentivizing student enrollment behaviors. These selection criteria were developed in partnership with the Ivy Tech leadership in order to avoid confounds while retaining external validity.

Our first and second eligibility criteria addressed practical concerns. First, many students who were not currently enrolled had graduated, moved, or were otherwise inaccessible to our partners. Second, Ivy Tech's primary objective is to graduate students, so extending an intervention to students who had already achieved this objective made little sense. Our third eligibility criteria was designed around budget considerations. Subsidizing tuition for students already enrolled in the summer term would limit both the number of students we could afford to include in the study and the impact we could have on the behavior of participating students. Our fourth eligibility criteria helped us avoid confounds associated with other experimental studies running in parallel at the same Ivy Tech campuses. In 2016, there was a summer enrollment incentive given to all Pell-eligible students. To ensure that our incentives had the same dollar value to all participants, we restricted our sample to those not participating in this study—that is, non-Pell-eligible students. In 2017, summer enrollment incentives were assigned as part of Brownback and Sadoff (2020). Thus, participants in this study were ineligible.

Eligible students who were interested in participating enrolled by completing an online survey that was included in the recruitment email.[6] After students completed the enrollment survey and consented to participate, our partners matched the students' survey responses to administrative data containing their academic progress: enrollment, grades, credit accumulation, graduation, transfer, and dropout status. This matching was successful for 121 of 156 students in the 2016 cohort (78%) and 277 of 285 students in the 2017 cohort (97%).[7] Our random assignment occurred after successfully matching student data, and so our internal validity is not threatened by this margin of attrition.

To better understand the external validity of our results, we compare demographic and baseline academic characteristics where available for (1) the enrolled participants, (2) the eligible participants, and (3) the statewide Ivy Tech undergraduate population

[6] The study enrollment period for Spring 2016 began April 22nd, 2016 and ended May 6th, 2016. The study enrollment period in Spring 2017 began April 21st, 2017 and ended May 4th, 2017.

[7] We were more successful at matching the second cohort because of improved procedures for eliciting students' administrative identifiers.

at the time of our two recruitment waves. As shown in Appendix Table A.1, female students select into our study at slightly elevated rates relative to the eligible population and the broader student body. We do not have academic data for the statewide Ivy Tech population but we can compare participants to eligible non-participants with respect to baseline credits accumulated and GPA. Participating students tended to have higher GPAs and to be further along in their academic careers. To the extent that treatment effects are larger (smaller) among these students, our estimated impacts may overestimate (underestimate) the treatment effects in the broader population. We examine treatment effect heterogeneity with respect to these characteristics in Tables A.3 and A.4.

Randomization of scholarships: Our experimental sample includes 398 enrolled and matched students across the two cohorts. Based on budget availability, we randomly awarded 69 scholarships in the 2016 cohort (57%) and 97 scholarships in the 2017 cohort (35%). The scholarships had a face value of $405 and could be used to pay for tuition for one summer course of up to three credit-hours (scholarships did not cover other costs such as books, materials and lab fees).

We assigned the scholarships using a stratified randomization within each cohort. In the 2016 cohort, the randomization strata were: five Grade Point Average (GPA) groups, above or below the median summer scholarship preferences (elicited through the enrollment survey), above or below the median age, and gender. In the 2017 cohort, the randomization strata were: three GPA groups, above or below the median age, and gender. In our analysis, we control for differences in the stratification and assignment ratio by using fixed effects for cohort. Table 1 shows that there are no differences in baseline characteristics between the treatment and control groups that are statistically significant at the 10% level.

Table 1: Baseline Characteristics by Treatment and Semester

	Summer 2016			Summer 2017		
	Control	Treatment	**t-test**	Control	Treatment	**t-test**
Demographics						
Age	28.250	29.449	**0.594**	28.678	29.155	**0.701**
	(1.661)	(1.495)		(0.725)	(1.027)	
Male	0.346	0.435	**0.328**	0.267	0.278	**0.835**
	(0.067)	(0.060)		(0.033)	(0.046)	
White	0.750	0.841	**0.219**	0.789	0.773	**0.763**
	(0.061)	(0.044)		(0.031)	(0.043)	
Baseline Credits	29.548	31.949	**0.497**	35.903	33.639	**0.425**
	(2.441)	(2.447)		(1.775)	(2.003)	
Baseline GPA	3.069	2.963	**0.468**	2.947	2.896	**0.576**
	(0.113)	(0.094)		(0.053)	(0.078)	
Survey measures						
Value of Summer Scholarship	152.206	143.284	**0.740**	281.301	273.537	**0.657**
	(20.733)	(17.311)		(10.144)	(14.564)	
Value of Fall Scholarship	245.750	235.606	**0.702**	268.032	246.447	**0.264**
	(20.043)	(17.297)		(11.130)	(16.327)	
Prefer Summer Course	0.192	0.203	**0.886**	0.592	0.557	**0.570**
	(0.055)	(0.049)		(0.037)	(0.051)	
Prefer Summer Cash	0.750	0.696	**0.514**	0.844	0.814	**0.537**
	(0.061)	(0.056)		(0.027)	(0.040)	
Plans to Enroll in Summer	0.500	0.540	**0.556**	0.818	0.851	**0.271**
	(0.049)	(0.045)		(0.020)	(0.024)	
Students	52	69		180	97	

Notes: Table reports means/proportions for each group with standard errors in parentheses. Scholarship values are calculated as the midpoint between the highest amount for which the student prefers the scholarship (over cash) and the lowest amount for which the student prefers the cash (over the scholarship). Students who always prefer cash are assigned a value of $25 for the course, and students who always prefer the course are assigned a value of $400 for the course. “Prefer Summer Course” is a binary measure of preference for summer courses over fall. “Prefer Summer Cash” is a binary measure of preference for cash payments in the summer over fall. Plans to enroll in summer are coded as 0 (No), 0.5 (Maybe) or 1 (Yes).

Preference elicitation: During the online enrollment survey, we explained to students the nature of the scholarships, when and how they could be used, and their exact tuition value. We then elicited cash-equivalents for both summer and fall tuition scholarships, relative preferences between the two scholarships, and the relative value of unconditional cash rewards delivered in the summer versus the fall. The first two elicitations provide revealed preferences for the scholarships. The third elicitation provides a measure of average discounting between the two time periods. To ensure incentive compatibility, we randomly selected one decision of one participant per wave to be binding.

Our primary preference measure captures the *relative* value of summer and fall tuition scholarships. To elicit individual preferences, we conducted a multiple price list in which students chose their preferred option between a free summer course or a free fall course to identify weak preferences for summer. The multiple price list then compared (1) a free summer course to a fall course with a varying price and (2) a free fall course to a summer course with a varying price. This revealed the willingness to pay to receive the scholarship in the preferred term, potentially identifying strict preferences between summer and fall scholarships. We used a similar elicitation to measure the relative value of receiving unconditional cash rewards in the summer versus the fall. See Appendix Figures B.2 and B.5 for screenshots of the preference elicitations.

We also elicited the cash value of summer and fall tuition scholarships for each student through multiple price lists. Students first chose between a summer scholarship and amounts of money ranging from $50 to $300 and then chose between a fall scholarship and the same money amounts. We estimate a student's cash value for each scholarship as the midpoint between the highest amount for which the student prefers the scholarship and the lowest amount for which the student prefers the cash. See Appendix Figures B.3 and B.4 for screenshots of the preference elicitations.

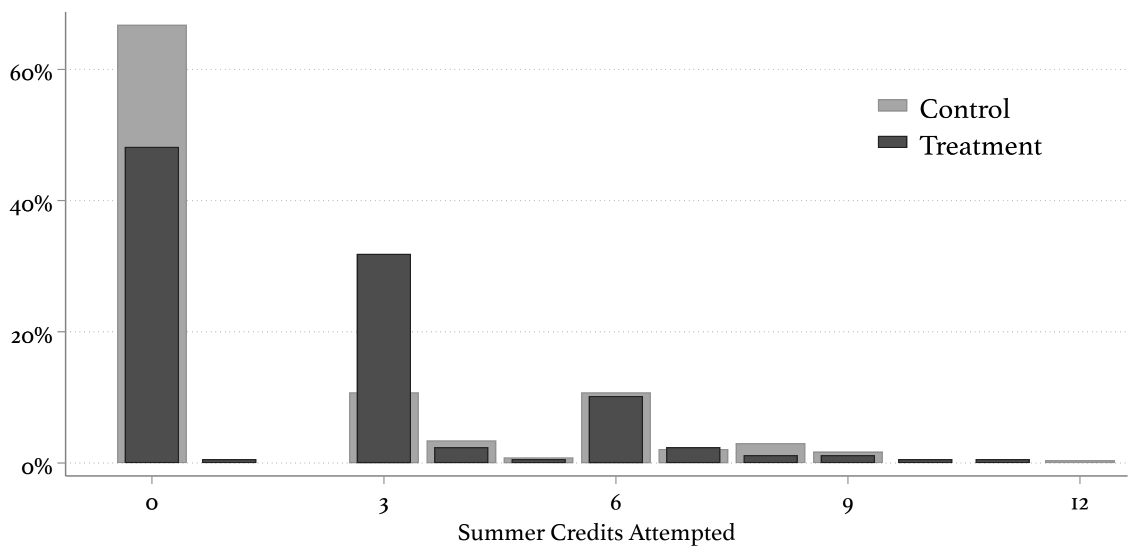
Along with enrollment preferences, we asked for stated summer enrollment plans, graduation plans, and reasons for non-enrollment in the summer semester. We provided multiple-choice options as reasons for non-enrollment along with a free response option (see Appendix Figure B.6 for the complete list).

3 Results

Our data include 398 total students across the 2016 and 2017 cohorts. For all students, we have educational outcomes from the Spring 2016 term through the Summer 2019 term. This gives us ten and seven terms of post-assignment outcomes for the 2016 and

2017 cohorts, respectively. To ensure comparability across cohorts, we evaluate the program based on outcomes in the one-year or two-year windows after the intervention.[8] We first estimate the impact of our scholarships on summer enrollment. We then examine key educational outcomes for community college students: graduation with an Associate degree and transfer to a four-year school in order to pursue a bachelors degree.[9] Finally, we explore heterogeneity by enrollment preferences.

Figure 1: Credit Hours Enrolled in during the Program Summer



Notes: Enrollment reflects all credits attempted during the program summer including failed and withdrawn courses.

Enrollment: We begin by examining the impact of our scholarship offer on summer enrollment. Figure 1 presents the distribution of summer credit hours attempted for both the treatment and control students. In the control group, 33 percent of students enroll in the summer term (i.e., attempt more than zero credits), which is similar to rates at community colleges nationally (Attewell and Jang, 2013). These rates are

[8]We define the one-year (two-year) post-program windows as one year (two years) after the *completion* of the summer term—i.e., end of summer 2017 (2018) for the 2016 cohort, and end of summer 2018 (2019) for the 2017 cohort.

[9]The degree and transfer categories are not mutually exclusive. Around half of students who start at two-year colleges and eventually earn degrees from four-year institutions do so after completing a two-year degree (Shapiro et al., 2018). Ivy Tech also provides over 100 different certificates. We do not evaluate these because of the vast heterogeneity in requirements for and benefits of these certificates. Further, 78% of students in our sample who receive a certificate go on to receive an Associate degree or transfer.

far lower than students' stated enrollment plans: 56 percent state they plan to enroll with an additional 30 percent stating they may enroll. The scholarship offer significantly increases summer enrollment with 52 percent of treatment students enrolling. These results suggest that the scholarships help students better fulfill their enrollment intentions.

Figure 1 shows that the treatment effects are almost entirely on the extensive margin. The scholarship offer decreases the share attempting zero credits and increases the share attempting three credits—the maximum value of the scholarship. We find no evidence of effects on the intensive margin—attempting more than three credits—and therefore focus on the extensive margin in our analysis.

Panel A of Table 2 presents OLS regression estimates of the treatment effect on different measures of enrollment, which are reported for each row. All regression estimates include covariates for cohort, baseline GPA, baseline credit accumulation, age, race, gender, and stated plans for enrolling in the summer term. We estimate that scholarships increase enrollment rates by 20 percentage points, a nearly 60% increase over the control group ($p < 0.001$). This 20 percentage point enrollment increase is concentrated in 3-credit courses, translating to an estimated increase of 0.59 credit hours attempted during the summer term ($p = 0.018$). At the end of the summer, treated students have completed 0.49 more credit hours than control group students ($p = 0.040$), a 32% increase above baseline.

Table 2: Summer Enrollment and Educational Outcomes

		ITT Estimate	IV Estimate	Corr. Estimate	Control Mean
Panel A: Summer Enrollment					
Summer	Enrollment	0.203 (0.046)			0.332
	Credits Attempted	0.586 (0.247)			1.750
	Credits Completed	0.489 (0.237)			1.517
Panel B: Educational Outcomes					
One-Year	Associate	0.073 (0.038)	0.362 (0.196)	0.176 (0.065)	0.228
	Transfer	0.076 (0.038)	0.373 (0.198)	0.013 (0.050)	0.129
	Combined	0.077 (0.044)	0.379 (0.222)	0.154 (0.072)	0.306
Two-Year	Associate	0.010 (0.045)	0.052 (0.220)	0.172 (0.072)	0.405
	Transfer	0.085 (0.040)	0.428 (0.212)	-0.007 (0.051)	0.147
	Combined	0.018 (0.048)	0.097 (0.236)	0.150 (0.073)	0.483
	Students	398	398	232	

Notes: The dependent variable is reported for each row. Column 1 of the top panel estimates the intent to treat (ITT) using ordinary least squares regression. In the bottom panel, "Combined" is an indicator variable equal to 1 if the student has either graduated or transferred. Columns 1 & 3 of the bottom panel report marginal effects from linear probability model. Column 2 of the bottom panel instruments for "Summer Enrollment" with the treatment assignment—using the estimates from the first row of the top panel as the first stage. Column 4 of both panels reports means from the control group. All regressions report heteroskedasticity-robust standard errors and include covariates for cohort, baseline GPA, baseline credit accumulation, age, race, gender, and stated plans for enrolling in the summer term, coded as 0 (No), 0.5 (Maybe), or 1 (Yes).

Educational Outcomes: Panel B of Table 2 presents the one-year and two-year impacts on graduation with an Associate degree and transfer to a four-year college. The dependent variable is reported for each row. All regressions estimate a linear probability model. In Column 1, we estimate the Intent to Treat (ITT) effects of offering students a summer scholarship regardless of whether the student uses the scholarship. In Column 2, we use assignment of the scholarship to instrument for summer enrollment in order to estimate the causal impacts of experimentally-induced summer enrollment. These can be compared to correlational estimates relating summer enrollment and educational outcomes in the control group, which are presented in Column 3. Column 4 reports control group means.

We find large impacts of the scholarship offer on graduation and transfer rates within one year of the intervention (Column 1). We estimate that one-year graduation rates increase by 7.3 percentage points ($p = 0.055$), a 32% increase over the control group in which fewer than a quarter of students receive a degree. Our intervention increases transfer rates by an estimated 7.6 percentage points ($p = 0.049$), a 58% increase. Combined, we estimate a 7.7 percentage point ($p = 0.082$) increase in graduation or transfer within one year, a 25% increase.

When we expand the evaluation window to two years after the intervention, the impact of the scholarship offer on combined graduation or transfer falls to a statistically insignificant 1.8 percentage point increase ($p = 0.707$). Similarly, the treatment effect on Associate degree attainment is small and not significant. However, the impact on transfer rates remains large: an estimated 8.5 percentage point increase ($p = 0.034$), which is a 58% increase.

Our instrumental variables approach is presented in Column 2 and shows that scholarship-induced summer enrollment increases the one-year rates of graduation and transfer by an estimated 36 percentage points ($p = 0.066$) and 37 percentage points ($p = 0.061$), respectively. The impact of summer enrollment on the combined graduation or transfer measure is an estimated 38 percentage points ($p = 0.088$).

The causal estimates we find are larger than the correlations observed in the control group. As shown in Column 3, the association between summer enrollment and one-year rates of combined graduation or transfer is about 15 percentage points ($p = 0.033$), less than half of the size of the IV estimate. This difference appears across educational outcomes and evaluation windows.

Mechanisms: Taken together, our results show that scholarship-induced summer enrollment substantially accelerates time to degree (i.e., graduating within one year) and has a persistent impact on rates of transfer to four-year colleges both one and two years after the intervention. As noted above, improving transfer rates is critical for community colleges: over eighty percent of students intend to transfer to a four-year college, but only about a quarter achieve that goal (Jenkins and Fink, 2016).

We explore potential mechanisms for the effects on graduation and transfer by examining the impact of scholarship-induced summer enrollment on credit accumulation and enrollment in subsequent terms. Column 1 of Table 3 presents the causal (IV) estimates by term and Column 2 presents the corresponding correlational estimates.

Table 3: Summer Enrollment, Credit Accumulation and Retention

	IV Estimate	Corr. Estimate	Control Mean
Panel A: Enrollment			
Fall	-0.014	0.094	0.737
	(0.222)	(0.063)	
Spring	0.053	0.021	0.565
	(0.251)	(0.079)	
Next Summer	-0.126	0.119	0.267
	(0.219)	(0.071)	
Panel B: Credit accumulation			
Summer	2.408	4.460	1.517
	(0.849)	(0.264)	
Fall	1.723	5.254	7.491
	(2.664)	(0.777)	
Spring	3.021	6.124	12.131
	(4.610)	(1.396)	
Next Summer	3.055	6.974	13.450
	(5.382)	(1.623)	
Students	398	232	

Notes: Each row presents the coefficient from a separate regression regressing credit accumulation (Panel A) or enrollment (Panel B) for the given term on an indicator for summer enrollment. Column 1 reports results of instrumental variables linear regression. Column 2 reports results of a linear probability model (OLS). Instrumental variables regressions use the first stage reported in Table 2 Panel A. Heteroskedasticity-robust standard errors. All regressions include covariates for cohort, baseline GPA, baseline credit accumulation, age, race, gender, and stated plans for enrolling in the summer term, coded as 0 (No), 0.5 (Maybe), or 1 (Yes).

As shown in Panel A, our correlational estimates are directionally consistent with prior observational studies, which find an association between summer enrollment and retention into the next school year (Attewell and Jang, 2013; Franke and Bicknell, 2019). However, our causal estimates are not. Scholarship-induced summer enrollment has a directionally negative impact on the likelihood of enrolling in the fall term.

Rather than advancing indirect outcomes like "momentum," the acceleration of degree attainment and transfers we observe seems to be largely mechanical. As shown in Panel B, treated students induced to enroll in summer courses earn an estimated 2.41 more credit hours earlier in their academic careers. This credit accumulation is largely carried forward into subsequent terms with treated students accumulating about three additional credits by the end of the first year post-intervention. The effect of summer enrollment on credit accumulation is equivalent to $40-52\%$ of an entire fall or spring semester.[10] This large credit accumulation relative to the average semester offers one potential reason why we find such large estimates for the impact of summer enrollment on degree acceleration.

Enrollment Preferences: As discussed in Section 2, we measure preferences for summer enrollment using incentivized multiple price lists that elicit the value of summer scholarships both relative to cash and relative to fall scholarships. Students value the summer scholarship at about $238 (60 percent of its face value), and their value of a fall scholarship is $6-7\%$ higher on average (see Appendix Figure A.2 for the distributions).

Average preferences mask important heterogeneity. Using preferences between summer and fall scholarships, we find that 54 percent of students hold at least a weak preference for the fall scholarship (i.e. they prefer a free fall course to a free summer one); and 46 percent hold at least a weak preference for the summer scholarships (i.e., they prefer a free summer course to a free fall one). We can further classify 37 percent of students as strictly preferring fall and 28 percent as strictly preferring summer. These students are willing to sacrifice scholarship value to receive the scholarship in their preferred term. In the analysis below, we split the sample by weak preferences: "Prefer Fall" and "Prefer Summer."[11]

We first explore heterogeneous costs of summer enrollment, which may drive enrollment preferences and behaviors. We focus on students' stated barriers to summer enrollment from our baseline survey (about one-fourth of our participants report at least one barrier to enrollment). Table 4 estimates the association between the most commonly reported barriers and preferring summer to fall scholarships.[12] Students are

[10] Control students complete an average of 5.97 and 4.64 credits during the Fall and Spring semesters after the intervention, respectively.

[11] We exclude from the preference analysis one participant whose responses to the elicitation did not meet any of the classifications. For 98 percent of participants, their preference for Fall vs. Summer scholarships is weakly consistent with their revealed cash value of the scholarships—those who weakly prefer fall to summer also have a cash value for a fall scholarship that is at least as high as their cash value for a summer scholarship and vice versa.

[12] The "Other" category pools barriers to summer enrollment with fewer than 10 positive responses.

significantly less likely to prefer the summer scholarship to a fall scholarship if they report needing to work during the summer ($p = 0.003$), having no time for summer courses ($p = 0.004$), or disliking summer courses ($p < 0.001$). Interestingly, we do not find a strong relationship between students who report financial barriers to summer courses and those who Prefer Summer ($p = 0.789$). Pooling all stated barriers, those who report any barrier to summer enrollment are 20 percentage points less likely to Prefer Summer ($p = 0.007$).

Table 4: Stated Barriers to Summer Enrollment

DV: Prefer Summer to Fall							
Need to work	-0.197					-0.132	
	(0.066)					(0.075)	
No time for summer courses		-0.193				-0.090	
		(0.067)				(0.081)	
Can't afford summer courses			-0.022			-0.003	
			(0.084)			(0.079)	
Dislike summer courses				-0.233		-0.219	
				(0.042)		(0.050)	
Other					-0.081	-0.110	
					(0.086)	(0.086)	
Any barrier reported							-0.196
							(0.072)
Constant	0.242	0.240	0.203	0.233	0.216	0.304	0.320
	(0.043)	(0.043)	(0.041)	(0.042)	(0.041)	(0.056)	(0.064)
Students	397	397	397	397	397	397	397

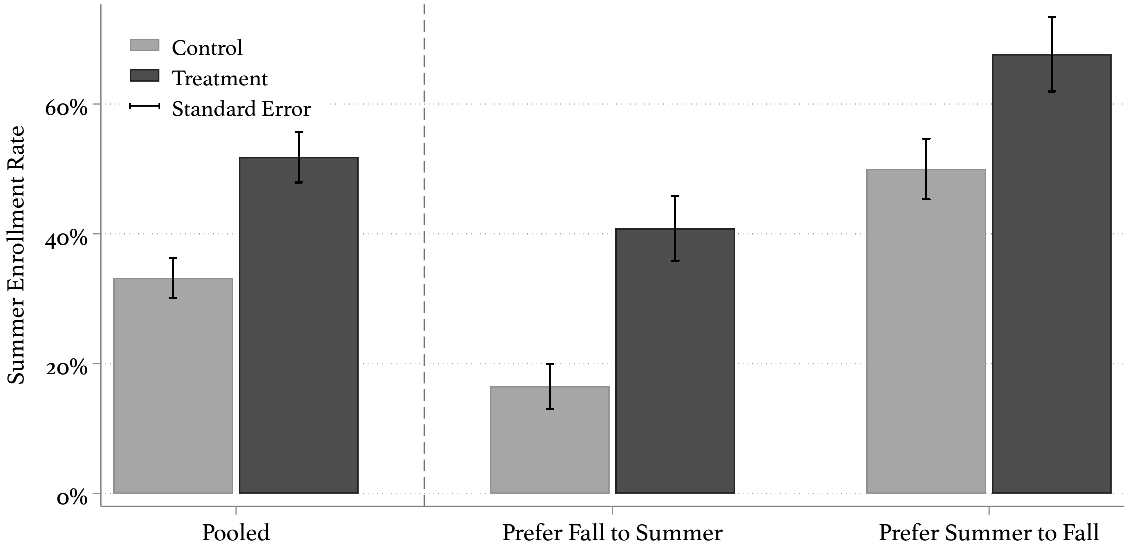
Notes: Dependent variable is a binary variable equal to 1 if the student prefers summer scholarships to fall scholarships. Independent variable is a binary variable equal to 1 if the student reports this barrier to summer enrollment on the baseline survey. The elicitation of these barriers is shown in in Figure B.6. All barriers with fewer than 10 positive responses were aggregated and categorized with "Other." "Any Barrier Reported" is a binary variable equal to 1 if the student reports any of the 9 possible barriers. Independent variables are ordered by their frequency of response (7% for the first three rows, 5% for the fourth, 7% report "other" barriers, and 21% report any barriers). All estimates obtained using OLS regressions with heteroskedasticity-robust standard errors in parentheses. All regressions only include covariates for cohort.

We next link enrollment preferences to summer enrollment and educational outcomes. Figure 2 shows summer enrollment rates divided by treatment group and enrollment preferences. Figure 3 then shows the rate of combined graduation or transfer one year post-program. We present regression-adjusted estimates for the same outcomes in Table 5, interacting treatment with enrollment preferences (Column 1) and with reporting any barrier to summer enrollment (Column 2).[13]

See Appendix Figure B.6 for a complete list.

[13]We explore additional drivers of heterogeneity in Appendix Tables A.3 - A.4 using survey measures

Figure 2: Enrollment Preferences and Summer Enrollment



Notes: Students who "Prefer Fall to Summer" prefer a scholarship for a free fall course over a scholarship for a free summer course. Students who "Prefer Summer to Fall" prefer a scholarship for a free summer course over a scholarship for a free fall course.

As shown in Figure 2, our elicited preference measures hold strong predictive validity over actual summer enrollment behaviors at baseline. In the control group, students who Prefer Summer are over three times more likely to enroll in summer school than students who Prefer Fall (50.0% vs. 16.5%). Despite large baseline differences in enrollment, scholarships significantly increase enrollment rates among both students who Prefer Fall and those who Prefer Summer, by an estimated 18-26 percentage points. Column 1 of Table 5 shows that the treatment effects are directionally larger for students who Prefer Fall but not significantly different across the two groups ($p = 0.453$). Column 2 of Table 5 reveals similar results focusing on students who report barriers to summer enrollment: they are less likely to enroll at baseline ($p < 0.001$), the scholarship significantly increases their enrollment rates ($p < 0.001$), but there is no difference in treatment effects compared to those who do not report barriers to enrollment ($p = 0.970$). Students who Prefer Fall may face significant barriers that dampen their summer enrollment at baseline, including disliking summer courses and needing to work. Critically, however, our results demonstrate that whatever costs or constraints

(prefer to receive unconditional cash in summer vs. fall, plan to enroll in summer school, semesters until planned graduation), baseline academic measures (completed semesters at Ivy Tech, baseline GPA, baseline credits), and demographics (age, gender, race).

these students face, the summer scholarships are highly effective at encouraging their summer enrollment.

Table 5: Heterogeneous Treatment Effects on Summer Enrollment and Graduation or Transfer

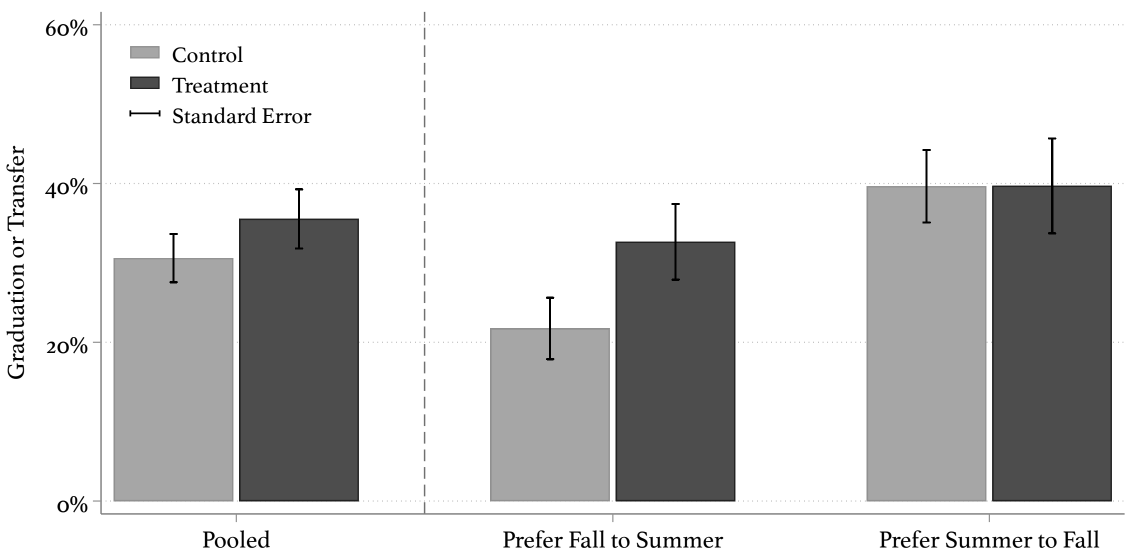
	Summer Enrollment		One-Year Graduation or Transfer	
Treatment	0.256	0.205	0.114	0.043
	(0.061)	(0.057)	(0.062)	(0.055)
Prefer Summer Course	0.316		0.173	
	(0.061)		(0.062)	
Treatment x Prefer Summer Course	-0.072		-0.110	
	(0.095)		(0.097)	
Any Barrier Reported		-0.441		0.010
		(0.066)		(0.087)
Treatment x Any Barrier Reported		-0.003		0.101
		(0.090)		(0.116)
Students	397	398	397	398

Notes: Dependent variable in Columns 1 & 2 is a binary variable equal to 1 if the student enrolls in summer courses. Dependent variable in Columns 3 & 4 is a binary variable equal to 1 if the student graduates or transfers within one year of the program. "Prefer Summer Course" is a binary variable equal to 1 if the student prefers summer scholarships to fall scholarships. "Any Barrier Reported" is a binary variable equal to 1 if the student reports any of the 9 possible barriers from Appendix Figure B.6. All estimates obtained using OLS regressions with heteroskedasticity-robust standard errors in parentheses. All regressions only include covariates for cohort. The sample sizes change by one student because of missing preference measures (see footnote 12 for details).

Finally, we examine the extent to which enrollment preferences may reflect heterogeneity in how summer school benefits educational outcomes. Similar to summer enrollment behaviors, we find a positive association at baseline between elicited preferences for the summer scholarship and educational outcomes. As shown in Figure 3, one-year graduation or transfer rates in the control group are almost two times higher for students who Prefer Summer compared to those who Prefer Fall (39.7% vs. 21.7%). However, we find no evidence that enrollment preferences are positively related to the *causal* impact of our intervention. In contrast, the treatment effects are concentrated among students who have a preference *against* the summer scholarships. For these students who Prefer Fall, summer scholarships increase one-year graduation and transfer rates by 11-17 percentage points—more than 50% above baseline ($p = 0.068$). Column 3 of Table 5 reveals little impact of the scholarship offer on students who Prefer Summer, though the effects are not statistically distinguishable between subgroups

($p = 0.256$). Our results show that students who dislike summer school benefit substantially when induced to enroll.[14]

Figure 3: Enrollment Preferences and One-Year Graduation or Transfer Rates



Notes: Students who "Prefer Fall to Summer" prefer a scholarship for a free fall course over a scholarship for a free summer course. Students who "Prefer Summer to Fall" prefer a scholarship for a free summer course over a scholarship for a free fall course.

We can further explore the population of students with potential benefits from summer enrollment by comparing outcomes among those who enroll from the treatment and control groups (i.e. those who enroll with and without the summer scholarships). Appendix Table A.5 follows the approach of Kowalski (2016) to identify marginal treatment effects (MTE). We find that the educational benefits for treatment group students induced into summer enrollment are statistically indistinguishable from control group students who enroll without scholarships. We note that this analysis is likely underpowered. Directionally, summer enrollment has a smaller impact on one-year graduation rates but a larger impact on one-year transfer rates for treatment group students (i.e., "compliers" and "always takers"), compared to control group students (i.e., "always takers"). Combining graduation and transfer, the point estimates of the regression suggest that over 90 percent of students would see positive impacts from summer enrollment.[15]

[14]Treatment effects are also directionally larger for students who report barriers to enrollment but the baseline associations with educational outcomes are weaker than those for enrollment preferences (Column 4 of Table 5).

[15]The coefficient on "Treatment × Summer Enrollment" estimates the impact of summer enrollment

Taken together, we find strong support for the external validity of our estimated impacts of summer enrollment. First, the local average treatment effect is estimated based on a large population—20 percent of treatment group students are induced to enroll despite a baseline summer enrollment of only 33 percent in the population. Second, the effects hold among a population of students who dislike summer and enroll at very low rates at baseline. Third, our MTE analysis suggests that there are positive treatment effects for the vast majority of students regardless of their propensity to enroll. These results suggest that the population of students who would benefit from summer enrollment is much larger than the minority who enroll in the absence of the scholarships.

4 Discussion and Conclusion

We find a large causal impact of summer tuition scholarships on educational outcomes, suggesting that targeting summer school is a promising avenue for students and schools. This evidence is also critical for financial aid policy, which has been inconsistent in providing aid for summer terms.

Our scholarships demonstrate that summer-focused interventions can be highly cost-effective. For students who took up the scholarship, it had a face value of $405 worth of tuition. Given take up rates of 51.8%, the intervention has a direct cost of approximately $210 per student. It is possible that the 20.3% of students who were induced into summer school faced costs that exceeded their benefits by up to $405—the maximum differential that the scholarships could overcome. Thus, the aggregate social cost of the intervention should not exceed $\$210 + \$405 \times 0.203 = \$292$ per student. Within one year of the intervention, the scholarships increased the rate of graduation and the rate of transfer by an estimated 7.3 and 7.6 percentage points, respectively. Thus, each additional student induced to graduate within one year of the intervention costs no more than $\$292/0.073 = \$4,000$.

A growing literature estimates average earnings returns to Associate degrees of between $17-40\%$ (Stevens et al., 2019; Bettinger and Soliz, 2016; Kane and Rouse, 1995; Marcotte, 2019; Marcotte et al., 2005). This translates to an estimated salary increase of $6,579 – $15,480 per year from an Associate degree compared to some college but no

in the treatment group relative to Summer Enrollment in the Control group. The interaction effect is positive for transfer rates and negative for Associate degree receipt and is never statistically significant. To extrapolate to the full population with Summer Enrollment propensities measured continuously from 0 to 1, the sum of "Treatment" plus "Treatment x Summer Enrollment" is positive for 94% of the sample (i.e., $0.095 + (-0.101) \times 0.94 \approx 0$). Appendix Table A.6 compares survey measures and demographics across compliance categories.

degree.[16] Belfield and Bailey (2017) conduct a review of the literature and provide a more conservative estimate of average returns between \$4,640 – \$7,160 in yearly salary. Using these estimates, the one-year earnings gain exceeds our conservative estimate of the cost of the intervention by $16 - 79\%$. Even if first year earnings are below these average estimated returns, the intervention is likely to be cost-effective based only on accelerating graduation by one year.[17]

These estimates do not include the benefits *to schools* from increasing summer enrollment. For postsecondary institutions, accelerating time to degree is increasingly critical to maintain their funding.[18] Moreover, the marginal cost to colleges of an additional student is often lower than the face value of the scholarship. This is particularly true in the summer when schools have slack capacity in terms of empty classrooms and partially filled courses. Summer enrollment programs have become increasingly popular as a policy to mitigate the negative enrollment shock from the COVID-19 pandemic (Weissman, 2021). Community colleges have been acutely affected by this enrollment decline with enrollment dropping by more than 10 percent in both the Fall 2020 and Spring 2021 semesters (NSC, 2021). As a result, summer scholarships and free summer courses are being used in an attempt to both recruit new students and accelerate progress for the students who enroll.

Our study also provides novel insight into the enrollment preferences of students. In particular, while preferences are strongly associated with enrollment, we find no evidence that these preferences reflect the educational benefits of summer school. Additionally, on the cost side, many of the barriers to enrollment can be addressed with a relatively low cost intervention. This creates an opportunity for schools to unlock achievement gains if they can expand summer enrollment. Summer scholarships represent one policy in this direction—they are scalable, cost-effective, and take advantage of the under-utilized resources during the summer term. Our finding that students who prefer fall scholarships experience as large if not larger treatment effects than those who prefer summer scholarship suggests that students who are less likely to seek

[16]The 2017 BLS estimate of median earnings for some college with no degree is \$38,700.

[17]Levin and García (2018) provide a comprehensive cost-benefit analysis of accelerating community college degrees in the context of the Accelerated Study in Associate Programs (ASAP). In addition to the earnings returns, they document substantial increases to tax revenues and reduced costs of public services for health, public assistance, and crime.

[18]See, Callahan et al. (2017) for information about performance-based funding for Indiana's community colleges. Additionally, the California Governor's 2018-2019 Budget assigned part of a community college's funding based on 3-year completion rates `http://www.ebudget.ca.gov/2018-19/pdf/BudgetSummary/HigherEducation.pdf`. Similarly, Arkansas' higher education funding is partially contingent on on-time degree completion `https://static.ark.org/eeuploads/adhe/ADHE_Policy_-_8-14-18_for_WEB.pdf`.

out summer school opportunities may benefit most from them.

Future work could examine the extent to which our results replicate at scale among a larger population. And, at the same time, could further explore the mechanisms driving student preferences, such as beliefs about the expected benefits of summer school, (perceived) costs of attendance, and how students trade off the short-run costs and long-run benefits. This could help inform the design of interventions that identify and target students who experience the largest benefits from summer enrollment.

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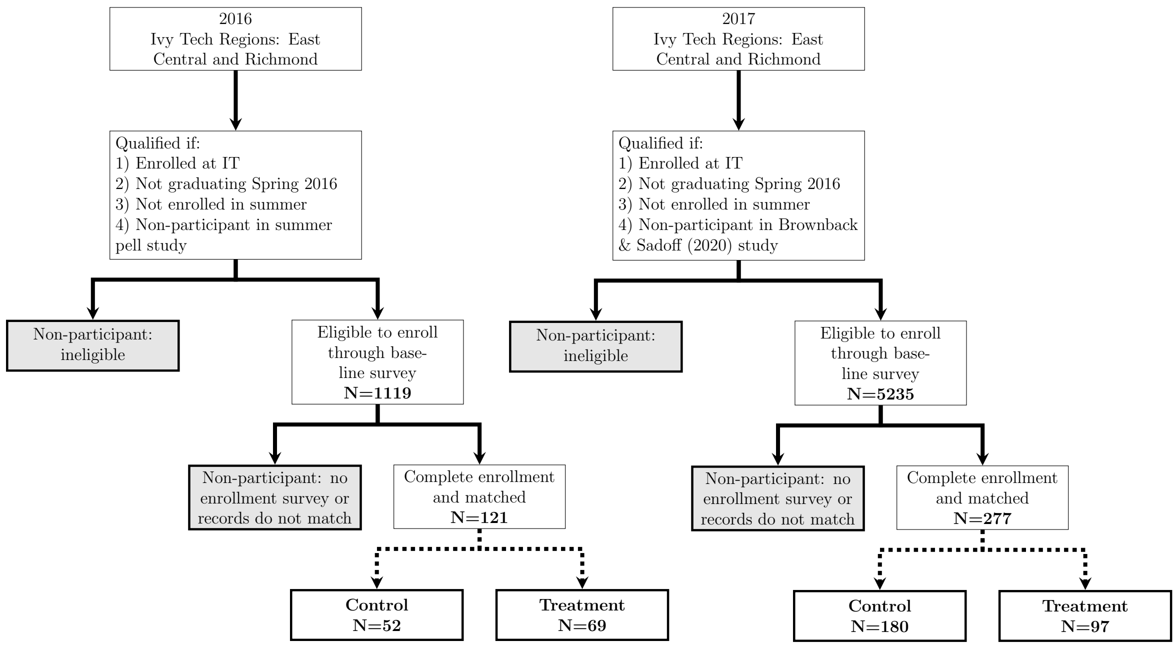
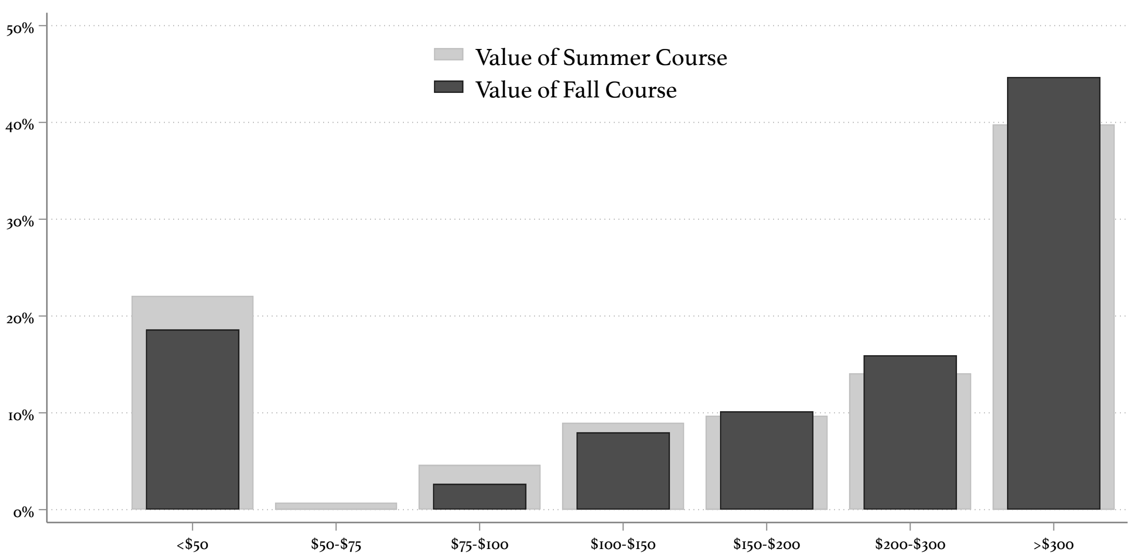
A Appendix: Figures and Tables

Figure A.1: Eligibility and Randomization for Each Recruitment Wave



Notes: Dashed arrows indicate random assignment. One Fall Treatment instructor eligible to participate in the spring opted out of continued participation. We randomly assigned two Fall Control instructors eligible in the spring to Spring Treatment. New spring instructors were randomized independently of re-enrolled instructors from the fall.

Figure A.2: Baseline value for free summer course and free fall course



Notes: Based on tuition rates at the time, the tuition voucher had a face value of just over $400. Values are given in terms of the interval between the highest amount for which the student prefers the scholarship (over cash) and the lowest amount for which the student prefers the cash (over the scholarship).

Table A.1: Demographics for Participants, Eligible Students, and Statewide Ivy Tech Population

	Summer 2016			Summer 2017		
	Study Sample	Eligible Students	Ivy Tech Population	Study Sample	Eligible Students	Ivy Tech Population
Demographics						
Male	0.397	0.504	0.429	0.271	0.397	0.432
	(0.045)	(0.015)		(0.027)	(0.007)	
White	0.802	0.815	0.753	0.783	0.847	0.761
	(0.036)	(0.01)		(0.025)	(0.005)	
Baseline Academic Progress						
Baseline Credits	30.917	26.250	N/A	35.110	24.922	N/A
	(1.742)	(0.577)		(1.350)	(0.338)	
Baseline GPA	3.008	2.691	N/A	2.929	2.340	N/A
	(0.072)	(0.030)		(0.044)	(0.016)	
Students	121	1119	78910	277	5235	75486

Notes: Table reports means/proportions and standard errors for each group. Information on the statewide Ivy Tech population was retrieved from of Education. Institute of Education Sciences (2017). Statewide average academic progress at the time of the recruitment is not available through of Education. Institute of Education Sciences (2017).

Table A.2: Heterogeneity: Preferences for Summer Enrollment

	Likelihood of Preferring Summer to Fall									
Survey Measures										
Prefer Summer Cash	0.166***									0.105*
	(0.055)									(0.060)
Summer Plans		0.433***								0.378***
		(0.072)								(0.085)
Semesters until Planned Graduation			-0.038***							-0.019*
			(0.011)							(0.012)
Academics										
Completed Semesters at Ivy Tech				0.002						-0.002
				(0.003)						(0.004)
Baseline GPA					0.018					0.017
					(0.031)					(0.033)
Baseline Credits						0.002**				0.001
						(0.001)				(0.001)
Demographics										
Age							0.000			0.002
							(0.002)			(0.002)
Male								0.168***		0.129**
								(0.050)		(0.051)
White									0.008	0.041
									(0.060)	(0.060)
Constant	0.079	-0.028	0.379***	0.187***	0.144	0.131***	0.187**	0.213***	0.192***	-0.200
	(0.049)	(0.044)	(0.072)	(0.044)	(0.101)	(0.048)	(0.073)	(0.039)	(0.062)	(0.159)
Students	397	397	347	397	397	397	397	397	397	347

Notes: Dependent variable is a binary variable equal to 1 if the student prefers summer vouchers to fall vouchers. "Prefer Summer Cash" is a binary variable equal to 1 if the student prefers cash payments in the summer over fall. "Summer Plans:" is measured from $0-1$ based on the student's stated plans to enroll in summer courses (1 means the student plans to enroll, 0 means the student does not). All estimates obtained using OLS regressions with heteroskedasticity-robust standard errors in parentheses. Columns 1–9 only include controls for cohort. Column 10 includes all covariates listed: cohort; GPA, credit accumulation, and completed semesters at baseline; age; race; gender; stated plans for the summer semester and for graduation; and preferences for payment in the summer. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.3: Heterogeneity: Summer Enrollment

	Summer Enrollment Rate								
Treatment	0.251**	0.237***	0.051	0.225***	0.370**	0.280***	0.270*	0.231***	0.114
	(0.100)	(0.080)	(0.117)	(0.074)	(0.185)	(0.092)	(0.142)	(0.059)	(0.107)
Prefer Summer Cash	0.150**								
	(0.070)								
Treatment x Prefer Summer Cash	-0.035								
	(0.115)								
Summer Plans		0.637***							
		(0.078)							
Treatment x Summer Plans		-0.055							
		(0.112)							
Semesters until Planned Graduation			-0.042***						
			(0.015)						
Treatment x Semesters until Planned Grad.			0.037						
			(0.023)						
Completed Semesters at Ivy Tech				0.000					
				(0.004)					
Treatment x Completed Semesters at Ivy Tech				-0.001					
				(0.007)					
Baseline GPA					0.110***				
					(0.033)				
Treatment x Baseline GPA					-0.049				
					(0.061)				
Baseline Credits						0.003*			
						(0.001)			
Treatment x Baseline Credits						-0.002			
						(0.002)			
Age							-0.001		
							(0.003)		
Treatment x Age							-0.002		
							(0.005)		
Male								0.056	
								(0.069)	
Treatment x Male								-0.005	
								(0.101)	
White									0.041
									(0.072)
Treatment x White									0.132
									(0.120)
Students	397	398	347	398	398	398	398	398	398

Notes: Dependent variable is a binary variable equal to 1 if the student enrolls in summer courses. "Prefer Summer Cash" is a binary variable equal to 1 if the student prefers cash payments in the summer over fall. "Summer Plans:" is measured from $0-1$ based on the student's stated plans to enroll in summer courses (1 means the student plans to enroll, 0 means the student does not). All estimates obtained using OLS regressions with heteroskedasticity-robust standard errors in parentheses. All regressions include controls for cohort. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.4: Heterogeneity: Degree Acceleration

	Graduation or Transfer One Year Post-Program								
Treatment	0.055	0.217*	0.036	0.002	0.157	-0.064	0.032	0.094	0.022
	(0.106)	(0.117)	(0.112)	(0.070)	(0.150)	(0.071)	(0.137)	(0.058)	(0.091)
Prefer Summer Cash	0.010								
	(0.079)								
Treatment x Prefer Summer Cash	0.008								
	(0.119)								
Summer Plans		0.097							
		(0.094)							
Treatment x Summer Plans		-0.211							
		(0.145)							
Semesters until Planned Graduation			-0.073***						
			(0.014)						
Treatment x Semesters until Planned Grad.			0.005						
			(0.021)						
Completed Semesters at Ivy Tech				-0.002					
				(0.004)					
Treatment x Completed Semesters at Ivy Tech				0.008					
				(0.007)					
Baseline GPA					0.120***				
					(0.032)				
Treatment x Baseline GPA					-0.030				
					(0.052)				
Baseline Credits						0.006***			
						(0.001)			
Treatment x Baseline Credits						0.004*			
						(0.002)			
Age							-0.004		
							(0.003)		
Treatment x Age							0.001		
							(0.004)		
Male								0.085	
								(0.069)	
Treatment x Male								-0.107	
								(0.105)	
White									0.138**
									(0.066)
Treatment x White									0.048
									(0.106)
Students	397	398	347	398	398	398	398	398	398

Notes: Dependent variable is a binary variable equal to 1 if the student graduates or transfers within one year of the program. "Prefer Summer Cash" is a binary variable equal to 1 if the student prefers cash payments in the summer over fall. "Summer Plans:" is measured from $0 - 1$ based on the student's stated plans to enroll in summer courses (1 means the student plans to enroll, 0 means the student does not). All estimates obtained using OLS regressions with heteroskedasticity-robust standard errors in parentheses. All columns include controls for cohort. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.5: Selection on Levels and Selection on Treatment Effects

	Combined	Associate	Transfer
Treatment	0.095	0.104	0.039
	(0.055)	(0.046)	(0.047)
Summer Enrollment	0.174	0.177	0.023
	(0.067)	(0.060)	(0.050)
Treatment × Summer Enrollment	-0.101	-0.127	0.061
	(0.090)	(0.079)	(0.078)
Students	398	398	398

Notes: Dependent variable is a binary variable equal to 1 if the student graduates or transfers (Column 1), graduates (Column 2), transfers (Column 3) within one year of the intervention. "Summer Enrollment" is a binary variable for enrollment in the summer term. All estimates obtained using OLS regressions with heteroskedasticity-robust standard errors in parentheses. All regressions include covariates for cohort, GPA and credit accumulation at baseline, age, race, gender, and stated plans for the summer semester.

Table A.6: Demographics that Predict Take-Up of Summer Scholarships

	Prefer Summer Course	Prefer Summer Cash	Summer Plans	Semesters until Planned Grad.	Completed Semesters	Baseline GPA	Baseline Credits	Age	Male	White
Never-Takers	-0.357***	-0.150**	-0.253***	0.537	0.047	-0.333***	-5.604	1.750	-0.008	-0.064
	(0.073)	(0.064)	(0.042)	(0.381)	(1.140)	(0.116)	(3.792)	(1.942)	(0.077)	(0.070)
Never-Takers + Compliers	-0.317***	-0.094*	-0.243***	0.825***	-0.221	-0.270***	-6.124*	0.440	-0.063	-0.042
	(0.063)	(0.048)	(0.033)	(0.307)	(0.967)	(0.090)	(3.455)	(1.493)	(0.064)	(0.058)
Always-Takers + Compliers	-0.134*	-0.059	-0.020	0.402	-0.312	-0.187*	-4.458	0.356	-0.007	0.037
	(0.072)	(0.054)	(0.034)	(0.384)	(1.050)	(0.101)	(3.744)	(1.622)	(0.074)	(0.061)
Constant: Always Takers	0.460***	0.816***	0.696***	4.614***	7.485***	3.259***	36.046***	28.133***	0.424***	0.828***
	(0.066)	(0.054)	(0.038)	(0.337)	(0.993)	(0.102)	(3.440)	(1.788)	(0.072)	(0.062)
Students	397	397	398	347	398	398	398	398	398	398

Notes: Dependent variable is a binary variable equal to 1 if the student enrolls in summer courses. "Prefer Summer Course" is a binary variable equal to 1 if the student prefers summer vouchers to fall vouchers. "Prefer Summer Cash" is a binary variable equal to 1 if the student prefers cash payments in the summer over fall. "Summer Plans:" is measured from $0 - 1$ based on the student's stated plans to enroll in summer courses (1 means the student plans to enroll, 0 means the student does not). All estimates obtained using OLS regressions with heteroskedasticity-robust standard errors in parentheses. Columns 1–9 only include controls for cohort. Column 10 includes all covariates listed: cohort; GPA, credit accumulation, and completed semesters at baseline; age; race; gender; stated plans for the summer semester and for graduation; and preferences for payment in the summer. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

B Appendix: Materials

Figure B.1: 2017 Recruitment Email Text

Dear [NAME],

The East Central and Richmond Regions of Ivy Tech have just been awarded funds as part of a research study to help additional students attend summer classes. We will be distributing vouchers to cover the cost of tuition for one (1) three-credit hour course for Summer 2017 at Ivy Tech (over a $400 value). The voucher will not cover books or fees.

We have a limited number of vouchers, so we ask that interested students enroll in the program by May 3, 2017. After May 5, 2017 we will draw names randomly to assign the free tuition vouchers. You can enroll at the following link: http://tinyurl.com/IvyTechSummer17

These vouchers are intended for students who plan to continue through Fall 2017 or will graduate with a credential at the end of Summer 2017.

Please contact your campus Bursar Office for any questions:

Figure B.2: Incentive-Compatible Elicitation of Scholarship Preferences

For each of the following, which do you prefer?

A Free Summer Course	○	○	A Full-Priced Fall Course
A Free Summer Course	○	○	$100 discount on a Fall Course
A Free Summer Course	○	○	$200 discount on a Fall Course
A Free Summer Course	○	○	$300 discount on a Fall Course
A Free Summer Course	○	○	A Free Fall Course
$300 discount on a Summer Course	○	○	A Free Fall Course
$200 discount on a Summer Course	○	○	A Free Fall Course
$100 discount on a summer course	○	○	A Free Fall Course
A Full-Priced Summer Course	○	○	A Free Fall Course

Figure B.3: Incentive-Compatible Elicitation of Summer Scholarship Value

For each of the following, which do you prefer?

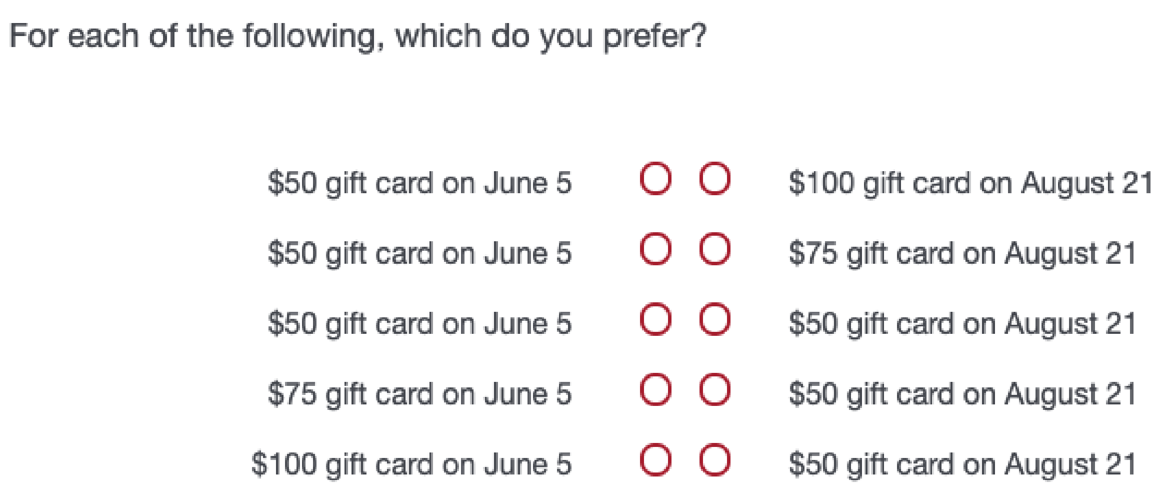
A Free Summer Course	○	○	$300 gift card on June 5
A Free Summer Course	○	○	$200 gift card on June 5
A Free Summer Course	○	○	$150 gift card on June 5
A Free Summer Course	○	○	$100 gift card on June 5
A Free Summer Course	○	○	$75 gift card on June 5
A Free Summer Course	○	○	$50 gift card on June 5

Figure B.4: Incentive-Compatible Elicitation of Fall Scholarship Value


For each of the following, which do you prefer?

A Free Fall Course	○	○	$300 gift card on August 21
A Free Fall Course	○	○	$200 gift card on August 21
A Free Fall Course	○	○	$150 gift card on August 21
A Free Fall Course	○	○	$100 gift card on August 21
A Free Fall Course	○	○	$75 gift card on August 21
A Free Fall Course	○	○	$50 gift card on August 21

Figure B.5: Incentive-Compatible Elicitation of Preferences for Cash


For each of the following, which do you prefer?

$50 gift card on June 5	○	○	$100 gift card on August 21
$50 gift card on June 5	○	○	$75 gift card on August 21
$50 gift card on June 5	○	○	$50 gift card on August 21
$75 gift card on June 5	○	○	$50 gift card on August 21
$100 gift card on June 5	○	○	$50 gift card on August 21

Figure B.6: Elicitation of Barriers to Summer Enrollment

If you don't enroll in summer courses at Ivy Tech, what would be the reason(s)? Please check any responses that apply or provide your own:

- I already received my degree from Ivy Tech
- I'm transferring to another school
- I don't want to take any more courses at Ivy Tech
- I don't like to take courses in the summer
- I can't afford to take summer courses
- I don't have time to take summer course
- I have to work
- I have to take care of children who are out of school for the summer
- Other