The Impact of Prior Learning Assessments on College Completion and Financial Outcomes

Angela Boatman, Vanderbilt University
Michael Hurwitz, College Board
Jason Lee, Tennessee Board of Regents
Jonathan Smith, Georgia State University

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Abstract

This paper estimates the impact of the College Level Examination Program (CLEP), an exam that offers credit for student competency in a content area in lieu of completing a course. Using a regression discontinuity design, we find that passing a CLEP exam leads to a 5.5 percent increase in degree completion and 1.6 percent increase in estimated income. The college completion results are notably strong for students who traditionally struggle to graduate and are often hard to track in education data, including two-year and for-profit enrollees and students in the military, students older than 24, underrepresented minorities, and homeschoolers.

I. Introduction

Despite sustained growth in college enrollment rates, degree completion remains a persistent problem in American postsecondary education. Sixty percent of first-time, full-time students who began seeking a bachelor's degree at a four-year college in the fall of 2008 completed their degree by 2014 (Kena et al. 2016). Only 20 percent of students who began at a public community college in 2008 received an associate's degree within three years (U.S. Department of Education 2014). Those who are able to complete a degree take increasingly longer time to do so (Bound, Lovenheim, and Turner 2010). Over time, these percentages amount to approximately 31 million students who enrolled in college during the past 20 years departing without a degree or certificate (Shapiro et al. 2014). Given the inextricable link between college completion and labor market and financial outcomes, these completion statistics are particularly worrisome. On average, bachelor's degrees recipients between 24-34 years old earn $49,900, associate's degree recipients earn $38,000, and high school completers earn $31,380 (U.S. Department of Education 2017). There is growing evidence that this relationship between degree attainment and labor market earnings is, at least, in part causal in nature.[1] On average, degree completion rates are lowest for underrepresented minorities, part-time, and adult students (Shapiro et al. 2017; Taniguchi and Kaufman 2005).

Prior learning assessments, a form of competency-based education, are one potential solution to address low rates of degree completion and potentially improve future financial outcomes. This form of education allows students to accumulate college credits based on their ability to demonstrate prior learning in a particular subject, typically by passing an exam. Providing a quick and inexpensive option to earn college credit may improve college completion,

[1] See Card (1999; 2001); Heckman, Lochlear, and Todd (2006); or McMahon (2009) for a review of this literature.

hasten time-to-degree, and save students money- all outcomes important to colleges. But in doing so, colleges must determine who is eligible for such credit, setting policies for the courses and exam score thresholds that will not compromise the academic integrity of their degrees. We are aware of no causal research on the efficacy of prior learning assessments and its optimal use in postsecondary institutions. This paper fills that void.

We investigate the causal impact of passing the College Level Examination Program (CLEP) on degree completion rates and financial outcomes. CLEP is a prior learning exam that students can elect to take at any point prior to or during college for an $85 fee per exam.[2] A passing score, determined by each institution, allows the student to earn college credit in lieu of taking a course. Credit is accepted at nearly 3,000 two-year and four-year colleges and universities in any of the 33 exams in five subject areas: composition and literature, world languages, history and social sciences, science and mathematics, and business.

To estimate the impact of CLEP on degree completion and financial outcomes, we use a regression discontinuity design on over 800,000 unique first-time exam takers between 2008 and 2015. The design compares students just above and below the minimum score threshold for credit on the relevant exam. We find that earning a credit-granting CLEP score increases the probability of receiving a college degree by 5.5 percent (2.5 percentage points). Among students attending a two-year college, earning a credit-granting CLEP score increases the probability of associate's degree completion by 17 percent (4.6 percentage points).

We also merge students' educational data with TransUnion credit bureau data to understand how passing CLEP exams affects several financial outcomes such as estimated

[2] During the years covered in this study, the cost of taking a CLEP exam was $80.

earnings,[3] credit scores, and various forms of loan debt. Students who marginally pass a CLEP exam earn, on average, $1,235 more per year based on estimated income than those who did not pass (a 1.6 percent increase in earnings compared to the base rate). We also observe a small reduction in the amount of debt past due in the last 12 months ($47). Passing a CLEP exam does not appear to impact the amount of student loan dollars borrowed, credit scores, or the probability of delinquency on student loan debt or other types of debt.

Given these significant outcomes, we then ask whether the effects vary by college type, subject area, and student characteristics. By doing so, we not only determine which colleges and students may benefit the most from offering and taking CLEP exams, but we also learn broader lessons about the design and delivery of competency-based education. We find that CLEP can improve degree completion rates for most students and colleges but particularly for those students and colleges with the lowest degree completion rates. For example, the degree completion effect is the strongest at two-year, less selective, and for-profit colleges, primarily for military students, underrepresented minorities, and students older than 24. Earnings impacts, on the other hand, are most pronounced at four-year and more selective colleges, which is consistent with larger returns to four-year degrees than two-year degrees

This research contributes to several strands of literature. First and foremost, this is among the very few economics papers to consider the impact of prior learning assessments on student outcomes, and the first to estimate causal impacts of any sort. Most research in the area is decades old or engages in a philosophical debate about differing methods of delivering education (e.g., Klein-Collins and Wertheim 2013), whereas we are able to quantify specific benefits to students and institutions as we consider how to design such policies. Our research also complements related

[3] TransUnion derives estimated income from a wide range of financial characteristics that include multiple income sources and debt service parameters. Further details are described in Appendix B.

literature on the impacts of course requirements on degree completion, including the negative impact of remediation (e.g., Bettinger, Boatman, and Long 2013) and the positive impact of earning college credit while in high school through Advanced Placement (e.g., Smith, Hurwitz, and Avery 2017). Both remediation and AP courses are distinctly different models from CLEP, and their impacts on students' academic success and degree completion have been widely studied.

Our paper also contributes to the vast and growing literature on college completion. There is no shortage of research on interventions or policies aimed at improving completion rates. It is common to see null to modest impacts of a policy or intervention in the frequently researched areas such as college costs (Bettinger 2015; Castleman and Long 2016; Dynarski 2002; Scott-Clayton 2011) or counseling and student support (Bettinger et al. 2012; Castleman and Page 2016). Take, for example, the U.S. Department of Education's Upward Bound program. This program, which serves approximately 60,000 low-income first-generation students per year at a cost of approximately $4,200 per participant (U.S. Department of Education 2015), was found to have no impact on postsecondary degree attainment (Seftor, Mamun, and Schirm 2009). Conversely, the City University of New York's (CUNY) Accelerated Study in Associate Programs (ASAP) program, offering students intensive college counseling and financial assistance, did appear to move the needle quite substantially on degree completion. This program follows a comprehensive, wrap-around student services model, thereby setting it apart from interventions that target only a single aspect of the student experience, such as financial aid, academic momentum, or advising. Research suggests ASAP nearly doubled associate's degree rates, but at the substantial cost of approximately $5,400 per student (Scrivener et al. 2015). The impacts in our study are notable as they are achieved through an extremely low-cost intervention and are large in magnitude,

particularly for associate's degree seeking students. As we discuss below, the $85 cost is small relative to the benefits.

Finally, our paper includes data and student information that is typically difficult to obtain. We observe several groups of students who traditionally struggle to complete college and are generally understudied, such as military personnel, homeschoolers, and students over the age of 24. These groups represent a large, and in some cases, growing segment of the college-going population and deserve further study. We also observe several rare financial outcomes through the merger of administrative CLEP data to TransUnion credit bureau data, thereby providing information on students' estimated income, credit score, delinquencies on debt repayment, outstanding government and private student loans, and home ownership. We know of only two other recent papers that use similar data: Scott-Clayton and Zafar (2016) and Chakrabarti, Gorton, and Lovenheim (2018), but in very different contexts. These data allow us to better quantify the impacts of prior learning assessments beyond a traditional lens that only considers educational outcomes.

II. Background

A. Prior Learning Assessments

CLEP is one of several initiatives in higher education focused on granting credits for prior knowledge. Many of these programs, including CLEP, are considered both a prior learning assessment (PLA) and a form of competency-based testing (CBT) (Klein-Collins 2010; Klein-Collins and Wertheim 2013). Unlike CBT, which focuses more on end-of-course student competency outcomes, CLEP and other PLA programs measure a student's prior learning and mastery of a college-level subject through an examination. If the student is able to demonstrate

sufficient knowledge on the subject matter, she typically receives college course credit without ever enrolling in the course (College Board, 2016). In this sense, PLA programs may allow students to save both time and tuition dollars by demonstrating competency in a course and earning college credits as a result.

PLA programs are designed to reduce time to degree, thereby lowering a variety of costs, including the student's tuition, foregone wages, and taxpayer's subsidies, ultimately resulting in a lower cost to degree (Bell and Valliani 2014; Complete College America 2011). If costs are an important barrier to college persistence and completion, then programs that reduce costs may lead to higher rates of degree attainment. The primary mechanism through which prior learning assessments work may be in lowering the cost borne by the student compared to earning degree credit through traditional, semester-long means. Prior research on reducing students' cost of college through need- and merit-based financial aid programs suggests that reducing the costs of attaining a degree results in greater persistence and degree completion rates (Bettinger 2004; Dynarski 2008). Academic momentum, or the speed at which students complete their college coursework, is an important predictor of bachelor's degree completion (Attewell, Heil, & Reisel 2012). As the amount of time students spend successfully earning credits each term increases, the likelihood of graduation also increases (DesJardins, Ahlberg, and McCall 2006).

PLAs, and more specifically CLEP, are not the only way in which college students may earn credits for prior knowledge. The Advanced Placement (AP) exam, also administered by the College Board, allows students to receive credit for courses taken in high school. In this sense, the two programs are quite different, as AP exams are taken at the end of a year-long course sequence in high school, whereas CLEP exams are prior learning exams administered without any requisite coursework. In a large sample of colleges offering two- and four-year degrees that were surveyed

by the College Board, of those colleges that offer credit for AP exams, approximately 85 percent offer credit for CLEP exams and vice versa.[4] So colleges that offer AP and CLEP credit are not substantially different from one another.

B. CLEP Background

The College Level Examination Program (CLEP) was the first widespread prior learning assessment program of its kind used in postsecondary education. CLEP was developed by the College Board in 1967 as an extension of the Comprehensive College Test designed by Educational Testing Service (ETS) in 1965. Today, CLEP offers 33 exams in 5 subject areas: composition and literature, world languages, history and social sciences, science and mathematics, and business. Students who pass a CLEP exam may earn three or more credits; and the amount a student can earn on an individual CLEP exam varies by college and subject area.

CLEP exam scores are accepted at nearly 3,000 colleges and universities, each of which sets its own policy for accepting CLEP credits (College Level Examination Program 2016). Additionally, colleges determine the minimum qualifying score to earn credit, and place restrictions on the number of credits a student may earn through CLEP or the circumstances under which a student may earn CLEP credit. For example, some colleges may not grant CLEP credit towards the core curriculum, or may not accept all of the 33 exams. Some colleges actively encourage students to take advantage of CLEP to advance their education, through setting appropriate and generous credit policies, advising students about CLEP, providing CLEP related information on their websites and catalogs, and opening CLEP test centers. The College Board

[4] We are not aware of any concordance studies between the CLEP and AP, by subject.

also supports limited print and email advertising for CLEP and provides colleges with free marketing materials.

Evidence on the effectiveness of CLEP and other PLA programs on student success is limited. The descriptive research suggests that students with PLAs, such as CLEP, had better academic outcomes than students who did not take a PLA (Barry 2013; Caldwell 1973; Klein-Collins 2010). These studies, however, do not control for issues of selection on who takes a PLA in the first place. We are aware of only one study focused solely on the effectiveness of receiving CLEP credits on student persistence and degree completion that also attempts to address issues of selection. Using a matching design to assess the effect of CLEP on college student outcomes at a single institution, Scammacca (2003) finds that students earning credits through a CLEP exam had higher college grade point averages than non-CLEP- earning students with similar entrance exam scores and high school rank, and compared to students receiving credit through comparable AP exams. This study still only examines students *receiving* CLEP credits compared to similar students who may or may not have chosen to take a CLEP exam. The ideal comparison group for studying the impacts of earning CLEP credits are those students who also elected to take a CLEP exam, but just barely missed the cutoff for receiving credit. We contribute to the literature by adopting this analytic strategy and causally estimating the impacts of earning credit-granting CLEP scores on college completion and financial outcomes.

C. CLEP Exam Taking

Students learn about CLEP exams through several avenues. According to survey data provided by the CLEP program office at the College Board, 17 percent of non-military students who take a CLEP exam first learn about the option in high school, whereas the vast majority (60

percent) first learn of the exams after enrolling in college. Only three percent of CLEP test-takers report learning of the exams from their employer. This first exposure to CLEP differs dramatically for test takers in the military, where only 4 percent of test takers first learn of the exam in high school, 16 percent in college, and 69 percent from their employer (the U.S. government).

Among all test-takers, 63 percent of students report taking a CLEP exam to save time in college, 57 percent report wanting to save money, and 56 percent desire to use the CLEP to satisfy core educational requirements. For continuing college students, their primary motivation might be to satisfy a remaining degree requirement in order to graduate on time, which may explain why we observe some college seniors taking CLEP exams.

As shown in Appendix Table A1, the most popular CLEP exam is the Spanish Language exam, with nearly a quarter of the test-takers (~206,000 students) between 2008-15 taking the exam. The second and third most popular exams are Analyzing and Interpreting Literature and College Algebra, respectively. Many of the exams are typical gateway college-level courses, such as English, Biology, and Mathematics courses, as well as foreign language exams like French or German. While college requirements differ across institutions and degree programs, the majority of CLEP exams fall into the category of general education courses, as opposed to remedial or advanced courses.[5]

As shown in Table 1, nearly a quarter of CLEP test takers in our full sample identified as Hispanic or Latinx and 56 percent self-identified as white. Black/African American and Asian students comprise 9 and 5 percent of the sample, respectively. The sample is evenly split between males and females and the average age of sampled students is 27 at the time of their first exam. Students affiliated with the U.S. military make up one quarter of the sample in part because the

[5] Individual colleges may elect to accept CLEP credits to satisfy remedial course requirements in math or English, but we are not able to observe this in our data.

exam is available free of charge for all qualifying U.S. Armed Forces personnel through the Defense Activity for Non Traditional Education Support (DANTES) program and exams centers are located on several military bases. Finally, homeschooled students contribute 3 percent. Appendix Table A2 provides descriptive data on CLEP test-takers, non-test takers and SAT test-takers more generally. Among CLEP-takers, 78 percent do not have a reported SAT score in our data, suggesting that CLEP serves a student population quite different than the SAT. CLEP test-takers without SAT scores are more likely to be male (55 versus 49 percent) and members of the military (36 versus 25 percent) compared to those with SAT scores.

III. Data and Empirical Strategy

A. Data

Our analysis has three primary data sources: (1) CLEP exam data; (2) college enrollment data from the National Student Clearinghouse; and (3) financial outcomes from the TransUnion credit bureau.

We use student-level data for every CLEP exam taken between 2008 and 2015. This data set is collected and maintained by the College Board and includes exam information and scores, along with self-reported information on student age, race, gender, military status, and homeschool status. Throughout our analyses, we focus on a student's first CLEP score to avoid concerns with endogenous retaking.[6]

To examine postsecondary outcomes, we merge the CLEP exam data with enrollment and graduation data from the National Student Clearinghouse (NSC) through 2015. As of 2015, over

[6] A separate but related issue is students taking multiple exams on the first day they sit for a test. While this only represents 3% of students, we run specification checks where we eliminate these students and find results that are identical to those presented.

3,600 colleges and universities participate in the NSC, comprising over 98% of all students enrolled in American postsecondary institutions. This coverage has changed over time with approximately 91% of all students enrolled in the postsecondary system accounted for during the 2011-12 academic year (Dynarski, Hemelt and Hyman 2015). Because the majority of students take the CLEP while enrolled in college, we include each of the eight cohorts of CLEP test-takers in the analyses, although the results are insensitive to eliminating more contemporary cohorts who had less time to complete degrees and participate in the labor market.

We obtained financial information from the TransUnion credit bureau. TransUnion is one of the three major credit bureaus in the United States. TransUnion merged their data with the above CLEP exam data and college enrollment and completion data, giving us a snapshot of a student's financial situation as of November 2017. These data provide information on estimated income, credit score, delinquencies on debt repayment, outstanding student loans (government and private), delinquencies on student loan repayments, and home ownership. TransUnion uses a wide range of financial characteristics to estimate a consumer's joint gross adjusted income (line 37 of the 1040 federal tax form). This algorithm is based on multiple income sources and debt service parameters.[7] In Appendix B, we describe the variable definitions and matching procedures in more detail, along with evidence on the quality of the data. In short, the match rate of approximately 90 percent is not a threat to our identification strategy and the variables, including the estimated income, are of high quality.[8]

[7] The income source data includes: investment income, alimony, business income, IRA distributions, pensions and annuities, real estate income, unemployment compensation, and Social Security benefits. The debt service information includes monthly spend data, and up to 30 months of extended account history, including credit lines, length of credit history, historical credit card balances, and recent credit card transactions.

[8] This match rate is the same as in Scott-Clayton and Zafar (2016), who use Equifax credit bureau's data in West Virginia.

Along with our three primary datasets, we add several smaller pieces of data. First, test score thresholds for college credit are retrieved from two sources: the College Board's Annual Survey of Colleges (ASC) and the CLEP official website. The ASC contains detailed information on a number of institution-level characteristics including credit-granting minimum scores separately for each CLEP subject. We then compare these cutoff scores across ASC surveys to those scores found on the CLEP website both to determine how static they are across time and to include any score cutoffs that institutions failed to report in a given ASC year or on the website. The modal threshold, capturing 80 percent of the CLEP cutoffs at both two-year and four-year colleges, is 50, with approximately 20 percent of institutions reporting thresholds other than 50, primarily between 40 and 60.

Second, we append variables from the Integrated Postsecondary Education Data System (IPEDS) to the colleges at which students enroll. IPEDS data contain information on the type of college, such as two- or four-year, as well as for-profit or not-for-profit status, public or private, and the average SAT scores of enrollees. Finally, we merge on the Barron's competitive index of colleges, which puts colleges into broad tiers of selectivity and competitiveness based on a host of underlying variables.

B. Descriptive Statistics

Table 1 shows the descriptive statistics of the sampled CLEP test-takers. In this study, we primarily consider a student's first CLEP score to examine postsecondary and longer-term financial outcomes.[9] The first and third columns present the averages for the full and analytic

[9] We choose to focus on student's first CLEP score, as we find that success on CLEP begets additional CLEP test-taking. Students who barely earn CLEP credit on their first exam are 3.5 percentage points more likely to take a subsequent exam in a different subject. About 9 percent of students who just miss the credit-granting CLEP score retake the CLEP exam in that same subject. We also find that students' second CLEP exam impacts the probability

samples, respectively. The average student in the full sample took 1.58 CLEP exams, with 73 percent of students only taking one exam. CLEP exam scores are integers, and fall between 20 and 80. Average CLEP scores of sampled students are 57, and about 26 percent of students first took the CLEP prior to enrolling in any postsecondary institution. Nearly two-thirds of students enrolled at a four-year college during or immediately after taking their first CLEP exam and another 20 percent enrolled at a two-year college. About 80 percent of enrolling students attend a postsecondary institution for which a score of 50 or higher on the relevant CLEP would earn them college credits. Slightly more than 70 percent of CLEP test-takers met the 50 threshold, which is the threshold that we focus on.

Almost half (48.5 percent) of sampled students ultimately earned a postsecondary degree by 2015. The majority of degree recipients earned a bachelor's degree- 35 percent of the total sample had completed a BA/BS by 2015. About one-fifth of sampled students earned an associate's degree. Some students earned both associate's degrees and bachelor's degrees, and as a result, the sum of the BA and AA attainment rates exceeds the overall degree attainment rate of 48.5 percent. The average estimated income across test-takers in our full sample is $77,157. As explained in Appendix B, this is an estimate of all income, not just wages, thus explaining why it is larger than average early to mid-career earnings. The average credit score is 689, which is roughly the average credit scores in the U.S, and about half of sampled individuals have credit scores of 700 or higher. About 13 percent of students were delinquent at least once on an outstanding debt over the past twelve months, with an average amount past due of $172. The average student has close to $18,000 in government student loans to repay and almost $1,600 to

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of degree completion. These findings are consistent with work by Smith, et al., (2017) on Advanced Placement exam retaking, and are available upon request.

private student loan agencies, with about 5 percent of borrowers delinquent on those loans. Finally, 31 percent of people in the sample have a mortgage as of November 2017.

C. Empirical Methodology

We use a regression discontinuity design (RDD) that compares students who just barely attain a credit-granting score to those seemingly identical students who just barely missed the credit-granting threshold. In our main analyses, we restrict to the first exam for each test-taker in our sample to account for potentially endogenous retaking of the test. To measure the impact of earning minimum CLEP credit-granting scores, we estimate the following equation:

$$(1)\ Y_{ij} = \beta_0 + \beta_1 Above_{ij} + \beta_2 Dist_{ij} + \beta_3 Above_{ij} * Dist_{ij} + Exam_j + TC + X_i'\gamma + \varepsilon_{ij}$$

where Y_{ij} is the outcome variable of interest, often an indicator of degree attainment or some financial measure, for student *i* that took exam subject *j*. $Dist_{ij}$ is the number of points away from 50 on exam *j*, which serves as our forcing variable and is re-centered at zero. $Above_{ij}$ is an indicator for meeting or exceeding 50. In other words, this variable equals one if $Dist_{ij} \geq 0$ and zero otherwise. We include the interaction of these two terms to allow for different slopes on each side of the threshold. All specifications also include exam subject fixed effects ($Exam_j$) and testing center fixed effects (*TC*).[10] Finally, X_i includes a vector of covariates (e.g., race, sex, age, and military status) that we only use in robustness checks. The coefficient of interest, β_1 in equation

[10] Testing centers are often, but not always, on college campuses. If not on a campus, colleges frequently direct students to a proximate testing center. In other words, including testing center fixed effects in our analysis is similar to including college fixed effects. However, in the NSC data, some, but very few, colleges only appear if a student graduates, not if they enroll but don't graduate. This implies that some college fixed effects perfectly predict college completion. As such, we use testing center fixed effects in our primary regression. We show that results are robust to college fixed effects in Appendix Tables A5 and A6.

(1) represents the causal effect of scoring a 50 or above on a CLEP exam.[11] While we cannot be certain students who score above a 50 receive college credit, in most instances, they are eligible. We separately explore alternative college-specific credit granting scores, which may better reflect the true impact of getting college credit through CLEP. We also explore impacts on college enrollment.

We estimate equation (1) using local linear regression with triangular kernels utilizing the Imbens and Kalyanaraman (2012) optimal bandwidth procedure, which leads to different sample sizes for each outcomes.[12] As is common in studies utilizing an RDD, we explore a number of specifications, all of which yield consistent estimates.

1. Continuous Density and Covariate Balance

In order to obtain unbiased estimates, there must be no strategic manipulation around the threshold scores. This seems unlikely with a complex and somewhat opaque scoring system. Nevertheless, such strategic manipulation would be visualized as bunching of observations at or just above the credit-granting boundary, which we do not observe (see Appendix Figure A1). Formal tests of continuous density proposed by McCrary (2008) confirm that no statistically significant discontinuities in density exist (see Appendix Table A3).

We also test for discontinuities in covariates across a score of 50 using the same specification as equation (1) but do not find any evidence of strategic manipulation. With the exception of race/ethnicity, Appendix Table A3 shows balanced covariates across the threshold. More generally, in the final row of the table, we test for collective differences in covariates across

[11] Students can and do retake CLEP exams. However, when we run the same regression but change the outcome to total number of CLEP exams above 50, we get a coefficient of 0.96. This implies that the reduced-form estimates we show are nearly identical to the potential two-stage least squares version.

[12] Lee and Card (2008) recommend clustering standard errors on the forcing variable when that variable is discrete. We find that such clustering actually results in smaller standard errors, so we opt instead to use heteroscedasticity robust standard errors, which leads to more conservative inferences.

the CLEP boundaries by regressing CLEP scores on the entire set of covariates presented. We then treat the predicted CLEP scores as the outcome variable in equation (1). There are no significant differences in predicted CLEP scores across the 50-point threshold, which is confirmed graphically in Appendix Figure A2.

IV. Main Results

A. College Completion Outcomes

In Table 2, we present the impact of scoring at least a 50 on a CLEP exam (i.e.- the most common passing score) on several educational outcomes. Scoring a 50 causes an increase in the probability of earning a college degree by 2.5 percentage points. The control mean is 45 percent so this represents about a 5.5 percent increase in the probability of graduating. There is a 2.2 percentage point (13.5 percent) increase in the probability of earning an associate's degree when scoring at least a 50 on a CLEP exam and a 1.1 percentage point (3.4 percent) increase in the probability of earning a bachelor's degree.

We demonstrate the robustness of these results in two ways- graphically and through alternative specifications. The top panel of Figure 1 shows a relatively flat line followed by a modest discontinuity in the probability of earning any degree. The middle panel shows a clear jump in the probability of receiving an associate's degree after earning at least a 50. The bottom panel shows the muted results for a bachelor's degree. The negative slope in the middle panel is a result of higher CLEP scores corresponding to increases in the probability of attending four-year colleges and earning a bachelor's degree. In Appendix A4, we vary the kernel, bandwidth, polynomial order, and include a series of controls. This Appendix Table shows that results are robust to the standard bandwidths suggested by the IK approach. We also show results using the

very narrow bandwidth of 3 points, where some results lose statistical significance, but we caution that such a small bandwidth fails to meet the standard requirement that there be at least 4 categories above and below the cutoff for a study to be eligible for a What Works Clearinghouse review as an RD design (Schochet et al. 2010). Appendix Table A5 shows that results are unchanged when using college fixed effects instead of testing center fixed effects.

The remaining columns in Table 2 relate to the timing of degree completion. Columns (4) and (5) show that the impact of earning a 50 on a CLEP exam increases the probability of graduating within 150 percent of the expected time of the respective degrees. The muted coefficients relative to the initial estimates suggest that some students take longer than 3 or 6 years. However, conditional on graduating, column (6) suggests that there is an improvement in time-to-degree. Students who score at least 50 on a CLEP exam graduate in 39 fewer days than those who score below a 50. This is largely driven at the associate's degree level. Finally, columns (9) through (11) explore how quickly a student graduates after taking the CLEP exam. Again, largely but not exclusively driven by associate's degree, students leave college with a degree 63 days sooner after receiving a passing CLEP score.

B. Financial Outcomes

Table 3 presents the main results for financial measures and outcomes, as measured in November 2017, regardless of exam taking date and college enrollment dates. The first column shows that students who attain a 50 on a CLEP exam earn, on average, just over $1,200 more per year in estimated income than those who did not attain a 50.[13] This represents about a 1.6 percent

[13] We cannot discern whether the increased earnings is a higher wage or simply that the person has a little more labor market experience since previous results show students earn degrees more quickly when getting college credit through CLEP. It is unlikely that the latter explains the entirety of the difference given likely differences in months of experience.

increase in earnings compared to the base rate. We do not see any impact on the binary indicator for credit scores being above 600, and only a weakly significant impact on credit scores at or above 700. We do not see an impact in the probability of being delinquent on debt in the last 12 months; however, we do see a small reduction in the amount past due in the last 12 months ($47).

Columns 6 through 8 examine the impact of CLEP credit on student loans. We already observed that passing a CLEP exam improves degree completion, which could be by virtue of taking more classes that require more loans. However, consistent with the fact that we see those receiving CLEP credit also more likely to graduate more quickly, we also find no impact on the size of outstanding student loans or the probability of delinquency on student loans.

Finally, as shown in column 9, students who attained a 50 or higher on CLEP are almost one percentage point more likely to have a mortgage, a proxy for home ownership. Off a base of 33 percent home ownership, this is about a 3 percent increase relative to students who do not receive CLEP credit.

Each of these outcomes is shown graphically in Figure 2 and alternative specifications are shown in Appendix Table A4. These robustness tests show a clear impact on estimated income as well as evidence in favor of an impact on the amount of debt past due in the last 12 months. Whether a person holds a mortgage is somewhat sensitive to the specification and not visually obvious, leaving some uncertainty on the impact of CLEP scores above 50 on owning a home. Appendix Table A6 reaffirms these conclusions by using college fixed effects instead of testing center fixed effects.

The most pronounced effect on financial outcomes is estimated income and so we briefly discuss the magnitude and potential mechanisms. The most obvious mechanism to consider is degree completion. However, the ratio of the effect on estimated income to any degree completion

yields a $49,000 (~$1,235/0.025) increase in estimated income from completing a degree a just a few years out of college. This is an implausibly large "sheep skin" or human capital effect off of a base of $75,000 in estimated income.[14] We cannot rule out that the standard errors mask a larger completion effect and a smaller estimated income effect. Regardless, there is almost certainly something beyond the returns to completing college that is driving the results. For example, there is also a time-to-degree impact such that those who receive CLEP credit enter the labor market earlier and have more experience and higher wages. Alternatively, those who receive credit through CLEP and complete their degree may also be more likely to be married and the estimated income may be larger by virtue of having a joint gross adjusted income. We further explore whether completion effects or alternative hypotheses are driving the results in more detail in Section 5 when we examine the type of colleges driving the results.

C. (Strategic) Enrollment Effects

The impact of the CLEP on student enrollment is important for two reasons. First, colleges and policy makers may be interested in this outcome in and of itself, especially if CLEP policies can improve enrollment at colleges that may be a particularly good fit for students. Second, students may take CLEP exams and strategically enroll in colleges that provide credit, which impacts the way we interpret our results.

We find no evidence that student college enrollment is impacted by CLEP scores.[15] Appendix Table A7 shows this on a variety of college type and quality outcomes by using the

[14] Jaeger and Page (1996) estimate some sheepskin effects in the range of 20-30 percent. Ost, Pan, and Webber (2018) find (internal rate of) returns to completing college for marginally academically prepared students of 4.1 percent.

[15] Since we find no strategic enrollment, we could also use distance from the credit-granting threshold at the first college enrolled as the running variable instead of distance from 50. We can also consider associate's and bachelor's degree completion for students starting at two and four-year colleges, respectively. These choices likely more accurately reflect the treatment on the treated effect. We show some of these estimates in Appendix Table A8, which are all substantially larger in magnitude.

subset of students who take CLEP before enrolling. To further illustrate that our main results are not driven by enrollment impacts of CLEP, we re-run the analyses using the subset of students who take CLEP after enrolling in college. For the sake of space, we do not present these results as they are unchanged relative to our main results.

V. Designing a CLEP Policy and Mechanisms

In this section, we seek to better understand CLEP credit-granting policy impacts and their implications for students. There is no single optimal CLEP policy as colleges have differing priorities and students have different abilities and needs. That said, our analyses shed light on some of the costs and benefits of choosing a campus-specific CLEP policy, as well as highlight general lessons for competency-based education.[16]

A. Which Colleges See the Largest Impacts?

In Table 4 we present the impacts of earning at least a 50 on a CLEP exam for all educational and financial outcomes by college type. The first two columns are for students enrolling in two-year and four-year colleges, respectively. They both show coefficients of at least 3 percentage points on the probability of earning any degree. At two-year colleges, this is driven by the large impact on the receipt of associate's degrees (4.6 percentage points) while at four-year colleges, there is a modest impact on associate's and bachelor's degrees (2.2 and 1.5 percentage points, respectively). The impact on both degrees at four-year institutions likely stems from the fact that a growing number of four-year colleges are offering both bachelor's and associate's degrees.

[16] One obvious campus-specific policy is choosing the threshold that warrants credit. Since 80 percent of colleges give credit for a score of 50 or higher, regardless of the exam, our heterogeneous effects at thresholds above or below 50 are too noisy to draw conclusions.

Why might the completion impacts be larger at two-year colleges than at four-year colleges or larger for associate's degree seekers than bachelor's degree seekers? We cannot fully answer the question but the most straightforward explanation is mechanical. Receiving credit through CLEP accounts for a larger fraction of required credits among students pursuing associate's degrees, compared to students pursuing bachelor's degrees. At many colleges, 60 credits are required for an associate's degree and 120 are required for a bachelor's degree, so six credits earned through CLEP would account for 10 percent of the total required credits in an associate program and 5 percent in a bachelor's program. Other studies support this mechanical story. In research on the impacts of Advanced Placement credit on college completion (Smith et al., 2017), the authors find similar effect sizes and are able to conclude that effects as mechanical in nature, as opposed to behavioral.

The next two columns of Table 4 show that the impact on degree completion does not differ meaningfully by whether students attend public or private colleges. Columns (5) and (6) separate findings by not-for-profit and for-profit colleges. For-profit colleges tend to have lower completion rates and higher student loan default rates than do not-for-profit colleges (Cellini and Turner 2018; Deming, Goldin, and Katz 2012). While we observe modest impacts of receiving credit through CLEP on completion at not-for-profit colleges, the coefficient for students at for-profit colleges is 5.2 percentage points, which is an 8.4 percent increase in the probability of earning a degree, on a base rate of 62 percent.[17] Finally, columns (7) through (11) consider some measure of college quality or selectivity. While statistical power is limited, students at the least selective schools, as measured by the average SAT score of enrollees and Barron's levels, are more likely to complete a degree when receiving at least a 50 on a CLEP exam. Students at colleges

[17] Most of these students are members of the military and attend a small number of for-profit colleges where the degree completion rates are higher than average.

with average SATs above 1200 have a negative (and noisy) coefficient on the probability of earning a degree. The impact of passing a CLEP exam on completing an associate's degree is present at both the top ranked and bottom ranked Barron's colleges.[18]

Moving to estimated income in Table 4, we see that much of the increased estimated income is driven by students first attending four-year colleges.[19] We also find large effects at private colleges and among Barron's top ranked colleges. At both for-profit and not-for-profit institutions, students experience an income bump from earning a score of 50, but these two estimates are of similar magnitude.

Overall, there is evidence that earning credit through CLEP impacts degree completion and earnings at most types of institutions. But the degree completion effect appears to be strongest at places with lower degree completion rates, such as two-year, less selective, and for-profit colleges. Earnings impacts, on the other hand, are most pronounced at four-year and more selective colleges.

The different estimates across subsamples should not be over-interpreted, as different types of colleges serve different types of students and offer different types of degree programs and majors. However, the differential estimates brings us back to the previous discussion of mechanisms. First, the financial benefits of bachelor's degrees may be much higher than for associate's degree, especially for this fairly unique population. Second, because the types of colleges at which students experience smaller completion impacts (e.g., four-year colleges) from earning CLEP credit are the same colleges at which financial outcomes are the largest, it is unlikely that degree receipt alone is responsible for the income impacts shown in Table 4. In conclusion,

[18] We also examined the impact of passing a CLEP exam prior to enrolling in college on the type of institution students choose to attend. We find no impacts of earning at least a 50 on a CLEP exam on the type or selectivity of the college to which students enroll.

[19] Appendix Table B1 shows that the financial outcomes are not driven by sample selection into the matched data with financial outcomes. Rather, the completion effects are the same using the entire sample or the sample that has financial outcomes.

while degree receipt is undoubtedly a contributor to the financial outcomes shown, there are countless other plausible mechanisms such as differing participation in the labor market, human capital acquisition, and marriage markets.

B. Which CLEP Exams Have the Largest Effects?

Colleges shape subject-specific CLEP-credit granting policies considering many factors. In some cases, the college may not offer courses equivalent to the material tested on the CLEP exam, and in other cases the material tested in the CLEP may allow students to place out of several courses. It is also possible that some exams provide students with more academic momentum, through either human capital accumulation or credit-granting channels.

Table 5 shows the results by subject area. The first row shows positive coefficients on degree completion across all six broad subject areas. Only the parameter on world languages fails to reach statistical significance, but it is also not statistically distinguishable from most of the other estimates. With the exception of business, most of the subjects are required to earn a degree, particularly at four-year colleges with an emphasis on well-rounded education, and satisfying the general education requirements via CLEP reduces the number of courses students must take, while freeing up time for students to potentially engage in more rigorous or more relevant coursework. Similarly, many Hispanic students take the Spanish exam and, if some fraction of them speak Spanish at home, it may be a somewhat low -cost way to remove the low-level course requirements. Again, this points to the debate over prior learning assessments and the role of postsecondary institutions. Should institutions be the purveyor of education or the certifier of knowledge? If taking lower-level courses that coincide with already obtained knowledge stands

in the way of earning a degree, perhaps institutions should consider adjusting graduation requirements to allow for this prior knowledge.

The coefficients on estimated income are again, all positive. These estimates are largest for science and math and smallest for history, social science, and business. Though we cannot observe course taking in our data, it is possible that passing CLEP exams leads to a greater investment in particular subjects or shifting majors (a la Avery et al., 2017) that may pay off in the future, such as STEM majors.[20]

C. Which Students Benefit the Most From CLEP?

When considering policies on adopting CLEP credit-granting policies and establishing cut scores, college administrators are also interested in which types of students benefit the most from passing a CLEP exam. One of the unique features of our data is that we have information on several sub-groups of students who struggle to complete degrees, and are often difficult to find in other datasets. Table 6 explores these subgroups.

Military students are a particularly notable group in our sample. About one-quarter of the sample is affiliated with the military, translating into more than 200,000 observations. In the first column of Table 6, we find that students affiliated with the U.S. military experience a 4.8 percentage point (12.3 percent) increase in the probability of degree completion as a result of earning a 50 or higher on a CLEP exam, with a base rate of 39 percent. The effect on bachelor's completion is 1.4 percentage points (9.2 percent on a base of 15.3 percent), and 4.8 percentage points (16.5 percent) for associate's degree completion from a base rate of 29.1 percent. The impact on associate's degree attainment is among the largest percentage point impacts throughout this

[20] We look at whether students who earn at least a 50 are more likely to major in that field but the estimates are too noisy to conclude anything meaningful.

paper and suggests that subsidizing CLEP exams propels veterans and members of the military towards degrees. We also observe an increase in estimated income of over $1,700 among this group.

The second column shows the impact of CLEP credit on students who self-identify as homeschooled. This population is seldom the subject of research given their low numbers and difficulty of identification in most data sources. With over 28,000 homeschooled students, our data set represents one of the largest samples of such students. We find that the impact of receiving a passing CLEP score on associate's degree attainment for homeschooled students is 2.3 percentage points. This 2.3 percentage point increase represents a 24.7 percent increase in associate's degree completion, from a base rate of 9.3 percent. There are no impacts that reach statistical significance on any financial outcomes for homeschooled students.

Next, we consider the impact of passing a CLEP exam, by race/ethnicity. The degree completion coefficients on the impact of earning a 50 or more on CLEP on Black and Hispanic students (4 percentage points) are twice as large as those for white and Asian students (2 percentage points). This suggests that CLEP credit can help all students, especially underrepresented minority students, complete college. The coefficients for estimated income are larger in magnitude for Black and Hispanic students than for White and Asian students, though these estimates are not statistically different from each other.

Finally, in column (7) and (8), we show the impact of CLEP credit on traditional and non-traditional age students, differentiated by age. Despite the fact that nearly 40 percent of students enrolled in postsecondary institutions fit into this non-traditional age category (NCES, 2015), these students are rarely the focus of higher education research. In Table 6 we observe that the degree completion impacts of earning a CLEP score of 50 or higher for these students are larger than for

students age 24 or younger. The 3.1 percentage points (6.4 percent) increase in degree completion, from a base rate of 48.2, is particularly large given that older students tend to experience lower rates of degree attainment. To our knowledge, there are no interventions that have an impact as sizable as this for non-traditional aged students.

Overall, these results suggest that passing a CLEP exam improves degree completion for underrepresented students and may also improve their labor market earnings. While we cannot make definitive claims explaining why these subgroups are impacted to such a large degree, we do know that, on average, these students tend to face more social and economic challenges. The costs of college may be more prohibitive for these students and they may also be juggling a host of other responsibilities, including supporting families and maintaining full-time jobs. As such, they may benefit the most from a policy that lowers the time and cost of completing a degree. When colleges consider offering CLEP credit and worry about costs such as tuition revenue loss, they should also consider the demonstrated benefits to groups that are less likely to complete degrees than their more advantaged peers, and that such adopting such policies has the potential to markedly increase graduation rates.

VI. Conclusion

Earning a college credit-granting CLEP score leads to a substantial increase in the probability of completing a postsecondary degree. These results—while persistent across the population of CLEP participants—are most pronounced for students enrolled in two-year colleges and those student subpopulations with historically lower college degree completion rates. These findings have important policy implications, as they suggest that a large prior learning assessment program with national reach, such as CLEP, has the potential to serve as one of the most cost-

effective ways to increase degree attainment rates in the U.S., particularly among underrepresented students. The effects of the CLEP program are promising, and, at the very least, warrant further investigation into the use of prior learning assessments as a tool for college success and increasing college completion rates. Our results also show that CLEP passes a cost benefit analysis under almost any reasonable set of assumptions. At a cost of $85 per exam during the years of this study, the expected benefit for students is approximately $1,200 in increased estimated yearly earnings, and closer to $2,000 for students attending private institutions.

It is also worthwhile to put the impact of CLEP in context by comparing the effect sizes of the program to those achieved through other interventions. One of the interventions with the largest impacts on associate's degree attainment has been CUNY's ASAP, discussed in this paper's introduction. While the ASAP program is quite different than CLEP, we focus on this program because the impacts are impressively large (nearly doubling the associate's degree completion rate from 21.8 percent to 40.1 percent) (Scrivener et al. 2015). The success of CUNY's ASAP was tempered by the high costs of $5,400 per student (Dynarski 2015). The completion impact of CUNY ASAP was approximately three times as large as the impact of passing a CLEP among two-year college enrollees (18.3 percentage points versus 4.6 percentage points). However, per student, ASAP is more than 60 times more expensive than CLEP ($5,400 for ASAP and $85 for CLEP). As a high cost, high touch intervention, the CUNY ASAP program offers promising evidence that the completion needle can be moved. However, our CLEP research shows that effective interventions need not come with a hefty price tag. It is important to note, however, that the supplemental services ASAP offers to students (financial aid, college advising, etc.) are intended to help students build important college-level skills, while the CLEP exam simply

provides students with a mechanism to receive credits for skills and knowledge that they already possess.

From the institution side, prior credit may cause concern for colleges and universities that are sensitive to tuition revenue. Administrators may worry about lost revenue from allowing students to place out of introductory coursework. However, these concerns should be weighed against the fact that CLEP credit-granting policies have the potential to increase overall completion rates. This is not trivial in the current education landscape where colleges increasingly find themselves accountable for graduation rates. The results also implicate the role of higher education in the labor market, which is often broken into two categories- signaling and human capital expansion. Compelling students to re-take courses for which they have already demonstrated competency would add little in the way of human capital. And removing prior learning assessments as an option to move through college could, all else equal, reduce completion rates, which is a signal unto itself (i.e., the "sheepskin effect"). Furthermore, offering prior learning assessments as a mechanism for accelerating credit accumulation may help to solve administrative challenges at over-subscribed institutions. Registration logistics and seat availability can impede progress to graduation, particularly in gateway or sequential courses. CLEP exams have the potential to address these capacity constraints where they might exist.

Future research should investigate the impacts of institutional CLEP adoption policies on completion and economics outcomes, as we only investigate the intensive margin of passing an exam. Regardless, critics of prior learning assessments often take a stance related to signaling and argue that college is intended to be a "personal growth" experience. Given the increasing sticker prices of postsecondary institutions, the "personal growth" model may be a luxury reserved for fewer and fewer students going forward.

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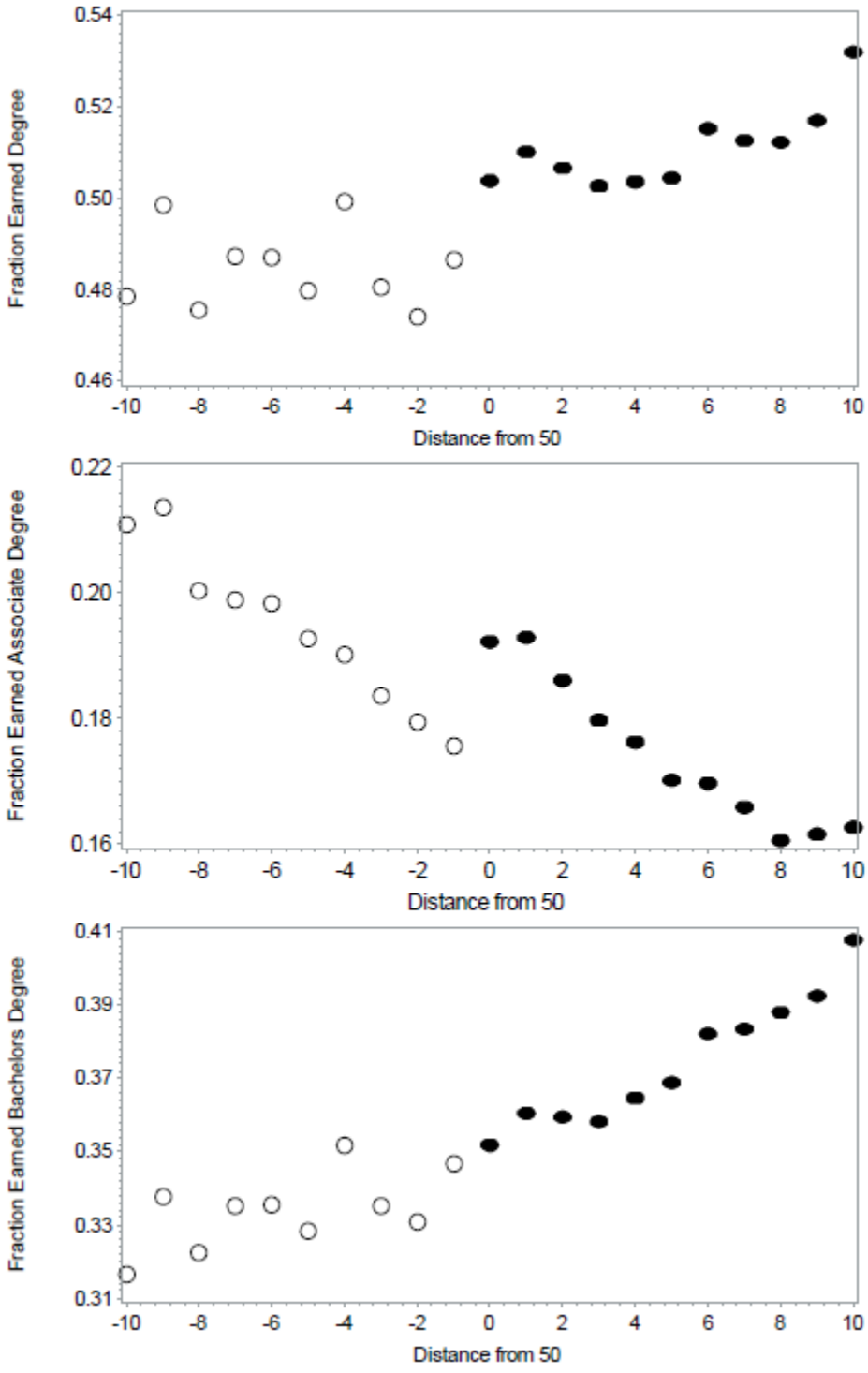
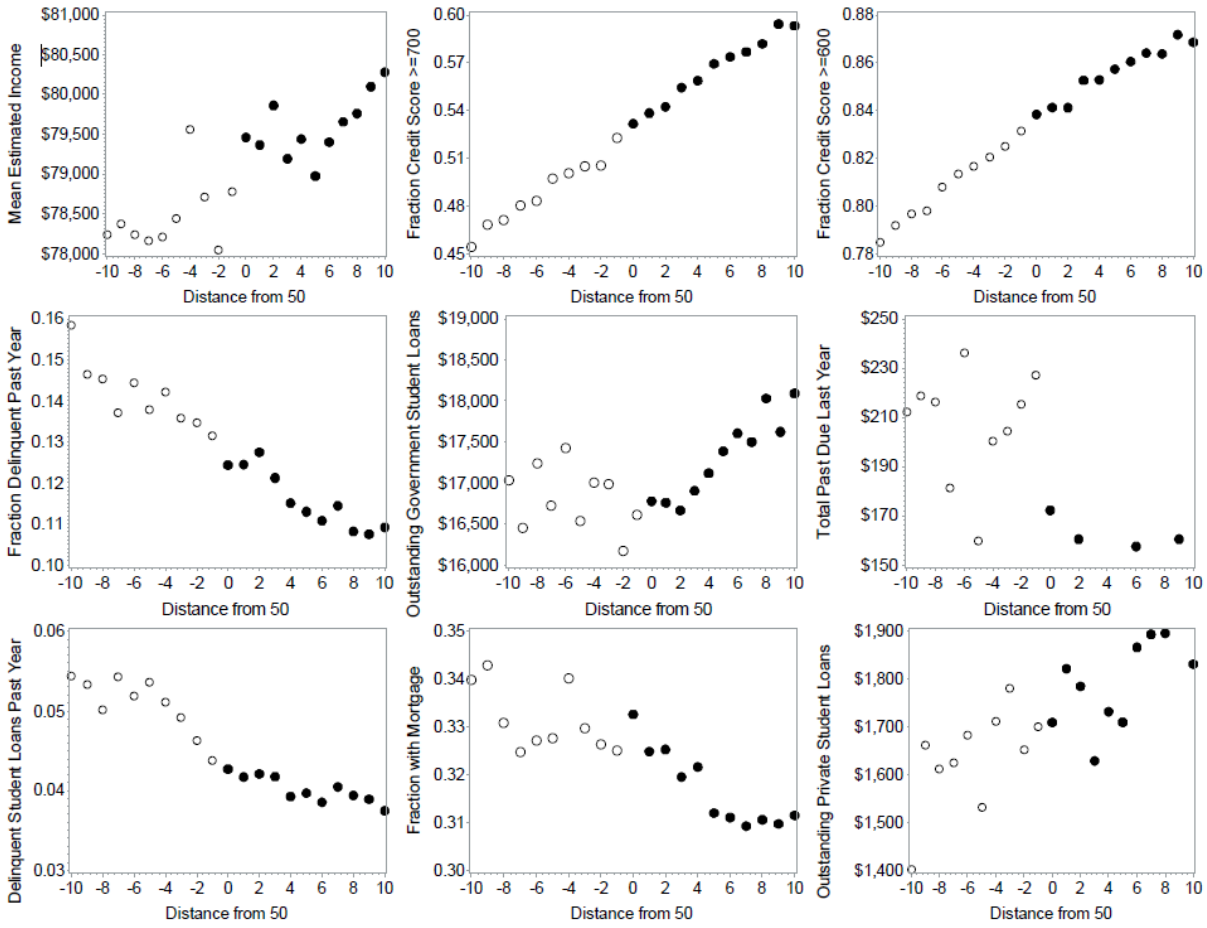
year-round workers as a percentage of the labor force, by sex, race/ethnicity, and educational attainment: Selected years, 1995 through 2016. In U.S. Department of Education, National Center for Education Statistics (Ed.), *Digest of Education Statistics* (2017 ed.). https://nces.ed.gov/programs/digest/d17/tables/dt17_502.30.asp (viewed January 23, 2019).

Figure 1: College Completion, by Distance to CLEP Score of 50 Threshold



Notes: Includes all CLEP exam-takers between 2008 and 2015 within a 10 point bandwidth of a CLEP score of 50. Degree receipt observed in National Student Clearinghouse data.

Figure 2: Financial Outcomes, by Distance to CLEP Score of 50 Threshold



Notes: Includes the 90 percent of all CLEP exam-takers between 2008 and 2015 that matched to TransUnion credit bureau data and within a 10 point bandwidth of a CLEP score of 50.

Table 1: Summary Statistics

	Full Sample (obs = 866,489)		Analytic Sample (bandwidth of 10, obs = 448,418)	
	Mean	*Std. Dev.*	*Mean*	*Std. Dev.*
Background Variables				
Asian	0.046	0.209	0.054	0.225
Black	0.094	0.292	0.109	0.311
Hispanic	0.239	0.426	0.096	0.295
White	0.556	0.497	0.672	0.469
Other	0.057	0.231	0.060	0.238
Missing Race	0.008	0.091	0.009	0.095
Female	0.494	0.500	0.472	0.499
Age	26.676	9.219	26.649	9.330
Military Member	0.264	0.441	0.320	0.467
Home Schooled	0.034	0.180	0.034	0.181
Education at Time of CLEP: High School	0.095	0.293	0.107	0.309
Education at Time of CLEP: High School Graduate	0.139	0.346	0.167	0.373
Education at Time of CLEP: In College	0.620	0.485	0.570	0.495
Education at Time of CLEP: College Grad	0.095	0.293	0.094	0.292
CLEP Variables				
Number of CLEP Exams	1.577	1.440	1.653	1.423
First CLEP Score	57.003	12.775	51.065	5.619
CLEP Score Greater Than or Equal to 50	0.707	0.455	0.608	0.488
Enrolled at an Institution Where Cut Score=50	0.814	0.389	0.842	0.365
Outcome Variables				
Enroll in College	0.837	0.369	0.827	0.378
Enroll in a 2-Year College	0.203	0.402	0.187	0.390
Enroll in a 4-Year College	0.634	0.482	0.640	0.480
Any Degree	0.485	0.500	0.465	0.499
Bachelor's Degree	0.346	0.476	0.333	0.471
Associate's Degree	0.184	0.387	0.168	0.374
Associate's Degree or Certificate	0.193	0.395	0.176	0.381
Time to Bachelor's Degree (Years) from first CLEP	1.875	1.661	1.870	1.699
Time to Associate's Degree (Years) from first CLEP	1.717	1.607	1.945	1.657
Time to Bachelor's Degree (Years) from first Enrollment	3.882	2.136	3.793	2.079
Time to Associate's Degree (Years) from first Enrollment	3.161	2.435	2.947	2.408
Estimated Income	77156.883	41827.414	79152.617	42541.129
Credit Score >= 600	0.827	0.378	0.838	0.368
Credit Score >=700	0.522	0.500	0.536	0.499
Delinquent on Debt in Last 12 Months	0.130	0.337	0.125	0.331
Total Past Due in Last 12 Months	171.716	2808.307	169.909	2646.909
Outstanding Government Student Loans	17806.684	36237.273	17095.461	35431.949
Outstanding Private Student Loans	1582.419	10039.735	1737.874	10459.808
Delinquent on Student Loans in Last 12 Months	0.048	0.214	0.044	0.205
Has Mortgage	0.305	0.460	0.322	0.467

Notes: Full sample includes all first time CLEP exam takers between 2008 and 2015.

Table 2: Impact of Receiving CLEP Credit on Degree Attainment

						College Graduates					
	Any Degree	*AA Degree*	*BA Degree*	*Associates Degree Within 3 Years*	*Bachelors Degree Within 6 Years*	*Days Between Initial Enrollment and Any Degree*	*Days Between Initial Enrollment and Associate Degree*	*Days Between Initial Enrollment and Bachelor's Degree*	*Days Between CLEP Date and Any Degree*	*Days Between CLEP Date and Associate Degree*	*Days Between CLEP Date and Bachelor's Degree*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*
Above 50	0.025***	0.022***	0.011***	0.017***	0.008**	-38.689***	-47.135***	-19.415**	-62.988***	-89.252***	-37.323***
	(0.003)	(0.003)	(0.004)	(0.002)	(0.004)	(7.643)	(12.414)	(9.437)	(6.093)	(10.161)	(6.974)
Observations	448,418	341,570	258,172	379,130	258,172	206,256	90,546	125,016	156,086	63,864	112,278
Optimal Bandwidth	10.687	7.774	5.479	8.119	5.347	10.614	13.262	8.732	7.416	8.340	7.996
Control Mean	0.451	0.163	0.321	0.102	0.285	1,276.818	1,122.365	1,415.074	677.523	778.983	707.420

Notes: Heteroskedasticity robust standard errors are in parentheses (* p<.10 ** p<.05 *** p<.01). Each estimate comes from a local linear regression with a triangular kernel of the outcomes regressed on a forcing variable representing the distance between the student's first CLEP score and 50, an indicator variable for whether the forcing variable is greater than or equal to 0 (i.e. eligible for credit) and interaction of these two terms. All estimates include testing center and CLEP exam fixed effects. Enrollment and completion data are through 2015.

Table 3: Impact of Receiving CLEP Credit on Financial Outcomes

	Estimated Income	*Credit Score > 600*	*Credit Score > 700*	*Delinquent on Debt in Last 12 Months*	*Total Past Due in Last 12 Months*	*Outstanding Government Student Loans*	*Outstanding Private Student Loans*	*Delinquent on Student Loans in Last 12 Months*	*Has Mortgage*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*
Above 50	1,234.919***	0.002	0.007*	-0.003	-46.969**	246.337	-18.004	-0.000	0.009**
	(369.802)	(0.003)	(0.004)	(0.003)	(19.765)	(287.030)	(74.253)	(0.002)	(0.004)
Observations	243,699	307,766	307,766	281,347	484,284	277,218	364,500	312,522	281,335
Optimal Bandwidth	6.538	8.341	8.244	7.477	15.211	7.204	10.670	8.654	7.157
Control Mean	78,775.522	0.831	0.522	0.131	226.986	16,611.388	1,699.995	0.044	0.325

Notes: Heteroskedasticity robust standard errors are in parentheses (* p<.10 ** p<.05 *** p<.01). Each estimate comes from a local linear regression with a triangular kernel of the outcomes regressed on a forcing variable representing the distance between the student's first CLEP score and 50, an indicator variable for whether the forcing variable is greater than or equal to 0 (i.e. eligible for credit) and interaction of these two terms. All estimates include testing center and CLEP exam fixed effects. TransUnion outcomes represent a snapshot in the fall of 2017.

Table 4: Heterogeneous Impact of Receiving CLEP Credit on Degree Attainment by College Characteristics

Outcome	*Two-Year* (1)	*Four-Year* (2)	*Public* (3)	*Private* (4)	*Not-for-Profit* (5)	*For-Profit* (6)	*Avg SAT <1000* (7)	*Avg SAT>=1000 & <=1200* (8)	*Avg SAT >1200* (9)	*Barron's Top 3* (10)	*Barron's Bottom 3* (11)
Any Degree	0.032***	0.030***	0.029***	0.028***	0.016**	0.052***	0.016*	0.012	-0.011	0.016	0.018**
	(0.007)	(0.005)	(0.005)	(0.005)	(0.006)	(0.010)	(0.009)	(0.008)	(0.027)	(0.012)	(0.007)
N	95,730	163,845	179,931	142,184	105,802	40,742	49,347	71,052	7,967	34,207	97,258
Associate's Degree	0.046***	0.022***	0.029***	0.021***	0.016***	0.034***	0.003	0.011***	0.013	0.011**	0.013***
	(0.007)	(0.003)	(0.004)	(0.004)	(0.005)	(0.009)	(0.006)	(0.003)	(0.011)	(0.005)	(0.003)
N	83,792	241,893	161,583	153,469	89,375	40,742	41,844	129,461	7,967	38,120	135,217
Bachelor's Degree	-0.005	0.015***	0.010*	0.017***	0.009*	0.032***	0.021**	0.003	-0.028	0.010	0.013*
	(0.007)	(0.005)	(0.006)	(0.005)	(0.006)	(0.010)	(0.008)	(0.008)	(0.029)	(0.012)	(0.007)
N	56,161	191,555	121,188	142,184	120,374	32,764	55,586	71,052	7,159	34,207	97,258
Estimated Income	236.227	1,197.307***	547.508	2,010.459***	1,812.689***	1,636.761*	1,239.620	1,556.080**	2,782.042	3,412.384***	302.158
	(492.796)	(449.034)	(445.375)	(669.863)	(630.122)	(938.742)	(878.301)	(637.586)	(2,478.760)	(937.383)	(513.474)
N	101,815	169,999	141,532	93,770	95,024	37,475	37,767	79,278	10,061	46,280	120,259
Credit Score >= 600	0.003	0.003	-0.004	0.010**	0.013**	0.002	0.010	0.001	-0.000	0.013	0.002
	(0.005)	(0.003)	(0.004)	(0.005)	(0.005)	(0.009)	(0.009)	(0.005)	(0.021)	(0.009)	(0.004)
N	94,018	214,874	158,027	117,833	88,016	37,484	35,234	87,470	7,022	30,210	130,242
Credit Score >= 700	0.006	0.006	0.006	0.006	0.008	0.001	0.012	0.002	0.002	0.005	0.001
	(0.009)	(0.005)	(0.005)	(0.007)	(0.008)	(0.011)	(0.012)	(0.007)	(0.028)	(0.012)	(0.007)
N	63,009	193,262	173,861	117,833	80,349	37,484	32,608	94,752	8,315	37,138	98,491
Delinquent on Debt in Last 12 Months	-0.013***	-0.001	-0.006*	-0.001	-0.006	0.006	-0.006	-0.002	-0.003	-0.005	0.005
	(0.005)	(0.003)	(0.003)	(0.005)	(0.006)	(0.008)	(0.008)	(0.005)	(0.015)	(0.005)	(0.005)
N	91,414	195,612	176,928	107,171	73,087	37,666	33,077	96,256	9,689	65,060	87,769
Total Past Due in Last 12 Months	-27.227	-47.609**	-31.615	-89.953**	-126.649**	-9.519	-94.867*	-32.475	147.191	-2.409	-86.615***
	(33.625)	(23.363)	(19.505)	(42.347)	(53.067)	(46.441)	(53.267)	(26.438)	(120.476)	(55.274)	(30.660)
N	122,734	257,378	262,882	106,875	80,982	49,704	49,139	72,203	7,138	58,941	121,654
Outstanding Government Student Loans	163.058	285.786	-16.691	434.912	595.859	301.723	-30.733	381.048	1,877.014	860.548	430.121
	(472.694)	(324.032)	(356.938)	(419.593)	(517.974)	(733.047)	(899.080)	(687.030)	(2,570.954)	(985.253)	(514.291)
N	62,939	236,036	157,937	139,248	101,925	34,016	37,843	71,297	7,702	40,367	98,563
Outstanding Private Student Loans	89.365	-38.590	11.107	-35.411	-117.737	66.809	-163.856	-188.919	-294.250	-491.975	15.742
	(144.032)	(96.381)	(90.652)	(143.077)	(196.106)	(144.390)	(279.986)	(153.210)	(834.737)	(354.792)	(140.569)
N	68,981	255,236	201,990	129,039	95,237	44,011	32,621	148,513	8,324	40,367	130,312
Delinquent on Student Loans in Last 12 Months	-0.002	-0.000	-0.000	-0.002	-0.005	0.009	-0.005	-0.002	0.006	-0.000	-0.000
	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)	(0.006)	(0.006)	(0.003)	(0.010)	(0.004)	(0.003)
N	81,434	238,734	176,928	140,174	96,077	30,302	33,077	110,007	8,470	54,699	111,121
Has Mortgage	0.000	0.009*	0.003	0.010	0.015*	0.016**	0.012	0.014*	0.017	0.008	0.009
	(0.007)	(0.005)	(0.004)	(0.006)	(0.008)	(0.007)	(0.010)	(0.008)	(0.020)	(0.008)	(0.006)
N	75,877	195,603	191,446	107,163	73,082	66,363	40,803	72,386	9,689	56,927	99,739

Notes: Heteroskedasticity robust standard errors are in parentheses (* p<.10 ** p<.05 *** p<.01). Each estimate comes from a local linear regression with a triangular kernel of the outcomes regressed on a forcing variable representing the distance between the student's first CLEP score and 50, an indicator variable for whether the forcing variable is greater than or equal to 0 (i.e. eligible for credit) and interaction of these two terms. All estimates include testing center and CLEP exam fixed effects. Enrollment and completion data are through 2015. TransUnion outcomes represent a snapshot in the fall of 2017.

Table 5: Impact of Receiving CLEP Credit, by CLEP Subject Area

Outcome	*Composition and Literature* (1)	*World Languages* (2)	*Spanish Language* (3)	*History and Social Sciences* (4)	*Science and Mathematics* (5)	*Business* (6)
Any Degree	0.025***	0.016	0.021*	0.014*	0.024***	0.034***
	(0.007)	(0.011)	(0.012)	(0.007)	(0.007)	(0.010)
N	98,166	40,893	33,492	86,117	87,080	39,578
Associate's Degree	0.029***	0.012*	0.018**	0.011***	0.021***	0.036***
	(0.005)	(0.007)	(0.008)	(0.004)	(0.005)	(0.011)
N	141,492	36,755	26,540	103,939	94,639	26,140
Bachelor's Degree	0.003	0.020*	0.020	0.008	0.013*	0.012
	(0.006)	(0.011)	(0.012)	(0.006)	(0.007)	(0.012)
N	98,166	36,755	30,027	103,939	87,080	26,140
Estimated Income	1,421.050**	812.570	1,405.219*	414.418	2,058.785**	470.596
	(686.806)	(781.741)	(831.124)	(555.345)	(872.843)	(993.657)
N	79,099	41,302	36,751	100,826	44,719	35,181
Credit Score >= 600	0.007	-0.010	-0.007	0.001	-0.005	0.010
	(0.006)	(0.009)	(0.011)	(0.006)	(0.005)	(0.009)
N	91,961	31,433	22,807	83,713	86,695	30,131
Credit Score >= 700	-0.006	0.003	0.003	0.021***	0.000	0.012
	(0.009)	(0.012)	(0.013)	(0.005)	(0.009)	(0.013)
N	79,275	34,964	28,780	130,834	57,764	30,131
Delinquent on Debt in Last 12 Months	-0.007	0.000	-0.003	-0.004	0.002	0.001
	(0.004)	(0.007)	(0.008)	(0.005)	(0.006)	(0.008)
N	135,930	42,261	32,177	85,007	52,661	30,406
Total Past Due in Last 12 Months	-113.672**	-43.417	-60.273*	-81.896	-8.668	-74.891
	(48.654)	(28.801)	(36.615)	(50.400)	(52.187)	(74.576)
N	79,966	45,334	37,486	121,550	58,692	24,731
Outstanding Government Student Loans	329.315	-24.323	28.525	30.897	527.801	-44.445
	(340.566)	(803.211)	(849.487)	(538.950)	(558.683)	(951.154)
N	142,698	51,307	46,341	83,806	63,793	21,595
Outstanding Private Student Loans	-235.066*	232.976	59.545	72.658	25.399	299.933
	(142.779)	(294.350)	(331.296)	(159.298)	(150.655)	(259.820)
N	92,001	31,362	25,758	89,818	95,745	30,167
Delinquent on Student Loans in Last 12 Months	0.005	0.007	0.005	-0.003	0.000	-0.012**
	(0.003)	(0.005)	(0.005)	(0.004)	(0.003)	(0.005)
N	105,196	42,261	37,586	70,371	58,947	30,406
Has Mortgage	0.019**	0.004	0.005	-0.004	0.008	0.000
	(0.008)	(0.007)	(0.008)	(0.007)	(0.008)	(0.012)
N	80,304	65,614	66,090	85,004	58,945	33,097

Notes: Heteroskedasticity robust standard errors are in parentheses (* p<.10 ** p<.05 *** p<.01). Each estimate comes from a local linear regression with a triangular kernel of the outcomes regressed on a forcing variable representing the distance between the student's first CLEP score and 50, an indicator variable for whether the forcing variable is greater than or equal to 0 (i.e. eligible for credit) and interaction of these two terms. All estimates include testing center and CLEP exam fixed effects. Enrollment and completion data are through 2015. TransUnion outcomes represent a snapshot in the fall of 2017.

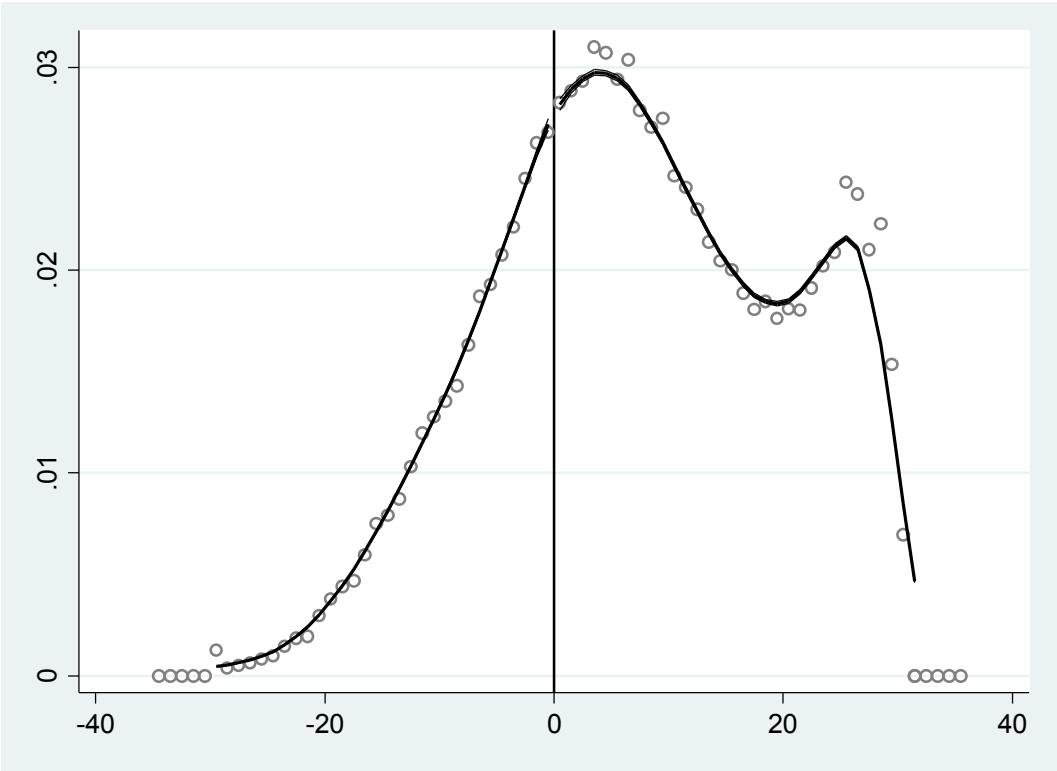
Table 6: Heterogeneous Impact of Receiving CLEP Credit on Degree Attainment by Student Characteristics

Outcome	*Military Member*	*Home Schooled*	*White*	*Asian*	*Black*	*Hispanic*	*Age < 25*	*Age >= 25*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
Any Degree	0.048***	0.009	0.021***	0.018	0.043***	0.037***	0.015***	0.031***
	(0.005)	(0.020)	(0.004)	(0.013)	(0.010)	(0.009)	(0.005)	(0.005)
N	170,104	11,197	322,356	25,781	45,317	58,678	214,280	194,237
Associate's Degree	0.048***	0.023**	0.022***	0.024**	0.029***	0.024***	0.019***	0.020***
	(0.007)	(0.011)	(0.003)	(0.009)	(0.007)	(0.008)	(0.003)	(0.004)
N	85,685	16,502	230,079	24,049	45,317	39,331	195,076	180,092
Bachelor's Degree	0.014***	-0.012	0.006	0.005	0.019***	0.023***	0.002	0.018***
	(0.005)	(0.018)	(0.005)	(0.012)	(0.007)	(0.008)	(0.005)	(0.005)
N	98,851	9,775	173,638	22,305	60,486	50,717	175,251	148,976
Estimated Income	1,712.931***	963.606	834.289*	1,228.772*	1,240.041	1,445.255*	600.212*	1,140.910**
	(600.626)	(2,381.277)	(458.275)	(740.657)	(1,562.215)	(869.803)	(342.252)	(471.416)
N	76,114	6,951	164,867	37,159	12,087	41,982	183,015	150,302
Credit Score >= 600	0.007	-0.013	0.003	0.003	-0.020	-0.006	-0.002	0.004
	(0.005)	(0.014)	(0.004)	(0.011)	(0.015)	(0.009)	(0.004)	(0.004)
N	103,132	11,036	187,396	34,211	14,220	35,136	154,671	150,440
Credit Score >= 700	0.003	-0.026	0.006	0.010	-0.027	0.006	0.009	0.003
	(0.007)	(0.028)	(0.005)	(0.010)	(0.019)	(0.012)	(0.005)	(0.006)
N	103,132	8,713	227,948	37,266	14,220	35,136	170,023	150,440
Delinquent on Debt in Last 12 Months	-0.003	-0.020*	-0.006*	-0.003	0.005	0.006	-0.002	-0.004
	(0.004)	(0.010)	(0.003)	(0.009)	(0.014)	(0.006)	(0.003)	(0.004)
N	111,557	15,816	211,281	40,551	15,554	67,911	174,272	163,354
Total Past Due in Last 12 Months	-39.827	23.333	-49.929**	77.119	-63.017	-188.354**	-16.232	-78.030**
	(50.785)	(28.504)	(22.249)	(97.094)	(61.759)	(74.835)	(12.006)	(36.957)
N	94,617	11,949	341,760	34,447	33,307	46,177	265,407	222,152
Outstanding Government Student Loans	224.790	55.702	59.777	672.641	2,447.043**	337.719	506.943	-26.587
	(190.499)	(733.333)	(321.123)	(968.172)	(1,105.505)	(502.337)	(398.959)	(385.667)
N	103,367	17,172	187,562	34,200	14,208	127,757	121,770	162,747
Outstanding Private Student Loans	-2.006	-475.601	-82.695	469.916*	148.436	150.189	-90.361	-37.266
	(58.055)	(296.539)	(98.857)	(253.037)	(293.981)	(165.156)	(113.280)	(104.180)
N	94,903	12,853	208,178	37,254	16,452	80,195	220,603	124,558
Delinquent on Student Loans in Last 12 Months	0.000	0.005	-0.003	0.010	0.011	-0.003	0.000	-0.003
	(0.002)	(0.007)	(0.002)	(0.008)	(0.009)	(0.004)	(0.002)	(0.002)
N	103,718	11,196	231,585	27,534	15,554	46,355	174,272	186,095
Has Mortgage	0.012*	-0.008	0.010*	0.003	0.011	0.010	0.001	0.009*
	(0.007)	(0.018)	(0.005)	(0.011)	(0.017)	(0.009)	(0.003)	(0.005)
N	95,235	8,512	167,731	31,188	15,554	42,796	237,308	175,027

Notes: Heteroskedasticity robust standard errors are in parentheses (* p<.10 ** p<.05 *** p<.01). Each estimate comes from a local linear regression with a triangular kernel of the outcomes regressed on a forcing variable representing the distance between the student's first CLEP score and 50, an indicator variable for whether the forcing variable is greater than or equal to 0 (i.e. eligible for credit) and interaction of these two terms. All estimates include testing center and CLEP exam fixed effects. Enrollment and completion data are through 2015. TransUnion outcomes represent a snapshot in the fall of 2017.

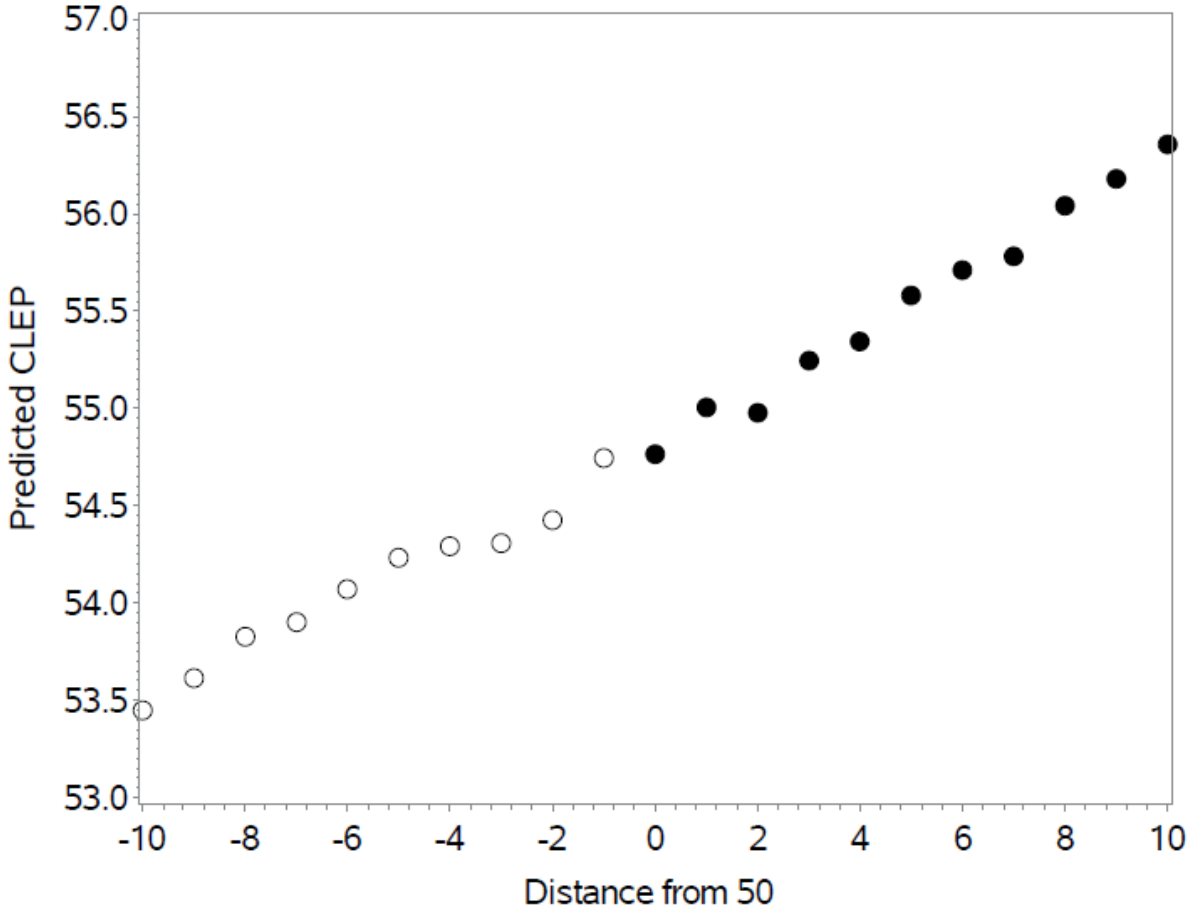
Appendix A – Supplemental Figures and Tables

Figure A1: Density of Observations



Notes: Includes all CLEP exam-takers between 2008 and 2015.

Figure A2 – Covariate Balancing Test



Notes: Using all CLEP exam-takers between 2008 and 2015 within a 10 point bandwidth of a CLEP score of 50.

Appendix Table A1: First CLEP Exams Statistics

Exam	*Freq.*	*Percent*	*Avg. Score*	*Std. Dev.*
Spanish Language	206208	23.8%	68.9	10.1
Analyzing and Interpreting Lit	93367	10.8%	57.9	9.8
College Algebra	54972	6.3%	49.5	12.5
College Mathematics	45015	5.2%	52.9	12.3
College Composition	42865	4.9%	54.1	5.8
College Composition Modular	31617	3.6%	55.3	6.8
Introductory Sociology	31525	3.6%	53.6	7.4
Principles of Management	27821	3.2%	49.4	10.8
History of United States I	25238	2.9%	51.5	10.7
Introductory Psychology	21786	2.5%	56.8	9.7
Biology	21252	2.5%	53.3	10.0
English Composition	20005	2.3%	46.5	11.4
Humanities	19857	2.3%	49.9	8.8
Human Growth and Development	19210	2.2%	53.8	7.8
Info Systems and Computer Appl	18696	2.2%	53.7	11.2
French Language	18520	2.1%	65.0	11.9
Freshman College Composition	17516	2.0%	57.1	11.0
American Government	16997	2.0%	47.3	11.8
History of United States II	15337	1.8%	49.8	9.8
English Composition with Essay	14825	1.7%	51.6	10.7
Natural Sciences	13503	1.6%	48.3	9.6
Principles of Marketing	11847	1.4%	55.9	10.8
Social Sciences and History	8864	1.0%	48.9	10.8
Precalculus	6901	0.8%	52.8	10.5
German Language	6849	0.8%	64.8	14.9
American Literature	6649	0.8%	45.9	12.6
Western Civilization I	6435	0.7%	54.5	9.0
Principles of Microeconomics	6168	0.7%	53.0	13.9
Principles of Macroeconomics	5859	0.7%	53.2	13.1
Calculus	5444	0.6%	53.2	12.4
Chemistry	5196	0.6%	46.4	11.5
Intro to Educational Psych	4718	0.5%	50.5	12.3
English Literature	4115	0.5%	49.8	10.3
Western Civilization II	4001	0.5%	50.5	8.6
Introductory Business Law	3862	0.4%	47.0	12.6
Financial Accounting	3853	0.4%	49.4	12.9

Notes: Full sample includes all first time CLEP exam takers between 2008 and 2015.

Appendix Table A2: Comparing Exam Takers

	Non-CLEP Takers (N = 12,461,229)				*CLEP and SAT Takers (N = 115,578)*				*CLEP and Non-SAT Takers (N = 417,524)*			
Variable	Mean	Std Dev	Min	Max	Mean	Std Dev	Min	Max	Mean	Std Dev	Min	Max
Male	0.459	0.498	0	1	0.494	0.500	0	1	0.551	0.497	0	1
White	0.613	0.487	0	1	0.557	0.497	0	1	0.562	0.496	0	1
Black	0.128	0.335	0	1	0.091	0.288	0	1	0.088	0.284	0	1
Hispanic	0.127	0.333	0	1	0.259	0.438	0	1	0.240	0.427	0	1
Asian	0.083	0.276	0	1	0.048	0.214	0	1	0.042	0.201	0	1
Parental Education - Less tha HS	0.045	0.207	0	1	0.055	0.229	0	1	--	--	--	--
Parental Education - HS Degree	0.129	0.335	0	1	0.124	0.330	0	1	--	--	--	--
Parental Education - Some College, no BA	0.267	0.442	0	1	0.270	0.444	0	1	--	--	--	--
Parental Education - BA or Higher	0.559	0.496	0	1	0.551	0.497	0	1	--	--	--	--
Parental Income < $50k	0.202	0.401	0	1	0.233	0.423	0	1	--	--	--	--
Parental Income - $50k - $100k	0.226	0.418	0	1	0.262	0.440	0	1	--	--	--	--
Parental Income > $100k	0.260	0.439	0	1	0.230	0.421	0	1	--	--	--	--
High School GPA	3.087	0.982	0	4	3.068	1.044	0	4	--	--	--	--
Took PSAT	0.803	0.398	0	1	0.782	0.413	0	1	-	-	-	-
Took an AP	0.473	0.499	0	1	0.444	0.497	0	1	-	-	-	-
PSAT Score	99.428	19.959	40	160	99.850	18.629	40	160	-	-	-	-
SAT Score	1,029.831	206.914	400	1600	1,040.397	188.441	400	1600	-	-	-	-
Military Personnel	--	--	--	--	0.249	0.433	0	1	0.361	0.480	0	1
Home Schooled	--	--	--	--	0.049	0.215	0	1	0.044	0.204	0	1
Number of CLEP Exams	--	--	--	--	1.686	1.578	1	27	1.798	1.785	1	33
First CLEP Exam Score	--	--	--	--	57.980	12.161	20	80	56.119	12.965	20	80
Average CLEP Exam Score	--	--	--	--	57.670	11.636	20	80	55.823	12.346	20	80

*Notes: Used SAT takers who graduated high school between 2004-2015 and CLEP takers between 2008-2015 who are under 30 years old (did not graduate high school prior to 2004). Among the 811k CLEP takers, 514k are under 30 and had enough information for matching.

Appendix Table A3: Covariate Balancing and Density Tests

Density		-0.004	
Above Threshold		(0.009)	
	BW = 5	BW = 7	BW = 10
Covariates			
Asian	-0.000	-0.001	-0.003**
	(0.002)	(0.002)	(0.001)
Black	-0.001	-0.002	-0.003*
	(0.003)	(0.003)	(0.002)
Hispanic	-0.006**	-0.003	-0.003
	(0.003)	(0.002)	(0.002)
White	0.013***	0.011***	0.013***
	(0.004)	(0.004)	(0.003)
Other	-0.006**	-0.005***	-0.004**
	(0.002)	(0.002)	(0.002)
Missing Race	0.000	0.000	-0.000
	(0.001)	(0.001)	(0.001)
Female	-0.000	-0.000	-0.001
	(0.005)	(0.004)	(0.003)
Age	-0.116	-0.105	-0.090
	(0.087)	(0.070)	(0.058)
Military Member	-0.002	-0.002*	-0.002*
	(0.002)	(0.001)	(0.001)
Home Schooled	0.002	0.003**	0.002**
	(0.002)	(0.001)	(0.001)
Highest Level of Education at time of CLEP			
In High School	-0.001	-0.001	-0.002
	(0.003)	(0.002)	(0.002)
High School Graduate	-0.006*	-0.005*	-0.002
	(0.003)	(0.003)	(0.002)
Enrolled in College	0.003	0.003	0.001
	(0.004)	(0.004)	(0.003)
College Graduate	0.004	0.003	0.003
	(0.003)	(0.002)	(0.002)
Predicted CLEP Score	**-0.033**	**0.012**	**0.018**
	(0.039)	**(0.031)**	**(0.026)**
Observations	**214,710**	**301,184**	**415,325**

Notes: Heteroskedasticity robust standard errors are in parentheses (* p<.10 ** p<.05 *** p<.01). Each estimate comes from a local linear regression of the covariates on the forcing variable (distance from 50), an indicator variable for whether the forcing variable is greater than or equal to 0 (i.e. eligible for credit), the interaction of these two terms, and CLEP exam and testing center fixed effects. We use triangular kernels and include testing center and CLEP exam fixed effects. The discontinuties in density come from formal McCrary tests and represent the log difference in height. We obtain predicted CLEP scores from regressing all covariates listed in this table on the student's CLEP score.

Appendix Table A4: Robustness Tests

Kernel	Tri.	Rect.	Tri.	Rect.	Tri.	Rect.	Tri.	Rect.	Tri.	Tri.	Rect.	Rect.
BW	3	3	5	5	10	10	10	10	IK	IK	IK	IK
Covariates	N	N	N	N	N	N	N	N	N	Y	N	Y
Second Order Polynomials	N	N	N	N	N	N	Y	Y	N	N	N	N
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*
Any Degree	0.009	0.010	0.024***	0.029***	0.025***	0.026***	0.023***	0.022***	0.025***	0.025***	0.024***	0.025***
	(0.008)	(0.008)	(0.005)	(0.005)	(0.003)	(0.003)	(0.005)	(0.005)	(0.003)	(0.003)	(0.003)	(0.003)
N	120,824	120,824	214,710	214,710	415,325	415,325	415,325	415,325	448,418	448,418	448,418	448,418
Bachelor's Degree	0.000	0.001	0.011**	0.013***	0.010***	0.012***	0.009**	0.008*	0.011***	0.010***	0.011***	0.010***
	(0.007)	(0.007)	(0.004)	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)
N	120,824	120,824	214,710	214,710	415,325	415,325	415,325	415,325	258,172	258,172	258,172	258,172
Associate's Degree	0.015***	0.015***	0.022***	0.024***	0.022***	0.021***	0.022***	0.022***	0.022***	0.022***	0.021***	0.021***
	(0.006)	(0.006)	(0.003)	(0.003)	(0.002)	(0.002)	(0.004)	(0.004)	(0.003)	(0.003)	(0.002)	(0.002)
N	120,824	120,824	214,710	214,710	415,325	415,325	415,325	415,325	341,570	341,570	341,570	341,570
Estimated Income	442.123	463.823	1,301.425***	1,452.835***	977.412***	802.035***	1,473.749***	1,464.875***	1,234.919***	1,149.417***	1,077.981***	949.538***
	(711.925)	(708.585)	(445.722)	(426.107)	(297.952)	(279.505)	(471.138)	(447.568)	(369.802)	(349.838)	(340.539)	(322.041)
N	97,719	97,719	173,665	173,665	336,665	336,665	336,665	336,665	243,699	243,699	243,699	243,699
Credit Score >= 600	0.001	0.000	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.002	0.000
	(0.007)	(0.007)	(0.004)	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
N	97,892	97,892	174,024	174,024	337,433	337,433	337,433	337,433	307,766	307,766	307,766	307,766
Credit Score >= 700	-0.007	-0.007	0.003	0.006	0.007*	0.007**	0.005	0.007	0.007*	0.004	0.008**	0.005
	(0.009)	(0.009)	(0.006)	(0.005)	(0.004)	(0.003)	(0.006)	(0.006)	(0.004)	(0.004)	(0.004)	(0.004)
N	97,892	97,892	174,024	174,024	337,433	337,433	337,433	337,433	307,766	307,766	307,766	307,766
Delinquent on Debt in Last 12 Months	-0.003	-0.003	-0.003	-0.001	-0.004	-0.004*	-0.002	-0.003	-0.003	-0.002	-0.005*	-0.004
	(0.006)	(0.006)	(0.004)	(0.004)	(0.002)	(0.002)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
N	99,267	99,267	176,577	176,577	342,690	342,690	342,690	342,690	281,347	281,347	281,347	281,347
Total Past Due in Last 12 Months	-73.644	-75.048	-74.302*	-77.486**	-63.710**	-57.213***	-88.182**	-84.287**	-46.969**	-44.544**	-31.677*	-29.159*
	(69.075)	(68.510)	(41.772)	(37.658)	(25.525)	(22.087)	(43.821)	(39.446)	(19.765)	(19.694)	(17.010)	(16.989)
N	98,887	98,887	175,895	175,895	341,383	341,383	341,383	341,383	484,284	484,284	484,284	484,284
Outstanding Government Loans	419.980	426.196	473.156	315.820	188.674	112.839	405.194	423.298	246.337	269.412	157.971	229.521
	(580.029)	(577.424)	(363.864)	(349.152)	(243.858)	(229.096)	(384.934)	(365.906)	(287.030)	(282.578)	(258.079)	(254.121)
N	97,953	97,953	174,099	174,099	337,535	337,535	337,535	337,535	277,218	277,218	277,218	277,218
Outstanding Private Student Loans	-20.213	-1.602	87.357	82.838	-11.712	-32.287	56.215	9.427	-18.004	-23.161	-48.952	-51.119
	(180.362)	(180.738)	(110.341)	(107.153)	(76.726)	(72.772)	(116.833)	(112.969)	(74.253)	(74.134)	(68.834)	(68.713)
N	97,953	97,953	174,099	174,099	337,535	337,535	337,535	337,535	364,500	364,500	364,500	364,500
Delinquent on Student Loans in Last 12 Months	0.003	0.004	0.002	0.001	-0.001	-0.002*	0.003	0.003	-0.000	0.000	-0.002	-0.002
	(0.004)	(0.004)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)
N	99,267	99,267	176,577	176,577	342,690	342,690	342,690	342,690	312,522	312,522	312,522	312,522
Has Mortgage	0.008	0.008	0.012**	0.012**	0.007**	0.006**	0.012**	0.009*	0.009**	0.008**	0.005	0.004
	(0.008)	(0.008)	(0.005)	(0.005)	(0.003)	(0.003)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.003)
N	99,265	99,265	176,572	176,572	342,677	342,677	342,677	342,677	281,335	281,335	281,335	281,335

Notes: Heteroskedasticity robust standard errors are in parentheses (* p<.10 ** p<.05 *** p<.01). Each estimate comes from a local linear regression of the outcomes on the forcing variable- distance from 50, an indicator variable for whether the forcing variable is greater than or equal to 0 (i.e. eligible for credit) and interaction of these two terms. All estimates include testing center and CLEP exam fixed effects. In specifications 7 and 8, we include squared expressions of the forcing variable and the interaction term. In specifications 10 and 12 we include covariates for race (Black, Hispanic, White, Asian, Other Race), sex, military status, and whether the student was non-traditional age (>=25). Models fitted with rectangular kernels exclude endpoints.

Appendix Table A5: Impact of Receiving CLEP Credit on Degree Attainment (College Fixed Effects)

						College Graduates					
	Any Degree	*AA Degree*	*BA Degree*	*Associates Degree Within 3 Years*	*Bachelors Degree Within 6 Years*	*Days Between Initial Enrollment and Any Degree*	*Days Between Initial Enrollment and Associate Degree*	*Days Between Initial Enrollment and Bachelor's Degree*	*Days Between CLEP Date and Any Degree*	*Days Between CLEP Date and Associate Degree*	*Days Between CLEP Date and Bachelor's Degree*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*
Above 50	0.027***	0.025***	0.013***	0.022***	0.009*	-44.937***	-63.319***	-19.979**	-59.192***	-76.317***	-30.919***
	(0.003)	(0.003)	(0.004)	(0.003)	(0.004)	(7.457)	(12.028)	(9.089)	(6.178)	(10.387)	(7.060)
Observations	370,807	281,313	211,932	312,682	211,932	206,256	90,546	125,016	156,086	63,864	112,278
Optimal Bandwidth	10.687	7.774	5.479	8.119	5.347	10.614	13.262	8.732	7.416	8.340	7.996
Control Mean	0.451	0.163	0.321	0.102	0.285	1,276.818	1,122.365	1,415.074	677.523	778.983	707.420

Notes: Heteroskedasticity robust standard errors are in parentheses (* p<.10 ** p<.05 *** p<.01). Each estimate comes from a local linear regression with a triangular kernel of the outcomes regressed on a forcing variable representing the distance between the student's first CLEP score and 50, an indicator variable for whether the forcing variable is greater than or equal to 0 (i.e. eligible for credit) and interaction of these two terms. All estimates include fixed effects for first college attended after/during CLEP and CLEP exam fixed effects.

Appendix Table A6: Impact of Receiving CLEP Credit on Financial Outcomes (College Fixed Effects)

	Estimated Income	*Credit Score >= 600*	*Credit Score >= 700*	*Delinquent on Debt in Last 12 Months*	*Total Past Due in Last 12 Months*	*Outstanding Government Student Loans*	*Outstanding Private Student Loans*	*Delinquent on Student Loans in Last 12 Months*	*Has Mortgage*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*
Above 50	1,226.610***	0.001	0.005	-0.003	-35.176**	285.184	-60.985	0.000	0.009**
	(389.995)	(0.003)	(0.004)	(0.003)	(17.305)	(308.624)	(80.264)	(0.002)	(0.004)
Observations	219,847	277,883	277,883	253,410	437,781	250,180	329,633	281,681	253,399
Optimal Bandwidth	6.538	8.341	8.244	7.477	15.211	7.204	10.670	8.654	7.157
Control Mean	78,775.522	0.831	0.522	0.131	226.986	16,611.388	1,699.995	0.044	0.325

Notes: Heteroskedasticity robust standard errors are in parentheses (* p<.10 ** p<.05 *** p<.01). Each estimate comes from a local linear regression with a triangular kernel of the outcomes regressed on a forcing variable representing the distance between the student's first CLEP score and 50, an indicator variable for whether the forcing variable is greater than or equal to 0 (i.e. eligible for credit) and interaction of these two terms. All estimates include fixed effects for first college attended after/during CLEP and CLEP exam fixed effects.

Appendix Table A7: Impact of Receiving CLEP Credit on Degree Enrollment, CLEP Takers Prior to Enrollment

	Enrolled in College	*First Enrolled in 2-Yr College*	*First Enrolled in 4-Yr College*	*First Enrolled in College Where Primary Degree is AA*	*First Enrolled in College Where Primary Degree is BA*	*First Enrolled in College Where Highest Degree is AA*	*First Enrolled in College Where Highest Degree is BA*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
Above 50	0.003	-0.003	0.005	-0.002	0.004	0.009	0.003
	(0.007)	(0.005)	(0.007)	(0.005)	(0.007)	(0.007)	(0.007)
Observations	89,522	108,224	99,091	108,224	89,522	89,522	99,091
Optimal Bandwidth	7.980	9.535	8.056	9.620	7.900	7.799	8.281
Control Mean	0.605	0.162	0.443	0.184	0.415	0.546	0.448

Notes: Heteroskedasticity robust standard errors are in parentheses (* p<.10 ** p<.05 *** p<.01). Each estimate comes from a local linear regression with a triangular kernel of the outcomes regressed on a forcing variable representing the distance between the student's first CLEP score and 50, an indicator variable for whether the forcing variable is greater than or equal to 0 (i.e. eligible for credit) and interaction of these two terms. All estimates include testing center and CLEP exam fixed effects.

Appendix Table A8: Sensitivity Analyses to Sample Selection

	Forcing Variable= Distance from credit-granting threshold at first institution			Forcing Variable= Distance from 50 on first-CLEP					
				Full sample (n=866,893)			Trans Union Sample (n=811,507)		
	Any Degree	*Associates Degree among Students Starting at 2-yr Colleges*	*Bachelor's Degree among Students Starting at 4-yr Colleges*	*Any Degree*	*Associates Degree*	*Bachelor's Degree*	*Any Degree*	*Associates Degree*	*Bachelor's Degree*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*
Treatment	0.030***	0.057***	0.012***	0.025***	0.022***	0.011***	0.027***	0.024***	0.012***
	(0.005)	(0.008)	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)
Observations	243,845	67,840	276,034	448,418	341,570	258,172	316,460	316,460	278,844
Optimal Bandwidth	7.174	11.086	11.848	10.687	7.774	5.479	7.944	7.013	6.594
Control Mean	0.562	0.329	0.459	0.451	0.163	0.321	0.486	0.176	0.347

Notes: Heteroskedasticity robust standard errors are in parentheses (* p<.10 ** p<.05 *** p<.01). Each estimate comes from a local linear regression with a triangular kernel of the outcomes regressed on a forcing variable representing the distance between the student's first CLEP score and 50 (or the college-specific minimum credit-granting threshold), an indicator variable for whether the forcing variable is greater than or equal to 0 (i.e. eligible for credit) and interaction of these two terms. In specifications 7-9, we exclude the testing center and exam-type fixed effects.

Appendix B – TransUnion Credit Bureau Data

B.1. – Matching Process

The College Board securely sent TransUnion the CLEP data, including first and last name, birthdate, social security number, and home address, as listed when registering for CLEP. Not all exam takers have complete information, but a vast majority do.

TransUnion then performed the match using their proprietary matching algorithm. They then de-identified the data and securely sent it back to the College Board, destroying it immediately upon sending such that in the end, no party had matched identifiable data. The procedure resulted in an approximately 90 percent match rate, which is similar to Scott-Clayton and Zafar (2016) who perform the analysis with Equifax credit bureau for all West Virginia public school students. All observations were returned to the College Board, regardless of match status.

B.2. – Variable Definitions

Our Variable Name	TransUnion Definition	Our Operation
Estimated Income*	CreditVision Income Estimator	
Credit Score*	VantageScore3.0	Must discretize when outcome
Delinquent on Outstanding Debt in Last 12 Months	Total past due amount of open trades verified in past 12 months	Equals 1 if value >=0, otherwise equals 0
Total Past Due in Last 12 Months	Total past due amount of open trades verified in past 12 months	
Outstanding Government Student Loans	Total balance of open government student loan trades updated in the past 12 months	
Outstanding Private Student Loans	Total balance of open student private loan trades updated in the past 12 months	
Delinquent on Outstanding Student Loans in Last 12 Months	Months since most recent student loan delinquency	Equals 1 if value between 0 and 12, otherwise equals 0
Has Mortgage	Number of open mortgage trades verified in past 12 months	Equals 1 if value >=1, otherwise 0

* We separately discuss these outcomes in the next section.

B.3. Estimated Income

With its proprietary algorithm, TransUnion uses a wide range of financial characteristics to estimate a consumer's joint gross adjusted income (line 37 of the 1040 federal tax form). This algorithm is based on multiple income sources including: investment income, alimony, business income, IRA distributions, pensions and annuities, real estate income, unemployment compensation, and Social Security benefits. In addition, debt service parameters are also factored in such as: monthly spend data, and up to 30 months of extended account history. This history includes credit lines, length of credit history, historical credit card balances, and recent credit card transactions.[21] The estimate does not account for whether someone is employed, but rather predicts a value that is restricted to between $0 and $1 million.

In Figure B1, we compare the median earnings from the College Scorecard to the TransUnion income estimator. To do so, we used the College Board sample of approximately 17 million observations matched to TransUnion data (and National Student Clearinghouse). This allows us to construct college-specific incomes for different cohorts, similar to the reporting level in the College Scorecard.[22]

The left panel plots college level median earnings from the College Scorecard versus median estimated income from TransUnion for students eight years after initial enrollment. The 45-degree line represents a one-to-one correspondence. Most dots are below the 45-degree line, suggesting that the TransUnion income estimator is substantially higher than the Scorecard earnings. However, this is largely a level shift, as the slope of the regression line is parallel to the 45-degree line. This makes sense since the income estimator is joint income and not just earnings, as in the Scorecard. Also, the correlation is about 0.7. The right panel shows colleges where at least 80 percent of students enrolled appear in the College Board data. We see the correlation jump to almost 0.8 but the slope of the line changes. We observe similar patterns in Figure B2, which performs the same exercise for students 10 years since initial enrollment.

Overall, we view this as compelling evidence that TransUnion's income estimate contains accurate and valuable information about an individual's income.

B.4. Credit Score

The credit score is known by TransUnion as the VantageScore 3.0. The score was developed jointly by TransUnion, Equifax, and Experian, and is used by many major lenders across the U.S.

[21] Further details on potential uses for the TransUnion CreditVision Income Estimator can be found at https://www.transunion.com/resources/transunion/doc/products/resources/product-creditvision-income-estimator-as.pdf.

[22] The College Scorecard includes all students who received federal financial aid. The College Board data contains observations for people who did and did not receive financial aid, but misses students who did not take the PSAT, SAT, or Advanced Placement exams.

It serves as their alternative to the FICO score, as it analyzes 24 months of an individual's credit history to develop a score between 300 and 850.

Due to privacy concerns, TransUnion requires that we do not use this raw credit score as an outcome. Consequently, we dichotomize it in several ways, such as credit score greater than or equal to 600 or separately, greater than or equal to 700.

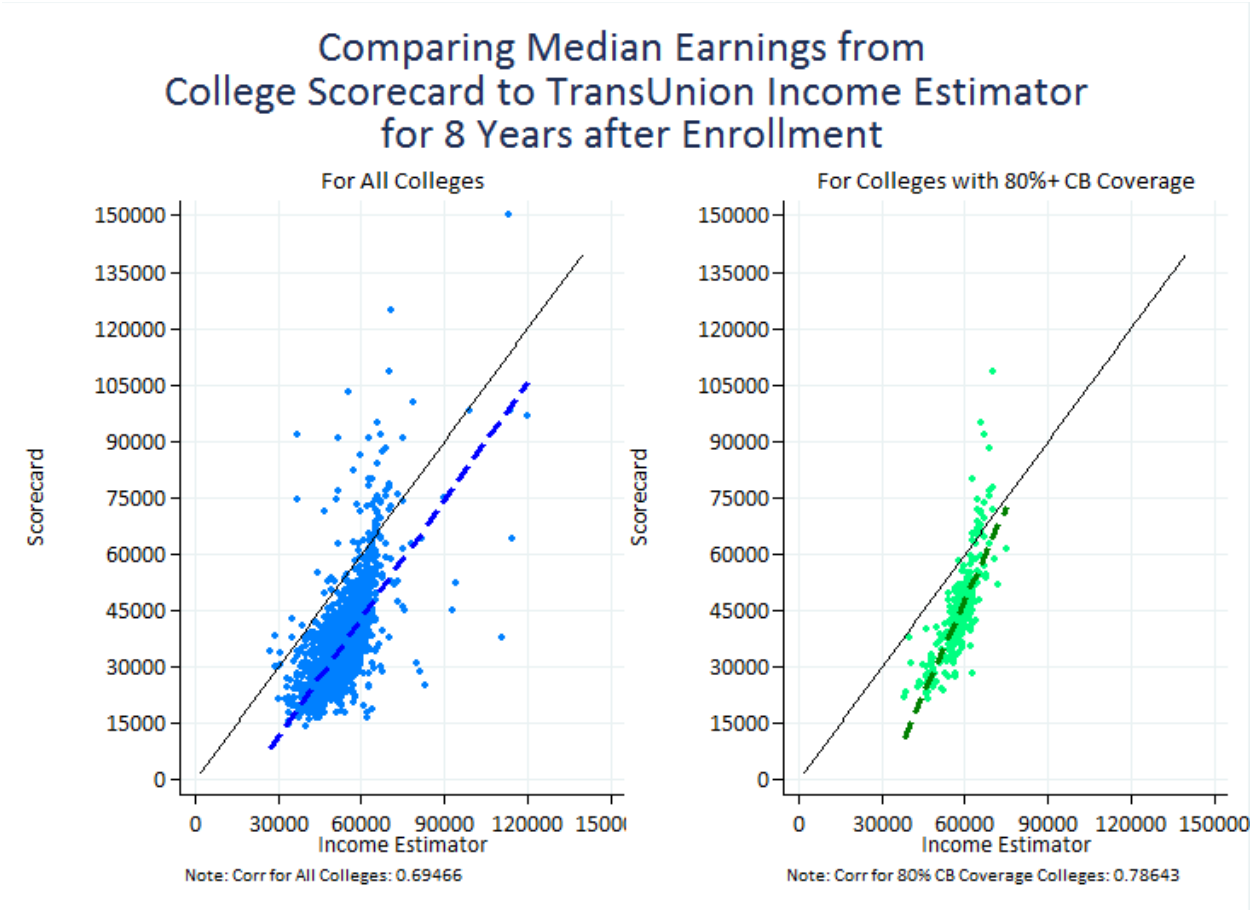
B.5. – Matching, Missingness, and Identification

Our primary specification in equation (1) relies on no strategic manipulation around a CLEP exam score of 50, the score that commonly earns college credit. One concern is that our matching with TransUnion data is somehow related to earning a 50 or higher. For example, perhaps earning a 50 improves college completion rates, which in turn increases the odds of opening credit cards, which creates a credit history. This could bias our results in unknown ways, depending on what type of person receives the credit history.

We formally test for such endogenous match rates in Appendix Table B1. To do so, we loop through each of our primary financial outcomes and generate a new outcome variable equal to 1 if it is missing a value in the TransUnion data, and equals 0 otherwise. The value can be missing if there was not a successful match, or if there was a match, but the value of the variable was missing.

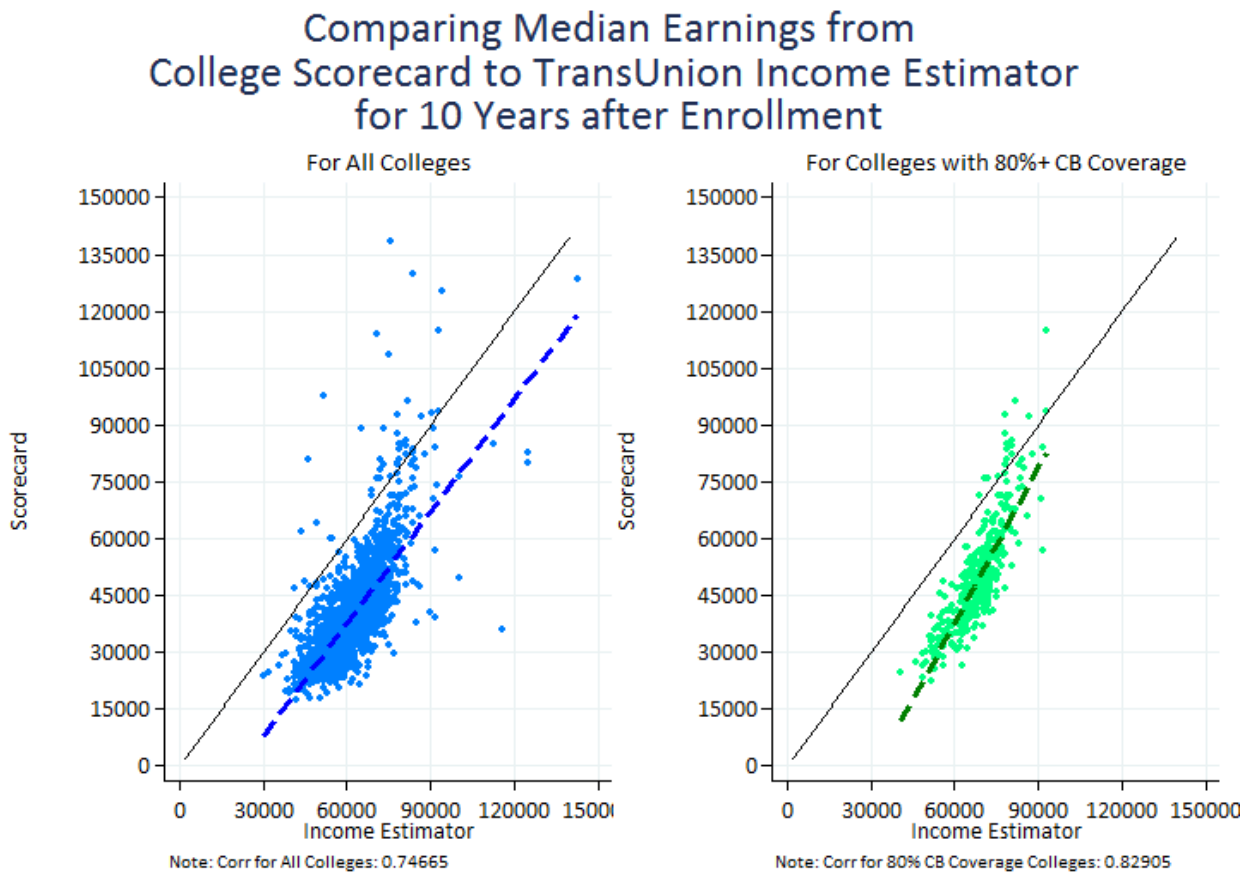
The table shows that we do not see students with populated variables discontinuously around the 50 threshold. A few coefficients show up as marginally significant but they are small in magnitude and not for the variables where we see significant effects in our main analyses. In the last column, we simply test the match rate around the 50 threshold and find so statistical differences. Overall, we take this as evidence that our identification strategy is not threatened by missing data.

Figure B1



Notes: Scorecard data are from the College Scorecard aggregated data at the college-year level, which is freely available online. Income estimator comes from TransUnion credit bureau. It is merged to individual-level CLEP data and aggregated to the college-year level.

Figure B2



Notes: Scorecard data are from the College Scorecard aggregated data at the college-year level, which is freely available online. Income estimator comes from TransUnion credit bureau. It is merged to individual-level CLEP data and aggregated to the college-year level.

Appendix Table B1: Missing Credit Bureau Data

	Estimated Income	*Credit Score >= 600*	*Credit Score >= 700*	*Delinquent on Debt in Last 12 Months*	*Total Past Due in Last 12 Months*	*Outstanding Government Student Loans*	*Outstanding Private Student Loans*	*Delinquent on Student Loans in Last 12 Months*	*Has Mortgage*	*Missing Records Matched to TransUnion*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*
Above 50	-0.004	-0.004*	-0.004*	-0.003	-0.003	-0.004	-0.004*	-0.003	-0.004	-0.003
	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)
Observations	278,844	351,514	351,514	316,460	546,320	316,460	416,287	351,514	316,460	351,514
Optimal Bandwidth	6.538	8.341	8.244	7.477	15.211	7.204	10.670	8.654	7.157	8.624
Control Mean	0.125	0.123	0.123	0.110	0.115	0.122	0.122	0.110	0.110	0.110

Notes: Heteroskedasticity robust standard errors are in parentheses (* p<.10 ** p<.05 *** p<.01). Each estimate comes from a local linear regression with a triangular kernel of the outcomes regressed on a forcing variable representing the distance between the student's first CLEP score and 50, an indicator variable for whether the forcing variable is greater than or equal to 0 (i.e. eligible for credit) and interaction of these two terms. All estimates include testing center and CLEP exam fixed effects. The TransUnion sample includes 811,5017 students