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ASSESSING THE IMPACT OF STUDENT WORK DURING COLLEGE

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Assessing the Impact of Student Work During College

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Abstract

The majority of today's undergraduates work for pay while enrolled in college. Prior research suggests that undergraduates employed during term time are less likely to graduate. Until relatively recently, data limitations have generally precluded assessment of labor force and earnings outcomes for working college students. Using transcript data from a large multi-campus university, combined with student earnings data, we find that traditional-age students who worked for pay during college on average earned more after leaving college than similar students who did not work. This post-college earnings premium is on par with the benefit from completing a degree, even after controlling for demographic and academic achievement characteristics, and across various student sub-groups. These findings are also robust to model specifications that account for selection bias. We consider the implications of these findings for educational policy.

Working During College: Stumbling Block or Stepping Stone?

The majority of today's undergraduates (62%) work for pay while enrolled in college (Carnevale, Smith, Melton & Price 2015). A large research literature (briefly summarized below) has focused on the short-term consequences of working during college – on grades, number of credits taken, and graduation. Such studies have predominantly reported negative effects from student employment (Neyt, Omey, Verhaest & Baert 2017). This paper argues that prior research has largely overlooked an important aspect of the working student phenomenon. Examining a longer time frame and focusing on *earnings after college* reveals a substantial positive aspect of student employment during college.

Analyses presented below indicate that undergraduates from a public university system who worked for pay during college had substantially higher earnings years later, compared to counterparts who were not employed while enrolled. The long-term economic benefit associated with paid employment while in college held for women and for men; for racial/ethnic minorities; for community college as well as four-year college entrants; for those who had no work experience before starting college; and even among those who did not complete a degree.

A substantial post-college earnings premium associated with working during college was observed in models that addressed selection effects, as well as in conventional regression analyses. Moreover, this wage premium was not a reflection of college majors, nor of academic performance, since models that controlled for these covariates also showed the benefit. Finally, the earnings advantage was evident from immediately after leaving college until data collection ended 15 years later.

The post-college earnings premium associated with working during college was sizable. Even undergraduates who earned modest amounts while enrolled earned significantly more after graduation, a boost comparable to the earnings increase associated with completing a degree. Students who worked for pay throughout their college years experienced a larger wage premium than those who worked for only a few semesters.

Earlier research portrayed working during college as a risky if sometimes unavoidable activity, at best a distraction from the process of completing a degree, and at worst a cause of dropping out. For this large sample of students from non-elite colleges, our findings suggest on the contrary that employers pay a wage premium for three things: completing a credential; accruing college credits (irrespective of completion); and a record of sustained work experience while in college. Undergraduates who both work during college and complete a degree gain the most in terms of a post-college earnings advantage. While that is the optimal outcome, college students who accumulate credits short of a degree while establishing a work history also benefit from higher pay after entering the labor market.

This paper first reviews the literature on the scope, benefits, and drawbacks of college student work during term time. It then discusses theories linking employment during college to post-college earnings. Our analyses of employment and post college earnings follow, concluding with a discussion of the implications for theory and policy.

Prior Research

Who works while in college?

The National Postsecondary Student Aid Study (NPSAS) is a nationally-representative study of undergraduate students conducted by the National Center for Education Statistics (NCES). NPSAS' definition of working students focuses on employment during term-time outside the

university, deliberately excluding campus-related jobs such as work-study and work during summer break (NCES 2015:9). It therefore provides a conservative estimate of the scope of undergraduate employment. We used the NCES' online analysis tool to obtain the estimates provided in Table One. (For estimates from an earlier wave of NPSAS, see Perna, Asha-Cooper & Li 2007).

TABLE 1. Undergraduate Student Work during Term Time

Characteristic	Proportion
Work Intensity	
Not Working	38%
1-20 hours per week	21%
More than 20 hours per week	41%
The proportions of each of the following sub-groups who did any paid work during term time:	
Gender	
Female	63%
Male	61%
Race/Ethnicity	
Asian	49%
Black/African-American	59%
Hispanic	61%
White	65%
Parent's Annual Income	
Less than $30,000	54%
$30,000 - $64,999	59%
$65,000 - $149,999	60%
$150,000 or more	54%
Institutional Level	
Two-Year Colleges	64%
Four Year Colleges	60%
Institutional Selectivity (four year colleges only)	
Unselective/Open Admissions	69%
Minimally Selective	60%
Moderately Selective	59%
Highly Selective	52%

Source. Authors calculations of the National Postsecondary Student Aid Survey (NPSAS)

According to the NPSAS, 62.3% of undergraduates were employed during term time. This rate did not vary greatly by gender, race, or parental income. Employment is more common

at two-year and less selective colleges, where many students attend part-time and are disproportionately from lower-income families. But even at highly-selective four-year institutions about half of students work (Perna et al. 2007).

Why do undergraduates work?

NPSAS asked whether students could afford to attend college if they did not work: 54% of employed students answered "No". Scholars have documented that many undergraduates face economic hardship while enrolled, including food and housing insecurity (Broton & Goldrick-Rab 2016). St. John (2003), Goldrick-Rab (2016), and others have argued that current financial aid levels are inadequate for many undergraduates. Federal financial aid calculations include an estimate of "Expected Family Contribution" that researchers have shown many families cannot afford (Goldrick-Rab 2016; King 2002; Stringer et al. 1998).

Alongside the roughly half of working undergraduates who say they *have to work* are others who choose to work for less compelling reasons. Clydesdale's (2007) ethnography of freshmen finds that the academic side of college is a secondary priority compared to the development of practical life skills. Earnings can take on a symbolic meaning as a marker of adulthood. Beyond this, earnings have a practical function, paying for dating, entertainment and consumerism, averaging $1000 a month in Clydesdale's study (2007:111).

Term time employment and academic performance

Evidence is mixed as to whether employment during term time helps or hinders students' academic performance during college. Riggert et al. (2006:69) concluded that the empirical literature is "… marked by diversity and contradiction. Some studies suggested that student employment negatively affected academic performances, while others concluded that the impact

of employment was neutral or even beneficial." A more recent review by Neyt et al. (2017:22) concludes: "… in general, we find that in previous studies mainly a negative effect of student employment on educational attainment is found… In particular, studies report that more intensive working schemes yield worse educational outcomes."

The main mechanism advanced to explain negative effects of employment is a 'time bind' that leads some working students into academic difficulties and higher rates of dropping out (Stinebrickner & Stinebrickner 2003, 2004). Tinto (1993: 64) argues that full-time employment limits time for interaction with other students and faculty, leading to poor social integration and to higher rates of student drop-out. Astin (1993:358) reports that colleges where many students work have lower sanctions against dropping out. Bozick (2007:271 & 273) reports that "Working in moderation… does not appear to have a disruptive effect …" however, "working more than 20 hours a week during the first year of college … limits students' ability to sustain enrollment."

Studying the effects of student employment on academic outcomes remains an active field, especially among labor economists. Darolia (2014) reports "Findings from this study indicate little discernible impact of working on students' grades … [however] increased work intensity results in fewer credits completed in each term by full-time students … This may contribute to increasing time-to-degree…." Scott-Clayton and Minaya (2016) examine campus work study, finding on average that work-study students experience better academic outcomes, but noting heterogeneity in effects such that for some subgroups work study is associated with worse academic outcomes.

This literature focuses on the effects of working during college on academic progress *in the short run*. This paper represents a shift in focus away from college grades, retention and

graduation towards a consideration of longer-term post-college outcomes – for which there is far less research, which we now review.

Term time employment and post-college earnings

Pascarella and Terenzini (2005: 520) conclude that working during college helps secure employment after graduation but does not enhance later earnings. Other find that term-time employment is associated with higher earnings after graduation. Titus (2010) analyzed a sample of US undergraduates and found that the boost in post-college earnings associated with working during a student's third year of college was higher than the wage benefit from completing a degree. Similarly, Stephenson (1982) found significantly higher post-college wage rates for US males who worked during college in the National Longitudinal Survey of Youth (NLSY). Gee San (1986) reported similar findings, noting that effects on earnings appeared to be highest three years after completing college. However, using the same data, Ehrenberg and Sherman (1987) found no direct effect of working on post college earnings. Similarly, Hotz et al. (2002) found payoffs to NLSY men who worked during college that became non-significant when analyzed using dynamic selection models.

In sum, some prior research reports a significant association between working during college and having higher earnings after college, but the number of studies is not large, and primarily relies on self-reported earnings data. This paper will address the same research question: is work during college associated with higher post college earnings? – using administrative data that reports both college and post-college earnings rather than the self-reported earnings data used in those earlier studies.

Theory, Mechanisms and Causation

An extensive body of theory considers the relationship between educational attainment, work experience, job assignment, and earnings (Bills 2003). Most of these theories were formulated when the norm was first to complete one's education and then to enter the labor market, rather than the present context where most undergraduates work for pay while enrolled in college. We identify four possible mechanisms by which work during college might impact post-college earnings:

Skill Acquisition. Human Capital theory posits that both formal education and work experience result in the accumulation of skills and knowledge that increase an individual's productivity and consequently are rewarded with higher pay. In Mincer's (1974) widely-used formulation, the log of earnings is considered an additive function of an individual's years of education plus work experience. For Mincer, the earnings return to education was viewed primarily as a "compensating difference." Individuals who spend more years in education have foregone income they would have earned if instead they had entered the labor force. Higher wage rates for college-educated employees compensate for this.

Extensions of the Human Capital framework have modified Mincer's framework to allow for non-linear effects of the length of work experience and of years of education (Manski 1989; Altonji 1993; Aina, Baici, Casalone & Pastore 2018), including modeling the effects of stopping out of college – hypothesized by Fortin and Ragued (2017) to cause skill depreciation and obsolescence – and the effects of delayed time to degree on post-college earnings (Aina & Pastore 2012). Economists have also broadened their concept of Human Capital beyond cognitive skills to include soft skills, character traits, and attitudes (Heckman & Kautz 2012).

The Human Capital perspective implies that college students' term-time employment experiences will produce skills valued by future employers. There is a rich literature on work-

based informal learning (for two reviews see Le Clus 2011 and Manuti et al. 2015). One implication is that extensive work experience during college, even in low-paying jobs, may produce competencies that are valued by employers and therefore result in higher post-college wages.

Signaling. A second mechanism by which employment during college may lead to increased earnings involves students' resumés. Screening and Signaling theories (Arrow 1973; Spence 1974; Bills 2003) suggest that employers lack direct knowledge of a job candidate's skills and capacities when hiring and therefore use "screens" to select candidates they deem more likely to become good employees. Similarly, job candidates seek to amass and display "signals" that they would be superior employees. These screens and signals include educational credentials (degrees), but a resumé listing extensive work experience can also signal a job applicant's promise. Holzer and Neumark's (1999) study of hiring found that employers look for applicants with more stable work histories. Similarly, a survey conducted by the *Chronicle of Higher Education* indicates that employers weigh prior work experiences (both paid work and internships) more heavily than indicators of educational achievement when hiring recent college graduates (Fischer 2013).

Social Networks. A third perspective on the benefits of employment during college highlights the importance of references and social networks for gaining post-college jobs. Granovetter (1995) documented the importance of networks in providing information about job openings or for recommending a person in one's social network when applying for an opening. Royster (2003) reported that poor and minority youth were less likely than whites to have those kinds of job networks. Smith (2007) found that low-income African-Americans were hesitant to act as network sponsors in case the nominee proved to be a poor worker. Job references are a

more bureaucratic version of network sponsorship, involving persons in authority who can attest to a job applicant's skills, or work behavior.

The relevance of this perspective is that students from low income backgrounds are less likely to have family and acquaintance networks that are well connected in the job world. Lower income students working during college may obtain references and networks through that employment, which they could not easily obtain elsewhere. One implication is that employment during college would be especially important for underprivileged undergraduates when they search for post-college jobs.

Grit. A fourth perspective on college employment and post-college earnings raises the possibility that any observed association between working during college and post-college earnings is spurious rather than causal. There might be personality attributes such as ambition, grit, or perseverance (Duckworth 2018) that predispose individuals to work during college and also lead to superior jobs after college with higher wages, creating a spurious correlation between working in college and higher post-college earnings.

In sum, four mechanisms have been theorized as linking employment during college to higher earnings post college – skill acquisition, signaling, building networks and references, or underlying personality traits. These are not mutually exclusive and our aim in this paper is not to test which of them matters more, a methodological challenge which Bills (2003) suggests is practically impossible. Nor will we claim that college employment is strictly causal, in the sense of eliminating the possibility that "spurious" personality factors underlie both college employment and post-college earnings. As Card (1999:2) argued in an analogous context: "In the absence of experimental evidence, it is very difficult to know whether the higher earnings observed for better-educated workers are *caused* by their higher education, or whether

individuals with greater earning capacity have chosen to acquire more schooling." The same logic applies to the causal status of working in college.

Our aim is more modest: to document the association between working during college and post-college earnings for a large population of undergraduates in relatively unselective public colleges and for several demographic subgroups within that population. In doing so we will control statistically for several covariates, and use methods that lessen selection bias. However, we will only be able to address selection on observables, so the possibility of selection on unmeasured characteristics (or of spurious effects) will remain.

Data and Methods

Sample

Data are drawn from anonymized records from a large urban multi-campus public university system that merged its students' application and transcript data with state records reporting wage and employment information during and after college. We selected all first-time degree students entering the system between Fall 1999 and Fall 2008.

This university system includes community colleges and four-year colleges. Taken as a whole, the system's student body is emblematic of non-elite, mass higher education. We provide analyses for first-time students who entered four-year colleges (whom we term "BA attempters") and separate analyses for those who started in Associates degree programs at community colleges (called "AA attempters").

The university system obtained information from the National Student Clearinghouse (NSC) to identify its students who had transferred outside the system and obtained degrees

elsewhere. Degree attainment variables therefore include degrees received from elsewhere as well as degrees completed within the public system.

Complete descriptive statistics are provided in Appendix Table A1. Both student sub-populations are young: even in the community colleges traditional-age undergraduates predominate. They are ethnically diverse: in the AA attempter sample, 69% are Black or Hispanic, while in the BA attempter sample, 48% are from these groups. Women constitute 55% of the AA sample and 60% of the BA sample. At the time of entry to college, 61% of the AA attempters and 53% of the BA attempters qualified for Pell grants, indicating a large proportion from families with relatively low income.

Among the AA attempters 58% had no degree by 2014, 31% had earned an Associate degree, and 25% had completed a Baccalaureate degree. Among BA attempters, 29% had no degree, 67% had completed a BA.

Selection and limitations of the analytic sample

The sample was limited by the availability of post-college wage data: students needed to have non-missing wage data for the outcome period (2013-Q3 through 2014-Q2). Students who were still enrolled in college at the start of the outcome period, 2013-Q3, were omitted. These constraints yielded analytic samples of 103,787 AA attempters and 59,266 BA attempters. Both samples are limited to those who began college and who subsequently remained working in the state. However, administrative data from the university system indicate that 94% of those who earned an associate degree and 83% of those who earned a bachelor degree still reside in the state a decade or more later. The system is also located in a metropolitan area in which job opportunities are relatively plentiful – which may limit the generalizability of findings.

Dependent Variable

The dependent variable is post-college annual earnings, measured between the third quarter of 2013 and the second quarter of 2014 (the latest data available) as reported by state records. In most analyses, we top-coded earnings at $100,000 per year, to reduce the influence of outliers. Robustness checks also estimated models predicting log earnings and earnings without top coding. Findings were not substantially affected by those alternative specifications.

Main Independent Variables

Because state administrative records do not indicate work hours or occupation, we are limited to information on two dimensions of work in college: earnings and the duration of paid employment during college, measured in three-month wage quarters. The models below examine paid employment during the first year of college. Earnings in the first two years of college were also examined in robustness checks. We defined five categories of paid work that applied both to earnings during the first year of college and to earnings in the year prior to college entry. 'No work' means subjects who had zero reported wages in their first year in college; this is used as the reference category for all models. As Table Two indicates, about 26% of the AA attempters and 33% of the BA attempters did not work for pay during their first year of college.

TABLE 2

Descriptive Statistics for Students' First-Year Earnings and Three-Year Work Intensity

	AA Attempters	BA Attempters
First Year Earnings	%	%
Non-Worker	26.5	33.0
Low ($0 < x < $5,000)	33.5	37.6
Moderate ($5,000 ≤ x < $15,000)	30.7	26.0
Higher ($15,000 ≤ x < $25,000)	6.4	2.6
Highest (x ≥ $25,000)	2.9	0.9
Prior Year Earnings		
Non-Worker	38.7	47.3
Lower (x < $15,000)	55.3	51.1
Higher (x ≥ $15,000)	6.0	1.6
Semesters of Work in first three years		
Mean (sd)	7.5 (4.1)	6.7 (4.3)
Sample Size (N)	103,787	59,266

The other college employment categories, representing increasing amounts of earnings, are: less than $5000 per year; $5000 to $14,999; $15,000 to $24,999, and $25,000 or more. Readers should note that the cut-offs for most of these work categories are quite low: $5000 per year could be earned by a student working for the minimum wage for under 13 hours per week throughout the year, and $15000 a year is roughly the amount that someone working 40 hours a week year-round at a minimum wage job could earn.

A second independent variable captures the duration of paid employment during college and is measured as the number of quarters that a student was employed during the first three years of enrollment in college. In order to avoid conflating earnings during a semester when a student had "stopped out" of college with those resulting from term-time employment, those models that focus on employment duration exclude students who have "stop outs" (semesters when they were not enrolled) during their first three years of college.

Covariates

In the models presented below, we employ the following set of covariates as controls:

Age. We limit our samples to students who entered college aged 18 to 25 and also include age at entry as a covariate in predictive models.

Cohort. A set of dummy variables represent the semester and year of college entry from Fall 1997 to Fall 2008 (i.e., cohort fixed-effects). The omitted reference category is the first cohort, Fall 1997. By the 20013/2014 earnings end-point that serves as the dependent variable, students in earlier cohorts had been exposed to more years of work experience on average than more recent cohorts of college entrants. Consequently, one would expect that, *ceteris paribus*, more recent college entrants would have lower post-college earnings than earlier cohorts by that time; i.e., increasingly large negative coefficients for the fixed effects dummies for more recent cohorts. Fall semester entrants also generally fair better than Spring semester entrants, after entering the labor market. These fixed effects may also capture some effects of fluctuations in the economic climate over time.

Gender. Women have higher rates of degree completion than men (Buchmann & DiPrete 2006). Despite this, women are still at a disadvantage in terms of wages; most recent estimates show that women earn about 73 cents on the dollar compared to men of similar educational and occupational attainment. Gender is included as a covariate in all models.

Race and Ethnicity. In these analyses a dichotomous variable indicates whether a student is Black or Hispanic, with White and Asian students as the reference group. The number of native Americans and other race students was very small and we omitted them from these analyses.

College Major. We control for students' degree major or last reported major (for non-graduates) to account for differences in the labor market value of different fields of study.

Cumulative College GPA. This was measured at graduation or in a student's final semester if a non-graduate.

Time spent in college. This variable is coded as the number of semesters of enrollment between the student's first and last date in the system. In some cases, this includes students who began in a community college and ended in a four-year college or vice versa. Since this variable is used along with a cumulative credits covariate, the coefficient for time spent in college represents time in college relative to the number of credits earned.

Earnings in the year before enrollment. We include a measure of students' pre-college earnings as a proxy for their "human capital" before entering college. We also undertook separate analyses omitting anyone who had earnings prior to entering college.

College Credits Earned. Transcripts report the cumulative number of undergraduate credits, either at graduation or when the student left the system. If the student graduated with a degree from another institution, they were assigned the typical number of credits of in-system graduates with that degree. We assign different reference categories for college credits to analyses of BA- and AA-attempters. We initially used a set of dummy variables for credits earned and a separate variable for degree attainment. However, this procedure produced multicollinearity: for example, BA graduates all had 120 or more credits. We therefore constructed a combined variable that reports cumulative credits earned: anyone with over 120 credits in the sample also had a BA degree.

Analytic Strategy

The first step in the analysis uses logistic regression models to assess association between working during college and the likelihood of students completing degrees (either associates or

bachelor's). This step determines whether students in these particular samples evidence the same negative relationship between working during college and graduation identified in prior research.

The second step estimates OLS regression models to determine the association between working during college at different levels of earnings during the first year or working for more semesters, and post-college earnings. We analyze these separately for AA attempters and BA attempters. Those regression models are then repeated for various student subsamples such as women, minorities, those who did not work before entering college, and so on, to determine whether the association between term time work and post-college earnings is also evident for each of these subgroups.

Since the data are observational (non-experimental), there may be systematic differences between those who work during college and those who do not, both on measured and unmeasured covariates or 'background factors'. If such differences do exist between term time workers and non-workers, OLS regressions could conflate the true association between term time work and later earnings with the effects of those background differences between groups. This is known as selection bias. Adding covariates representing multiple dimensions on which treated and untreated groups might differ does not adequately remove the effects of selection bias (Winship & Morgan 1999).

Therefore, a third analysis step uses an econometric method for reducing selection bias. First one estimates a 'treatment model,' which calculates the probability for each respondent of working (as compared to not working) during college (Guo & Fraser 2014). The inverse of those probabilities is then used as a weight for each respondent. Inverse probability weighting (IPW) modifies the sample so that the "treated" and "untreated" groups become balanced on measured covariates: they have similar mean values on those variables, removing those background factors

as a source of selection bias. A second model, known as the outcome model, then predicts the post-college earnings outcome using a dummy predictor for treatment (work) plus covariates, employing these IPW weights. Selection models of this type are common in medical and economic research but are relatively new to other social sciences. See Xie, Brand, and Jann (2012) for a comprehensive discussion.

Our analyses incorporate a recent extension of this general approach known as Augmented Inverse-Probability Weighted regression (AIPW) which enhances robustness and efficiency of estimation (Rubin & van der Laan 2008; Tan 2010). AIPW first computes inverse-probability weights predicting treatment status (IPW). Subsequently, separate regressions are estimated for each level of the treatment variable to obtain the treatment-specific outcomes for each. The Average Treatment Effect (ATE) is estimated from the weighted means of each treatment level regression.

One important advantage of the AIPW technique is that if either the treatment model or the outcome model is incorrectly specified that the method nevertheless yields unbiased estimates of treatment, what statisticians call a 'doubly robust' measure (Glynn & Quinn 2010; Funk et al. 2010; Lunceford & Davidian 2004). These AIPW models provide estimates of the effect of working on post-college earnings that are less susceptible to selection bias or confounding from measured background factors than those from the OLS models. However, this approach cannot remove the possibility of selection on unmeasured background factors, so the possibility of spurious effects is not eliminated.

Findings

Descriptive Statistics for our undergraduate sample are provided in Appendix A. Table Three reports logistic regression models that link undergraduates' working during their first year of

college to their likelihood of graduation. For ease of interpretation, Table Three reports marginal effects in addition to odds ratios. For the BA attempters, the first marginal effect of -.024 should be read as a BA attempter who worked during the first year of college but earned less than $5000 has a 2.4 percentage point lower chance of graduation with a BA than a student with no work, net of controls. This marginal effect increased to a 6.6 percentage point lower probability of graduating with a BA for students who earned between $5000 and $14,999 during their first year of college. The marginal effects on graduation are even larger for undergraduates who earned over $15,000 in their first year. At these levels of earnings "employees who study" may be more prevalent.

Similar negative effects of working upon degree completion are observed for the sample of AA attempters. Students who earned under $5000 in their first year had graduation rates of 4.7 percentage points lower than non-working students. This grew to 6.3 percent lower among students who earned $25,000 or more.

TABLE 3

Working during college and students' probability of graduation, Logistic Regression – odds ratios and marginal effects.

	AA Attempters		BA Attempters	
	Odds Ratios	Marginal Effects	Odds Ratios	Marginal Effects
Earning Intensity (ref: non-workers)				
Low ($0 < x < $5,000)	.819***	-.047	.890***	-.024***
Moderate ($5,000 ≤ x < $15,000)	.819***	-.047	.731***	-.066***
Higher ($15,000 ≤ x < $25,000)	.782***	-.057	.586***	-.116***
Highest (x ≥ $25,000)	.761***	-.063	.616***	-.104***
Age at Entry (years)	.903***	-.024	.912***	-.019***
Female	1.777***	.133	1.795***	.125***
Black/Hispanic	.615***	-.114	.455***	-.167***
Pell Eligible	1.157***	.034	1.019	.004
Full-time at Entry	1.479***	.088	1.703***	.118***

Prior Year Earning Intensity(ref: Non-worker)				
Lower (x < $15,000)	.871***	-.032	.973	-.005
Higher (x ≥ $15,000)	.914*	-.021	.909	-.020
Sample Size (N)	103,731		59,266	

*p<.05 **p<.01 ***p<.001

Note: We also control for a student's cohort of entry (not shown in table)

In sum, for this public university sample there were negative effects of employment during college on graduation, similar to those reported by earlier scholars for other undergraduate samples. However, the following sections will examine a positive effect or potential benefit of working during college: higher post-college earnings.

Table Four presents OLS regression models predicting earnings years after college from earnings during the first year of college plus covariates, for those who initially enrolled in an AA program (columns 1 and 2) or a BA program (columns 3 and 4). In each case, the left-hand model is shorter and contains as predictors only dummies for first year earnings plus demographic variables and entry cohort. The right-hand model adds to those college major, cumulative GPA and credits earned, and time in college, as controls.

Column one reports that AA attempters who worked during their first year of college earned significantly more after college than students who did not work in college. The post-college benefit increases from $631 per year for those who earned under $5000 during school, to $4252 for those who earned between $5,000 and $14,999, to $18,461 for those who earned $25,000 or more during their first year of college.

Column two adds covariates such as cumulative credits earned, major, semesters in the university and cumulative GPA. These variables describe later stages of students' careers and therefore represent intervening variables or possible mechanisms impacted by working during ones first year of college that may in turn influence post-college earnings. If these covariates did

function this way as intervening mechanisms, then after controlling for these variables the coefficients for working during college would be reduced in magnitude. However, that is not the case: the extended models show large significant effects of work during college on post-college earnings, even after controlling for major, credits earned and degrees, time in college, and cumulative GPA. The post-college earnings premium increases monotonically with higher earnings during the first year of college, but there are substantial “payoffs” to employment during college even for the lower earnings categories.

TABLE 4

Effects of first-year earnings on post-college earnings in dollars ($). Ordinary Least Squares Regressions

	AA Attempters	AA Attempters + Educational Characteristics	BA Attempters	BA Attempters + Educational Characteristics
First Year Earning Intensity (ref: Non-worker)				
Low ($0 < x < $5,000)	631***	1,035***	1,270***	1,639***
Moderate ($5,000 ≤ x < $15,000)	4,252***	4,532***	3,494***	4,332***
Higher ($15,000 ≤ x < $25,000)	9,338***	9,593***	9,208***	10,179***
Highest (x ≥ $25,000)	18,461***	18,155***	20,504***	20,625***
Age at College Entry (years)	-475***	-495	-655***	-756***
Female (ref: Male)	-6,664***	-7,621***	-4,803***	-5,908***
Black or Hispanic (ref: White or Asian)	-5,173***	-3,565***	-7,861***	-4,135***
Pell Eligible	-1,408***	-1,589***	-1,677***	-1,648***
Full-time at Entry	949***	300	2,011***	763
Prior Year Earning Intensity (ref: Non-Worker)				
Lower (x < $15,000)	974***	1,245***	2,030***	2,003***
Higher (x ≥ $15,000)	4,067***	3,747***	2,899**	2,557**
# of Semesters Enrolled	--	-823***	--	-1,308***
Last Academic Major (ref=Business)				
STEM	--	130	--	-3,129***
Health	--	3,744***	--	122
Education	--	-3,311***	--	-3,714***
Social Sciences	--	-2,325***		-8,544***
Humanities	--	-7,200***		-13,179***
Liberal Arts	--	-682***	--	-6,193***
Other Majors/Unknown	--	-890***	--	-6,919***
Credits Attempted - AA Students (ref: 20-59)				
Less than 20	--	-3,112***	--	--
60-89	--	2,342**	--	--
90-119	--	4,433***	--	--
120 credits or more	--	6,817***	--	--
Credits Earned - BA Students (ref: <90-119)				
Less than 20	--	--	--	-6,312***
20-59 credits	--	--	--	-5,286***
60-89 credits	--	--	--	-2,578***
120 credits or more	--	--	--	2,414***
Cumulative GPA	--	2,832***	--	5,359***
Sample Size (N)	103,271	100,596	59,258	58,983

***p<.001 **p<.01 *p<.05

Note: We also control for a student's cohort of entry (not shown in table)

The covariates are of some interest in their own right: age at entry is significantly related to post-college earnings. So are gender and race, and whether one had paid work in the year prior to starting college. Major or field of study is related to post-college earnings, with Health majors earning significantly more than the reference category (business majors) and education majors earning less.

The coefficients for the set of dummies that represent credits earned by AA attempters provide a useful yardstick against which to compare the benefit of working during college. The reference category for credits is 20 to 59 credits: not enough for an associate degree. Table Four shows that AA entrants who complete 60-89 credits, enough for the associate degree, have average earnings benefits of $2,342 over the reference category, and those who make it beyond that, presumably by transferring to a BA program, earn even more post-college. By comparison, the earnings boost associated with working in college was $4,532 if one earned more than $5,000 in one's freshman year. In other words, the post-college earnings premium associated with modest employment during the first year is larger than the earnings bump from completing the number of credits for an Associate degree, confirming Titus' (2010) observation in nationally-representative survey data.

Columns three and four present similar regression models but for BA attempters. Again, both the short model and the longer model show statistically significant higher post-college earnings associated with working during the first year of college: from $1,270 for those who earned under $5,000 in their first year to $20,504 for those who earned $25,000 or more. The longer model that controlled for GPA, major, time in college and credits showed somewhat larger coefficients, suggesting that the post-college benefits of college work are not attributable to those factors.

Readers should also note the coefficients for credits earned in the longer model. The reference category is just below the 120 credits typically needed to graduate with a BA. The coefficient of $2,353 for 120 plus credits can be interpreted as the annual post-college wage benefit associated with completing a BA degree. Again, the post-college earnings boost associated with "moderate" work during the first year of college is larger than that associated with degree completion.

Table Five repeats similar regression models for specific subgroups. We only report the coefficients for each level of earning in college (in dollars); the same covariates/controls are used throughout but are not reported in the table due to space constraints. (The full models are reported in Appendix tables A2-A7). A post-college earnings premium associated with first-year employment in college is observed for each subpopulation of undergraduates at each level of earnings, suggesting a statistically and substantively significant relationship between employment during college and post college earnings among different kinds of undergraduates. Particularly relevant are the last two rows of Table Five, which show that the positive association between first-year work and post-college earnings is evident even among students who had not worked in the year prior to beginning college.

TABLE 5

Effects of earnings during school on undergraduates' post-college earnings in dollars ($). Ordinary Least Squares Regressions, Subgroup Analyses.

Model Specifications/Filters	Low first-year earnings	Moderate first- year earnings	Higher first- year earnings	Highest first- year earnings	Model Adjusted R-Squared	N
AA attempters	1,035***	4,532***	9,593***	18,155***	.2506	100,596
AA non-completers	962***	4,688***	9,910***	18,588***	.2501	68,417
AA completers	1,174***	4,371***	9,052***	18,081***	.2653	32,232
BA attempters	1,639***	4,332***	10,179***	20,625***	.3121	58,983
BA non-completers	1,633***	4,983***	11,199***	22,814***	.2661	19,617
BA completers	1,719***	4,441***	9,222***	18,868***	.3297	39,374
AA attempters, minority students	859***	4,559***	9,303***	17,880***	.2403	69,604
BA attempters, minority students	1,462***	4,919***	10,665***	21,274***	.2919	28,532
AA attempters, female students	1,149***	4,076***	9,290***	16,584***	.2384	55,393
BA attempters, female students	1,144***	3,801***	9,454***	16,175***	.3128	35,181
AA attempters, not working before entry	1,335***	5,136***	13,818***	24,874***	.2337	39,327
BA attempters, not working before entry	1,853***	4,774***	10,550***	24,314***	.3000	27,924

***p<.001 **p<.01 *p<.05
Note: Full Models Included in Appendix Tables A1-A12

Table Six examines the relationship between duration of employment during college and post-college earnings, controlling for demographic factors, credits earned, college major and so on. There is a consistent pattern that indicates the longer the duration of employment during the first three years of college, the larger the associated post-college wage premium. BA attempters who worked for up to one year in college earned $2,883 more post-college. Those who worked one to two years in college earned $4,559 more, and those who worked for 9 or more quarters (2-3 years) earned $6,751 more, on average, post-college. The equivalent associations for AA attempters were $1,258, $3,161, and $6,069.

TABLE 6

Effects of duration of employment on undergraduates' post-college earnings in dollars ($). Ordinary Least Squares Regressions – Full Models.

	AA Attempters + Educational Characteristics	BA Attempters + Educational Characteristics
First three years employment continuity (ref: No Employment)		
Up to 4 quarters	1,258**	2,883***
5-8 quarters	3,161***	4,559***
9-12 quarters	6,069***	6,751***
Age at College Entry (years)	-347***	-622***
Female (ref: Male)	-7,224***	-5,945***
Black or Hispanic (ref: White or Asian)	-2,206***	-3,176***
Pell Eligible	-1,868***	-1,575***
Full-time at Entry	89	-1,497
Prior Year Earning Intensity (ref: Non-Worker)		
Lower (x < $15,000)	1,663***	2,059***
Higher (x ≥ $15,000)	10,006***	8,070***
# of Semesters Enrolled	-1,320***	-1,667***
Last Academic Major (ref=Business)		
STEM	-78	-2,590***
Health	7,357***	356
Education	-3,224***	-3,318***
Social Sciences	-2,184***	-9,777***
Humanities	-8,274***	-14,292***
Liberal Arts	-962**	-6,609***
Other Majors/Unknown	-1,528***	-7,986***
Credits Attempted - AA Students (ref: 20-59)		
Less than 20	-3,753***	--
60-89	2,697***	--
90-119	5,969***	--
120 credits or more	6,935***	--
Credits Earned - BA Students (ref: <90-119)		
Less than 20	--	-478
20-59 credits	--	-3,393***
60-89 credits	--	-987
120 credits or more	--	381
Cumulative GPA	5,421***	7,381***
Sample Size (N)	100,596	39,245

***p<.001 **p<.01 *p<.05

Note: We also control for a student's cohort of entry (not shown in table)

In sum, for both AA and BA attempters, the duration of employment during the first three years of college is associated monotonically with substantially higher wages years later.

Selection Models.

As discussed previously, AIPW treatment models estimate the effect of a treatment on an outcome after correcting statistically for selection bias: differences in measured background characteristics. Table Seven reports average treatment effects (ATE) for BA attempters and for AA attempters. In both cases the treatment is a dichotomy: no paid employment in the first year of college versus any paid employment. For BA attempters, the average treatment effect was $2,828 per year in post college earnings, while for AA attempters the ATE was $2,962. Both were statistically significant ($p<.001$).

TABLE 7

Effects of work during the first year of college on undergraduates' later earnings, Augmented inverse probability weighting (AIPW) treatment effects model.

Model Specifications/Filters	Effect of any first year earnings ($)	Sample Size (N)
AA Attempters	2,962***	100,596
BA Attempters	2,828***	59,258

***p<.001 **p<.01 *p<.05

Selection models of any type can only adjust for selection on 'observables' or measured covariates. This always leaves open the possibility of selection on 'unobservables' or spurious correlation: that there could be some unmeasured factor that was associated both with working in college (the treatment) and with post-college earnings (the outcome).

Robustness checks & threats to validity

One concern in predictive modeling is that findings might depend upon the particular specification of variables or of the model as a whole and therefore might differ if those specifications were changed. A related concern is whether the observed findings might be driven by outliers or by the inclusion of certain groups. In Appendix B we present regression models that use different categories for the variable representing first year earnings and different specifications of the outcome variable such as log earnings after college, or dollar earnings without top-coding. We also measure of earnings during the first two years of college, instead of just the first year. Finally, we estimate a model that excluded all the highest earning undergraduates, to see whether they might be driving the treatment effect.

In each case, the coefficient for employment during college remains substantial in magnitude and statistically significant. These alternative models, along with the regressions in Table Four that analyzed specific subgroups, suggest that the effect of working in college is robust: it does not disappear when models are re-specified and it holds for all the diverse subgroups of undergraduates considered.

Discussion and Conclusion

Media stereotypes portray college as a protected interlude between high school and adulthood, a time-out for young adults before life in the real world begins. But for the majority of undergraduates nowadays, college life is no time-out. Indeed, it is often a period of substantial pressure from commuting, paid work, and family obligations, in addition to educational activities (Goldrick-Rab 2016; Perna 2010).

Previous researchers focused on paid employment during college as a threat to students' academic performance. Indeed, they were correct in one way: the analyses presented above also show for one state university system that students who work a lot are less likely to graduate.

However, the relatively recently-developed capacity to merge postsecondary education data with comprehensive employment data at the student level permits researchers to look beyond degree completion outcomes and follow students into their working lives.

Using newly available data, we demonstrate another more positive side of the story that has been overlooked by most previous research: for students of the multi-campus state university system studied here, working during college clearly pays off in terms of higher earnings in the years after college. This positive economic benefit seems substantial and widespread among different kinds of undergraduates. In magnitude, the earnings benefits are as large as those associated with completing the degree.

Our findings lead us to speculate that for students from non-elite mass-higher-education colleges, such as the system we analyzed, the formal credential may have lost some of its importance to employers who hire (cf. Fischer 2013). In this context, a record of steady work experience may be valued as an additional indicator of dependability and self-discipline that carries weight in distinguishing one mass-college-going job applicant from another. In other words, it suggests a hypothesis that where credential inflation renders degrees less distinctive, "working one's way through college" becomes a useful additional signal. Indeed, the survey cited above suggests that many employers have come to value experience above academic markers when deciding to hire college graduates (cf. Fischer 2013). Conversely, where credentials retain their distinctiveness (e.g., at the high end of the college prestige pyramid) working during college may be less important for future earnings than the elite college degree itself, which acts as a signal or brand name.

From the perspective of students, working during college not only fulfills an immediate need to earn money, it has also become one more resource –alongside other signals such as

pursuing a double major or participating in extra-curricular activities in college, by which today's undergraduates try to improve their chances of employment in a good job by signaling their exceptional merit to employers. The value of work may also go beyond signals, since prior work experience may impart working students with work relevant skills that allow them to adapt to and succeed in post-college employment.

Future research might include audit studies with artificial job applicants to examine whether undergraduates' job histories increase their chances during job applications, and whether "working one's way through college" has differential payoffs for graduates depending on the selectivity of the college attended.

The findings we presented above were limited to a single, albeit very large, state university system. They depended upon the availability of data from government sources on earnings and employment before, during and after college. Fortunately, similar data have recently been compiled in several states. We therefore believe that researchers will be able to undertake similar studies for other states and university systems that can review our finding that employment during college is acting as a stepping stone and not only as a stumbling block.

The main implication of this research for educators and policymakers is that we should avoid characterizing undergraduate employment as a threat to academic performance, or as a necessary evil, and instead appreciate that working undergraduates are not only earning much needed income in the short-term but are also enhancing their future long-term earnings prospects. Many colleges already assist their undergraduates in obtaining work in the form of internships, and research suggests that internships are an important factor in hiring (Fischer 2013). But these are likely to be unpaid and therefore at odds with the increasing financial needs of today's undergraduates. Some colleges – for example Northeastern University – go further and build

partnerships with employers whereby undergraduates alternate full-time paid employment with semesters in college, in a sandwich pattern. These partnerships, typically called ‘co-op’ programs, exist at colleges including Georgia Tech, Cornell University and Purdue University, though Northeastern appears unique in enrolling almost all of its students in co-op for at least one year (Northeastern University nd).[1] Policies like these that perceive undergraduate employment as a positive force and an opportunity for important informal learning and therefore facilitate intertwined employment and study are consistent with our findings on working during college as a stepping stone for many undergraduates.

[1] Generally, co-op programs seem to be more common in majors in which the undergraduate credential is the terminal degree (e.g., Engineering or Computer Science).

References

Aina, C. & Pastore, F. (2012). *Delayed graduation and overeducation: A test of the Human capital model versus the screening hypothesis*. (Report No. 6413). Bonn, Germany: Institute for the Study of Labor. Retrieved from http://ftp.iza.org/dp6413.pdf.

Aina, Carmen, Baici, E., Casalone, G., & Pastore, F. (2018). *The economics of university dropouts and delayed graduation: a survey*. (GLO Discussion Paper No. 189).

Altonji, J. G. (1993). The demand for and return to education when education outcomes are uncertain. *Economics of Education Review*, *26*(3), 296-311.

Arrow, K. (1973). Higher education as a filter. *Journal of Public Economics 2*, 193–216.

Astin, A. (1993). *What Happens in College? Four Critical Years Revisited*. New York: Wiley.

Aud, S., Fox, M. & Kewal Ramani, A. (2010). *Status and Trends in the Education of Racial and Ethnic Groups*. (NCES 2010-015). Washington DC: National Center for Education Statistics.

Berker, A., Horn, L. & Carroll, C.D. (2003). *Work First, Study Second*. (NCES 2003-167). Washington DC: National Center for Education Statistics.

Bills, D. B. (2003). Credentials, Signals, and Screens: Explaining the Relationship Between Schooling and Job Assignment. *Review of Educational Research 73*(4), 441-469.

Bozick, R. (2007). Making It Through the First Year of College: The Role of Students' Economic Resources, Employment, and Living Arrangements. *Sociology of Education 80*, 261–285.

Broton, K., & Goldrick-Rab, S. (2016). The Dark Side of College (Un)Affordability: Food and Housing Insecurity in Higher Education. *Change: The Magazine of Higher Learning 48*(1), 16-25.

Buchmann, C., & DiPrete, T. (2006). The Growing Female Advantage in College Completion: The Role of Family Background and Academic Achievement. *American Sociological Review 71*(4), 515-541.

Burdman, P. (2005). *The Student Debt Dilemma: Debt Aversion as a Barrier to College Access*. (Occasional Paper 13.05). Berkeley, California: Center for Studies in Higher Education. Retrieved from https://escholarship.org/uc/cshe_rw.

Card, D. (1999). The causal effect of education on earnings. In Ashenfelter, O. & Card, D. (Eds.) *Handbook of Labor Economics, Volume 3* (pp.1801-1863). Amsterdam: North-Holland Publishing.

Carnevale, A. P., Smith, N., Melton, M., and Price, E.W. (2015). *Learning While Earning: The New Normal*. Washington, DC: Center for Education and the Workforce, Georgetown University. Retrieved from https://cew.georgetown.edu/cew-reports/workinglearners/

Clydesdale, T. (2007). *The First Year Out: Understanding American Teens after High School*. Chicago: University of Chicago Press.

Darolia, R. (2014). Working (and studying) day and night: Heterogeneous effects of working on the academic performance of full-time and part-time students. *Economics of Education Review 38*: 38-50.

Duckworth, Angela. 2018. *Grit: The Power of Passion and Perseverance*. New York: Scribners.

Eckel, Ca., Montmarquette, C., & Rojas, C. (2007). Debt Aversion and the Demand for Loans for Postsecondary Education. *Public Finance Review 35*(2), 233-262.

Ehrenberg, R. G., & Sherman, D.R. (1987). Employment while in college, academic achievement, and postcollege outcomes: A summary of results. *The Journal of Human Resources 22*(1), 1-23.

Fischer, K. (2013, March 4). The Employment Mismatch. *The Chronicle of Higher Education*. Retrieved from https://www.chronicle.com/article/The-Employment-Mismatch/137625.

Fortin, B., & Ragued, S. (2017). Does temporary interruption of postsecondary education induce a wage penalty? Evidence from Canada. *Economics of Education Review 58*(C), 108-122.

Funk, M. J., Westreich, D., Wiesen, C., Stürmer, T. Brookhart, M.A., & Davidian, M. (2010). Doubly Robust Estimation of Causal Effects. *American Journal of Epidemiology 173*(7),761-767.

Glynn, A.N., and Quinn, K.M. (2010). An Introduction to the Augmented Inverse Propensity Weighted Estimator. *Political Analysis 18*(1), 36-56.

Goldrick-Rab, S. (2016). *Paying the Price: College Costs, Financial Aid, and the Betrayal of the American Dream.* Chicago: University of Chicago Press.

Granovetter, M. (1995). *Getting a Job* (2nd ed.). Chicago: University of Chicago Press.

Guo, S., and Fraser, M.W. (2014). *Propensity Score Analysis*. Second Edition. London & New York: Sage Publications.

Hakkinen, I. (2006). Working while enrolled in a university: Does it pay?" *Labour Economics 13*(2), 167-189.

Heckman, J.J., and Kautz, T. (2012). *Hard Evidence on Soft Skills.* (Working Paper 18121). Cambridge, MA: National Bureau of Economic Research. Retrieved from http://www.nber.org/papers/w18121.

Hotz, V. J., Xu, L., Tienda, M., and Ahitov, A. (2002). Are there returns to Young Men Working While in School? *The Review of Economics and Statistics 84*(2), 221-236.

Holzer, H., and Neumark, D. (1999). Are Affirmative Action Hires Less Qualified? Evidence from Employer-Employee Data on New Hires. *Journal of Labor Economics 17*(3), 534-569.

Jewell, S. (2014). The Impact of Working While Studying on Educational and Labour Market Outcomes. *Business and Economics Journal 5*(3), 1-12.

King, J.E. (2002). *Crucial Choices: How students' financial decisions affect their academic success*. Washington DC: American Council on Education.

Le Clus, M. (2011). Informal learning in the workplace: A review of the literature. *Australian Journal of Adult Learning 51*(2), 355-373.

Lunceford, J.K. & Davidian, M. (2004). Stratification and Weighting via the Propensity Score in Estimation of Causal Treatment Effects: A Comparative Study. *Statistics in Medicine 23*(19), 2937-2960.

Manski, C.F. (1989). Schooling as experimentation: a reappraisal of the post-secondary dropout phenomenon. *Economics of Education Review 8*(4), 305-312.

Manuti, A., Pastore, S., Fausta Scardigno, A., Giancaspro, M., & Morciano, D. (2015). Formal and informal learning in the workplace: A research review. *International Journal of Training and Development 19*(1), 1-17.

Mincer, J. (1974). *Schooling, Experience, and Earnings.* New York: National Bureau of Economic Research.

National Center for Education Statistics. (2015). *Profile of Undergraduate Students: 2011-2014*. (NCES 2015-167). Washington, DC: U.S. Department of Education, National Center for Education Statistics.

Neyt, B., Omey, E., Verhaest, D., & Baert, S. (2017). *Does Student Work Really Affect Educational Outcomes? A Review of the Literature*. (GLO Discussion Paper, No. 121). Maastricht, Netherlands: Global Labor Organization (GLO). Retrieved from http://hdl.handle.net/10419/169354.

Northeastern University. (No Date). Department of Cooperative Education and Career Development. https://www.northeastern.edu/coop/about/

Pascarella, E., & Terenzini, P. (2005). *How College Affects Students: A Third Decade of Research*. New York: Wiley.

Perna, L.W. (2006). Understanding the Relationship Between Information About College Prices and Financial Aid and Students' College-Related Behaviors. *American Behavioral Scientist 49*(12), 1620-1635.

Perna, L.W., Asha-Cooper, M., & Li, C. (2007). Improving Educational Opportunities for Students Who Work. *Readings on Equal Education 22*, 109-160.

Perna, L.W. (ed.). (2010). *Understanding the Working College Student: New research and its implications for policy and practice*. Sterling VA: Stylus Publishing.

Riggert, S.C., Boyle, M., Petrosko, J.P., Ash, D., & Rude-Perkins, C. (2006). Student Employment and Education: Empiricism and Contradiction. *Review of Educational Research 76*(1), 63-92.

Royster, D. (2003). *Race and the Hidden Hand*. Berkeley: University of California Press.

Rubin, D.B. & van der Laan, M. (2008). Empirical Efficiency Maximization: Improved Locally Efficient Covariate Adjustment in Randomized Experiments and Survival Analysis. *International Journal of Biostatistics 4*(1), 1-40.

Ruhm, C.J. (1995). The Extent and Consequences of High School Employment. *Journal of Labor Research 16*(3), 293-303.

San, G. (1986). The Early Labor Force Experience of College Students and Their Post-college Success. *Economics of Education Review 5*(1), 65-76.

Scott-Clayton, J., and Minaya, V. (2016). Should student employment be subsidized? Conditional counterfactuals and the outcomes of work-study participation. *Economics of Education Review 52*, 1–18.

Smith, S. (2007). *Lone Pursuit: Distrust and Defensive Individualism among the Black Poor*. New York: Russell Sage Press.

Spence, M. (1974). *Market Signaling: Informational Transfer in Hiring and related screening processes*. Cambridge MA: MIT Press.

St. John, E.P. (2003). *Refinancing the College Dream: Access, Equal Opportunity, and Justice for Taxpayers*. Baltimore: Johns Hopkins University Press.

Stephenson Jr, S.P. (1982). Work in college and subsequent wage rates. *Research in Higher Education 17*(2), 165-178.

Stinebrickner, R., & Stinebrickner, T.R. (2003). Working during school and academic performance. *Journal of Labor Economics 21*(2), 473-491.

Stinebrickner, R., & Stinebrickner, T.R. (2004). Time-use and college outcomes. *Journal of Econometrics 121*(1/2), 243-269.

Stringer, W.L., Cunningham, L.F., O'Brien, C.T., & Merisotis, J.P. (1998). *It's All Relative: The Role of Parents in College Financing and Enrollment.* USAGroup Foundation. New Agenda Series 1.

Tan, Z. (2010). Bounded, Efficient and Doubly Robust Estimation with Inverse Weighting. *Biometrika 97*(3), 661–682.

Tinto, V. (1993). *Leaving College: Rethinking the Causes and Cures of Student Attrition*. Chicago: University of Chicago Press.

Titus, M.A. (2010). Understanding the Relationship Between Working While in College and Future Salaries. In Perna, L. (Ed.), *Understanding the Working College Student: New Research and Its Implications for Policy and Practice* (pp. 261-282). Sterling VA: Stylus.

Weiss, F., Klein, M., & Grauenhorst, T. (2014). The effects of work experience during higher education on labour market entry: Learning by doing or an entry ticket? *Work, Employment and Society 28*(5), 788-807.

Winship, C., and Morgan, S.L. (1999). The Estimation of Causal Effects from Observational Data. *Annual Reviews of Sociology 25*, 659-707.

Xie, Y., Brand, J. & Jann, B. (2012). Estimating Heterogeneous Treatment Effects with observational data. *Sociological Methodology 42*(1), 314-347.

Appendix A: Supplemental Tables

Table A1. Complete Descriptive Statistics

	AA Attempters %	BA Attempters %
Mean Earnings in Outcome Period (sd)	$38,814 ($23,149)	$46,074 ($25,762)
Earnings in First Year of College		
Non-Worker	26.5	33.0
Low	33.5	37.6
Moderate	30.7	26.0
Higher	6.4	2.6
Highest	2.9	0.9
Earnings in Year Before First Enrollment		
Non-Worker	38.7	47.3
Less (x<$15,000)	55.3	51.1
More (x>$15,000)	6.0	1.6
Quarters of Work in First Three Years		
Non-Worker	9.2	12.9
1-4 quarters	17.2	20.7
5-8 quarters	24.2	23.8
9-12 quarters	49.4	42.6
Mean Age (sd)	19.4 (1.7)	18.5 (1.0)
Female	54.8	59.6
Underrepresented Minority	69.3	48.4
Pell Eligibility	61.1	53.3
Mean Semesters Enrolled (sd)	7.2 (4.6)	9.3 (4.0)
Full-time in First Semester	89.7	97.6
Degree Attainment		
No Degree Earned	57.8	29.0
AA Earned	17.3	4.5
BA Earned	25.0	66.5
Credits Earned		
Less than 20	31.7	7.8
20-59	19.5	11.3
60-89	18.2	8.6
90-119	4.2	4.5
120 or more	26.4	67.9
Major Field of Study		
Business	18.2	20.5
STEM	13.2	8.6
Health	10.0	6.2
Education	4.5	7.0
Social Sciences	6.3	15.3
Humanities	4.5	7.9
Liberal Arts	27.8	21.5
Other/Unclassified	15.5	13.0
N	103,787	59,266

Table A2. Effects of first-year earnings on AA and BA attempters post-college earnings in dollars ($), Ordinary Least Squares Regressions (Rows 1 and 4 of Table 5)

	AA Attempters (N=100,596)	BA Attempters (N=58,983)
First Year Work Intensity (ref: Non-worker)		
Low ($0 < x < $5,000)	1,035***	1,639***
Moderate ($5,000 ≤ x < $15,000)	4,532***	4,332***
Higher ($15,000 ≤ x < $25,000)	9,593***	10,179***
Highest (x ≥ $25,000)	18,155***	20,625***
Age at College Entry (years)	-495	-756***
Female (ref: Male)	-7,621***	-5,908***
Black or Hispanic (ref: White or Asian)	-3,565***	-4,135***
Pell Eligible	-1,589***	-1,648***
Full-time at Entry	300	763
Prior Year Work Intensity (ref: Non-Worker)		
Lower (x < $15,000)	1,245***	2,003***
Higher (x ≥ $15,000)	3,747***	2,557**
# of Semesters Enrolled	-823***	-1,308***
Last Academic Major (ref=Business)		
STEM	130	-3,129***
Health	3,744***	122
Education	-3,311***	-3,714***
Social Sciences	-2,325***	-8,544***
Humanities	-7,200***	-13,179***
Liberal Arts	-682***	-6,193***
Other Majors/Unknown	-890***	-6,919***
Credits Attempted - AA Students (ref: 20-59)		
Less than 20	-3,112***	--
60-89	2,342**	--
90-119	4,433***	--
120 credits or more	6,817***	--
Credits Earned - BA Students (ref: <90-119)		
Less than 20	--	-6,312***
20-59 credits	--	-5,286***
60-89 credits	--	-2,578***
120 credits or more	--	2,414***
Cumulative GPA	2,832***	5,359***

***p<.001 **p<.01 *p<.05

Note: We also control for a student's cohort of entry (not shown in table)

Table A3. Effects of first-year earnings on BA completers and non-completers post-college earnings in dollars ($), Ordinary Least Squares Regressions (Rows 5 and 6 of Table 5)

	BA Completers (N=39,370)	BA Non-Completers (N=19,613)
First Year Work Intensity (ref: Non-worker)		
Low ($0 < x < $5,000)	1,708***	1,601***
Moderate ($5,000 ≤ x < $15,000)	4,367***	4,856***
Higher ($15,000 ≤ x < $25,000)	9,142***	11,733***
Highest (x ≥ $25,000)	18,671***	22,415***
Age at College Entry (years)	-708***	-791***
Female (ref: Male)	-4,977***	-7,910***
Black or Hispanic (ref: White or Asian)	-3,103***	-4,693***
Pell Eligible	-1,277***	-2,081***
Full-time at Entry	599	339
Prior Year Work Intensity (ref: Non-Worker)		
Lower (x < $15,000)	1,900***	2,360***
Higher (x ≥ $15,000)	1,343	3,979**
# of Semesters Enrolled	-1,426***	-886***
Last Academic Major (ref=Business)		
STEM	-3,106***	-689
Health	-42	3,651***
Education	-4,656***	-4,499***
Social Sciences	-10,952***	686
Humanities	-15,854***	-4,139***
Liberal Arts	-8,366***	-475
Other Majors/Unknown	-9,415***	296
Credits Earned - BA Students (ref: <90-119)		
Less than 20	N/A	-5,229***
20-59 credits	N/A	-3,037***
60-89 credits	N/A	-985
120 credits or more	N/A	-2,448**
Cumulative GPA	7,798***	3,129***

***p<.001 **p<.01 *p<.05

Note: We also control for a student's cohort of entry (not shown in table)

Table A4. Effects of first-year earnings on AA completers and non-completers post-college earnings in dollars ($), Ordinary Least Squares Regressions (Rows 2 and 3 of Table 5)

	AA Completers (N=32,210)	AA Non-Completers (N=68,386)
First Year Work Intensity (ref: Non-worker)		
Low ($0 < x < $5,000)	1,332***	963***
Moderate ($5,000 ≤ x < $15,000)	4,435***	4,657***
Higher ($15,000 ≤ x < $25,000)	8,960***	9,831***
Highest (x ≥ $25,000)	17,794***	18,341***
Age at College Entry (years)	-260**	-635***
Female (ref: Male)	-5,942***	-8,223***
Black or Hispanic (ref: White or Asian)	-3,294***	-3,734***
Pell Eligible	-1,565***	-1,502***
Full-time at Entry	1,151**	60
Prior Year Work Intensity (ref: Non-Worker)		
Lower (x < $15,000)	543*	1,616***
Higher (x ≥ $15,000)	3,061***	4,189**
# of Semesters Enrolled	-592***	-857***
Last Academic Major (ref=Business)		
STEM	-21	33
Health	8,104***	742*
Education	-3,894***	-2,930***
Social Sciences	-2,414***	-1,201**
Humanities	-7,884***	-6,560***
Liberal Arts	-1,848**	-698**
Other Majors/Unknown	-2,682***	-213
Credits Earned - BA Students (ref: <20-59)		
Less than 20	N/A	-3,580***
60-89 credits	N/A	3,820***
90-119 credits	N/A	4,129***
120 credits or more	N/A	6,945***
Cumulative GPA	4,920***	2,444***

***p<.001 **p<.01 *p<.05

Note: We also control for a student's cohort of entry (not shown in table)

Table A5. Effects of first-year earnings on Under-represented minority students' post-college earnings in dollars ($), Ordinary Least Squares Regressions (Rows 7 and 8 of Table 5)

	BA Attempters (N=28,526)	AA Attempters (N=69,570)
First Year Work Intensity (ref: Non-worker)		
Low ($0 < x < $5,000)	1,497***	905***
Moderate ($5,000 ≤ x < $15,000)	4,894***	4,569***
Higher ($15,000 ≤ x < $25,000)	10,567***	9,285***
Highest (x ≥ $25,000)	21,126***	17,734***
Age at College Entry (years)	-543***	-433***
Female (ref: Male)	-5,434***	-6,595***
Pell Eligible	-1,368***	-1,210***
Full-time at Entry	11	198
Prior Year Work Intensity (ref: Non-Worker)		
Lower (x < $15,000)	1,770***	1,046***
Higher (x ≥ $15,000)	2,679***	3,803**
# of Semesters Enrolled	-1,016***	-677***
Last Academic Major (ref=Business)		
STEM	-269	281
Health	1,632**	2,759***
Education	110	-2,994***
Social Sciences	-5,312***	-2,034***
Humanities	-8,777***	-6,349***
Liberal Arts	-3,148***	-798***
Other Majors/Unknown	-3,945***	-868***
Credits Attempted - AA Students (ref: 20-59)		
Less than 20	--	-2,701***
60-89	--	2,158***
90-119	--	3,437***
120 credits or more	--	6,181***
Credits Earned - BA Students (ref: <90-119)		
Less than 20	-4,759***	--
20-59 credits	-3,944***	--
60-89 credits	-1,807**	--
120 credits or more	3,251***	--
Cumulative GPA	4,680***	2,743***

***p<.001 **p<.01 *p<.05

Note: We also control for a student's cohort of entry (not shown in table)

Table A6. Effects of first-year earnings on Female students' post-college earnings in dollars ($), Ordinary Least Squares Regressions (Rows 9 and 10 of Table 5)

	BA Attempters (N=35,181)	AA Attempters (N=55,393)
First Year Work Intensity (ref: Non-worker)		
Low ($0 < x < $5,000)	1,144***	1,149***
Moderate ($5,000 ≤ x < $15,000)	3,801***	4,076***
Higher ($15,000 ≤ x < $25,000)	9,454***	9,290***
Highest (x ≥ $25,000)	16,175***	16,584***
Age at College Entry (years)	-963***	-349***
Female (ref: Male)	-3,335***	-1,732***
Pell Eligible	-1,425***	-1,281***
Full-time at Entry	1,578*	-26
Prior Year Work Intensity (ref: Non-Worker)		
Lower (x < $15,000)	1,835***	906***
Higher (x ≥ $15,000)	3,944***	3,179***
# of Semesters Enrolled	-1,175***	-639***
Last Academic Major (ref=Business)		
STEM	-4,376***	-1,093
Health	-403	3,558***
Education	-4,572***	-4,152***
Social Sciences	-9,863***	-3,744***
Humanities	-13,464***	-6,808***
Liberal Arts	-6,538***	-1,191***
Other Majors/Unknown	-8,963***	-2,267***
Credits Attempted - AA Students (ref: 20-59)		
Less than 20	--	-2,226***
60-89	--	2,301***
90-119	--	4,752***
120 credits or more	--	8,349***
Credits Earned - BA Students (ref: <90-119)		
Less than 20	-5,197***	--
20-59 credits	-4,790***	--
60-89 credits	-2,635**	--
120 credits or more	3,712***	--
Cumulative GPA	5,558***	2,973***

***p<.001 **p<.01 *p<.05

Note: We also control for a student's cohort of entry (not shown in table)

Table A7. Effects of first-year earnings on non-working at college entry students' post-college earnings in dollars ($), Ordinary Least Squares Regressions (Rows 11 and 12 of Table 5)

	BA Attempters (N=27,924)	AA Attempters (N=55,393)
First Year Work Intensity (ref: Non-worker)		
Low ($0 < x < $5,000)	1,853***	1,335***
Moderate ($5,000 ≤ x < $15,000)	4,774***	5,136***
Higher ($15,000 ≤ x < $25,000)	10,550***	13,818***
Highest (x ≥ $25,000)	24,314***	24,874***
Age at College Entry (years)	-360*	57
Female	-5,199***	-7,217***
Black or Hispanic (ref: White or Asian)	-3,813***	-3,052***
Pell Eligible	-2,234***	-2,015***
Full-time at Entry	672	142
# of Semesters Enrolled	-1,421***	-897***
Last Academic Major (ref=Business)		
STEM	-2,724***	-247
Health	556	5,713***
Education	-4,065***	-3,158***
Social Sciences	-8,421***	-1,553**
Humanities	-13,441***	-7,615***
Liberal Arts	-6,574***	-116
Other Majors/Unknown	-7,241***	-943**
Credits Attempted - AA Students (ref: 20-59)		
Less than 20	--	-3,099***
60-89	--	2,566***
90-119	--	4,495***
120 credits or more	--	7,768***
Credits Earned - BA Students (ref: <90-119)		
Less than 20	-6,432***	--
20-59 credits	-5,498***	--
60-89 credits	-2,668***	--
120 credits or more	2,812***	--
Cumulative GPA	5,462***	3,061***

***p<.001 **p<.01 *p<.05

Note: We also control for a student's cohort of entry (not shown in table)

Appendix B: Robustness Checks

Table B1. Effects of first-year earnings on AA and BA attempters post-college earnings in dollars ($), Ordinary Least Squares Regressions – Outcome Variable not Top-Coded at $100,000

	AA Attempters (N=100,596)	BA Attempters (N=58,983)
First Year Work Intensity (ref: Non-worker)		
Low ($0 < x < $5,000)	997***	1,444**
Moderate ($5,000 ≤ x < $15,000)	4,650***	4,387***
Higher ($15,000 ≤ x < $25,000)	9,849***	11,127***
Highest (x ≥ $25,000)	20,291***	31,106***
Age at College Entry (years)	-513***	-1,047***
Female (ref: Male)	-8,540***	-8,763***
Black or Hispanic (ref: White or Asian)	-4,581***	-5,611***
Pell Eligible	-1,790***	-2,786***
Full-time at Entry	298	2,704*
Prior Year Work Intensity (ref: Non-Worker)		
Lower (x < $15,000)	1,297***	1,829***
Higher (x ≥ $15,000)	3,840***	3,723*
# of Semesters Enrolled	-937***	-1,687***
Last Academic Major (ref=Business)		
STEM	-18	-3,250***
Health	3,480***	-2,396**
Education	-3,852***	-6,681***
Social Sciences	-2,494***	-10,766***
Humanities	-7,848***	-16,705***
Liberal Arts	-924***	-8,001***
Other Majors/Unknown	-1,072***	-9,965***
Credits Attempted - AA Students (ref: 20-59)		
Less than 20	-3,547***	--
60-89	2,421**	--
90-119	4,919***	--
120 credits or more	7,236***	--
Credits Earned - BA Students (ref: <90-119)		
Less than 20	--	-7,832***
20-59 credits	--	-6,963***
60-89 credits	--	-4,178***
120 credits or more	--	2,083*
Cumulative GPA	3,087***	7,192***

***p<.001 **p<.01 *p<.05

Note: We also control for a student's cohort of entry (not shown in table)

Table B2. Effects of first-year earnings on AA and BA attempters post-college earnings in dollars ($), Ordinary Least Squares Regressions –Natural Log of Outcome

	AA Attempters (N=100,596)	BA Attempters (N=58,983)
First Year Work Intensity (ref: Non-worker)		
Low ($0 < x < $5,000)	.041***	.043**
Moderate ($5,000 ≤ x < $15,000)	.158***	.130***
Higher ($15,000 ≤ x < $25,000)	.316***	.304***
Highest (x ≥ $25,000)	.517***	.520***
Age at College Entry (years)	-.015***	-.021***
Female (ref: Male)	-.191***	-.130***
Black or Hispanic (ref: White or Asian)	-.064***	-.078***
Pell Eligible	-.034***	-.036***
Full-time at Entry	.012	.036*
Prior Year Work Intensity (ref: Non-Worker)		
Lower (x < $15,000)	.036***	.052***
Higher (x ≥ $15,000)	.111***	.098*
# of Semesters Enrolled	-.022***	-.034***
Last Academic Major (ref=Business)		
STEM	-.016*	-.106***
Health	.064***	-.054***
Education	-.108***	-.095***
Social Sciences	-.066***	-.218***
Humanities	-.231***	-.357***
Liberal Arts	-.040***	-.186***
Other Majors/Unknown	-.042***	-.181***
Credits Attempted - AA Students (ref: 20-59)		
Less than 20	-.084***	--
60-89	.051***	--
90-119	.095***	--
120 credits or more	.174***	--
Credits Earned - BA Students (ref: <90-119)		
Less than 20	--	-.142***
20-59 credits	--	-.107***
60-89 credits	--	-.058***
120 credits or more	--	.089***
Cumulative GPA	.072***	.124***

***p<.001 **p<.01 *p<.05

Note: We also control for a student's cohort of entry (not shown in table)

Table B3. Effects of first-year earnings on AA and BA attempters post-college earnings in dollars ($), Ordinary Least Squares Regressions – Highest Earners Excluded

	AA Attempters (N=97,808)	BA Attempters (N=58,483)
First Year Work Intensity (ref: Non-worker)		
Low ($0 < x < $5,000)	1,011***	1,629***
Moderate ($5,000 ≤ x < $15,000)	4,516***	4,333***
Higher ($15,000 ≤ x < $25,000)	9,600***	10,193***
Age at College Entry (years)	-514***	-788***
Female (ref: Male)	-7,591***	-5,834***
Black or Hispanic (ref: White or Asian)	-3,528***	-4,149***
Pell Eligible	-1,607***	-1,636***
Full-time at Entry	477*	1,254***
Prior Year Work Intensity (ref: Non-Worker)		
Lower (x < $15,000)	1,264***	2,003***
Higher (x ≥ $15,000)	3,833***	3,003**
# of Semesters Enrolled	-830***	-1,314***
Last Academic Major (ref=Business)		
STEM	38	-3,178***
Health	3,969***	128
Education	-3,208***	-3,837***
Social Sciences	-2,353***	-8,591***
Humanities	-7,260***	-13,259***
Liberal Arts	-634**	-6,222***
Other Majors/Unknown	-813***	-6,978***
Credits Attempted - AA Students (ref: 20-59)		
Less than 20	-3,151***	--
60-89	2,303***	--
90-119	4,366***	--
120 credits or more	6,825***	--
Credits Earned - BA Students (ref: <90-119)		
Less than 20	--	-6,531***
20-59 credits	--	-5,455***
60-89 credits	--	-2,717***
120 credits or more	--	2,339***
Cumulative GPA	2,860***	5,323***

***p<.001 **p<.01 *p<.05

Note: We also control for a student's cohort of entry (not shown in table)

Table B4. Effects of first-year earnings on AA and BA attempters post-college earnings in dollars ($), Ordinary Least Squares Regressions – Using first three years of earnings as main independent variable

	AA Attempters (N=97,808)	BA Attempters (N=58,483)
First Year Work Intensity (ref: Non-worker)		
Low (x < $7,500)	160	1,996***
Moderate ($7,500 ≤ x < $20,000)	2,158***	3,778***
Higher ($20,000 ≤ x < $35,000)	5,084***	6,462***
Highest (x ≥ $35,000)	11,995***	12,130***
Age at College Entry (years)	-552***	-763***
Female (ref: Male)	-7,293***	-5,825***
Black or Hispanic (ref: White or Asian)	-4,013***	-4,717***
Pell Eligible	-1,402***	-1,461***
Full-time at Entry	528*	1,231*
Prior Year Work Intensity (ref: Non-Worker)		
Lower (x < $15,000)	617***	1,397***
Higher (x ≥ $15,000)	2,921***	2,593**
# of Semesters Enrolled	-836***	-1,332***
Last Academic Major (ref=Business)		
STEM	244	-2,612***
Health	4,231***	597
Education	-2,794***	-3,325***
Social Sciences	-2,275***	-8,419***
Humanities	-6,764***	-12,736***
Liberal Arts	-409*	-5,872***
Other Majors/Unknown	-657**	-6,813***
Credits Attempted - AA Students (ref: 20-59)		
Less than 20	-3,576***	--
60-89	2,680***	--
90-119	4,982***	--
120 credits or more	7,591***	--
Credits Earned - BA Students (ref: <90-119)		
Less than 20	--	-7,418***
20-59 credits	--	-6,085***
60-89 credits	--	-3,108***
120 credits or more	--	2,542***
Cumulative GPA	2,750***	5,432***

***p<.001 **p<.01 *p<.05

Note: We also control for a student's cohort of entry (not shown in table)