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Student Outcomes at Community Colleges:

What Factors Explain Variation in Loan Repayment and Earnings?

Cody Christensen
Vanderbilt University

Lesley J. Turner
Vanderbilt University

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ABSTRACT

Community colleges play an important role in providing access to higher education and promoting economic mobility, but student outcomes vary widely across institutions. Although community colleges have been largely excluded from recent federal accountability action, the potential re-regulation of Gainful Employment raises the question of whether these schools should be subject to future accountability measures. If variation in student outcomes across community college programs is correlated with factors and policies under an institution's control, this would suggest that there are "levers of action" that a college can pull to improve student outcomes. However, if variation is primarily explained by factors that are outside of an institution's control, such as the characteristics of students the school serves, then accountability policies could penalize community colleges for fulfilling their mission of providing access to their local communities. To shed light on these questions, we examine the program-, institution-, and state-level correlates of community college student outcomes, using program-level data on post-college earnings and loan repayment for more than 1,200 community colleges. We find that student demographics are correlated with net earnings and loan repayment, largely because programs that enroll more underrepresented minority and female students have worse outcomes. Student demographics explain a relatively small share of the variation in earnings and repayment. In contrast, field of study explains most of the variation in net earnings across programs and much of the variation in loan repayment. Moreover, after controlling for field of study, we find a positive association between the share of students in a program who are underrepresented minorities and net earnings, suggesting that programs that enroll more Black and Hispanic students are more likely to be in fields that lead to smaller earnings gains. Finally, we show that institutions that enroll the largest shares of minority students tend to offer fewer programs with high earning premia and more seats in programs that have lower net earnings, on average. These findings have significant implications for devising federal accountability standards and underline the importance of both providing incentives for institutions to offer programs that lead to economic stability and supporting the important role this sector plays in providing equitable access to a postsecondary education.

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I. Introduction

Community colleges—open access, public two-year institutions—play an important role in America's higher education system. They educate millions of students each year, function as less expensive entry points for individuals seeking to transfer to four-year institutions, and absorb displaced workers during economic recessions (Rouse, 1995; Bahr et al, 2013; Barr and Turner, 2013). Community colleges are also important for advancing equity and social mobility. By definition, they are local institutions with open-door admissions policies and thus provide nontraditional students and other disadvantaged populations with access to higher education (Bailey and Morest, 2006; Romano and Eddy, 2018).

At the same time, many community college students struggle during and after their time in college. While outcomes vary widely across institutions, on average, community college students face lower graduation rates, a higher risk of student loan default, and weaker economic success compared to similar students who attend four-year public and non-profit universities (Looney and Yannelis, 2015; Long, 2018; Miller, 2018).

Ideally, community colleges would both provide access to higher education and enhance students' economic outcomes. In reality, the need to maintain low tuition combined with declining support from state governments often creates tension between these two goals.[1] This makes community colleges a particularly challenging sector for federal policymakers to regulate. Indeed, in recent years, policymakers have largely excluded community colleges from federal accountability measures. However, given the potential re-regulation of the Gainful Employment (GE) provision (or a similar accountability measure), whether community colleges should be subject to accountability pressure is an important question. Under the past iteration of GE, only non-degree (i.e., "certificate") programs in community colleges were subject to regulation.[2] If GE is re-regulated, policymakers should think carefully about whether expanding GE to include associate degree programs (or contracting the rule to exclude all community college programs) would best serve students in this sector.

There are potential benefits and consequences to including community college programs in federal accountability measures. Federal accountability pressure could lead to improvements in instructional quality and programmatic offerings or incentivize state policy makers to revisit decisions around funding for community colleges and prospective students. If done well, this could result in improved student outcomes. On the other hand, if programs providing access to underserved groups face disproportionate accountability, that could reduce educational opportunities available to such students.

Using a nationally representative sample of community college programs, we explore whether "demographics are destiny" for community colleges or whether factors under the control of institutions and states also contribute to variation in student success. This question has important implications: if variation in student outcomes across community college programs is correlated with factors and policies under an institution's control, this would suggest that there are "levers of action" that a college can pull to

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1. State appropriations to community colleges were approximately $3,800 per full-time-equivalent (FTE) student in 2017 (Cummings et al. 2021) and actually fell (in real terms) over the decade spanning the Great Recession. Community colleges are quite reliant on state and local appropriations. On average, the majority of institutional revenue received by community colleges came in this form (Ma, Pender, and Libassi 2020).

2. The "gainful employment" definition was established in regulations authorized by the Higher Education Act that were initiated by the Obama administration in 2010 largely in response to abuse by the career training sector and were the subject of subsequent negotiated rulemaking. Although GE was never fully implemented, it would have restricted eligibility to participate in federal student aid for programs with high levels of student debt relative to typical post-college earnings. The regulations went into effect in July 2015 but were rescinded by the Trump administration in 2019.

improve student outcomes. However, if variation in program outcomes is primarily explained by factors that are outside of an institution's control, such as the characteristics of students the school serves, then accountability policies could penalize many community colleges for fulfilling their mission to serve students in the local community.

We find that program demographics are correlated with earnings and loan repayment, with those serving more students of color having worse outcomes. However, accounting for institutional inputs and program mix reduces the size of the association between loan repayment and student race/ethnicity. In the case of net earnings, accounting for field of study *reverses* this relationship, with the share of students who are underrepresented minorities being associated with higher net earnings. Lastly, we find that the majority of the variation in program-level earnings and much of the variation in loan repayment is largely explained by the mix of program offerings. It is important to note that these correlations do not necessarily reflect a causal relationship. Nonetheless, given that the differences in outcomes by program of study we find are consistent with existing causal evidence on earnings returns across programs (e.g., Jespen et al., 2014; Bahr et al., 2015; Stevens, Kurlaender, and Grosz, 2019; Grosz, 2020), our findings indicate if community colleges were to shift program offerings in response to accountability pressure, students would likely benefit. Such changes need not take the form of a wholesale restructuring of program offerings but rather as an expansion of the number of seats offered in high-return programs.[3]

The remainder of this paper is organized as follows. Section II discusses existing evidence on institution- and program-level postsecondary outcomes of former community college students. Section III describes the data and analysis sample. Section IV presents results on the associations between community college characteristics and student outcomes, and Section V concludes with a discussion about the policy implications of this analysis.

II. Evidence on the determinants of community college students' outcomes

There is a large body of research on the economic returns to attending a community college (Kane and Rouse, 1993; Leigh and Gill, 1997; Marcotte et al., 2005; Jacobson, LaLonde, and Sullivan, 2005). Relative to high school graduates, associate degree-holders have higher average wages and annual earnings, although the magnitude varies by state, institutional attributes, and student characteristics (Calcagno et al., 2008; Porchea et al., 2016). The evidence is mixed on the returns to sub-associate degree credentials. Some studies find positive returns to obtaining an undergraduate certificate, while others find little or no evidence that certificate programs improve labor market outcomes (Jespen, Troske, and Coomes, 2012).

Recently, new research has shed light on the program-level labor market outcomes of former community college students (Jespen et al., 2014; Bahr et al., 2015; Dadgar and Trimble, 2015; Xu and Trimble, 2016; Minaya and Scott-Clayton, 2017; Stevens, Kurlaender, and Grosz, 2019). These studies leverage longitudinal administrative data from a particular community college system linked to corresponding records from the state's unemployment insurance database. By comparing within-student differences in earnings before and after attending a program, researchers are able to estimate the economic returns to different fields of study and credentials. This research generally finds that associate programs in allied health and nursing lead to the largest earnings gains. Vocational and trades certificates (particularly long-term certificates) also increase earnings, on average. Returns to liberal arts programs

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3. Grosz (2020) shows that despite binding capacity constraints and high returns to nursing associate degrees, because funding is allocated on a per-student basis and such programs are relatively high cost, there are limited incentives for schools to expand these programs.

(at the associate and certificate level) are mixed, with some studies finding positive returns while others find little or no returns. Short-term certificates in cosmetology and culinary studies typically have small or negative effects on earnings. However, this research has only been conducted in a handful of states. Given the large variation in state-level policies and local labor market conditions, program-level estimates from these studies may not be generalizable to other settings (Xu & Trimble, 2016).

Our study makes several contributions. It is one of the first to examine the variation program-level outcomes for the universe of all two-year postsecondary institutions for which there are available data.[4] Also, we provide some of the first descriptive evidence about the variation in labor market outcomes within similar programs across different community colleges. Third, we use program-level loan repayment rates (in addition to program-level earnings) as a secondary measure of post-college economic success. Previous research has not studied program-level loan repayment due to a lack of available data.

The goal of this study is to identify program- and institution-level characteristics that are correlated with labor market outcomes of former community college students. These characteristics include students' race and gender, the types and mix of programs offered, and other program- and institution-level policies. Special attention is given to factors that community colleges have direct control over; namely, program offerings.

We focus on program-level outcomes because school-level averages can mask substantial heterogeneity that exists between programs and across different credential levels (Marcotte et al., 2005; Calcagno et al., 2008) even within a single institution (Matsudaira and Turner, 2020). Program-level analysis provides a more-accurate picture of the labor market outcomes that students from a given program are likely to experience after attending a college (Schneider and Sigelman, 2018; Carnevale et al., 2020).

III. Data and Analysis Sample

Our analyses focus on certificate and associate degree programs at community colleges. We focus on two outcome measures – earnings and loan repayment rates – which we describe in detail below. A total of 1,240 community colleges report earnings or loan repayment data at the school-level with 94 percent reporting these data for at least one program. Programs are defined using unique 2-digit classification of instructional program (CIP) codes, by credential level, by postsecondary institution.[5] We combine data from a variety of sources to measure program-, school-, and state-level characteristics and policies potentially related to community college student outcomes.

A. Student outcomes

Earnings. Our primary measure of program-level earnings is the "Net Earnings Premium" (NEP). Generally speaking, a program's NEP measures the extent to which former students' earnings gains are large enough to cover the direct and indirect costs of attending the program (Matsudaira and Turner, 2020). Specifically, NEP is defined as the median earnings of all program exiters with earnings three years after program exit, minus median "counterfactual earnings," minus out-of-pocket expenses related to

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4. Our data, described in Section III, cover programs serving between 65 and 99 percent of community college students.

5. Postsecondary institutions are classified using six-digit Office of Postsecondary Education Identifier (OPEID) numbers. A few community colleges also offer a small number of bachelor's degree programs. We consider a public institution to be a community college if it is categorized as a predominantly certificate or associate degree-granting institution in the College Scorecard.

attending the program (amortized over 20 years).[6] The calculation for program-level NEP is show in equation (1).

$$NEP = (\text{Median Cohort Earnings }) - (\text{Median Counterfactual Earnings}) - (\text{Amortized Out of Pocket Expenses}) \quad (1)$$

We do not observe outcomes of students who attended very small programs due to privacy considerations. Because the underlying data used to construct the NEP are reported at the 4-digit CIP level (which is then aggregated to the 2-digit CIP level), about 35 percent of community college students attend a program that is too small for earnings data to be publicly reported. Raked weights are used to reweight programs to be representative of community colleges nationwide in terms of CIP code and credential level.

Loan repayment. We use a dollar-based loan repayment rate proposed by Matsudaira and Turner (2020). As shown in equation (2), a program's loan repayment rate (LRR) equals the change in the aggregate balance of the cohort, three years after repayment entry, relative to the original cohort balance.

$$LRR = 1 - \frac{(\text{Balance in year 3})}{(\text{Balance at origination})} \quad (2)$$

A program with an LRR equal to one indicates that every borrower from the given program has fully repaid his or her loan balance within three years of entering repayment. A positive LRR indicates that the cohort has made progress in reducing their aggregate loan balance while one with a negative LRR indicates that the program's repayment cohort has, on average, negatively amortized on their debt. The data used to calculate loan repayment rates comes from NSLDS and includes students who entered repayment in 2016.[7] Although only 5 percent of programs (containing less than 1 percent of students) are missing an LRR, we also use weights to ensure that the set of programs with a nonmissing LRR are reflective of enrollment across all programs in terms of field by credential level.

Program-level loan repayment and net earnings are moderately correlated ($\rho = 0.314$). While both metrics should be related to program costs and post-college economic success, there are a few reasons why the measures may not be more aligned. First, the NEP will not capture unreported tipped income and earnings from self-employment, which may make up a substantial portion of earned income in some sectors. Second, if students who borrow make up a small share of all students in a program or receive very

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6. Median earnings of program exiters are derived from the College Scorecard program-level data with several adjustments to the College Scorecard data. First, because earnings for the pooled 2016-2017 cohort are measured one year after exit, while the NEP aims to measure earnings three years after exit, each program's median earnings are adjusted using the estimated income growth rate for individuals in the American Community Survey (ACS) with the same credential and field of study. Second, the NEP is intended to reflect the outcomes of both graduates and non-completers, but the Scorecard data only pertains to program graduates. To account for differences in earnings between completers and noncompleters within undergraduate programs, Matsudaira and Turner (2020) scale program-level earnings by the ratio of completer to non-completer earnings at the institution-level and the average completion rate. In other words, program-level Scorecard earnings are scaled down more when (a) there is a large earnings premium between completers and non-completers at an institution, and (b) when the program-level completion rate is small, meaning there is a large share of non-completers in a given program.

   Out-of-pocket costs are estimated using estimated years of enrollment (at the credential level) multiplied by per-student collected tuition and fees revenue. In the case of undergraduate certificate and associate degree programs, counterfactual earnings equal median earnings of prime-aged working adults with only a high school degree in the same state as the institution, as measured in the American Community Survey (ACS).

7. Borrowers who are back in school, have a military deferment, or are not required to repay their loans for another reason (e.g., death, disability, defrauded) are excluded from the numerator and denominator.

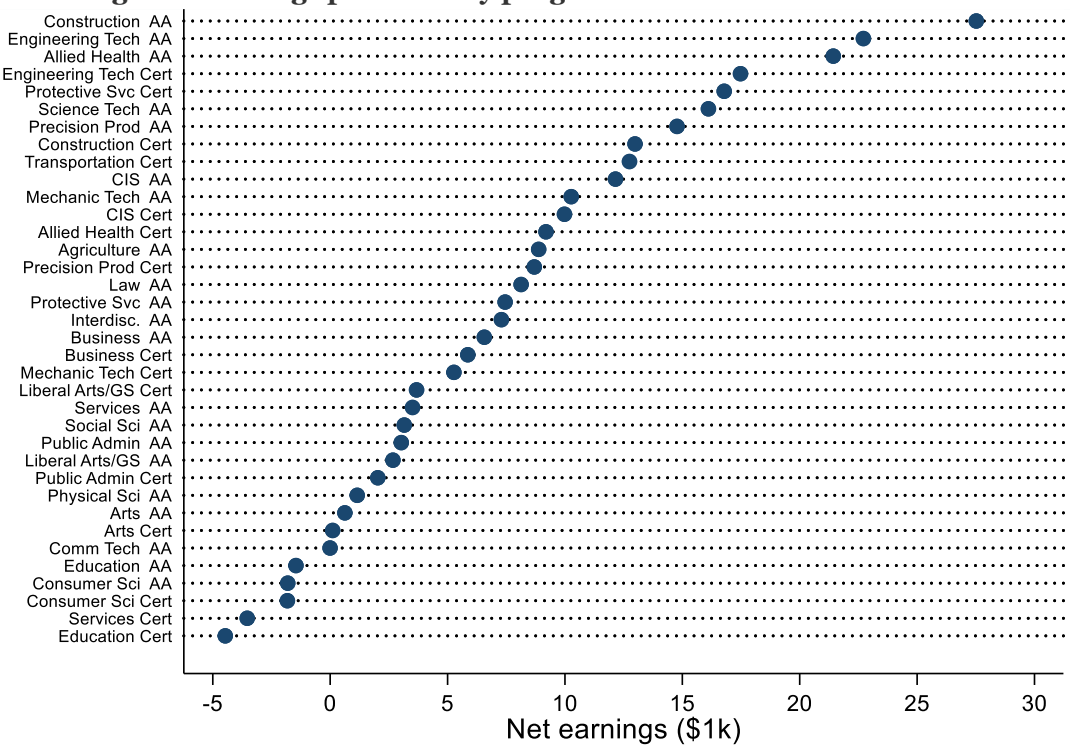
different earnings gains, we might expect these two measures to diverge. Nonetheless, to the extent that students who borrow take on additional risk, a metric that reflects their post-college success may be useful even if this group is not representative.

B. Program-level correlates of student outcomes

Figures 1 and 2 show the ranking of programs by NEP and LRR, respectively. Programs are defined by their field of study and credential. Although the ordering of programs shown in Figures 1 and 2 depends on the outcome, skilled trades (e.g., construction, mechanic, and repair technologies), allied health, and STEM (e.g., engineering, computer and information sciences) programs tend to be at the top of the distribution of earnings and loan repayment while education, service, consumer science, and liberal arts programs tend to be at the bottom.

We generate estimates of the racial/ethnic and gender composition of programs using IPEDS completions data. We calculate the share of completers that are American Indian or Alaskan Native (AIAN), Asian, Black, Hispanic, and White, as well as the share of completers that are women.[8] Given that program-level demographic data in IPEDS only includes graduates, while the NEP and LRR measures are intended to apply to both completers and noncompleters, our approach imposes the assumption that graduation rates are the same for students in different demographic groups. To reduce measurement error due to small programs, we calculate demographic shares using a three-year average, spanning the 2015 to 2017 academic years.

Figure 1: Average net earnings premium by program



Notes: Two-digit CIP codes are listed in Appendix C. Programs with fewer than 4000 total students nationwide are not shown.

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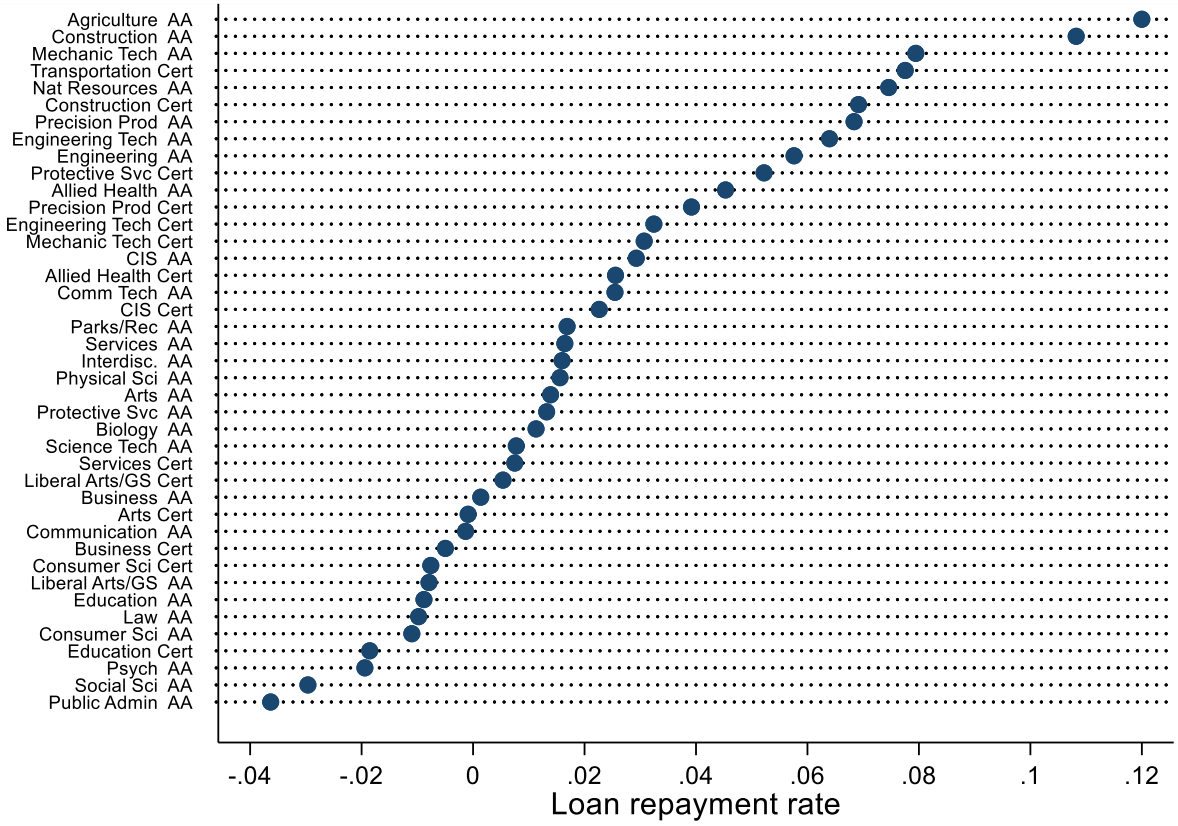
8. A small number of completers fall outside one of these five race/ethnicity categories (e.g., students of two or more races, foreign students). We exclude these counts when calculating the share of students in each racial/ethnic group.

Figure 2: Average loan repayment rate by program

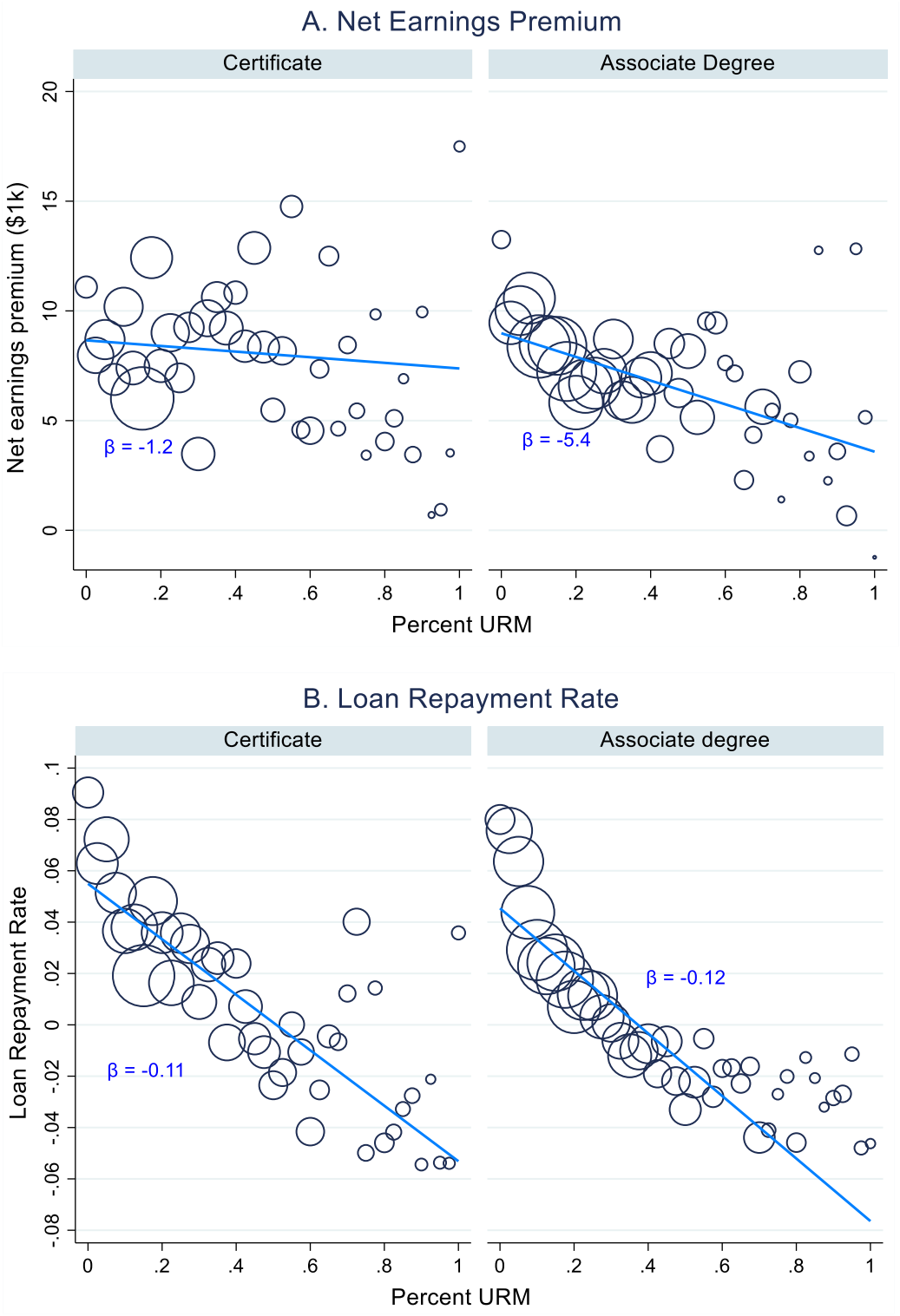


Notes: Two-digit CIP codes are listed in Appendix C. Programs with fewer than 4000 total students nationwide are not shown.

Figures 3 through 5 provide visual evidence of the correlation between program demographic characteristics and student outcomes. For each demographic characteristic, we construct 40 evenly spaced intervals and plot the average outcome (NEP or LRR). Associate and certificate programs are plotted in separate panels. The solid line is the linear fit of the average outcome on the share of students who have the specified demographic characteristic (weighted by the number of students), and the estimated slope (β) is shown in each panel.

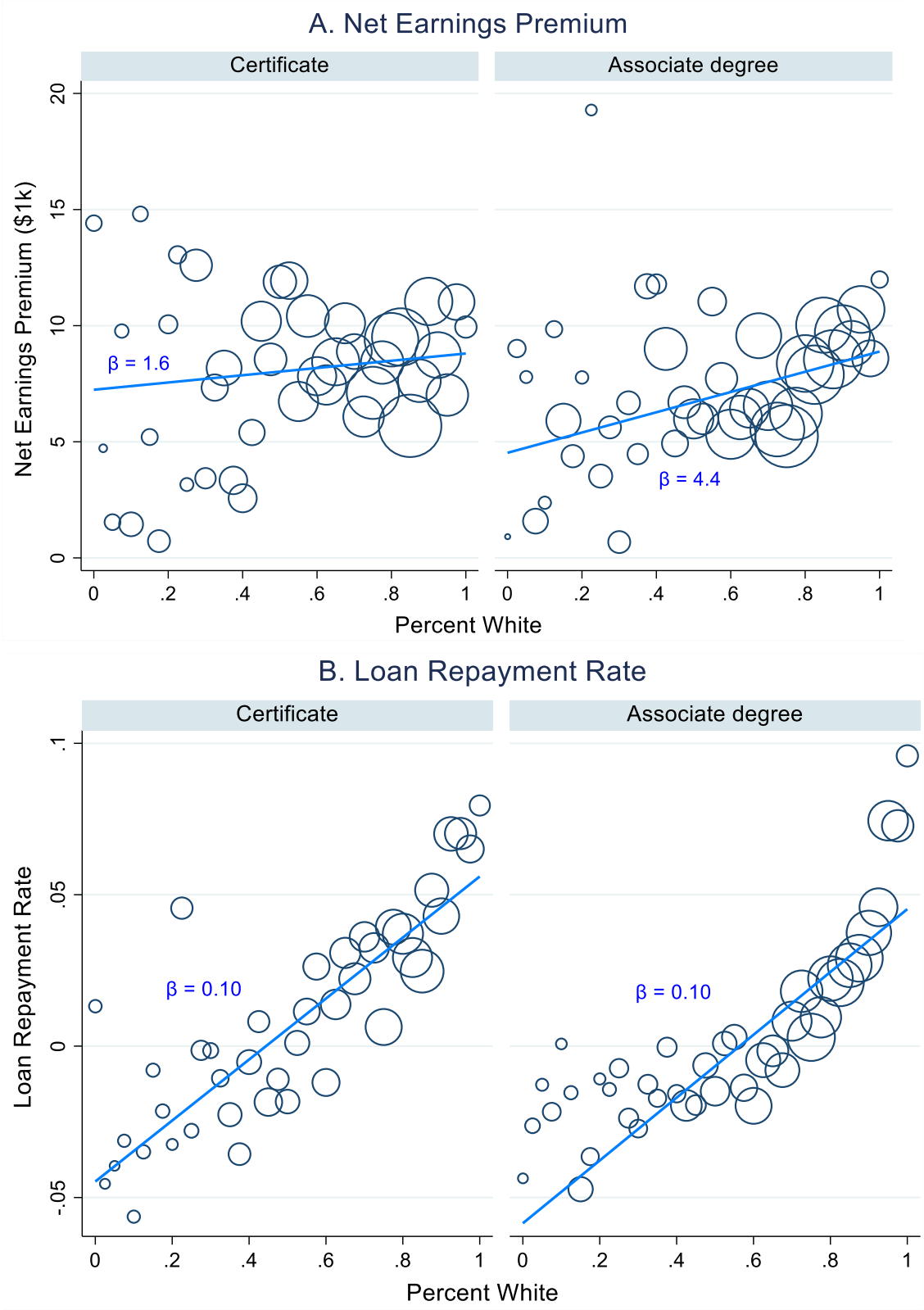
The racial/ethnic composition of a program and a program's NEP are correlated and programs that serve more underrepresented minority students tend to have lower net earnings. As an example, focusing on Panel A of Figure 3, $\beta = -1.2$ for certificate programs. This indicates that a 10-percentage point increase in the share of students in a program who are underrepresented minorities is correlated with a $120 lower program NEP. This correlation is larger in associate degree programs: a 10-percentage point increase in the share of students that are underrepresented minorities is correlated with a $540 reduction in a program's NEP. We see the opposite relationship between net earnings and the share of students that are White in Figure 4.

Figure 3: Correlations between Student Outcomes and Demographics: % Underrepresented Minority



Notes: Larger circles indicate a larger underlying number of exiters. URM = American Indian or Native Alaskan, Black, or Hispanic.

Figure 4: Correlations between Student Outcomes and Demographics: % White



Notes: Larger circles indicate a larger underlying number of exiters.

Gender is also correlated with net earnings in certificate programs, with a 10-percentage point increase in the share of students who are women being correlated with a $610 reduction in average net earnings. The relationship between gender composition and net earnings for associate degree programs appears nonlinear. The relationship between program-level NEP and gender composition appears negative for associate programs that have fewer than 70 percent women, but the relationship appears positive for associate programs that are between 70 and 90 percent female.

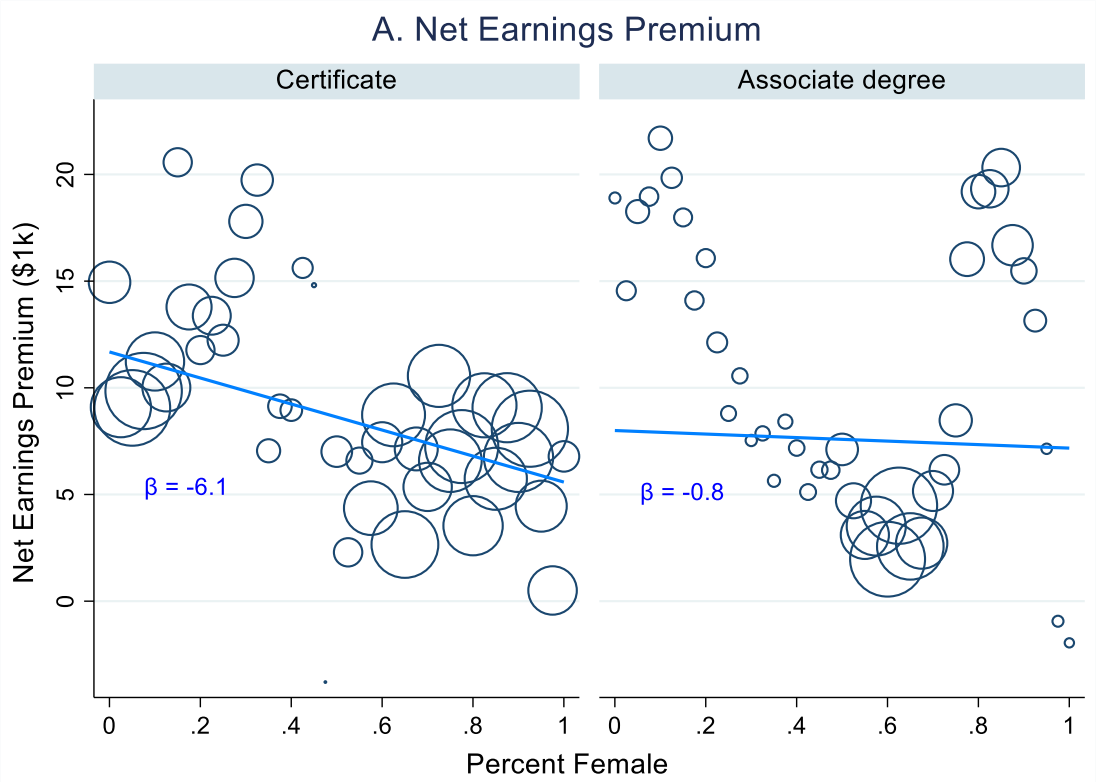
These figures also show strong correlations between program demographics and loan repayment rates. Panel B of Figure 3 suggests that a 10-percentage point increase in the share of students that are underrepresented minorities is correlated with a 1.1 percentage point lower share of a cohort's balance that is repaid after three years. We find an opposite correlation in Panel B of Figure 4, which shows the share of students that are White. A 10-percentage point increase in the share of students that are White is associated with a 1 percentage point higher share of a cohort's balance that is repaid after three years.

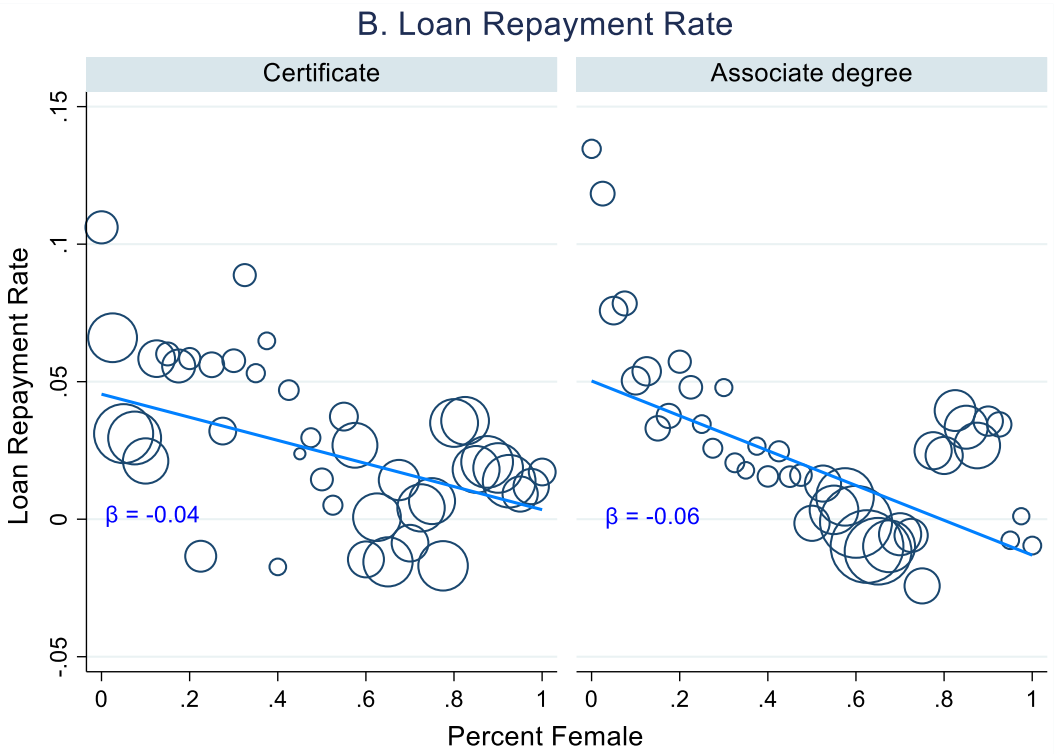
Lastly, we see that a program's gender composition is also correlated with repayment rates. As seen in Panel B of Figure 5, a 10-percentage point increase in the share of students that are female is associated with approximately a half of a percentage point drop in the fraction of a cohort's balance that is repaid after three years.

These patterns are concerning for the prospect of using earnings and loan repayment in an accountability system that covers community college programs. The broad goals of accountability in higher education should be to provide incentives for schools to make changes that will improve student outcomes and, possibly, to exclude schools or programs that consistently produce poor outcomes from participating in Title IV federal student aid programs. Community colleges are open-access institutions and generally serve students in the surrounding geographic area. If performance on these prospective metrics is a function of the types of students an institution serves, it is unlikely that linking incentives (or penalties) to performance will lead to desired goals of improving program quality. Instead, such accountability pressures may even serve to restrict access to higher education for students who could benefit the most.

In Section IV, we explore whether these simple correlations between student demographics and program performance can be partially explained by factors that are potentially under the control of a school (or state). In the remainder of this section, we describe the factors and policies under consideration.

Figure 5: Correlations between Student Outcomes and Demographics: % Female





Notes: Larger circles indicate a larger underlying number of exiters.

C. School-level correlates of student outcomes

At the school-level, we consider the role of both costs and inputs. We use two measures of costs found in the College Scorecard: collected tuition and fees per full-time equivalent (FTE) student and the average cost of attendance for federal student aid recipients.[9] Collected tuition and fees accounts for institutional discounts applied to the sticker price of tuition, while the latter measure includes cost of living expenses and nets out grants from the institution, state, and federal government. We include these measures in our analysis because increases in financial aid and/or reductions in tuition have been shown increase community college enrollment and attainment (e.g., Martorell et al., 2014; Denning, 2017; Denning, Marx, and Turner, 2019; Anderson, 2020; Acton, 2021).

When examining the correlates of net earnings, we also include an indicator for whether the community college participates in federal student loan programs. This measures the extent to which students can access federal loans to finance their college costs.[10] Research suggests that when institutions opt-out of federal loan programs, student attainment is lower (Dunlopc, 2013; Wiederspan, 2016). Fewer than 10 percent of community colleges in our data opt out.

School-level inputs include spending on instruction per full-time-equivalent (FTE) student, per-FTE spending on student services, average faculty salaries, and the percent of faculty that are full-time.[11] While Stange (2012) finds that per-student spending is largely uncorrelated with academic outcomes within the community college sector, reductions in instructional spending following funding shocks to four-year public institutions has been shown to lower attainment (Deming and Walters, 2017).

D. State-level correlates of student outcomes

At the state-level, we consider states with free community college programs and performance-based funding (PBF) policies. We classify a state as either having a first-dollar free community college program, last-dollar program, or no program before 2017.[12] According to Mishory (2018), five states had implemented a first-dollar free community college program by 2017 (Indiana, Louisiana, Mississippi, Oklahoma, and Washington) and an additional five states had a last-dollar free community college program (Delaware, Minnesota, Missouri, Oregon, and Tennessee).

We use data collected by InformEd States on the presence and structure of states' performance-based funding systems.[13] Measures include a binary indicator for whether the state had PBF for community colleges between 2014 and 2016, the percent of funding to community colleges allocated based on performance, indicators for whether the state had bonus funding for adult, low-income, minority, or

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9. Schools can report an average cost of attendance for the academic year or over the length of the largest program. About 90 percent of schools report an academic year average cost of attendance.

10. Loan program participation comes from Cochrane and Szabo-Kubitz (2016).

11. With the except of spending on student services per FTE, all of these measures come from the College Scorecard. We use the 2015 Delta Cost Project data – available at https://deltacostproject.org/delta-cost-data – to construct the remaining measure.

12. Last-dollar free college programs cover any remaining costs after all other sources of grant aid are applied. In these states, students with sufficient grant aid to cover tuition and fees do not receive any monetary benefit from the free college program, although other requirements or supports (e.g., community service, mentoring) may still affect their enrollment, attainment, and post-college outcomes (Carruthers and Fox, 2016). In first-dollar programs, state and federal grant aid can be used to cover living expenses and other non-tuition costs.

13. These data are available at: https://informedstates.org/data.

academically underprepared community college student enrollment over this period, and indicators for whether the state had bonus funding for STEM and health-related fields in community colleges. Evidence on the effects of PBF suggests that linking funding to outcomes can lead to small improvements in retention and graduation (Ortagus et al. 2020).

Finally, we include two measures of overall funding for community colleges: state and local appropriations per FTE in 2015, and the amount of general fund appropriations to all two-year public institutions in the state, averaged over the years 2014 through 2016.[14] Chakrabarti et al. (2020) show that shocks to state public higher education appropriations affect community college students' attainment and student debt levels. Based on this evidence, it is reasonable to expect that state appropriations for community colleges could influence program-level earnings and loan repayment rates.

E. Characteristics of schools and state policies

Table 1 displays the average characteristics of community colleges, where characteristics are presented separately for community colleges that predominantly offered certificates ("predominantly certificate-granting") and those that predominantly offered associate degree programs ("predominantly associate-granting"). Panel A shows that the average NEP at predominantly associate-granting and predominantly certificate-granting community colleges is $8,300 and $8,500, respectively. Median earnings 10 years after college entry are $30,000 for predominantly certificate-granting community colleges and $32,000 for predominantly associate-granting community colleges.[15]

Three years after entering repayment, borrowers have reduced their aggregate loan balance by 1 to 2 percent on average. Approximately 30 percent of borrowers from predominantly certificate-granting community colleges and 38 percent of borrowers from predominantly associate-granting community colleges had made any progress paying down their loans in the first three years of repayment.

Turning to Panel B, close to 60 percent of community college students are women and around 50 percent are first generation students. Students at predominantly certificate-granting community colleges are more likely to be White (62 versus 49 percent), while those in predominantly associate-granting community colleges are more likely to be Asian (7 versus 4 percent) or Hispanic (28 versus 17 percent). About 15 percent of students in each type of community college are Black and 1 percent are Native American or Alaskan Native ("AIAN").

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14. Per-student appropriations were obtained from the Delta Cost Project and total general fund appropriations are from InformEd States.

15. As a point of comparison, average median earnings for high school graduates in the states these institutions are located in are just under $20,000.

Table 1: Community college student outcomes, demographics, costs, and financial aid receipt

Predominant degree =	Certificate		Associate degree	
	(1) Mean	(2) SD	(3) Mean	(4) SD
A. Outcomes				
Net earnings premium ($1k)	8.5	(9.1)	8.3	(7.8)
Med. earnings 10 years after entry (	30.0	(4.2)	32.1	(3.9)
Dollar-based loan repayment rate	0.01	(0.05)	0.02	(0.04)
Borrower-based loan repayment ra	0.30	(0.08)	0.38	(0.09)
B. Student demographics				
Percent female	0.59	(0.05)	0.58	(0.05)
Percent race/ethnicity =				
AIAN	0.01	(0.03)	0.01	(0.04)
Asian	0.04	(0.06)	0.07	(0.08)
Black	0.15	(0.13)	0.16	(0.13)
Hispanic	0.17	(0.20)	0.28	(0.22)
White	0.62	(0.22)	0.49	(0.24)
First generation student	0.51	(0.06)	0.49	(0.06)
C. Costs and financial aid receipt				
Tuition per FTE	$2,044	(1027)	$2,229	(1415)
Average net cost	$12,594	(2028)	$12,749	(2723)
Percent ever received Pell Grant	0.88	(0.07)	0.88	(0.09)
Percent ever received fed. Loans	0.41	(0.19)	0.37	(0.22)
Does not participate in fed loans	0.09		0.08	

Notes: Sample includes 554 predominantly certificate-granting institutions and 683 predominantly associate degree institutions. School-level NEP equals the weighted average of program NEPs in the school. Median earnings 10 years after entry comes from the College Scorecard and applies to all students who had earnings and were not enrolled in a higher education institution 10 years after they entered the school. The dollar-based loan repayment rate is the school-level analogue to the programmatic LRR. The borrower-based repayment rate represents the share of borrowers who reduced their loan balance by at least $1, measured 3 years after entering repayment. Weighted averages and standard deviations by number of program exiters (net earnings premium and dollar-based loan repayment rate), number of former students with earnings 10 years after entering college (median earnings at 10 years), number of borrowers in the repayment cohort (borrower-based loan repayment rate), or number of undergraduate students (Panels B and C).

Collected tuition and fees and the average cost of attendance are similar across predominantly certificate-granting and associate-granting community colleges. Panel C shows that students pay an average of about $2,000 in out-of-pocket costs for tuition and fees, and just under $13,000 in average living expenses. Close to 90 percent of students in each type of community college receive Pell Grants and around 40 percent borrow federal student loans. Between 8 and 9 percent of community college students cannot take out federal loans, however, because they attend an institution that has opted out of participating in these programs.

Table 2 provides descriptive statistics on community college inputs and state-level policies. Panel A shows that per-student spending on instruction averages about $5,000 and faculty are paid between $7,000 and $8,000 per month (or $63,000 to $69,000 for a 9-month academic year), on average. Around 45 percent of faculty are full-time at both types of community colleges. Five percent of predominantly associate-granting community colleges are in states with first-dollar free community college programs before 2017 and 7 percent are located in states that with last-dollar free community college programs. However, 44 percent of predominantly certificate-granting community colleges are in a state with a first-dollar free community college program.[16]

Table 2: Community college inputs and state characteristics

Predominant degree =	Certificate		Associate degree	
	(1) Mean	(2) SD	(3) Mean	(4) SD
A. Inputs				
Instructional spending per FTE	$5,023	(2444)	$5,340	(1653)
Average monthly faculty salary	$7,003	(1999)	$7,742	(1641)
Percent faculty full-time	0.44	(0.24)	0.46	(0.27)
B. State characteristics				
Free community college program				
First dollar	0.44		0.05	
Last dollar	0.02		0.07	
Performance based funding				
Any	0.66		0.56	
Percent from PBF	0.07	(0.14)	0.06	(0.16)
Bonus for				
Adults	0.13		0.22	
Low-income	0.60		0.43	
Minority	0.11		0.14	
Acad. disadvantaged	0.56		0.37	
STEM	0.55		0.39	
Health	0.12		0.30	
State funding for CCs ($1m)	$1,049	(1747)	$1,562	(1878)

Notes: Sample includes 554 predominantly certificate-granting institutions and 683 predominantly associate degree institutions. Weighted averages and standard deviations (for non-binary measures) by number of undergraduate students.

Finally, the majority of community colleges are located in states with performance-based funding. Specifically, 66 percent of predominantly certificate-granting community colleges and 56 percent of

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16. Most free community college programs have explicit restrictions on the length of time students can take-up the benefits after graduating from high school. To the extent that sub-associate degree seeking students are more likely to be non-traditional aged students, fewer than 44 percent will be eligible for the program.

predominantly associate-granting community colleges are in states with some form of performance-based funding. Yet, on average, less than one tenth of state funding is tied to performance.[17]

Most states with PBF provide additional funding based on enrollment of low-income students and academically disadvantaged students and for STEM-focused programs. Predominantly certificate-granting community colleges are in states that provide around $1 billion to the community college sector (about $1,600 per student) while predominantly associate-granting community colleges are in states that provide close to $1.6 billion (about $1,800 per student).

IV. Correlates of community college program performance

Student demographic characteristics are correlated with program-level Net Earnings Premiums and Loan Repayment Rates. We quantify these raw correlations in Table 3, which presents results from weighted ordinary least squares (OLS) regressions of the outcome measures (NEP and LRR) on the racial/ethnic and gender composition of students within a program. Appendix A contains additional information on these methods.

For each demographic group, the point estimate can be interpreted as the change in expected net earnings (Panel A) or loan repayment (Panel B) when moving from a program with the average share of students in that group to a program with a 10-percentage point higher share of students in that group (relative to White or male students). For example, 14 percent of students in associate degree programs are, on average, Black, while 68 percent are White. Column 2 in Table 3 (Panel A) shows a point estimate of -0.349 for "% Black." This means that an associate degree program with 24 percent Black students and 58 percent White students is predicted to have a net earnings premium that is $349 lower relative to a program with average enrollment shares of White and Black students.

These estimates suggest that a program's race/ethnicity and gender composition are significantly correlated with program-level net earnings and loan repayment. The *R*-squared of each regression can be interpreted as the percent of variation in the outcome that is explained by the included regressors. Panel A of Table 3 shows that student demographic characteristics explain less than 2 percent of the variation in associate degree program net earnings and less than 8 percent of certificate program net earnings. Student demographics explain between 14 and 20 percent of the variation in loan repayment.

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17. That said, in three states, the majority of funding for community colleges is based on performance: Tennessee (80 percent), Ohio (83.3 percent), and North Dakota (100 percent).

Table 3: Correlations between Program Demographics and Student Outcomes

	(1) Certificate	(2) Associate	(3) Combined
A. Net earnings ($1k)			
% Asian	-1.417	0.627	0.047
	(1.235)	(0.642)	(0.596)
% Black	-0.245	-0.349	-0.301
	(0.193)	(0.157)*	(0.134)*
% Hispanic	0.272	-0.780	-0.418
	(0.385)	(0.197)**	(0.243)+
% AIAN	-5.734	1.421	-0.404
	(2.085)**	(1.169)	(1.123)
% Female	-0.608	-0.040	-0.396
	(0.107)**	(0.175)	(0.108)**
R-squared	0.078	0.018	0.019
Number of programs	1,228	2,708	3,936
B. Loan repayment rate			
% Asian	-0.003	0.001	0.001
	(0.006)	(0.002)	(0.002)
% Black	-0.015	-0.016	-0.015
	(0.001)**	(0.001)**	(0.001)**
% Hispanic	-0.003	-0.008	-0.007
	(0.003)	(0.001)**	(0.001)**
% AIAN	-0.002	-0.019	-0.010
	(0.004)	(0.005)**	(0.005)+
% Female	-0.004	-0.005	-0.004
	(0.001)**	(0.001)**	(0.0005)**
R-squared	0.138	0.203	0.168
Number of programs	2,813	7,792	10,605

Notes: Point estimates and standard errors from regressions of the outcome measure on the race/ethnicity and gender composition of a program. Each point estimate represents the predicted change in the outcome due to a 10-percentage point increase in the representation of that group (relative to % White students for race/ethnicity and relative to % male students for % female). Observations are weighted to reflect the distribution of students across all programs at the specified credential level. Robust standard errors clustered by institution; $**\ p < 0.01$, $*\ p < 0.05$, $+\ p < 0.10$.

We next turn to see whether the correlation between student demographics and program outcomes can be accounted for by program-, school-, and state-level factors and the extent to which these factors explain the remaining variation in outcomes. If, for instance, community colleges that serve more female or underrepresented minority students also offer a different mix of programs, spend less on instruction,

charge higher tuition, or are located in states with less beneficial policies, then the magnitude of the correlation between race and outcomes should fall as we control for these factors.

We conduct these analyses by sequentially adding variables to the baseline models we estimate in Table 3. In total, we add three sets of control variables to the model. The first set of controls add measures of institutional inputs and costs (Panel C of Table 1 and Panel A of Table 2). The next set of controls are for field of study, and the final set of controls are for state-level policies (Panels B and C of Table 2). Point estimates and significance levels for each racial/ethnic group and outcome measure are presented in Figures 6 and 7. In both figures, estimates for certificate programs and associate programs are presented in Panels A and B, respectively.

Figure 6 shows the associations between program-level race/ethnicity compositions and net earnings. The baseline model estimates – represented by the light blue bars in Figure 6 – correspond to the estimates from a regression of net earnings on the race/ethnic composition of programs shown in Table 3. The first set of controls we add to the baseline model are for institution-level inputs and costs. These variables, for example, account for the extent to which prices and institutional spending vary with student demographics. The strength of the association between race/ethnicity and NEP declines for both certificate and associate degree programs after accounting for institutional factors. For associate degree programs, the magnitude of the association between the share of students in a program who are Black and net earnings falls by 18 percent after accounting for institution-level factors. The magnitude of the association between the share Hispanic and program NEP falls by 10 percent. Changes in these associations for certificate programs are less pronounced, although the raw association between net earnings and program demographics are generally smaller.

The third specification controls for field of study. These controls account for the possibility that some schools may offer more programs that lead to high earnings – such as health and STEM – whereas others might have more program offerings in less-lucrative fields in the arts, public service, or humanities. Accounting for field of study reverses the association between net earnings and the share of Black and share of Hispanic students in an associate degree program. Specifically, within a given field of study, an associate degree program with relatively more Black students is predicted to have significantly *higher* net earnings than one with more White students. This finding suggests that within a given field of study, earnings outcomes are not necessarily worse (and may in fact be better) when a program has higher URM enrollment. Second, it suggests that field of study itself is correlated with the share of students who are underrepresented minorities and that Black and Hispanic students are more likely to enroll in programs where students have low post-college net earnings. Student demographics only explain 2 percent of the variation in net earnings demographics, but when combined with school inputs and field of study, over 65 percent of the variation is explained.[18]

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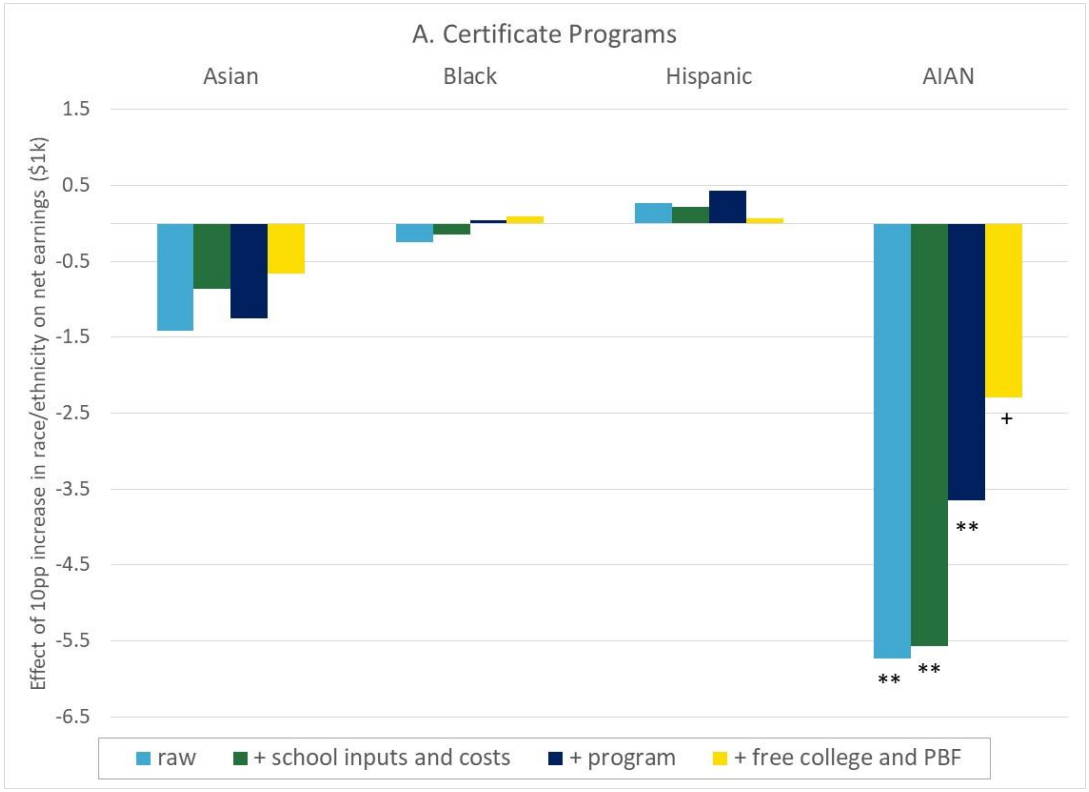
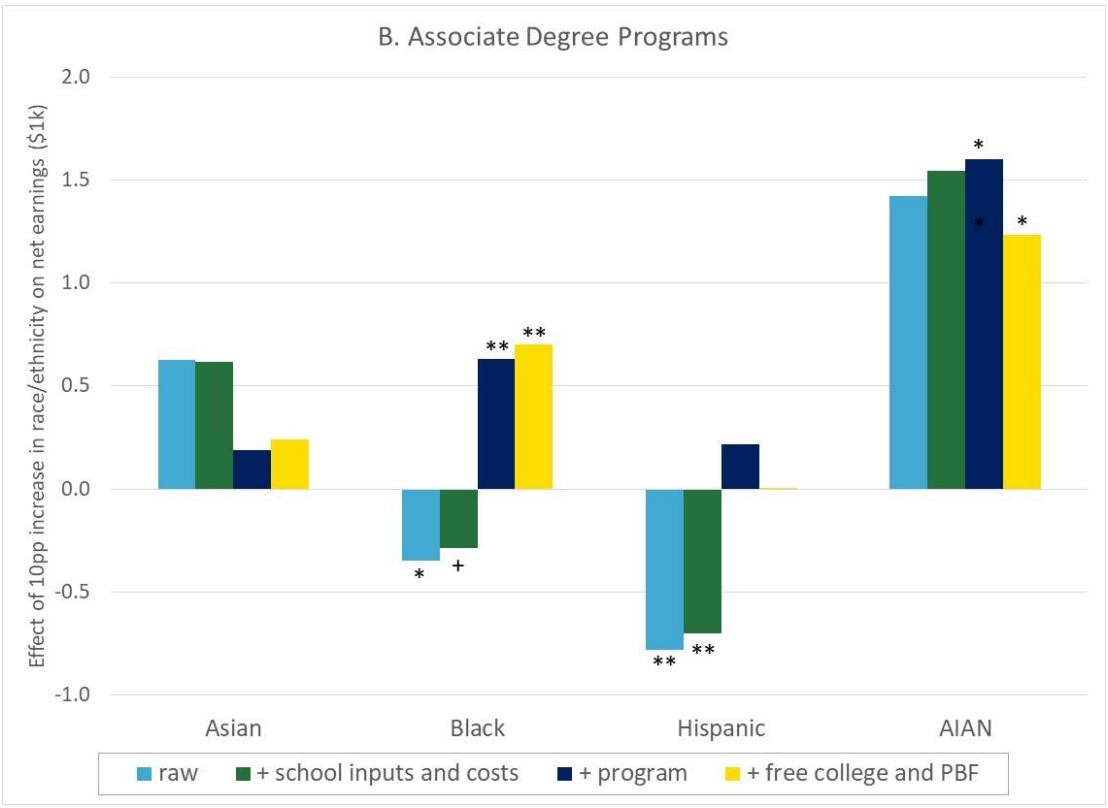
18. The R-squared indicates the share of variation in the outcome that is explained by covariates. Table 3, Panel A, Column 2 shows that a regression of net earnings on student demographics results in an R-squared of 0.02. After adding controls for school inputs and field of study, the R-squared increases to 0.656 (Appendix Table B.2, specification 3).

Figure 6: Correlations Between Student Race/Ethnicity and Program Net Earnings





Notes: See Appendix B for full list of estimates and for the covariates included in each model.

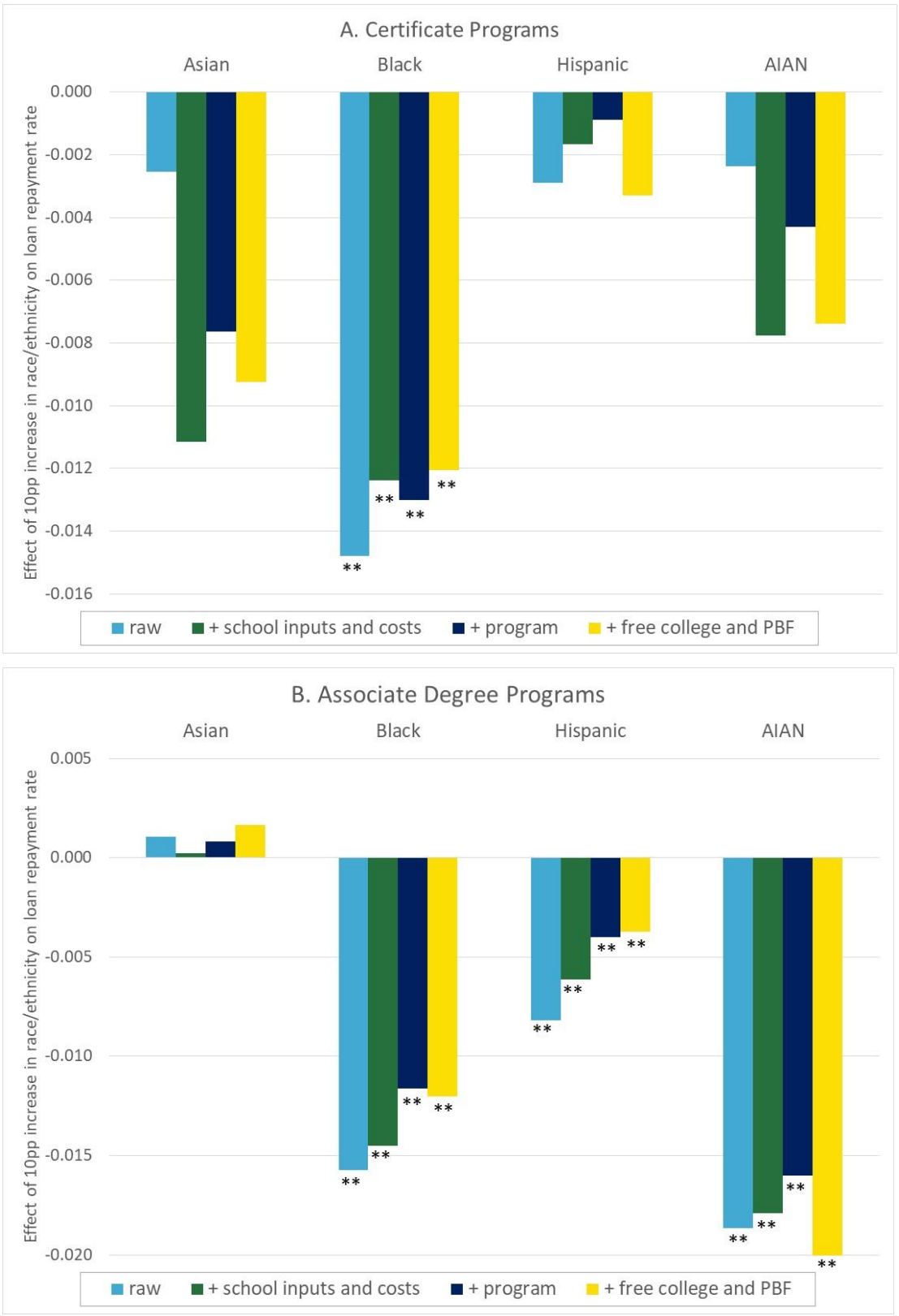
For certificate programs, associations between the share of students who are Black and who are Hispanic continue to be small but are both positive after controlling for field of study. The negative association between the American Indian/Alaskan Native share of students remains but falls by 35 percent.

The final set of controls we include are for state-level funding (including performance-based funding) and free college policies. Estimates from this fully-specified model are depicted by the yellow bars. We observe a positive association between the share of students in associate programs that are Black and program-level NEP. A ten-percentage point difference in the share of Black students in an associate degree program corresponds to $700 *higher* predicted net earnings after controlling for all of the observable factors described above. We observe similar positive associations for programs with more American Indian/Alaskan Native students at the associate degree level. For certificate programs, the share of students who are American Indian or Alaskan Native continues to have a marginally significant ($p < 0.10$) negative association with net earnings, but the size of this relationship falls by an additional 37 percent once state-level factors are taken into account.

We now turn to the loan repayment rate metric; estimates are shown in Figure 7. We find strong negative associations between loan repayment and nearly all race/ethnicity categories for both associate and certificate programs. In the fully specified model – controlling for school inputs and costs, program types and mixture, and state-level policies – we see that increases in the share of certificate program students who are Black continues to have a strong negative association with loan repayment (Panel A). Controlling for school-level inputs leads to a 16 percent reduction in the magnitude of this association. In contrast to the patterns shown in Figure 6, however, additional controls for program of study and state-level policies do not lead to further reductions. The share of Black, Hispanic, and Native American students in associate degree programs is also associated with statistically significant lower loan repayment (Panel B). For associate degree programs, however, institutional inputs and field of study can explain some of this relationship – controlling for both sets of factors reduces the size of the association between loan repayment and the share of students who are Black by 26 percent, the share Hispanic by 51 percent, and the share AIAN by 14 percent.

Taken together, the estimates from Figures 6 and 7 suggest that the raw differences in predicted earnings outcomes (and to some extent loan repayment outcomes for associate degree programs) for programs with high and low shares of underrepresented minority students could be explained by differences in (A) the mixture of programs offered by community colleges with high and low shares of underrepresented minorities, and/or (B) differences in the within-school distribution of underrepresented minorities and White students across programs. We explore the importance of each of these two channels by examining whether there are systematic differences in the program offerings at community colleges with large and small shares of underrepresented minority students.

Figure 7: Correlations Between Student Race/Ethnicity and Program Loan Repayment Rate



Notes: See Appendix B for full list of estimates and for the covariates included in each model.

As there are more than 80 unique field of study by credential level categories, we create two broader groupings of programs. First, we divide programs into five groups (quintiles) based on average net earnings (shown in Figure 1), pooling associate and certificate programs. Second, roughly following Carnevale (2020), we create 15 categories of broad field of study by credential level groups (e.g., Allied Health, STEM, Liberal Arts, etc.). Appendix C contains additional information on the construction of these groupings.[19]

Programs in the top 20 percent of net earnings typically have an average NEP of $12,500 or more. This group includes associate degree programs in construction, engineering technology, Allied Health, and science technology, as well as certificate programs in engineering technology, protective services, and construction. Conversely, programs in the bottom 20 percent of net earnings have low—and sometimes negative—average earning premiums and include service and education certificate programs as well as education and consumer science associate degree programs. A full breakdown of programs by NEP quintile is shown in Appendix C.

Next, we divide institutions into four equal-sized groups (quartiles) based on the share of students who are underrepresented minorities. At least 57 percent of students enrolled in schools in the top quartile are underrepresented minorities while in the bottom quartile, URM students make up less than 23 percent of the student body. For each of these four groups of institutions, we calculate the share of program seats in each net earnings quintile (Table 4).[20] If program offerings did not vary with the race/ethnicity of the student body, we would expect to see around 20 percent of program seats in each net earnings quintile.[21]

In fact, the availability of programs with the highest net earnings decreases as we move from schools with low URM enrollment to those with high URM shares. For institutions serving the lowest share of URM students, 24 percent of program offerings are those with the highest average net earnings premium, and just seven percent of programs at these institutions are programs with the lowest average net earnings premium. Conversely, at institutions that serve the highest concentration of URM students, just 16 percent of programs that are offered are programs with the highest earnings premiums, while 12 percent of programs at these institutions are programs with the lowest expected NEP. Said differently, institutions that enroll the largest shares of minority students tend to offer fewer programs with high earnings premia. Relative to institutions that enroll mostly White students, these community colleges tend to offer more seats in programs that have lower net earnings, on average.

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19. There is a good deal of overlap between programs in the top two net earnings quintiles and programs classified as skilled trades, STEM, allied health, and protective services. Almost all programs in the bottom quintile are classified as consumer and public services, liberal arts, and business

20. Shares are based on the number of completers, which is a reasonable proxy for the number of available seats in a given field and degree or credential program.

21. In theory, the bottom quintile should also have approximately 20 percent of students. In practice, around 27 percent of community college students enroll in a liberal arts/general studies associate degree program, which leads to an uneven distribution of enrollment in programs between the second to last and bottom quintiles.

Table 4: Program Offerings by Share Underrepresented Minority Quartile

Quartile URM enrollment:	Bottom quartile: Schools w/ the smallest share of URM students (< 23% URM)	Second quartile (23 - 37%)	Third quartile (38 - 56%)	Top quartile: schools with the highest share of URM students (> 56%)
Net earnings quintile:				
Top quintile (NEP > $12,150)	24%	20%	19%	16%
Fourth quintile ($7,450 - $12,150)	23%	19%	17%	15%
Third quintile ($2,870 - $12,150)	20%	24%	28%	27%
Second quintile* ($2,670 - $2,870)	26%	27%	26%	30%
Bottom quintile (< $2,670)	7%	10%	10%	12%

Notes: This table displays the share of program seats by program earnings quintile in a school, where schools are divided into four equally sized groups (quartiles) based on the share of students who are underrepresented minorities. Schools in the lowest quartile are those with URM enrollment making up less than 23 percent of the student body. Schools in the second and third quartiles are those with URM students making up 23-37% and 38-56% of all students, respectively. Schools in the top quartile are those with URM students making up more than 56 percent of the student body. Earnings quintiles are based on the distribution of programs (2-digit CIP by credential level) by average NEP (see Figure 1 and Appendix B). The range of average net earnings for each quintile is shown below each (row) category. *The second quintile only includes liberal arts/general studies associate degree programs, which enroll approximately 27 percent of community college students. As a result, programs in the bottom quintile contain about 10 percent of all community college students. N = 1239 schools.

We next turn to look at specific fields of study and credentials. Table 5 focuses on schools at the top and bottom of the distribution of URM enrollment, using the same quartiles as Table 4. For this analysis, we group programs into broad fields of study (see Appendix C for details). The first two columns show the percent of program offerings in the broad field and credential level. The third column illustrates the difference in availability of each program group. For instance, the relative availability of skilled trades associate degree programs is almost three times greater in schools that have the lowest concentration of URM students compared to schools with the highest. Schools with the lowest share of URM students offer twice as many STEM associate degree seats as those serving the most URM students.

Table 5: Specific Program Offerings by Share URM Quartile

	Q1	*Q4*	*Q1 to Q4 ratio*
By broad field of study and credential			
Skilled trades associate	0.03	0.01	2.89
Allied health certificate	0.14	0.06	2.10
Allied health associate	0.12	0.08	1.52
Skilled trades certificate	0.08	0.05	1.52
STEM associate	0.06	0.04	1.40
STEM certificate	0.04	0.04	1.14
Business associate	0.06	0.06	0.99
Liberal arts/GS associate	0.26	0.29	0.87
Business certificate	0.04	0.05	0.82
Service associate	0.07	0.09	0.80
Law/protection associate	0.00	0.00	0.80
Service certificate	0.05	0.08	0.57
Lib. Arts/humanities/soc sci. cert.	0.02	0.04	0.56
Law/protection certificate	0.00	0.00	0.38
Social science associate	0.02	0.08	0.23

Note: Q1 URM enrollment = (0, 0.23); Q4 = [0.57, 1). See Appendix C for programs in each net earnings quintile.

Taken together, Tables 4 and 5 suggest that school-level differences in the availability of programs in the skilled trades, STEM fields, and Allied Health – which typically have the highest net earning premiums, on average – likely contribute to the negative correlation between student demographics and program level outcomes.

V. Conclusion

The evidence presented in this study reveals the complexity in regulating the community college sector. Institution-level accountability measures – such as the Cohort Default Rate or institutional accreditation – ignore the wide variation in student outcomes across different programs and fields of study. But even accountability measures that are specific to programs – such as the GE rule – raise potential concerns. This is because many factors correlate with student outcomes. Some of these factors are under the control of the institution, while other are not.

In particular, community colleges do not have control over the students they enroll. Similarly, community colleges do not have control over their geographic location or strength of the surrounding labor market. These factors may be important determinants of a students' future economic success but are outside of the scope of what could be changed by a federal accountability. Moreover, programs located within institutions that serve large shares of underrepresented students could be unfairly punished by program-level accountability metrics, since the students that attend these institutions will likely face greater challenges in the labor market, all else equal.

At the same time, the fact that community colleges provide access to low-income and minority students underlines the importance of ensuring these students receive some benefit from enrolling. While earnings and employment are far from the only benefits of attending college, students who enter college with few resources should expect to see some economic benefit in return for their time and money. Indeed, our findings suggest that community colleges *do* have control over other important factors that can improve students' economic circumstances. For example, community colleges and state higher education leaders have some control over the types and mixture of programs they offer (or encourage students to enroll in), the mix of full-time/adjunct faculty they hire, spending on instruction and student services, and, at the state-level, the amount and structure of community college funding. As we demonstrate, these factors are correlated with student outcomes.

On balance, we find that demographics are *not* destiny for program-level outcomes in the community college sector. Negative associations between program-level demographics and earnings shrink after controlling for a rich set of program-, institution-, and state-level factors. An important contributor to the differences in outcomes between Black and White students at community colleges appears to be the programs of study they are offered rather than the characteristics of students themselves.

Regulating the community college sector is an inherently tricky business, but we find that community colleges have room to improve when it comes to the labor market outcomes of their former students.

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APPENDIX A: METHODS

The goal of this paper is to examine characteristics and policies associated with community college students' earnings and loan repayment outcomes. To do so, we estimate four ordinary least squares (OLS) models. Each model iteratively adds new sets of control variables. Models are run separately for certificate and associate degree programs and for the pooled set of programs. In all cases, observations are weighted to account for missing data on earnings and loan repayment such that the set of programs with nonmissing data is representative of all programs nationwide when weights are used.[1] We calculate robust standard errors that are clustered at the institution-level.

Model 1 regresses the outcome variables (LRR and NEP, respectively) on the percentage of students in the program by race/ethnicity (percent White is the omitted category) and by gender (percent male is the omitted category). *Y* is the outcome of program *p* with credential level *c*, *Race* is a vector of control variables for program *p*'s racial/ethnic, *Gender* is the percent of students in program *p* that are women, and e is the error term. Standard errors are clustered at the institution level.

$$Y_{pc} = \beta_0 + \beta_1 Race_{pc} + \beta_2 Gender_{pc} + u_{pc} \quad (1)$$

Model 2 adds a vector of control variables for institutional characteristics (X_j) and Model 3 adds a vector of program fixed effects or program by credential level fixed effects in the pooled model (CIP_p). Model 4 adds controls for state characteristics (Z_s). u_{pc} is the residual from each regression.

$$Y_{pc} = \beta_0 + \beta_R Race_{pc} + \beta_G Gender_{pc} + \beta_X X_j + u_{pc} \quad (2)$$

$$Y_{pc} = \beta_0 + \beta_R Race_{pc} + \beta_G Gender_{pc} + \beta_X X_j + \beta_{CIP} CIP_{pc} + u_{pc} \quad (3)$$

$$Y_{pc} = \beta_0 + \beta_R Race_{pc} + \beta_G Gender_{pc} + \beta_X X_j + \beta_{CIP} CIP_{pc} + \beta_{St} Z_s + u_{pc} \quad (4)$$

The estimates from these four regression models correspond to the four bars in Figures 6 and 7. Specifically, Equation 1 is the model for the "Raw" estimates; Equation 2 is the model for the "+ School inputs and costs" estimates; Equation 3 is the model for the "+ Programs" estimates; Equation 4 is the model for the "+Free College and PBF" estimates.

A small number of schools are missing data used to construct specific covariates. In these cases, we include an indicator for whether this variable is missing and set the value of the variable equal to zero.[2]

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1. See Matsudaira and Turner (2020) for additional details on the construction of these weights.

2. Specifically, 5 percent of programs (6 percent of students) are in schools missing information on state and local appropriations, 3 percent of programs (2 percent of students) are in schools without information on spending on student services, 5 percent of programs (2 percent of students) are in schools without data on the percent of faculty that are full-time, and 4 percent of programs (2 percent of students) are missing data on faculty salaries. Finally, information on state general fund appropriations to community colleges is missing for 0.5 percent of programs (N = 53) because this data is not available in the state of South Dakota.

APPENDIX B: ADDITIONAL TABLES AND FIGURES

Table B.1: Correlations between Certificate Program Net Earnings and Student, School, and State Characteristics

	(1)	(2)	(3)	(4)
R-squared	0.078	0.151	0.405	0.435
% Asian	-1.417	-0.857	-1.248	-0.656
	(1.235)	(1.363)	(1.031)	(0.938)
% Black	-0.245	-0.150	0.044	0.092
	(0.193)	(0.188)	(0.168)	(0.174)
% Hispanic	0.272	0.220	0.437	0.070
	(0.385)	(0.313)	(0.296)	(0.328)
% AIAN	-5.734	-5.573	-3.650	-2.296
	(2.085)**	(1.983)**	(1.292)**	(1.236)+
% Female	-0.608	-0.699	-1.412	-1.413
	(0.107)**	(0.102)**	(0.338)**	(0.343)**
Average net cost ($1k)		-0.062	0.046	0.017
		(0.169)	(0.147)	(0.141)
T&F per FTE ($1k)		0.895	0.724	0.929
		(0.250)**	(0.244)**	(0.224)**
Fed loan opt-out		-2.387	-1.433	-0.794
		(1.039)*	(1.046)	(1.103)
Instr. spend/FTE ($1k)		-0.256	-0.240	-0.262
		(0.128)*	(0.120)*	(0.143)+
Student svc. spend/FTE ($1k)		-0.202	-0.724	-0.554
		(0.718)	(0.651)	(0.754)
Faculty salary ($1k)		-0.016	0.008	0.202
		(0.417)	(0.314)	(0.335)
% faculty FT		1.433	1.690	2.047
		(2.342)	(1.942)	(2.024)
Free college - first dollar				-0.293
				(1.293)
Free college - last dollar				-3.682
				(1.196)**
State + local approps/FTE ($1k)				-0.079
				(0.123)
State CC budget ($1m)				0.001
				(0.0005)
Any PBF				-0.839
				(1.325)
Percent budget BPF				-0.163
				(2.487)
PBF bonus: low income				-0.740
				(1.59)
PBF bonus: adults				-2.457
				(1.893)
PBF bonus: URM				2.110
				(1.882)
PBF bonus: acad. disadvantaged				2.913
				(1.532)+
PBF bonus: STEM				0.369
				(2.061)
PBF bonus: health				2.958
				(2.238)
Field of study FE			X	X
Number of programs	1,228	1,228	1,228	1,228

Table B.2: Correlations between Associate Program Net Earnings and Student, School, and State Characteristics

	(1)	(2)	(3)	(4)
R-squared	0.018	0.021	0.656	0.669
% Asian	0.627	0.619	0.187	0.240
	(0.642)	(0.651)	(0.498)	(0.536)
% Black	-0.349	-0.287	0.630	0.700
	(0.157)*	(0.162)+	(0.134)**	(0.120)**
% Hispanic	-0.780	-0.703	0.217	0.004
	(0.197)**	(0.208)**	(0.230)	(0.232)
% AIAN	1.421	1.545	1.599	1.234
	(1.169)	(1.171)	(0.631)*	(0.599)*
% Female	-0.040	-0.028	-1.401	-1.394
	(0.175)	(0.176)	(0.296)**	(0.275)**
Average net cost ($1k)		-0.080	-0.137	-0.123
		(0.114)	(0.095)	(0.092)
T&F per FTE ($1k)		0.291	0.356	0.523
		(0.163)+	(0.132)**	(0.141)**
Fed loan opt-out		2.527	0.987	1.228
		(1.368)+	(0.961)	(1.015)
Instr. spend/FTE ($1k)		0.025	-0.230	-0.277
		(0.155)	(0.139)+	(0.155)+
Student svc. spend/FTE ($1k)		0.029	-0.020	-0.171
		(0.510)	(0.473)	(0.524)
Faculty salary ($1k)		-0.006	0.367	0.295
		(0.240)	(0.222)+	(0.218)
% faculty FT		0.284	0.681	1.042
		(1.280)	(1.137)	(1.253)
Free college - first dollar				-0.713
				(0.739)
Free college - last dollar				-0.577
				(0.862)
State + local approps/FTE ($1k)				-0.034
				(0.146)
State CC budget ($1m)				0.0003
				(0.0004)
Any PBF				1.860
				(0.949)+
Percent budget BPF				-2.841
				(2.259)
PBF bonus: low income				1.565
				(1.049)
PBF bonus: adults				-0.100
				(1.528)
PBF bonus: URM				-0.138
				(1.264)
PBF bonus: acad. Disadvantaged				-0.667
				(0.98)
PBF bonus: STEM				-0.486
				(1.56)
PBF bonus: health				-0.339
				(1.626)
Field of study FE			X	X
Number of programs	2,708	2,708	2,708	2,708

Table B.3: Correlations between Certificate Program Loan Repayment and Student, School, & State Characteristics

	(1)	(2)	(3)	(4)
R-squared	0.138	0.211	0.243	0.272
% Asian	-0.003	-0.011	-0.008	-0.009
	(0.006)	(0.007)+	(0.007)	(0.007)
% Black	-0.015	-0.012	-0.013	-0.012
	(0.001)**	(0.002)**	(0.002)**	(0.002)**
% Hispanic	-0.003	-0.002	-0.001	-0.003
	(0.003)	(0.003)	(0.003)	(0.003)
% AIAN	-0.002	-0.008	-0.004	-0.007
	(0.004)	(0.005)	(0.005)	(0.007)
% Female	-0.004	-0.004	-0.007	-0.006
	(0.001)**	(0.001)**	(0.002)**	(0.002)**
Average net cost ($1k)		0.003	0.002	0.002
		(0.002)	(0.002)	(0.002)
T&F per FTE ($1k)		0.001	0.001	0.002
		(0.003)	(0.003)	(0.003)
Instr. spend/FTE ($1k)		0.003	0.003	0.001
		(0.001)*	(0.001)*	(0.001)
Student svc. spend/FTE ($1k)		0.010	0.009	0.002
		(0.004)*	(0.004)*	(0.005)
Faculty salary ($1k)		0.005	0.005	0.005
		(0.002)*	(0.002)*	(0.002)*
% faculty FT		-0.016	-0.016	-0.015
		(0.011)	(0.011)	(0.009)+
Free college - first dollar				-0.002
				(0.009)
Free college - last dollar				0.001
				(0.011)
State + local approps/FTE ($1k)				0.003
				(0.001)*
State CC budget ($1m)				0.000002
				(0.000004)
Any PBF				-0.008
				(0.011)
Percent budget BPF				0.036
				(0.026)
PBF bonus: low income				0.057
				(0.016)**
PBF bonus: adults				-0.049
				(0.016)**
PBF bonus: URM				0.023
				(0.011)*
PBF bonus: acad. Disadvantaged				0.017
				(0.013)
PBF bonus: STEM				-0.088
				(0.017)**
PBF bonus: health				0.059
				(0.016)**
Number of programs	2,813	2,813	2,813	2,813

Table B.4: Correlations between Associate Program Loan Repayment and Student, School, and State Characteristics

	(1)	(2)	(3)	(4)
R-squared	0.203	0.251	0.358	0.407
% Asian	0.001	0.0002	0.001	0.002
	(0.002)	(0.002)	(0.002)	(0.002)
% Black	-0.016	-0.014	-0.012	-0.012
	(0.001)**	(0.001)**	(0.001)**	(0.001)**
% Hispanic	-0.008	-0.006	-0.004	-0.004
	(0.001)**	(0.001)**	(0.001)**	(0.001)**
% AIAN	-0.019	-0.018	-0.016	-0.021
	(0.005)**	(0.005)**	(0.004)**	(0.005)**
% Female	-0.005	-0.005	-0.009	-0.008
	(0.001)**	(0.001)**	(0.001)**	(0.001)**
Average net cost ($1k)		0.001	0.001	0.001
		(0.001)	(0.001)	(0.001)
T&F per FTE ($1k)		0.003	0.004	0.003
		(0.002)*	(0.002)*	(0.002)*
Instr. spend/FTE ($1k)		0.003	0.002	0.002
		(0.001)**	(0.001)**	(0.001)
Student svc. spend/FTE ($1k)		0.006	0.007	0.004
		(0.003)+	(0.003)*	(0.003)
Faculty salary ($1k)		-0.001	-0.00003	0.002
		(0.002)	(0.002)	(0.002)
% faculty FT		-0.001	-0.001	-0.003
		(0.006)	(0.006)	(0.006)
Free college - first dollar				-0.014
				(0.006)*
Free college - last dollar				-0.029
				(0.009)**
State + local approps/FTE ($1k)				0.002
				(0.001)+
State CC budget ($1m)				-0.00001
				(0.000002)**
Any PBF				-0.024
				(0.007)**
Percent budget BPF				0.048
				(0.021)*
PBF bonus: low income				0.036
				(0.009)**
PBF bonus: adults				-0.067
				(0.012)**
PBF bonus: URM				0.018
				(0.007)*
PBF bonus: acad. Disadvantaged				0.039
				(0.008)**
PBF bonus: STEM				-0.066
				(0.012)**
PBF bonus: health				0.055
				(0.011)**
Field of study FE			X	X
Number of programs	7,792	7,792	7,792	7,792

APPENDIX C: FIELD OF STUDY GROUPINGS

Appendix Table C.1A: CIP Groupings of Certificate Programs

CIP Grouping	2-digit CIP	2-digit CIP Label
(1) Skilled trades	47	Mechanic Tech
	48	Precision Prod
	46	Construction
	49	Transportation
(2) Business	52	Business
(3) Consumer and Public Services	31	Parks/Rec
	9	Communication
	50	Arts
	10	Comm Tech
	25	Library Sci
	13	Education
	44	Public Admin
	12	Services
	19	Consumer Sci
(4) Law/Protective Svc	22	Law
	43	Protective Svc
(5) Health	51	Allied Health
(6) Liberal Arts, Humanities, and Social Sciences	5	Area Studies
	24	Liberal Arts/GS
	30	Interdisciplinary
	23	English
	42	Psych
	16	Foreign Lang
	45	Social Sci
	38	Philosophy
	39	Theology
	54	History
(7) STEM	14	Engineering
	41	Science Tech
	15	Engineering Tech
	11	CIS
	4	Architecture
	26	Biology
	27	Math/Stat
	40	Physical Sci
	1	Agriculture
	3	Nat Resources

Appendix Table C.1B: CIP Groupings of Associate Degree Programs

CIP Grouping	2-digit CIP	2-digit CIP Label
(1) Skilled trades	48	Precision Prod
	47	Mechanic Tech
	49	Transportation
	46	Construction
(2) Business	52	Business
(3) Consumer and Public Services	44	Public Admin
	9	Communication
	10	Comm Tech
	25	Library Sci
	31	Parks/Rec
	50	Arts
	13	Education
	12	Services
	19	Consumer Sci
(4) Law and Protective Svc	22	Law
	43	Protective Svc
	29	Military Tech
(5) Health	51	Allied Health
(6) Humanities and Social Sciences	38	Philosophy
	45	Social Sci
	5	Area Studies
	23	English
	42	Psych
	16	Foreign Lang
	54	History
	30	Interdisciplinary
	39	Theology
(7) Liberal Arts/Gen. Studies	24	Liberal Arts/GS
(8) STEM	27	Math/Stat
	41	Science Tech
	11	CIS
	14	Engineering
	40	Physical Sci
	26	Biology
	4	Architecture
	15	Engineering Tech
	3	Nat Resources
	1	Agriculture

Appendix Table C.2: Major Fields of Study by Net Earnings Premium Quintile

Quintile	2-digit CIP	Field by credential	Broad field of study grouping
1	46	Construction AA	Skilled trades
1	15	Engineering Tech AA	STEM
1	51	Allied Health AA	Allied health
1	15	Engineering Tech Cert	STEM
1	43	Protective Svc Cert	Law/protective services
1	41	Science Tech AA	STEM
1	48	Precision Prod AA	Skilled trades
1	46	Construction Cert	Skilled trades
1	49	Transportation Cert	Skilled trades
1	11	CIS AA	STEM
2	47	Mechanic Tech AA	Skilled trades
2	11	CIS Cert	STEM
2	51	Allied Health Cert	Allied health
2	1	Agriculture AA	STEM
2	48	Precision Prod Cert	Skilled trades
2	22	Law AA	Law/protective services
2	43	Protective Svc AA	Law/protective services
3	30	Interdisc. AA	Humanities/social sciences
3	52	Business AA	Business
3	1	Agriculture Cert	STEM
3	52	Business Cert	Business
3	47	Mechanic Tech Cert	Skilled trades
3	26	Biology AA	STEM
3	24	Liberal Arts/GS Cert	Lib. arts/humanities/soc. sci.
3	12	Services AA	Consumer/public services
3	45	Social Sci AA	Humanities/social sciences
3	44	Public Admin AA	Consumer/public services
3	9	Communication AA	Consumer/public services
4	24	Liberal Arts/GS AA	Liberal arts/general studies
5	44	Public Admin Cert	Consumer/public services
5	42	Psych AA	Humanities/social sciences
5	3	Nat Resources AA	STEM
5	40	Physical Sci AA	STEM
5	50	Arts AA	Consumer/public services
5	50	Arts Cert	Consumer/public services
5	10	Comm Tech AA	Consumer/public services
5	13	Education AA	Consumer/public services
5	19	Consumer Sci AA	Consumer/public services
5	19	Consumer Sci Cert	Consumer/public services
5	10	Comm Tech Cert	Consumer/public services
5	12	Services Cert	Consumer/public services
5	13	Education Cert	Consumer/public services

Notes: Only programs with at least 4000 students enrolled nationwide are listed (all programs are included in analyses). Q1 = programs with the highest net earnings, Q5 = lowest net earnings. AA = associate degree.

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