# Institutional Determinants of Labor Market Outcomes for Community College Students in North Carolina

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## Abstract

**Objective:** The labor market success of community college students depends on both the attributes of individual students and the characteristics of the community colleges they attend. In this article, we examine the impact of community college characteristics on the earnings of first-time college students who enrolled in the North Carolina Community College System in 2002-2003.

**Method:** We estimate multilevel models that incorporate variables representing institutional features of community colleges along with individual characteristics obtained from student-level administrative college transcript data, Unemployment Insurance wage data, and enrollment and graduation data from the National Student Clearinghouse across 830,000 community college students between 2001 and 2010.

**Results:** We find that a number of characteristics of community colleges enhance earnings independently of the attributes of individuals. In particular, males attending community colleges in service areas with higher unemployment rates receive lower earnings, and students in colleges with larger enrollments earn more.

**Contributions:** There are relatively few studies of how institutional factors affect community college effectiveness and those that do this usually concentrate on the attainment of particular awards or transfer rates to 4-year colleges. We address this gap by examining how institutional factors influence the labor market returns to community college participation. Our results underscore the importance of social contexts for explaining student achievement and success as well as highlight the need for much more research to understand differences in labor market outcomes of community college participation and the economic value of credentials and credits.

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The labor market benefits of community college participation have received considerable academic and policy attention in recent years. This interest reflects, in large part, the increasingly prominent role that community colleges are playing within a system of higher education that is experiencing rapid changes in the nature of work and labor markets (Cohen & Brawer, 2008; Milliron & De Los Santos, 2004). Community colleges enroll about 50% of all first-time college students in the United States, and it is expected that by 2015, community college enrollments will account for 43% of all enrollments in higher education (Cohen & Brawer, 2008). In North Carolina, one in nine residents are enrolled in a community college (North Carolina Community College System [NCCCS], 2012b), and they represent 48% of all enrollments in higher education in the state (The Completion Arch, 2012).

Going forward, the changing nature of the North Carolina labor force and labor market will continue to put its community colleges in the forefront of workforce development. Since the 1990s, North Carolina has seen a 273% rise in its foreign-born population, which represents the greatest increase in the United States. This includes a 394% growth in the Hispanic/Latino population (Ralls, 2008), which is likely to translate into a significant surge in the demand for community college training, as it is projected that Hispanic students will represent one third of all high school enrollments in North Carolina by 2018 (Marks, 2007). Furthermore, middle-skill jobs, which require more than a high-school diploma but not a 4-year degree, make up the largest part of North Carolina's labor market, representing about 50% of jobs. Yet in 2009, only 43% of the labor force had appropriate training for middle-skill jobs (National Skills Coalition, 2014). Given the significance of community colleges for individuals, organizations, and society, understanding better how they affect student outcomes is a pressing area of research generally, and for North Carolina in particular.

Studies of the labor market outcomes of participation in community colleges have generally found that most awards (e.g., certificates, diplomas, and associate degrees) yield positive returns, though these outcomes differ by type of award and across subgroups within the population (see Belfield & Bailey, 2011, for a review of the published evidence on this subject). Much of the research on this topic has emphasized the variety of pathways taken by students at community colleges and has sought to explain these on the basis of the motivations and characteristics of the students themselves. These include aspirations to transfer to 4-year colleges and demographic characteristics such as gender, race, and socioeconomic status to measures of educational aspirations and parental involvement.

A relatively neglected area of research on the labor market effects of community college participation is the role of institutional factors associated with the colleges and the labor markets into which they send students. Examples of these factors include a college's aggregate student population characteristics, the composition of their offerings,

and the local unemployment rate within the college's service area. A key issue in studies of education is how the institutional features within which instruction takes place affect both human capital acquisition and students' ability to convert skills and credentials into labor market success (e.g., Mobley, 2001, 2002). This topic is also important for policy purposes, as some of the features of college contexts are amenable to public and private interventions. For those institutional features that are beyond the control of community colleges, crucial policy concerns center around matters of institutional accountability and rankings. For example, is it fair to penalize community colleges for factors that affect their ratings but are beyond their control, such as the characteristics of their geographical service area like the local unemployment rate? And, if not, how can accountability systems attempt to control for those factors when calculating or reporting ratings? Most studies of how institutional factors affect community college effectiveness have concentrated on outcomes such as the attainment of particular awards or transfer rates to 4-year colleges (e.g., Calcagno, Bailey, Jenkins, Kienzl, & Leinbach, 2008; Clotfelter, Ladd, Muschkin, & Vigdoret, 2013). Only a few studies (e.g., Mobley, 2001, 2002) have examined explicitly the impacts of community college characteristics on labor market outcomes such as earnings.

In this article, we address this gap in the literature by examining how institutional factors influence the labor market returns to community college participation. Our sample consists of students in North Carolina who began their postsecondary studies at a community college in the 2000s. We conceptualize institutional factors in terms of characteristics of the labor market and geographical areas served by the community college and features of the colleges themselves, such as their size, financial resources, demographic characteristics, and instructional portfolios. We estimate multilevel models that explain students' medium-term earnings on the basis of these institutional characteristics while controlling for a large number of student characteristics.

## Labor Market Returns to Community College Participation

The literature on the economic returns to community college participation is extensive. Belfield and Bailey (2011) summarized this literature by concluding that an additional year of schooling raises yearly earnings between 5% and 10% on average. Much of this research has explored differences in earnings between various population subgroups, such as gender differences in labor market returns. Kane and Rouse (1995) and Leigh and Gill (1997) reported that an associate degree provides earnings increases of around 25% for men and 30% for women. Jepsen, Troske, and Coomes (2014) also analyzed returns for other credentials besides associate degrees and found that diplomas have quarterly earnings returns of nearly US$2,400 for women and US$1,500 for men, compared with much smaller returns for certificates.

Not all research, though, is focused only on students who have earned credentials. Kane and Rouse (1995), like many other researchers, looked at the effects of some college (no degree) and found that, even when controlling for family background and ability, the average person who attended a 2-year college, even without completing an

associate degree, earned about 10% more than the average person without any college education. Furthermore, they estimated that economic returns at a 2-year or 4-year college were roughly 4% to 6% for every 30 completed credits (two semesters). Jacobson, LaLonde, and Sullivan (2005) found that an additional year of community college for displaced workers increased long-term earnings by approximately 9% for men and 13% for women.

Others have examined returns to credentials by field and subfield. Bahr (2014) estimated labor market returns to students in the California community college system by four levels of credentials in 23 fields of study, as well as to course credits in 181 subfields. He found large variations between fields of study: The return to credits in technical career subfields (e.g., engineering, health) was positive and often strong, whereas the return to credits in nontechnical subfields (e.g., education, social science) was most frequently found to be negative. He also found that overall returns to community college credentials were a result of the underlying coursework completed by students, as opposed to the credential itself. Dadgar and Weiss (2012) also examined labor market returns to credentials based on field and subfields using comprehensive data from the Washington State community college system. They too found significant variation between fields, with small increases for nontechnical credentials (e.g., an AA in Social Science) and moderate to high returns to certain technical fields (e.g., an AA in nursing). However, unlike Bahr, they found slight labor market returns to students who did not obtain credentials. Belfield, Liu, and Trimble (2014), using the same data we analyze here, found that associate and bachelor's degrees yielded very strong returns, though returns to certificates and diplomas were weak. Moreover, they showed that even small accumulations of credits had labor market value; the returns to health sector credentials in particular were extremely high. In addition, returns were much higher for female students than for male students. Although there is consensus that variation exists between fields, then, findings are mixed on whether credentials or accumulation of human capital increases employability and leads to greater labor market returns.

Most studies of the economic returns to community college participation have treated community colleges as homogeneous institutions, ignoring that they often differ in important ways. Bryk and Raudenbush (1988) argued that past research on this topic is characterized by a mismatch between a complex, multilevel reality and the single-level models used to study it. Similarly, Mobley (2001) points out,

> Another weakness in the literature on school-to-work transitions of community college students is methodological in nature. Studies that address the role of community colleges in facilitating students' entry into the labor market tend to conduct analyses at the individual (the student) level. These single-level models rarely consider the contributions to student outcomes from other levels (for example, classroom, school, and even state-level variables). (p. 3)

Given the diversity of community college-level attributes and the possible consequences for student outcomes, multilevel modeling becomes an important theoretical

and methodological tool for advancing our understanding of how community colleges affect labor market outcomes.

Several studies have recently estimated multilevel models that seek to explain the effectiveness of community colleges, and we draw on these in guiding our choice of institutional variables. Titus (2004) identified institutional characteristics of 4-year colleges that appear to influence student persistence, including whether the college is residential, enrollment, revenue, and patterns of budget expenditure. He concluded that persistence is higher at more selective, residential, and larger institutions (Titus, 2004). Sjoberg (1999) examined how college differences in Carnegie classification, size, wealth, complexity, location, and quality affected student persistence (attrition). Jenkins (2007) used transcript-level data for Florida community college students and measured how institutional characteristics affected graduation, transfer, and persistence. He found the most important college-level attribute was how closely aligned programs and services were with activities that supported student success.

A study by Calcagno et al. (2008) represents one of the most robust efforts at multilevel analysis modeling of the efficacy of community college features. Their model predicted student probabilities of completing a certificate or degree or transferring to a baccalaureate institution based on four categories of community college characteristics: (a) general institutional features (e.g., enrollment, proportion of part-time faculty, and certificate-to-degree ratio), (b) institutional-level compositional characteristics (e.g., proportion of minority students), (c) financial indicators (e.g., Pell grants, loans, tuition, and instructional spending), and (d) geographical location (urban, rural, or suburban). They found that a student's probability of graduating or transferring was lower in larger institutions and in community colleges with a greater proportion of part-time faculty and minority students. Another study by Clotfelter et al. (2013) measured the success of each college in the NCCCS along two dimensions: attainment of an applied diploma or degree and completion of the coursework required to transfer to a 4-year college or university. Their research showed that individual characteristics explained most of the variation in outcomes and that it was hard to distinguish between community colleges except between the extreme high and low performers once student characteristics were controlled (Clotfelter et al., 2013).

Mobley (2001, 2002) used hierarchical linear modeling to investigate whether the structure of a community college makes a difference in how well a young adult is able to transition from school to work and whether community college characteristics affect certain types of students differently. The institutional-level characteristics she examined included enrollments, percentage of full-time faculty, transfer rate, and availability of career counseling. She found that enrollment size was positively correlated to wages and that a race/ethnicity gap existed in wages but that institutional characteristics did not account for this gap.

A multi-level theoretical framework that assumes that labor market returns are due to characteristics of individual students as well as the institutional characteristics of the community colleges guides our analysis. Community colleges with particular features select students with specific characteristics (such as family background, race, or gender), and so on. This basis will be associated with different labor market returns.

We also assume, however, that the contexts associated with community colleges will have effects on labor market returns that are over and above the characteristics of individual students; we summarize these institutional characteristics of community colleges below and outline our rationale for why they should affect students' earnings.

## Data

### NCCCS

The NCCCS, like the community college systems in other states, plays a significant role in the education system in North Carolina. It represents the third largest state community college system nationally, with 58 colleges statewide—California, with 117 colleges, and Texas, with 64, are first and second, respectively (although Texas has five different systems that together account for the 64 colleges). Every resident of North Carolina lives within 30 miles of a community college, and 840,000 students, or one in nine residents, were enrolled in their local community college in 2010-2011 (NCCCS, 2012b). The colleges offer a collective total of more than 1,000 curriculum programs classified under more than 250 curriculum titles (NCCCS, 2008b), based on the Classification of Instructional Programs (CIP 2000) coding. Programs are offered at the certificate, diploma, and associate degree levels (NCCCS, 2008b), and nationally, the NCCCS ranks fifth in the number of technical and vocational degrees completed each year (Fahy, 2005). Furthermore, the NCCCS provides one of the largest workforce continuing education programs, with over 1,400 training categories for employers to choose from.

### Individual-Level Data

Our individual-level data are comprised of all first-time-in-college students in designated curriculum programs leading to awards who began in the NCCCS in the academic years 2001-2002 through 2009-2010. These data thus exclude continuing education and noncredit-seeking students, as well as credit-seeking students enrolled in customized programs created for a specific business or industry. The data set contains information on individual students and student transcript information. The college transcript data were merged with student-level data from the National Student Clearinghouse (NSC), which tracks students as they transfer to other Title IV–eligible colleges.

The combined student data set was then merged with North Carolina Department of Commerce Unemployment Insurance (UI) records using social security numbers. The UI data include earnings collected on a quarterly basis from UI-covered employers and include total earnings from all jobs, as well as Standard Industrial Classification (SIC) and North American Industry Classification System (NAICS) information for each job (there is no information on hours of work or occupation). Our primary focus here is on the 2002-2003 NCCCS entry cohort, for which we have 9 years of NCCCS and NSC transcript data; we also have earnings data for the period from the first

quarter of 1996 (i.e., before any of the students in our sample enrolled in college) to the first quarter of 2012. All earnings are adjusted for inflation and expressed in 2010 dollars based on the quarterly Consumer Price Index for Urban Wage Earners and Clerical Workers (CPI-W). This data set yields over 5 million quarters of earnings data across 830,000 students. The dependent variable for our analysis is (the log of) 2011 quarterly earnings (and we include in the analysis only those individuals reporting 2011 earnings). We estimate all analyses separately by gender.

Our individual-level variables are the same as those analyzed by Belfield et al. (2014), and comprised of both student and transcript data. Our model thus includes dichotomous variables representing a student's race (Black, Hispanic, and Other), whether she or he was a high school graduate, was from a single parent household, was disabled, and was aged between 18 and 19 years[1] when first enrolled in the community college. From the earnings data, we included years of work experience and work experience squared. From the transcript data, we included dummy variables for highest credential earned (certificate, diploma, associate's degree, bachelor's degree, or above), various aid-related variables (the amount of grants, loans and other aid per term over the student's life), and expected family contribution per term over the student's life.

## Institutional-Level Data

We collected institutional information for each of the 58 North Carolina community colleges. We classified the institutional-level data into six categories, which we describe in this section. Measures of these community college characteristics and their descriptive statistics are presented in Table 1. Correlations between these community college characteristics are presented in Table 2.

*General institutional characteristics.* Our first indicator of the institutional composition of the community college is (the log of) student enrollment in 2002-2003 (NCCCS, 2003a). Most studies that assess the impact of institutional-level variables on educational outcomes include this measure of organization size, though previous findings about its direction and significance are mixed. Some studies have found a negative relationship between enrollment and measures of community college efficacy (e.g., Calcagno et al., 2008). Still other studies have found no correlation between enrollment and student outcomes (e.g., Clotfelter et al., 2013). On the contrary, Kuo (1999) found a positive relationship between size and outcomes and argued that economies of scale allow larger institutions to offer more programs and degrees than smaller institutions, resulting in better outcomes. Moreover, Mobley's studies (2001, 2002), which represent the only multilevel studies using wages as a dependent variable, also found a positive relationship between wages in the labor market and institutional size and concluded that economies of scale allow larger institutions to invest in and develop occupational training programs that prepare students for available work and higher paying occupations. We too expect to find a positive relationship between wages and enrollment. We hypothesize that larger institutions (a) are able to invest in and develop

**Table 1.** Community College Variables Used in the Analysis.

| Variable name | M | Minimum | Maximum |
|---|---|---|---|
| General institutional characteristics | | | |
| (Log) Student enrollment in 2002-2003 | 9.34 | 7.50 | 10.95 |
| Proportion of full-time faculty | 0.31 | 0.13 | 0.56 |
| Student body composition characteristics | | | |
| Proportion of students applying for financial aid | 0.44 | 0.24 | 0.70 |
| Proportion of students entering to finish high school | 0.19 | 0.02 | 0.49 |
| Proportion of students enrolled part-time | 0.12 | 0.07 | 0.19 |
| Community college service area characteristics | | | |
| UNC campus in service area | 0.10 | 0 | 1 |
| Single-county service area | 0.52 | 0 | 1 |
| Labor market characteristics of community college service area | | | |
| Rural or urban service area | 0.48 | 0 | 0.99 |
| Service area unemployment rate, 2008-2010 | 2.16 | 1 | 3 |
| Institutional labor market focus | | | |
| Proportion of FTE enrollments in CE offerings | 0.68 | 0.53 | 0.81 |
| Proportion of "applied" offerings in curriculum programs | 0.58 | 0.40 | 0.77 |
| Rate of student transfer, 2002-2003 cohort | 0.34 | 0.22 | 0.61 |
| Proportion of instructional budget allocated to continuing education | 0.28 | 0.12 | 0.64 |
| Student readiness for labor market opportunities | | | |
| First-time student licensure pass rate, 2002-2012 | 0.84 | 0.68 | 0.92 |
| Proportion of students in customized industry programs | 0.05 | 0.01 | 0.21 |

*Note.* UNC = University of North Carolina; FTE = full time equivalent; CE = Continuing Education.

occupational training programs that prepare students for available work and higher paying occupations, (b) offer students more resources to assist in their transition to the labor market, and (c) are located in areas with greater job opportunities.

Studies are also mixed on the effect of our second general institutional measure, the proportion of full-time faculty (NCCCS, 2002, 2003b, 2004, 2005, 2006, 2007, 2008a, 2009, 2010, 2011, 2012a). Some researchers maintain that a lower proportion of full-time faculty members does not lead to lower student outcomes (Ehrenberg & Zhang, 2005), but the majority of research indicates that a higher proportion of part-time faculty is negatively related to student outcomes (e.g., Jacoby, 2006). Some have argued that part-time faculty are less certain about their place in the institution, less prepared to teach, less committed to the institution, and less available to students; these are among the factors that are likely to lead to lower student outcomes (Cottingham, Newman, & Sims, 1981; Eagan & Jaeger, 2009). By contrast, the study by Mobley (2001) is the only study that examined the association between the proportion of part-time faculty and wages and found no statistically significant relationship, and this is consistent with our expectations.

**Table 2.** Correlations Between Community College Variables (*N* = 58).

| | Earnings (female) | Earnings (male) | Log enrollment | % full-time faculty | % students applying for financial | % of students entering to finish HS | % of part-time students | UNC campus in area | Single county served | Percentage urban | Unemployment Rate Scale | % of offerings CE | % of "applied" curriculum offerings | Transfer rate (02-03 cohort) | % of overall budget allotted to CE | licensure pass rate (2002-2012) | No. of industry customized programs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Log enrollment | 0.6799 | 0.4559 | 1.0000 | | | | | | | | | | | | | | |
| % full-time faculty | −0.2901 | −0.2232 | −0.3661 | 1.0000 | | | | | | | | | | | | | |
| % students applying for financial aid | −0.4478 | −0.2587 | −0.625 | 0.4519 | 1.0000 | | | | | | | | | | | | |
| % of students entering to finish HS | −0.3685 | −0.5097 | −0.304 | 0.1338 | −0.1292 | 1.0000 | | | | | | | | | | | |
| % of part-time students | −0.0865 | −0.1008 | 0.0124 | 0.2676 | −0.227 | 0.424 | 1.0000 | | | | | | | | | | |
| UNC campus in area | −0.0984 | −0.0357 | 0.0239 | 0.0448 | −0.0697 | −0.05 | −0.0784 | 1.0000 | | | | | | | | | |
| Single county served | 0.0972 | 0.2112 | −0.0274 | 0.0979 | 0.1029 | −0.2465 | −0.0867 | −0.0117 | 1.0000 | | | | | | | | |
| Percentage urban | 0.5577 | 0.4907 | 0.7816 | −0.3794 | −0.5896 | −0.4201 | 0.1073 | 0.0575 | 0.1199 | 1.0000 | | | | | | | |
| Unemployment Rate Scale | −0.2236 | −0.1738 | −0.2592 | 0.106 | 0.4729 | 0.0021 | −0.1153 | −0.1984 | 0.0216 | −0.2535 | 1.0000 | | | | | | |
| % of offerings CE | −0.1694 | −0.1368 | −0.1487 | −0.2444 | 0.2451 | −0.158 | −0.8557 | 0.1422 | 0.0524 | −0.2587 | 0.1366 | 1.0000 | | | | | |
| % of "applied" curriculum offerings | −0.2622 | −0.1328 | −0.4554 | 0.2297 | 0.3305 | 0.2453 | 0.1408 | −0.1583 | −0.0582 | −0.353 | 0.1572 | −0.0517 | 1.0000 | | | | |
| Transfer rate (02-03 cohort) | 0.0118 | −0.2723 | −0.2354 | 0.1496 | 0.047 | 0.2091 | 0.1243 | −0.2242 | 0.191 | −0.2574 | −0.1212 | 0.0366 | 0.2187 | 1.0000 | | | |
| % of overall budget allotted to CE | −0.3241 | −0.2482 | −0.2969 | −0.0721 | 0.3565 | −0.0962 | −0.3338 | 0.0992 | −0.0273 | −0.2706 | 0.0894 | 0.4759 | 0.2664 | 0.0078 | 1.0000 | | |
| Licensure pass rate (2002-2012) | 0.4776 | 0.2971 | 0.7058 | −0.0877 | −0.368 | −0.1744 | 0.0573 | 0.0862 | 0.0132 | 0.5706 | −0.2592 | −0.1611 | −0.3588 | −0.211 | −0.3481 | 1.0000 | |
| No. of industry customized programs | −0.3178 | −0.2728 | −0.4285 | 0.1253 | 0.2548 | 0.2702 | −0.0148 | −0.1506 | −0.1099 | −0.3919 | 0.3248 | 0.0964 | 0.2122 | 0.0178 | −0.1006 | −0.4678 | 1.0000 |

*Note.* HS = high school; UNC = University of North Carolina; CE = Continuing Education.

*Student body composition characteristics.* These variables are specific to the composition of the student body of the community college, and we obtained them by aggregating individual-level data on students within each college. The first variable, proportion of students who applied for financial aid, is based on the assumption that those applying for financial aid will be lower income students. At the individual level, research has shown that higher income students tend to have more educational success (Toutkoushian & Smart, 2001). This suggests that a community college with a higher proportion of students applying for financial aid will be associated with lower outcomes overall. Other research has shown that student motivation strongly correlates with higher student outcomes (e.g., Pintrich & Schunk, 1996), and if one assumes that students who have a greater financial stake in their education (i.e., by applying for financial aid) will be more motivated to achieve labor market success, then it is likely that there will be a positive relationship between financial aid and wages.

The second variable, the proportion of students who entered community college to finish high school by obtaining a GED, indicates the overall proportion of students in each community college who entered the college without completing high school but intended to earn their high school equivalence certificate, at a minimum. The consensus of most literature is that high-performing high school students will have better education outcomes (e.g., Lee, 2012). Several studies have also shown that higher student outcomes are positively related to institutional selectivity (Marcus, 1989; Sjoberg, 1999). Thus, we would expect to find lower wages and outcomes in community colleges that have higher proportions of students entering the college without having completed high school.

Third, we expect that the proportion of part-time students in the community college will have a negative impact on labor market outcomes. Nora's (e.g., 2002) engagement model for student persistence in higher education suggests that a higher proportion of part-time students would negatively affect the social and academic engagement of students, which would lead to lower student outcomes. More specifically, we would expect part-time students to have fewer formal and informal interactions with faculty and to be less involved in learning communities and social/academic experiences that create a sense of purpose and allegiance to the institution and to higher education. Calcagno et al. (2008) found a positive relationship between the proportion of full-time students in the community college and positive student outcomes, supporting the theoretical assertion that lower levels of engagement among part-time students may lead to lower student outcomes. Other factors may also put part-time students at a disadvantage; for example, part-time students may be more likely to have competing priorities for time and resources.

*Community college service area characteristics.*[2] These variables are specific to the geographical area served by the community college. The first is whether there is a University of North Carolina (UNC) 4-year college campus in the community college service area.[3] We presume that community colleges that share a service area with a UNC campus will have a greater proportion of students intending to transfer to that campus and so are likely to have stronger and clearer pathways and agreements for transferring

to that specific 4-year college; this ought to lead to higher wages. However, a greater institutional focus on the needs of transfer students might result in lower wages, as these community colleges may be disproportionately preparing students to transfer rather than to enter the labor market.

Second, the geographical area that the community college is expected to serve varies in size and number of counties. Some community college service areas span multiple counties, and some community colleges are asked to serve only one county.[4] Our measure is whether the community college's service area is a single county. We hypothesize that community colleges that serve a single county may be better able to focus their efforts on preparing their students for the job opportunities that are available in the geographical area, which is likely to result in students getting better jobs and higher wages.

*Labor market characteristics of the community college service area.* These variables are specific to the labor market in the community college service area. The first is whether the service area is urban or rural.[5] Although community colleges in urban service areas may have students with higher wages because they have greater job opportunities, urban areas are also likely to be associated with more job applicants, which might depress wages.

Second, we measure the average unemployment rate[6] in the service area during the period from 2008 to 2010. Labor market characteristics, including unemployment rates, have generally not been included in previous multilevel models. Nevertheless, this seems to be an essential variable to consider, given the strong theoretical relationship between overall wages in a specific area and the strength and stability of the local labor market, as measured by number of jobs and job opportunities.

*Institutional labor market focus.* These variables measure the extent to which the community college's offerings are focused on providing students with skills that match the job opportunities in the local labor market. We first use two institution-level measures of offerings to students: the proportion of full-time equivalent (FTE) enrollments in continuing education offerings[7] and the proportion of "applied" offerings in the curriculum programs at the community college.[8] Together, these variables demonstrate the opportunities students have to receive training and credentials that will prepare them for opportunities in their local labor market.

We also include a measure of the rate of student transfers to 4-year colleges (NCCCS, 2003a). While the transfer rate has often been studied as an indicator of the efficacy of community colleges,[9] others have used it as a proxy for the vocational emphasis of the community college. Mobley (2001), for example, assumes that community colleges with a higher proportion of transfer students will allocate more resources to those students and fewer resources to labor market-focused programs.

Finally, we use an indicator of the proportion of the instructional budget that is allocated to continuing education in 2002-2003 (Briggs, 2002) to reflect the community college's labor market focus from a fiscal and resource standpoint (cf. Calcagno et al., 2008; Clotfelter et al., 2013). We use this measure because the NCCCS's funding model

is based heavily on enrollment (the correlation between student enrollment and total budget is almost .94 in these data), so a pure expenditure or budget variable is too collinear with enrollment. We assume that community colleges that have a higher proportion of their institutional budget earmarked for continuing education students (who are excluded from our data set) will be associated with lower wages for individuals in our data set, which consists of curriculum students.

*Student readiness for labor market opportunities.* We use two variables to measure the extent that students are prepared for labor market opportunities. The first is first-time licensure pass rate (NCCCS, 2002, 2003b, 2004, 2005, 2006, 2007, 2008a, 2009, 2010, 2011, 2012a),[10] or the rate at which students in all industry licensure programs offered at the community college (e.g., certified public accountant, certified nursing assistant) pass their licensure exam on the first attempt. We assume that community colleges with higher first-time licensure pass rates are doing a better job of preparing students for entering the labor market. Second, we measure the proportion of students enrolled in customized, industry-specific programs (NCCCS, 2003a).[11] We expect that community colleges with higher percentages of students in customized programs are working more closely with industry to prepare their students for relevant opportunities available in the labor market. Thus, we use this variable as a proxy for an institution's relationship with industry as well as its ability to create relevant programs for students who prepare them for openings in the labor market.

## Analysis

Our point of departure for our analysis of the determinants of earnings is the basic Mincerian model, which is represented by Equation 1. This model has been shown by past research to be relatively robust in accounting for earnings differences among individuals (see Belfield et al., 2014). Because we are using 2011 earnings, it seems reasonable to assume that our independent variables (which are all measured prior to 2011) precede earnings both temporally and causally:

$$Y_i = \alpha + \beta X_i + e_i. \tag{1}$$

In Equation 1, $Y_i$ represents the (log) earnings of individual $i$, $X_i$ represents the individual-level predictors of earnings used in Belfield et al. (2014; see above), and $e_i$ represents the error term for individual $i$.

We add to this individual-level model random intercepts associated with each community college ($j$), as shown in Equation 2:

$$Y_{ij} = \alpha + \beta X_{ij} + u_j + e_{ij}. \tag{2}$$

In this model, $u_j$ signifies the average level of earnings that students in that college obtained after controlling for their individual characteristics. This is a simple multi-level model, in which earnings are assumed to be a function of both individual-level

variables ("Level 1" characteristics) and the average earnings of the community college that they attended ("Level 2" characteristics). We estimate this multilevel model using the "xtmixed" procedure in Stata.

Finally, we estimate a model that adds the institutional variables described above ($Z_j$), which is represented by Equation 3. The vector of coefficients β* indicates the effects of these institutional variables on the earnings obtained by students in that community college ($j$):

$$Y_{ij} = \alpha + \beta X_{ij} + \beta * Z_j + u_j + e_{ij}. \tag{3}$$

## Results

The results from our estimation of the multilevel model represented by Equation 3 are presented in Table 3. We estimated this model separately for men and women. We do not present results for the individual-level variables, as these are generally consistent with those reported by Belfield et al. (2014) in their analyses of these data. Like Belfield et al., we also find that while women earned less than men overall, women obtained greater wage returns to associate and bachelor's degrees than men. In addition, students who earned a diploma or higher had higher wages than those who obtained no award, regardless of gender. The individual-level results from our study also indicate the presence of earnings gaps by race/ethnicity, with White students earning more than their racial/ethnic minority counterparts.

Our estimation of the model represented by Equation 2 indicates that, after controlling for the individual-level variables, about 1% of the variation in earnings for men and about 0.7% of the variation in earnings for women can be explained by differences between the community colleges. Our measured institutional variables (Equation 3) explain 52% of the total variation in earnings between community colleges for men and 60% of the total variation in earnings between community colleges for women.[12] Thus, compared with students' individual attributes, which explain about 20% of the variation in earnings for men and about 17% for women (Belfield et al., 2014), the institutional characteristics of the 58 NCCCS community colleges explain relatively little of the variation in individual wages. Nevertheless, our measured institutional variables are fairly successful in accounting for the variation in wages that we can attribute to the community colleges.[13]

Turning to our results for specific community college characteristics, we find that a number of institutional variables are positively related to earnings: (log) enrollment size is positively associated with earnings for both men and women; men whose community colleges have single-county service areas earn more; and women who attend community colleges that have a greater ratio of applied to academic offerings earn more (the association for men is also positive but not statistically significant).

Other institutional characteristics are negatively related to earnings: Men who attend community colleges that have higher proportions of entering students who have not completed high school earn less (the association is also negative for women but not statistically significant); women who attend community colleges that have a higher

**Table 3.** Institutional Marginal Effects From Random Effects With Inclusion of Student-Level Characteristics.

| Variable | Female (N = 238,914) | | Male (N = 147,309) | |
|---|---|---|---|---|
| | Coefficient | SE | Coefficient | SE |
| General institutional characteristics | | | | |
| Student enrollment in 2002-2003 (log) | 0.093*** | 0.024 | 0.066* | 0.033 |
| % of full-time faculty | 0.007 | 0.11 | −0.291* | 0.147 |
| Student composition characteristics | | | | |
| % student body applying for financial aid | 0.134 | 0.115 | 0.227 | 0.147 |
| % student body entering to finish high school | −0.109 | 0.124 | −0.331* | 0.166 |
| % student body enrolled part-time | −1.255 | 0.770 | 1.200 | 1.02 |
| Community college service area characteristics | | | | |
| UNC campus in service area | −0.033 | 0.027 | −0.069 | 0.037 |
| Single county service area | 0.029 | 0.016 | 0.093*** | 0.022 |
| Labor market characteristics of community college service area | | | | |
| Rural or urban service area | 0.061 | 0.062 | −0.133 | 0.082 |
| Service area unemployment rate, 2008-2010 | −0.028 | 0.017 | −0.061** | 0.022 |
| Institutional labor market focus | | | | |
| % FTE equivalent enrollments in CE offerings | −0.767* | 0.325 | 0.028 | 0.432 |
| % "Applied" offerings in curriculum programs | 0.257* | 0.113 | 0.240 | 0.151 |
| Rate of student transfer, 2002-2003 Cohort | 0.129 | 0.13 | −0.716*** | 0.174 |
| % instructional budget allocated to CE | −0.005 | 0.101 | −0.106 | 0.137 |
| Student readiness for labor market opportunities | | | | |
| First-time student licensure pass rate, 2002-2012 | 0.052 | 0.257 | −0.373 | 0.346 |
| % student body in customized industry programs | −0.157 | 0.257 | −0.136 | 0.341 |
| Constant | 7.050*** | 0.374 | 7.378*** | 0.499 |
| SD of random intercept—Student-level variables only | 0.082 | | 0.102 | |
| SD of random intercept—Institutional and student variables | 0.052 | | 0.069 | |
| Intraclass correlation coefficient (LR test) | 294.91*** | | 298.65*** | |

*Note.* Dependent variable is log earnings. Model includes student-level variables that are not displayed. Student-level variables include college education (e.g., awards or credits), a vector of prior college characteristics, a vector of precollege personal and ability-related characteristics, and work experience. UNC = University of North Carolina; FTE = full-time equivalent; CE = Continuing Education; LR = likelihood ratio.
*$p < .05$. **$p < .01$. ***$p < .001$.

proportion of continuing education courses earn less; and men in community colleges that have a high rate of student transfers earn less (the association for women is positive but not statistically significant).

## Discussion and Conclusion

Our results suggest that institutional factors do matter for the success of community college students, though there is much more variation *within* community colleges produced by individual attributes than there is *between* colleges. That relatively little variation in earnings (only about 1% for men and about 0.7% for women) can be explained by differences between community colleges is also consistent with the results obtained by Clotfelter et al. (2013), who were able to differentiate extremely high from very low performing colleges but were unable to distinguish statistically the majority of colleges with regard to their performance. Still, our measured institutional variables explain about half of the variation for men and about 60% of the variation for women that are due to differences between community colleges.

A number of our findings are consistent with our expectations and prior research on the labor market outcomes of community college attendance. For instance, students of colleges with larger enrollments earn more. Among other benefits conferred by their economies of scale, larger institutions are able to provide greater resources and more programs and degrees than smaller institutions, resulting in better labor market outcomes (see also Kuo, 1999; Mobley, 2001).

That men who attend community colleges with higher proportions of nonhigh-school completers earn less is consistent with the argument that these colleges are likely to have lower performing students, who are likely to obtain lower wages (Marcus, 1989; Sjoberg, 1999). Because our model controls for individual characteristics, this finding suggests a contextual effect, perhaps produced by the impact of peers.

Several of our findings suggest that a college's curricular emphases and course offerings affect student earnings. Our finding that men who attend community colleges with higher transfer rates earn less suggests that these institutions have a greater focus on the needs of transfer students and thus allocate more resources to them and less to vocational programs and students, thereby lowering students' ability to find higher paying jobs (see also Mobley, 2001). Moreover, the more academic nature of transfer curricula suggests that workers who enroll in transfer programs will be less prepared with the technical skills usually required for jobs paying higher wages. In contrast, we found that women in community colleges with a higher ratio of applied courses (versus academic courses) in their curriculum programs earn higher wages. We also found that women who attend community colleges with a higher proportion of continuing education courses earn less. In interpreting this finding, we should remember that our sample of students consists only of those participating in curricular offerings, not those in continuing education courses. The curricular students are likely to be disadvantaged in their instruction in those colleges that devote a higher percentage of their resources to continuing education courses.

Finally, we found that labor market demand affects student wages, as those attending community colleges in service areas with higher unemployment rates receive lower earnings (though the effect of unemployment is statistically significant only for males). This is consistent with our expectation that higher unemployment rates reflect fewer job opportunities for students in the service area, resulting in lower paying jobs.

Our findings have a number of implications for research on labor market returns to community college education. In particular, our results underscore the importance of social contexts for explaining student achievement and success, a prominent theme in sociological studies of education and social inequality. However, the fact that so little of the variation in earnings is due to institutional characteristics suggests that much more research needs to be done to respond to the growing interest in measuring labor market outcomes of community colleges and the economic value of credentials and credits. In particular, the relatively weak relationships between community colleges and earnings implies the need to develop a more comprehensive set of indicators of community college performance, given the multiple missions of community colleges and the fact that their characteristics are often a product of localized community demand (Bahr, 2012; see also Bailey, 2012). Researchers should also focus on institutional differences *within* community colleges and compare the labor market performance of students in the same college who pursue different pathways and courses of study. This underscores the need for more targeted, multilevel case studies of the institutional characteristics associated with various indicators of performance.

For educational policy, an important insight from our results is that some of the community college traits we have discussed are beyond the control of individual community colleges. Examples of these include characteristics of the geographical service area, such as the unemployment rate. Such institutional characteristics are contextual factors that a community college must deal with as best it can and are not open to direct manipulation by public policies or business decisions. The fact that these characteristics are beyond the control of community colleges but still impact student employment placement and labor market returns implies that a state or federal rating or ranking system that judges community colleges based on their labor market outcomes will systematically disadvantage colleges that already have geographic and structural disadvantages that are not under their control. This in turn raises some important questions, such as whether states or the federal government should adjust for these geographic and structural factors when constructing ratings and rankings and, if it is feasible, how to go about doing it.

Other institutional features are within the control of the community college, however, and so might be improved by more effective management practices. Examples of such characteristics include the proportion of budget allocated to various instructional activities, such as continuing education courses or the percent of applied versus academic offerings. But other relevant characteristics are more difficult to quantify, such as the stability of their leadership, their vision for success, and the extent to which community colleges' strategies are aligned with the needs of their local communities and the goals of their students. Achieving a high degree of fit between the objectives of the community colleges and those of their students and local areas is likely to be especially important for policy makers and community college leaders.

A multilevel approach is valuable for conceptualizing and assessing the relative impacts of local areas, community colleges and their students on labor market outcomes, and other aspects of community college performance. Studies of how community college characteristics influence students' labor market returns are likely to grow

in importance as these institutions come to occupy an increasingly prominent role in placing students in rapidly changing labor markets.

## Declaration of Conflicting Interests

## Funding

## Notes

1. We used this variable to differentiate between "traditional" and "nontraditional" students and assumed that ages 18 to 19 represented the typical age of college freshmen first entering the higher education system.
2. The North Carolina State Board of Community Colleges designates a unique service area for each community college taking into account "the past and present patterns of providing services, including existing agreements between colleges" (North Carolina State Board of Community Colleges, 2004). We assigned all labor market variables to community colleges based on these service area designations. Most service areas use counties as lines of demarcation, though some serve multiple counties. We combined and averaged the labor market values for community colleges that span multiple counties.
3. We created and coded this variable by identifying University of North Carolina (UNC) campuses and then matching them to community college service areas.
4. Single-county designation does not seem to be strongly related to the degree of urbanization of the service area (.1199) or institutional size (−.0274), and there is great variance is the size of North Carolina counties (ranging from 221 square miles to 1,562 square miles; average = 538 square miles).
5. We use the urban/rural definitions set forth by the North Carolina Rural Economic Development Center in their rural data bank (see http://www.ncruralcenter.org).
6. Given the drastic increase in unemployment beginning in 2008 and the subsequent partial recovery by 2010, average unemployment during the period provides a more accurate depiction of how unemployment rate might affect workers' labor market opportunities. We then created an ordinal variable that represented colleges 2% or greater below the state average, within 2% in either direction, and greater than 2% above the state average.
7. We calculated this using the full-time equivalent (FTE) of continuing education enrollments divided by the overall FTE enrollment.
8. Calculated by dividing the number of applied curriculum course offerings by the overall number of curriculum course offerings in each community college. Applied courses are nongeneral education courses that are assigned to terminal degrees, diplomas, or certificates and not associated with a transfer program.
9. North Carolina Community College System (NCCCS,2013) uses student transfer rate as an annual performance measure.
10. Calculated from 2002 to 2012 using the NCCCS's annual Critical Success Factors reports for those years.

11. Calculated using data from the NCCCS's 2003 annual statistical report (NCCCS, 2003a).
12. The variation in individual wages explained by differences between community colleges is $.1022 = .01$ for men and $.0822 = .0067$ for women (Equation 2). The variation in wages accounted for by the random intercept when the measured institutional variables are in the model is $.0692 = .0048$ for men and $.0522 = .0027$ for women (Equation 3). The amount of variance in individual wages between community colleges that can be explained by our measured institutional variables is thus $(.01-.0048)/.01 = .52$ for men and $(.0067-.0027)/.0067 = .597$ for women.
13. The assumption of the multilevel model is that there are no unobserved factors at the individual level that affect the choice of which community college to attend; thus, what we observe as an "effect" of a community college could actually reflect the sorting of students into that school that is not picked up by the individual-level variables.

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