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Christopher Jepsen
Peter Mueser
Kenneth Troske
Kyung-Seong Jeon

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University of Kentucky
244 Gatton College of Business and Economics
Lexington, KY 40506-0034
http://isfe.uky.edu/

The Benefits of Alternatives to Conventional College: Comparing the Labor-Market Returns to For-Profit Schools and Community Colleges

Christopher Jepsen,[1] Peter Mueser, Kenneth Troske & Kyung-Seong Jeon

Abstract:

This paper provides novel evidence on the labor-market returns to for-profit postsecondary school and community college attendance using a two-step model to avoid recent concerns with single-stage fixed effects methods. Specifically, we link administrative records on for-profit school and community college attendance with quarterly earnings data for over 400,000 students in one state. Five years after enrollment, quarterly earnings conditional on employment exceed earnings in the absence of schooling by 20-29 percent for students attending for-profit schools and 16-27 percent for students attending community colleges. Despite differences in costs, in aggregate the benefits of attendance generally exceed the costs in both for-profit schools and community colleges. Finally, we present evidence showing that students in for-profit schools and community colleges pursue different degrees and focus on different areas of study.

JEL classification: J24, I26

Keywords: postsecondary education, labor-market returns, for-profit schools

[1] Corresponding author. Affiliations: Jepsen, University College Dublin, CES-Ifo, and IZA; Mueser, University of Missouri and IZA; Troske, University of Kentucky and IZA; and Jeon, University of Missouri. We thank seminar participants at IZA, the Stockholm School of Economics, the University of Jyväskylä, the London School of Economics, the Society of Labor Economists/European Association of Labor Economists annual conference, Colorado State University, Grinnell College, Lancaster University, the European Society for Population Economics annual conference, the Centre for Vocational Education Research annual conference, the Education Finance and Policy annual conference, the BIBB Conference on the Economics of Vocational Training, the CES-IFO Institute of Economics of Education conference, and the 20th IZA/SOLE Transatlantic meeting for useful comments. We thank the European Commission (Marie Curie Career Integration Grants) and the Spencer Foundation (Small Grants) for financial assistance. Several individuals in the state Department of Higher Education provided invaluable assistance in procuring and interpreting the school data. All opinions and errors are the authors' sole responsibility.

I. Introduction

The relative earnings for high school graduates have declined substantially over the last few decades, and job opportunities for less-skilled workers are becoming more limited. U.S. states have drastically reduced funding for higher education (Phelan, 2014). In response, between 2000 and 2010 enrollment in for-profit colleges (also known as proprietary schools) increased by 350 percent while enrollment in public higher education institutions rose by less than 30 percent (Snyder, de Brey and Dillow, 2019). Since 2010, total enrollment has fallen by 42 percent in for-profit schools compared to 20 percent in public two-year schools.

At the same time, the U.S. government, along with several states, increased oversight of the for-profit school industry in response to "abusive practices" such as false promises to students of future earnings and employment opportunities (U.S. Department of Education, 2015). In the midst of this on-going controversy on the effectiveness of for-profit schools as well as the decline in funding for public schools, evidence on whether these schools improve labor-market outcomes and what type of school is more efficient at improving outcomes is critical for deciding whether for-profit or community colleges should receive public support or be allowed to grow.

To add to the existing literature, we estimate the returns to for-profit schools and public community colleges using administrative data for over 100,000 students who enrolled in for-profit schools and over 290,000 students who enrolled in public community colleges in one state between 2005 and 2012. We complement previous studies using national data by including a broader set of for-profit schools and students, specifically schools that do not receive U.S. federal aid, as well as students who do not receive federal financial aid. Our preferred model is a two-step model using person fixed effects and calendar quarter in the first stage to predict earnings in the pre-enrollment period, estimated separately by gender, school type, and degree

type. This model addresses recent concerns with fixed effects models (documented in de Chaisemartin and D'Haultfoeuille (2020) and elsewhere) and allows the earnings increment resulting from program participation to vary with time since enrollment.

We find sizable earnings returns to for-profit school attendance as predicted from a base period 5 to 24 quarters before enrollment. By the fifth year after entry (17-20 quarters after enrollment) for students attending for-profit schools, quarterly earnings conditional on employment exceed earnings in the absence of schooling by 21 to 24 percent for certificate programs and 20 to 29 percent for associate's degree programs. For students attending community colleges, the earnings increases are 20 to 27 percent for those seeking certificates and 16 to 19 percent for those seeking associate degrees. Estimated effects on employment are much more modest, ranging between 0 and 4 percentage points in the fifth year after entry. We perform a number of specification checks of our main analysis, including implementing propensity score matching using inverse probability weighting and are results are largely robust to alternative specifications of the model.

A closer inspection of the data reveals sufficient differences in both demographics and the areas of study that for-profit schools and community colleges are serving distinct markets. Given these differences we believe that estimates of the average treatment effect on the treated (ATT) on the full sample provide more meaningful estimates of the benefits received by students attending the two school types than matching estimators that exclude as much as half of the students, although both models produce similar results. However, the ATT from the preferred model reflect both the characteristics of students and the areas of study for those actually attending these schools, which is why we choose to focus on these results.

Overall, our results suggest that students attending both for-profit schools and community colleges, on average, experience a positive gain in earnings. Although one can certainly point out issues with both for-profit schools and community colleges (particularly the low completion rates), both schools appear to produce value for those who attend, making it difficult to imagine that eliminating one type of school would lead to a Pareto-improving outcome in this market.

II. Relation to Previous Literature

Research on the labor-market returns to for-profit schools falls in to three categories: (1) studies using nationally representative data sets such as the Beginning Postsecondary Survey (BPS) (Deming, Goldin, and Katz, 2012; Lang and Weinstein, 2013; Cellini and Chaudhary, 2014; and Liu and Belfield, 2014);[2] (2) studies using administrative data (Liu and Belfield, 2013; Cellini and Turner, 2019) and (3) audit studies (Darolia et al., 2015; and Deming et al., 2016).[3] Cellini and Koedel (2017) and Cellini (forthcoming) review this literature and conclude that for-profit colleges generally have lower returns than public colleges, whereas Gilpin and Stoddard (2017) interpret the findings as inconclusive.

The most prominent recent paper in this area is by Cellini and Turner (2019). They use administrative data from the U.S. Department of Education to study labor-market returns to certificates in for-profit colleges among the subset of students who receive federal aid under Title IV of the Higher Education Act of 1965. Their approach matches students in for-profit certificate programs with students in public community colleges and finds that earnings are lower for the former group.

[2] Due to the small sample of students attending for-profit schools, Chung's (2008) analysis of the labor-market returns of attending for-profit schools using data from the National Education Longitudinal Study is inconclusive.
[3] Armona, Chakrabarti, and Lovenheim (2018) focus on financial aid and student loan debt, although they provide some estimates of the returns for students attending for-profit schools using both survey and administrative data. Results generally suggest returns are smaller for-profit schools, but most estimates are quite imprecise.

Our first contribution to the existing literature using national data is that we exploit data with a much broader set of for-profit schools and students in one state. Survey datasets have the advantage of covering the entire country, but they have relatively small numbers of respondents attending for-profit schools.[4] The national data used by Cellini and Turner (2019) include only schools eligible for Title IV federal assistance, and they have data only on students who actually receive federal aid. Many for-profit schools offer only certificates and do not participate in federal government programs. Any comprehensive look at for-profit institutions should include schools and students that do not receive federal assistance as well as those that do.

Second, we use a more flexible model specification. Although several recent papers estimate models that allow the return to community college to vary by time since enrollment, existing studies of for-profit schools usually fit models that assume the return is constant in each time period. Previous work such as Cellini and Turner (2019) also pools students from for-profit and community colleges when estimating fixed-effects models. We find that these less flexible models have potential biases because they fail to account for heterogenous returns and population differences between students attending for-profit schools and community colleges.

Finally, we present evidence showing that students in for-profit schools and community colleges pursue different degrees and focus on different areas of study. We undertake comparisons in returns for the small number of students who are comparable—in terms of personal characteristics and area of study—and find that results are largely unchanged. However, we suggest that the two types of schools serve distinct markets, so that the comparison does not represent choices faced by many individuals.

[4] BPS data, for example, include only first-time students and are limited to students attending Title IV eligible institutions. Deming, Goldin, and Katz (2012) and Lang and Weinstein (2013) acknowledge that many students in for-profit colleges have previously attended postsecondary education.

III. Data

Our analyses examine the enrollment and earnings returns for students who entered for-profit post-secondary schools or public community colleges located in Missouri from January 2005 to December 2012. In order to estimate counterfactual earnings, we also use data on pre-entry earnings for individuals who entered school as late as December 2015. For more information on the data, see Jepsen et al. (2021).

For-profit schools with a physical presence in the state must provide student-level data as part of Missouri's Proprietary School Certification Program.[5] As in most states, the set of schools includes campuses of national institutions such as the University of Phoenix as well as local institutions focusing on one or two subjects such as truck driving academies.[6] The data are not limited to schools that receive Title IV funding from the U.S. government or to students who receive federal financial aid. Although we know of no comprehensive listing that would allow us to identify whether all for-profit schools within the state are included, the analyses here are based on a more comprehensive listing of for-profit schools – for one state – than that used in any previous analyses. The state's Enhanced Missouri Student Achievement Study (EMSAS) records provide information about individuals who enroll in any of the state's 14 community colleges.

Our analysis will focus on spells of enrollment, where a spell is a period of participation in either a for-profit school or a community college, allowing for periods of non-enrollment of no more than a year within a spell. The sample is limited to students who specify that they are seeking certificates or associate's degrees; the majority of students in for-profit schools and

[5] See http://dhe.mo.gov/psc/. We were able to identify the for-profit or not-for-profit status of all schools that accepted students in 2010, where 99 percent attended private for-profit institutions; private nonprofit institutions accounted for the remainder. We refer to these schools as for-profit schools to be consistent with the literature.
[6] Although we do not have data on schools that are on-line only, discussions with state education officials suggest that very few on-line only schools exist during this time period. We found no evidence of any on-line only for-profit colleges in the Integrated Postsecondary Education Data System (IPEDS).

community colleges specify these program types.[7] We exclude students who attend a public four-year educational institution in the state anytime between the beginning of a spell and two years following the end of the last spell of enrollment are omitted from the analysis, who attend both for-profit schools and community colleges during the period of our study, or indicate at the time of enrollment that they are not permanent residents of Missouri or Kansas, the states for which we have administrative earnings data.[8]

For each student, the data contain the specific school attended, the Classification of Instructional Programs (CIP) code with the field of study, and—for award recipients—the type of degree or certificate received.

These data are matched with administrative data on earnings from the Missouri and Kansas Unemployment Insurance (UI) programs, which provide information on quarterly earnings for the overwhelming majority of workers who live in these states.[9] We have adjusted all earnings for inflation, with 2010 as the base year. Despite excluding some types of earnings such as self-employment, program effects on employment and earnings based on wage records are generally comparable to those obtained in surveys, at least for in the context of worker training programs (Kornfeld and Bloom, 1999) and welfare programs (Wallace and Haveman, 2007).

Our outcome analyses use quarterly earnings information from the first quarter of 1999 through the third quarter of 2014. Thus, we have data for at least five years prior to school

[7] We omit the third of community college students who specify "other" as the degree they are seeking, many of whom intend to transfer to a four-year college. Among for-profit students, we omit the 15 percent of students who indicate that they are seeking a bachelor's or graduate degree.

[8] We keep students who do not specify a state of permanent residence (primarily community college students) because we find that the proportion of these students who have earnings reported in our UI wage record data is similar to that of students who report living in Missouri or Kansas.

[9] Although the St. Louis metropolitan area is on the border with Illinois, the proportion of Missouri residents who work in Illinois is small. Within the metropolitan area, only 16 percent of private sector jobs were in Illinois in 2012 (www.bls.gov/news.release/cewqtr.toc.htm), and these jobs were mostly held by Illinois residents.

attendance and over four years (19 quarters) after initial enrollment in a for-profit school or community college. The resulting data set is a panel of student entries and time periods. We exclude quarters where the individual is under the age of 18 or over the age of 60 at any time during the quarter, as well as any quarter of earnings more than 24 quarters prior to program entry or more than 25 quarters after program entry. We also exclude all observations for individuals where age or Social Security number are missing. The number of individuals omitted for these latter reasons is very small. In the for-profit data, we also omit the approximately 22 percent of cases where the date of exit is missing.[10]

Although our data pertain only to those attending for-profit schools and community colleges in Missouri, the state is typical of the U.S. The industrial structure is similar to that of the U.S. as a whole, and earnings and wages are no more than 10 percent below the U.S. average. The proportion of the population that is African-American is slightly below the national average. The proportion Hispanic is substantially below the U.S. average but similar to that of most states. Because the state is representative of the nation in many respects, the results provide estimates that are plausible for many parts of the country.

IV. Methods

To estimate labor-market returns, we compare the post-schooling earnings of an individual with the pre-schooling earnings of the same individual. In effect, the comparison group and the treatment group (to use experimental terminology) consist of the same individuals, so most of the measured and unmeasured factors that influence earnings are the same.

This fixed-effects model is a valid tool for estimating returns to schooling for individuals with pre-schooling earnings information. Economists regularly use fixed-effects models to

[10] In the community college data, exit date is never missing.

estimate labor-market returns for nontraditional students including previous work on for-profit schools (Cellini and Turner, 2019; Cellini and Chaudhary, 2014) and community colleges (Jepsen, Troske and Coomes, 2014, Belfield and Bailey, 2017).[11] Using pre-schooling time periods as controls is appropriate in our data because over 80 percent of students are age 20 or older when they initially enroll, and average age is around 30.

Following Cellini and Chaudhary (2014), we focus on quarters with positive earnings. We fit the model separately by gender, type of school (for-profit versus community college), and program (certificate versus associate's degree) yielding eight sets of estimates. Although the fixed effects model adjusts for individual differences, it is necessary to obtain estimates of the effects of calendar quarter and age in order to predict the earnings that an individual would have obtained following enrollment if he or she had not enrolled. To estimate such counterfactual earnings, we obtain estimates of these parameters using earnings for all individuals prior to enrollment. In particular, we undertake such estimation using earnings 24 to five quarters prior to enrollment for all individuals who began participation over the period 2005 through 2015. The fixed-effects model fits the following multivariate regression:

$$(1) \qquad LNEARN_{it} = \delta \cdot AGE_{it} + \eta_i + \tau_t + \varepsilon_{it}.$$

In this equation, *i* denotes a person and *t* denotes a quarter. *LNEARN* is the log of total reported UI earnings across all jobs for the quarter. Quarters with no reported UI earnings are excluded. *AGE* is the individual's age in years, represented by a cubic. The parameter η is a set of person fixed effects, capturing all person-specific components that are constant over time, such as

[11] The main limitation of student fixed effect models pointed out by Dynarski, Jacob, and Kreisman (2016) is the underlying assumption that the pre-enrollment earnings trends between completers and dropouts are similar. This concern does not apply here because we do not compare completers and dropouts.

race/ethnicity or innate ability. The model also contains a set of dichotomous variables to control for each calendar quarter (τ). The last component (ε) is the error term.

Based on (1), we construct counterfactual earnings for each individual for quarters beginning four quarters prior to the enrollment. In particular, for an individual *i*, we specify:

(2) $$\widehat{LNEARN}_{it} = \hat{\delta} \cdot AGE_{it} + \hat{\eta}_i + \hat{\tau}_t.$$

Because we estimate the model in (1) on earnings five or more quarters prior to program entry, and the latest entry date available is at the end of 2015, the most recent earnings available are for quarter 3 in 2014. The reason for estimating this model is to provide estimates of the calendar quarter and age coefficients that cannot, by construction, be influenced by earnings subsequent to enrollment. Furthermore, our approach avoids the potential bias that can occur in fixed effects models as described in de Chaisemartin and D'Haultfoeuille (2020).

We then fit the following equation for all entries occurring from 2005 through 2012:

(3) $$LNEARN_{it} - \widehat{LNEARN}_{it} = \alpha \cdot ENROLL_{it} + \beta \cdot ENTRY_{it} + \varepsilon_{it}.$$

ENROLL is a variable equal to one for each quarter in which the individual is enrolled in school for the entire quarter and a value of one-half for the first quarter and last quarter of school enrollment. Because the school entry and exit dates are unlikely to coincide perfectly with the calendar quarter, we assume that individuals spend only half of those quarters enrolled in school.

The input of interest is for-profit school or community college attendance. The vector *ENTRY* contains a set of dichotomous variables measuring time relative to entry into schooling, beginning four quarters prior to the date of entry through quarter 25. Hence, we include a variable for the fourth quarter before enrolling, a variable for the third quarter before enrolling, extending through the twenty-fifth quarter after enrolling. The variables for the four quarters before enrollment are included to capture the possibility of an "Ashenfelter dip" in earnings in

the quarters immediately before enrollment, as Jepsen, Troske, and Coomes (2014) document large dips in earnings immediately prior to community college attendance. The reference period or omitted category is the set of quarters more than four quarters before enrollment. The coefficients report the difference in earnings for the specified quarter relative to quarters more than one year before school entry, taking account of age and calendar quarter effects.

As mentioned previously, we have earnings data from the first quarter of 1999 through the third quarter of 2015. Because we exclude observations more than 24 quarters before program entry and more than 25 quarters after program entry, we have up to 50 quarters of earnings observations per person.

The quarterly variables for the period after initial enrollment provide a flexible way to capture the returns to attendance, similar to recent work on the returns to community colleges (Jaggars and Xu, 2016; Bahr, 2016; Minaya and Scott-Clayton, forthcoming).[12] Unlike the estimator in much previous work on for-profits, we do not constrain the earnings to have any specific parametric relationship with the time since enrollment. Estimates of the impact of attendance are identified relative to the implicit counterfactual defined by the dummies for calendar quarter and the cubic function for age. Furthermore, we do not pool the data, either by gender, school type, or program type, to avoid constraining the estimates.

Because the sample includes only individuals who attend for-profit schools or community colleges, identification of the effects in post-participation quarters derives from a comparison with earnings for quarters at least a year prior to participation and by the assumption that, given controls for age and calendar quarter, the patterns of schooling returns are similar for those

[12] The seminal papers on returns to community college, Jacobson, LaLonde, and Sullivan (2005a, 2005b), also allowed the overall effect of community college attendance to vary with the number of quarters since enrollment through the inclusion of what they call short-run deviations.

beginning their attendance at different ages and in different periods. Having data on non-students is not necessarily essential for identification, as Stevens, Kurlaender, and Grosz (2019) and Jepsen, Troske, and Coomes (2012) find similar returns for community college awards in models that exclude dropouts to their preferred model that includes them.

We look at spells of attendance rather than completion of a degree in order to avoid endogeneity concerns associated with non-random completion, as noted in Cellini and Chaudhary (2014). Another, more practical, reason for the focus on attendance rather than completion is that, in those cases where the degree completed is not specified, we cannot always determine whether the individual left the program without a degree or if the information is missing for some other reason.

By design, our structure is only relevant for individuals with observed earnings. In other words, our earnings estimates understate the contribution of enrollment to overall earnings if attendance increases the likelihood of employment. As a complement to these analyses, we also fit a model that predicts expected employment:

$$(4) \qquad EMP_{it} - \widehat{EMP_{it}} = \alpha \cdot ENROLL_{it} + \beta \cdot ENTRY_{it} + \varepsilon_{it}.$$

Employment (*EMP*) is a dichotomous variable equal to one for individuals with observed earnings. Here $\widehat{EMP_{it}}$ is estimated in equations paralleling (1) and (2) above. We estimate the model as a linear probability model.

As a way to incorporate the possibility that individuals may have left Missouri (and Kansas) and thus have no UI earnings, we have fitted the above employment model on a sample that omits quarters if we observe no employment for an extended period through the end of our earnings data. In particular, if we observe no earnings in quarter 30 (or the last quarter for which earnings data are available, if earlier), and the continuous string of quarters with no earnings

subsequent to initial enrollment is at least 10 quarters in length, we omit this string of quarters from the analysis. This approach will fail to account for employment of those who left the state after completing enrollment and were employed elsewhere before resuming employment in the state, because the intervening years would be coded as including no employment. Conversely, this approach omits some individuals who are unemployed for more than 10 quarters or withdraw from the labor market because of poor opportunities. In each case, bias would result if these activities were associated with school attendance. Given this limitation in the employment analysis, most of our discussion will focus on earnings conditional on employment.

V. Results

Descriptive Statistics

Table 1 contains the descriptive statistics for the analysis sample of over 100,000 entries for students into the state's for-profit schools and nearly 300,000 entries for students into the state's community colleges between January 2005 and December 2012.[13] We provide statistics separately by gender, type of school and by degree program.

To summarize, the numbers in Table 1 show that students in for-profit schools differ from students in community colleges on several dimensions such as race, age, and education. Black students, high school dropouts, and GED recipients are over-represented in for-profit schools. The majority of for-profit students pursue a certificate, whereas the vast majority of community colleges pursue an associate's degree. Large differences also exist in field of study: men in community colleges are much more likely to study academic subjects than men in for-profits, and women in for-profits are much more likely to study health than women in

[13] Recall, the analysis sample is limited to entries into certificate or associate's degree programs, where the individual indicated permanent residency in the state or the neighboring state for which we have administrative earnings data, and where the individual had not been enrolled in a for-profit school or community college in the state in the prior 12 months.

community colleges. Given these significant differences, for-profits and community colleges appear to operate in different parts of the higher education market. We explore these differences more thoroughly later in the paper.

Tables 2a and 2b provide mean earnings and levels of employment for selected quarters prior to and subsequent to enrollment by gender, school and program type. Figures 1a and 1b (for men and women, respectively) present the trends in average earnings by quarter relative to quarter of entry, where quarter zero denotes the quarter of initial enrollment. Individuals with no reported earnings in the states' employment records are coded as having zero earnings for the quarter, so the reported means are not conditional on employment.[14]

As Figure 1a shows, men in certificate programs have noticeably higher earnings than men in associate's degree programs for both for-profit schools and community colleges, although the difference narrows for for-profit students after around four years. All groups experience an "Ashenfelter dip" in earnings immediately prior to the time of school entry, as well as reduced earnings following the entry quarter, often called a "lock-in" effect, reflecting participation in school. Because earnings growth is higher in the post-entry period than the pre-schooling period, average earnings generally exceed their pre-schooling levels a few quarters after school. The highest average earnings, observed 25 quarters after enrollment, are approximately $6,000 per quarter for the community college certificate program, and the lowest, $4,300 are for the for-profit associate's degree program.

For women, average earnings are much more similar for the different schools and programs. Average earnings for those in community college programs are somewhat higher than for for-profit programs, both prior to enrollment and in later periods. Participants in both school

[14] As noted above, these means exclude strings of quarters of length 10 or more after initial enrollment where no earnings are observed in quarter 30, or to the end of our observation window if prior to that point.

types and degree programs experience large increases in average earnings during the first few post-entry quarters; the rate of growth is more modest in later periods. Average earnings are usually highest for the community college certificate programs ($4,600 in quarter 25); earnings for the for-profit programs are lower ($3,500).

For both men and women, these trends in average earnings strongly suggest positive impacts of participation in both for-profit schools and community colleges. We now turn to regression results, which control for calendar quarter, age, and student fixed effects, for the estimates of the return to school attendance.

Effects on Earnings

Figures 2a and 2b contain the earnings regression results for the model depicted in equation (3) for men and women, respectively, with separate regressions for each of the four lines in each figure. The figures show the earnings gains (relative to predicted earnings) to attendance for individuals pursuing certificates (dashed lines) and associate's degrees (solid lines) for each quarter beginning four quarters before entry to 25 quarters after entry.[15] The lines indicate the estimated increment in log earnings in that quarter relative to the period from 24 to five quarters before entry (the reference period), controlling for age and year/quarter.[16] Finally, note that the calendar quarter dummies included in equation (1) control for calendar quarter effects such as those due to statewide changes in wages due to inflation or variation in the growth of the economy.

Figure 2a shows a broadly similar pattern for men across school type and degree

[15] Coefficient estimates and standard errors are shown in Appendix Table A1. For simplicity, figures exclude confidence intervals. We discuss important differences across estimates in significance levels in the text.
[16] Note that the graph shows the combined effect of the coefficients for the dummy variables in $ENTRY$ and the coefficient for $ENROLL$. We use the $ENROLL$ dummy variable to capture the average number of quarters in which enrollment was observed (rounded to the nearest discrete value). For example, the average number of quarters of enrollment for men in certificate programs is about three, so the dummy variable for enrollment is set to one-half for quarters 0 and 2, and one in quarter 1, i.e., identifying the first three quarters in which individuals are enrolled.

program: slightly declining earnings in the last four quarters before entry, a large decline around entry (particularly for men in for-profit certificate programs), followed by consistent gains in earnings. Earnings continue to rise for men enrolled in for-profit associate's degree programs, but earnings gains level off around four years after entry for the other three groups. By the fifth year after entry,[17] the average earnings increment relative to predicted earnings in the absence of schooling (based on earnings five to 24 quarters prior to entry) for men seeking certificates in both for-profit schools and community colleges is about 20 percent.[18] In contrast, the average return for for-profit associate's degree students is 29 percent, compared to only 19 percent for community college students seeking associate's degrees.[19] By the end of our period, men in associate's degree programs in for-profit colleges have the largest gain in earnings, well over 30 percent, followed by men in certificate programs in for-profit colleges, with gains of slightly over 25 percent. Men in community colleges continue to experience smaller growth in earnings than men in for-profit colleges, despite having the highest earning growth in the first 10 quarters after enrollment.

Figure 2b shows a different pattern for women. Women in associate's degree programs in community college experience the lowest growth, with growth in for-profit associate's degree programs slightly higher. Growth rates for women in the certificate programs are somewhat higher and for-profit and community college returns are similar after two years. In the fifth year after entry, the increases in earnings (again, relative to five to 24 quarters prior to entry) average 16 percent for women pursuing associate's degrees in community colleges, compared to 20

[17] We choose five years or quarters 17-20 after entry because that time period corresponds roughly with the average post-schooling time period in Cellini and Chaudhary (2014), thus facilitating comparisons of our results with theirs.
[18] Coefficients for earnings reported in the figures and tables refer to effects on the natural logarithm of earnings. We have converted these to percentages for ease of interpretation.
[19] Estimates of return have standard errors between 1 and 2.5 percentage points, so differences of less than 3 percentage points are often not statistically significant at conventional levels. See Appendix Tables A1a and A1b.

percent for for-profit schools. Returns average from 24 to 27 percent for women in certificate programs. In quarters 21 to 25, earnings growth tapers for associate's degree programs.

Overall, Figures 2a and 2b illustrate that individuals who attend for-profit schools fare as well as, if not better than, individuals who attend community colleges. The highest gains are for men pursuing associate's degrees in for-profit schools, and the lowest gains are for women pursuing associate's degrees in community colleges.

Effects on Employment

Figures 3a and 3b provide estimates of the effects of enrollment on employment for males and females. Recall that this analysis omits quarters with zero earnings that are of length 10 or greater up through quarter 30 (or the end of the earnings record if prior to that) following school entry, so individuals who permanently left the state do not contribute to this analysis after their departure.

Looking first at Figure 3a, men seeking certificates have an immediate decline in employment of 6-9 percentage points, compared to no decline for men enrolled in associate's degree programs. After that, the highest short-run employment (compared to employment of at least one year prior to enrollment) are for men in community colleges pursuing certificates. In contrast, men in certificate programs at for-profit colleges have the lowest employment gains – less than one percentage point (and in some cases negative) – throughout the period. For men seeking an associate's degree at a for-profit school, employment prospects improve steadily before peaking 13 quarters after entry at around 5 percentage points. Although the employment gains decline after this point, the employment gains are generally higher than for the other three

programs in the last ten quarters of our analysis.[20]

Turning to Figure 3b we see that all four groups of women experience a decline in employment rates (relative to predicted employment) during the period of enrollment, with the decline ranging from 2 to 12 percentage points. Women attending certificate programs in community colleges have no more than a 2 percentage point improvement in employment, and in later quarters have lower employment relative to the pre-enrollment period. The highest gains in employment are for women attending certificate programs in for-profit colleges, where women experience gains of 3 to 5 percentage points for years two to five after enrollment. Women pursuing associate's degrees, either in for-profit schools or in community colleges, have more modest employment gains of 2 to 3 percentage points for much of the post-enrollment period.

Comparing Figures 3a and 3b we see stark differences in the patterns of employment for men and women. Certificates in for-profit schools provide the best employment outcomes for women and the worst outcomes for men, whereas certificates in community colleges provide the smallest improvement for women and provide the highest short-run improvement for men. Associate's degree programs provide similar gains for both men and women three to five years after enrollment.

Sensitivity Analysis

The first sensitivity analysis conducted here is whether to pool data across different groups such as degree or school type. Cellini and Turner (2019) pool data between for-profit and community college students seeking certificates. Table 3 explores the sensitivity of the results to pooling the data in this way for students seeking certificates. Columns 1 and 3 present the results

[20] For people who entered schooling in 2005-2006, five to six years later is 2010-2012, a period of unusually high unemployment. If those with new credentials faced particular problems obtaining employment during this period, this would cause a decline in employment near the latter part of our data window.

from the model in Appendix Table A1, with separate regressions for for-profit students and community college students. In columns 2 and 4, we estimate pooled models on the combined sample of for-profit and community college students. We include interaction terms between for-profit attendance and each control variable in the second-stage equation estimated in equation 2.[21] The first two columns are for men, and the second two columns are for women.

The table clearly shows that pooling the data affects the results. In the pooled data (Columns 2 and 4), the earning gains for for-profit students are much lower than the coefficients for community college students, a pattern found in Cellini and Turner (2019). In contrast, the gap in earnings gains between school types is much smaller in the separate models (Columns 1 and 3), with men in for-profit colleges having higher earnings gains in the longer term. Our conclusion is that pooling the data in this way is not appropriate. The formal assumption implied by pooling the data is that the income attainment processes for the two groups of students, prior to entry into schooling, are the same.[22] In the case at hand, the very different results show that the prior processes differ substantially, and we believe results of the pooled model are likely to be misleading. Given the stark differences in student characteristics between the two school types documented above, we believe that separate models should be estimated by school type, degree sought, and gender to provide the most flexible model.

In Appendix Table A3, we make the same comparison between pooled and separate models for individuals seeking an associate's degree. Again, the pooled model produces lower earnings gains for for-profit students compared to community college students. However, the reported earnings penalty for for-profit students, and thus the gap between for-profit students and community college students, is smaller for associate's degree seekers.

[21] Such interaction terms are not included in the first stage because they are absorbed by the person fixed effects.
[22] In practice, we often pool data to improve precision as long as the processes are not "too different."

Jepsen et al. (2021) document that the results are not sensitive to several robustness tests. First, we exclude observations with earnings $1 or less per quarter, as well as trimming the sample of the top 1 percent and the bottom 1 percent of the remaining observations (a robustness test in Cellini and Chaudhary, 2014). Second, we exclude students who study the academic/other field, as very few students in for-profit schools – usually less than five percent – are in such fields, suggesting that the difference in earnings and employment gains between school types are not driven by students pursuing academic fields of study. Our final robustness test includes only Title IV schools (as in Cellini and Turner, 2019).

So far, the results are for attendance regardless of completion. In Figures 4a and 4b, we limit the sample to completers to facilitate comparisons with previous work such as Jepsen, Troske, and Coomes (2014) that compares community college completers to dropouts. However, because completion is not random, the results should not be interpreted as causal. Not surprisingly, earnings gains are higher for completers (Figure 4) than for the full sample of attendees (Figure 2). With the exception of men pursuing associate's degrees, completers in community college do as well as, and often better than, completers in for-profits. But community college students are between a fifth and a third as likely to complete certificates or degrees as are for-profit students.

As mentioned previously, the results for employment omit any strings of zero earnings of length 10 or more quarters at the end of the period. Jepsen et al. (2021) show that the coefficients are sensitive to this choice, with higher coefficients for the model that excludes any strings of five or more zeros and lower coefficients for the model excluding strings of 15 or more zeros. However, the ranking of coefficients is stable across these changes.

VI. For-Profit Schools and Community Colleges: Further Comparisons

Dissimilarity Measures

As mentioned previously, for-profit and community college students differ on many dimensions. A particularly important difference is field of study. Table 4 provides tabulations of the index of dissimilarity between for-profit schools and community college by gender and degree sought for characteristics of students and field of study. We see that, for men seeking certificates, the index of dissimilarity for field of study is 0.39, implying that 39 percent of the students (in either the for-profit or the community college sample) would have to be shifted from one field to another for the field of study distributions to be the same for students in for-profit schools and community colleges. Returning to Table 1, the reason for this large value is clear. The two most popular fields of study for men in certificate programs at for-profit schools are trades and transport, with around 60 percent of men seeking a certificate in one of these two fields, in contrast to certificates in community college, where these two fields together account for only 21 percent of students, whereas the two most popular programs, vocational and health, account for 54 percent of students.

The index of dissimilarity for field of study for-profit and community college students for men seeking an associate's degree is 0.673. This reflects the fact that, among men seeking associate's degrees in for-profit schools, 36 percent are in the vocational field and 28 percent are in the computer field, whereas for men in community colleges, 70 percent are in the other field, largely those in "academic."

For women, the index of dissimilarity for field of study between for-profit and community college students is of the same order of magnitude as for men, but the explanation differs. Among women in for-profit schools, the health field is by far the most popular field of study regardless of degree program, with 77 percent of women seeking a certificate program in

this field and 64 percent of women seeking as associate's degree in this field. For women in community colleges, health also is the most popular for certificates, but it is much smaller (44 percent), whereas the other/academic field is by far the most popular for associate's degrees (79 percent).

The index of dissimilarity implies differences by race and age in the distribution between the two types of schools, although these are somewhat more modest than differences in field. The distribution of students seeking certificates across the 13 regions of the states (based on school location) is quite discrepant for both men and women, and nearly half the students in a school type would need to be reassigned to another region to provide equal shares. In contrast, regional differences for associate's degree seekers are less extreme, with comparable figures between a fifth and a quarter.

The final line of Table 4 provides the index of dissimilarity when we use a logit to estimate the probability that a student (in a given gender-degree group) is in a for-profit school rather than a community college using all the measures listed in Table 1, in addition to prior earnings and employment, and year of entry into school. The index of dissimilarity is based on deciles of the propensity score in the full sample. The index of dissimilarity is over 0.7 in every case, with a maximum value of 0.86 for women seeking associate's degrees. This value is our best overall indicator of the extent of differences in the types of students served and type of training for for-profit schools and community colleges.

Effect Estimates Based on Matching

These measures make clear that for-profit schools and community colleges are serving different student populations and providing instruction in different fields of study. The analysis of this section attempts to identify the returns for comparable individuals in comparable fields.

We use propensity score matching to form a comparison group of students in each school type by gender and degree sought. We consider two alternative estimates. The first estimate is based on students who attend for-profit schools and identifies comparable students in similar fields in community colleges; in this case, for-profit school is the "treatment" and community college is the comparison group. The second estimate starts with community college students and asks what the return is for comparable for-profit students in the same fields of study; here, community college is the treatment and for-profit school is the comparison. As above, we perform these analyses separately for men seeking a certificate, men seeking an associate's degree, women seeking a certificate, and women seeking an associate's degree. Using the sample that includes students in both types of schools, we estimate the probability that an individual enrolls in a for-profit school, using a logit. More details on the matching algorithm are in the appendix.

Estimates of returns for men seeking certificates appear in Appendix Figure A1a. Appendix Table A5 shows that we find matches for only about half of the for-profit students when for-profit is taken as the treatment. However, the estimated returns for this more limited sample "FP Return (FP Treatment)" are quite similar to those reported in Table 2a.[23] We observe that estimated returns for the small proportion of community college students matched with for-profit students, "CC Returns (FP Treatment)," are appreciably higher, implying that the small proportion of students who find comparable training in community colleges do very well. For the matched sample, returns for for-profit students average 21 percent for the fifth year, but are 34 percent for the matched community college sample. However, the returns are not uniformly higher for community college students. When community college is taken as the treatment,

[23] Note that the treated sample is unweighted, so the return only differs from that reported earlier because not all treated cases can be matched.

returns for community college students in this sample are only 18 percent, but the for-profit returns for the sample that is matched to it are 27 percent.

When we consider men seeking associate's degrees (Appendix Figure A1b), we find somewhat different results. When for-profit schools are taken as the treatment, community college returns for the comparison cases matched to the for-profit students are appreciably lower (community college returns average 18 percent compared to 25 percent for for-profit students in year five). When community college is taken as the treatment, the community college returns are also lower than the for-profit returns (fifth year averages of 16 percent versus 40 percent).

The differences in returns across conditions are smaller for women. However, for those seeking certificates (Appendix Figure A1c) in the case where for-profit schools are the treatment, the basic patterns are similar to those of men, implying that the community college students with characteristics and fields similar to for-profit students have higher returns than the for-profit students (fifth year average 30 percent versus 21 percent). There is essentially no difference in the return in the fifth year between the two types of schools when community college is taken as the treatment. Finally, when we consider women seeking associate's degrees (Appendix Figure A1d), we find that the returns for for-profit schools and community college are quite similar when for-profit is taken as the treatment, but when community college is taken as the treatment, returns for for-profit schools are much higher.

Overall, these analyses do not suggest that either for-profit schools or community colleges dominate in terms of expected return. The case of certificates is notable in that the ranking of returns depends on the choice of the treatment group. Specifically, for both men and women, the select set of community college students who are similar to for-profit students and have similar fields of study have greater returns than for-profit students, but the returns for the

selected set of for-profit students who match community college students are higher than or similar to the returns for community college students.

VII. Direct Costs of Attendance and Rate of Return

Our analyses above focus on the labor market return to school attendance, calculated as an increment to earnings. We have not considered any direct costs. We do not have a measure of direct cost incurred for any of the individuals in our sample. However, the for-profit schools reported, for each certificate or degree that they offered, the total cost of obtaining the degree, including tuition and fees, as well as incidentals, such as books and supplies. Similarly, each community college provided information on tuition and fees, as well as the cost of books and supplies, which can be converted to a per-credit-hour cost. Using these costs, Jepsen et al. (2021) estimate the costs to completing an award by school type. They show that the costs for obtaining a certificate in a for-profit school, approximately $14,000, are twice as much as the cost at a community college. For an associate's degree, the average cost at a for-profit is more than $25,000, usually more than three times the cost at a community college. Differences in field of study do not explain these cost differentials.

Given that the direct costs of attendance for students in for-profit and community colleges differ, it is natural to estimate returns net of those costs. For such calculations, we used average earnings of those seeking certificates or degrees by quarter since enrollment reported in Figures 1a and 1b, in conjunction with our estimates of the effect on earnings for this same population from Figures 2a and 2b. We combine this with employment rates (Table 2b), along with estimates of enrollment effects on employment (Figures 3a and 3b), to provide the dollar difference in the expected earnings (including direct costs) for the average recipient in each

quarter. Estimates therefore account for both the effects on earnings for those working and on the likelihood of employment.[24]

Our estimates of the effects of enrollment on earnings cover only 25 quarters after entry, but returns presumably are expected to accrue for a more extended period. In the face of this uncertainty, we choose to extrapolate our data to 100 quarters (25 years), simply taking the average dollar benefit received in quarters 21-25 and extending it through quarter 100. Direct costs are assumed paid over the quarters of enrollment. Although these assumptions are arbitrary, the basic pattern of results is not sensitive to the particulars.

Although internal rates of return do not provide a comprehensive measure of the value of an investment, such a measure does indicate at what interest rates net returns would be positive. Table 5 provides estimates of the internal rate of return. Return estimates vary quite dramatically, although all indicate a return on investment in excess of 5 percent. For men, the internal rate of return for those seeking certificates at for-profit schools is 13.6 percent, whereas it is 39 percent for men in community colleges. For men seeking associate's degrees, the for-profit rate of return is 5.4 percent, whereas the return for men attending community colleges is 20.5 percent.

The net rates of return for for-profit schools are lower primarily because the direct costs are so much higher. Rates of returns are generally higher for certificates than for associate's degrees, with the exception of women in for-profit schools. Although the investment in a certificate may seem more favorable, it is also a smaller investment; comparison of internal rates of return may be misleading in such cases. Similarly, the effective investment in for-profit schools is also greater, so the lower rate of return may be associated with the greater size of the investment.

[24] The basic pattern of results is not sensitive to the particular estimates of the impact of employment.

Although these estimates ignore the possibility that student who do not finish their chosen field may face smaller direct costs, the basic conclusions would not change because a substantially smaller proportion of community college student complete degrees.

VIII. Conclusion

This paper investigates the relationship between attendance in a for-profit school or a community college and subsequent earnings. We use an individual fixed-effects method, estimated in two steps, to control for time-invariant differences between students. We find positive effects of attendance on earnings for students enrolled in both types of schools and degree programs. The lowest increment in earnings is for women pursuing associate's degrees in community colleges.

How do our results compare to others in this literature? Cellini and Chaudhary (2014) find an earnings increment conditional on employment of around 10 percent in the four years after leaving school for young students in the NLSY attending associate's degree programs at for-profit institutions. If we look at a similar post-schooling time period, the average returns in quarters 4 to 19 (the first four years after 4 quarters) are between 11 and 13 percent. However, for longer post-schooling periods, our analysis suggests that the returns to attendance grow, so that the effective benefits of attendance are appreciably larger than those estimated for this initial period.

Jepsen, Troske, and Coomes (2014) find that students who complete associate's degree programs in Kentucky community colleges have higher quarterly earnings of 56 percent for women and 24 percent for men. Their time period of study is 4.5 to 6 years after entry, so we use our results for quarters 22-25 for comparison (the last four quarters for which we have estimates). Over this time period, our estimates for the average gains for those attending

community colleges are 22-36 percent for men and 17-21 percent for women.[25] For comparison, Stevens, Kurlaender, and Grosz (2019) find average returns in excess of 40 percent for attending vocational associate's degree programs. With respect to employment outcomes, we find an increase of no more than 6 percentage points in any one quarter, with averages across quarters less than half that, much smaller than the effect for completing an associate's degree of 12-19 percentage points in Jepsen, Troske, and Coomes (2014).

Deming, Goldin, and Katz (2012) and Lang and Weinstein (2013) have preferred estimates that compare for-profit schooling to public schooling rather than reporting overall returns. Deming, Goldin, and Katz (2012) report lower earnings for degree seeking students in for-profit schools, whereas Lang and Weinstein (2013) find no statistically significant differences, although power in the latter study is very limited.

For individuals pursuing certificates, Cellini and Turner (2019) find that for-profit students have lower returns than matched community college students. In contrast, Lang and Weinstein (2013) find no difference. Our results suggest that men seeking certificates receive higher returns in for-profit schools when we match the student characteristics and fields of community colleges, but the reverse is true when we match on for-profit characteristics and fields. Women receive slightly higher returns in community college when matched on for-profit characteristics, but there is no difference when they are matched on community college characteristics. Studies of public or nonprofit schools offering certificates provide a wide variety of estimates. In a study of Kentucky community colleges, Jepsen, Troske, and Coomes (2014) find modest unconditional earnings gains of 5-7 percent. For California, Stevens, Kurlaender, and Grosz (2019) find larger effects when they condition on employment, of 12 to 23 percent. If

[25] This pattern of results also holds if we compare our results to unreported results from Kentucky that condition on employment by estimating a log earnings model.

we use the time period of 5 to 20 quarters after enrolling (comparable to the period considered in those studies), we find an average conditional earnings increase of 17-19 percent in community colleges.

With the exception of Cellini and Turner (2019), our results suggest that the earnings increments of for-profit school attendance are broadly similar to previous studies such as Cellini and Chaudhary (2014) for for-profit colleges and Stevens, Kurlaender, and Grosz (2019) for community colleges.

As far as we are aware, no other studies have attempted to take into account differences in cost of attendance for for-profit schools and public alternatives. Our estimates of direct cost confirm the general view that for-profit schools are much more expensive than community colleges, whether students are seeking certificates or associate's degrees. As a result, the effective rate of return for students attending for-profit schools is lower. However, our estimates suggest that, over the long run, the average for-profit student receives an earnings increment that ultimately covers those direct costs.

Overall, our results suggest that the universe of students attending for-profit schools and community colleges in this state seem to gain valuable labor market skills, although the benefits are not equally distributed, and, in some cases, the tuition costs are substantial relative to the returns. We have also provided evidence suggesting that the two types of schools serve different students, offer different degrees and fields of study, and are located in different places. This observation suggests that direct comparison of the costs and returns for for-profit schools and community colleges may be misleading. If a student who wishes to pursue a given area of study can attend only a for-profit school, the returns that could be obtained at a community college are

not relevant. The more appropriate question is whether those returns are sufficient to justify attendance.

Our results do not allow us to reject the reality that some students complete expensive or time-consuming programs and obtain minimal labor market returns. However, these results suggest that, in aggregate, both types of schools provide benefits that outweigh the costs incurred by the students they serve. For this reason, there is little basis for restructuring policy in favor of either the for-profit schooling sector or public community colleges.

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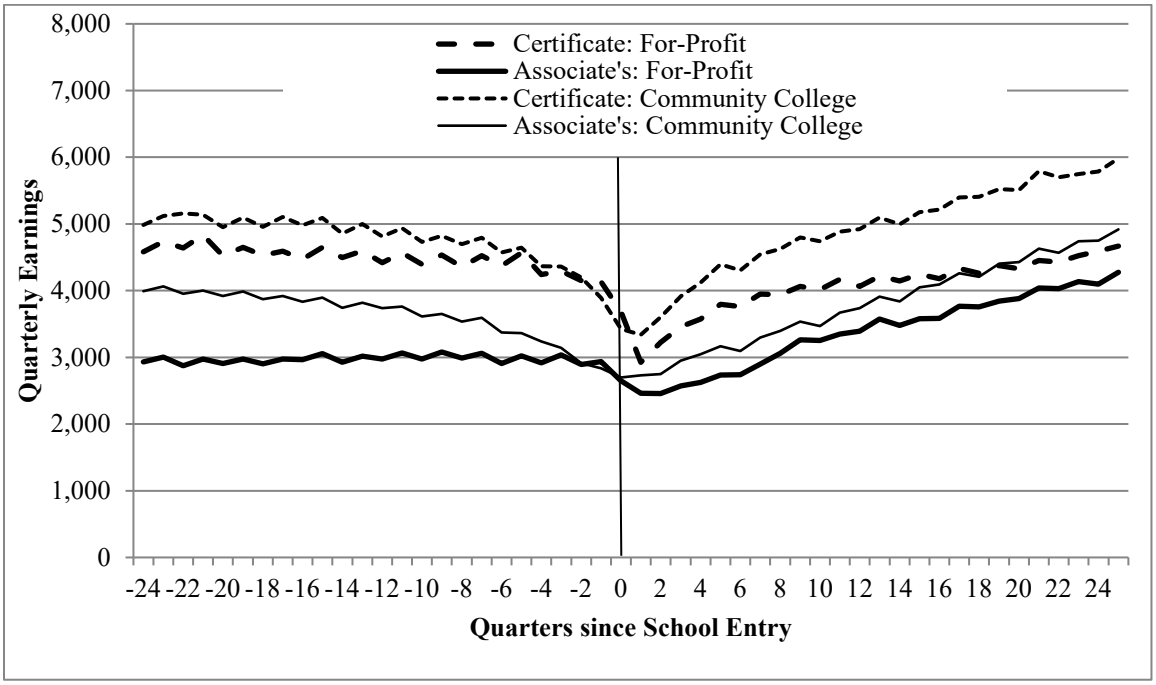
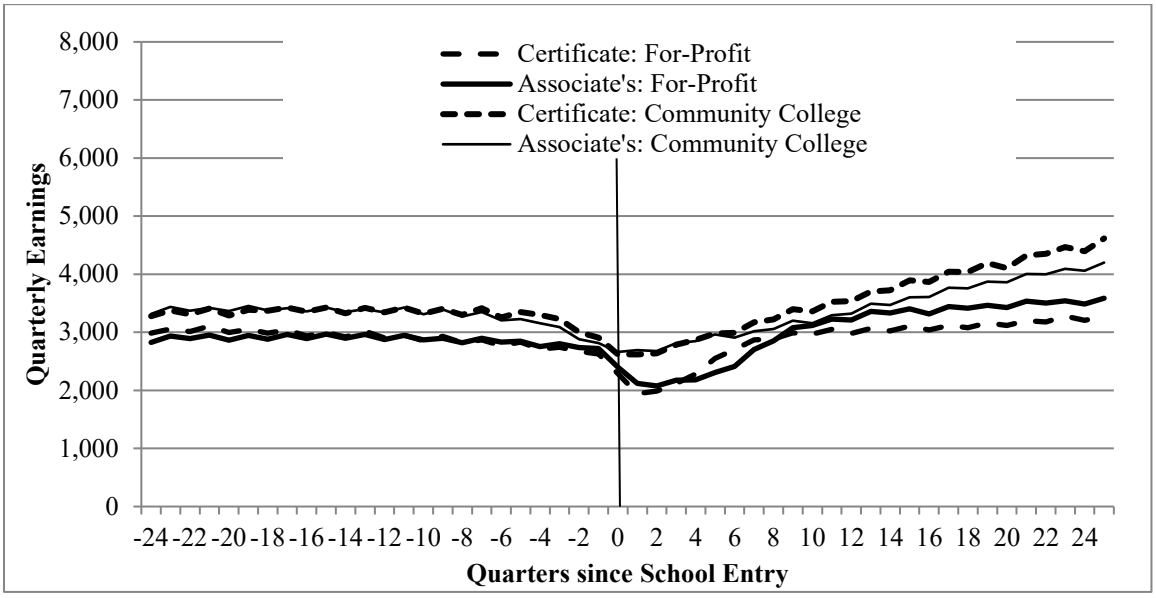
Figure 1a – Quarterly Earnings by School, Program Type and Quarters since School Entry, Men



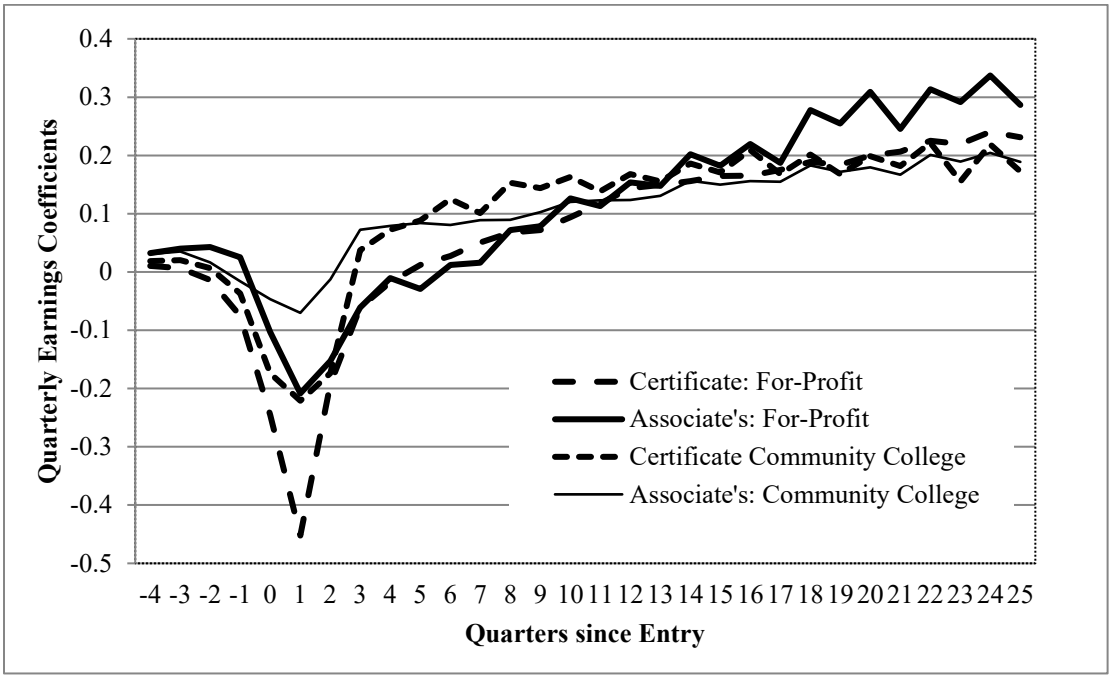
Note: The figure shows the average quarterly earnings for men pursuing associate's degrees and men pursuing certificates. Earnings are not conditional on employment, except for the exclusion of strings of quarters of zero earnings of length 10 or more through quarter 30 following initial enrollment. Earnings are measured in first quarter 2010 dollars.

Figure 1b – Quarterly Earnings by School, Program Type and Quarters since School Entry, Women



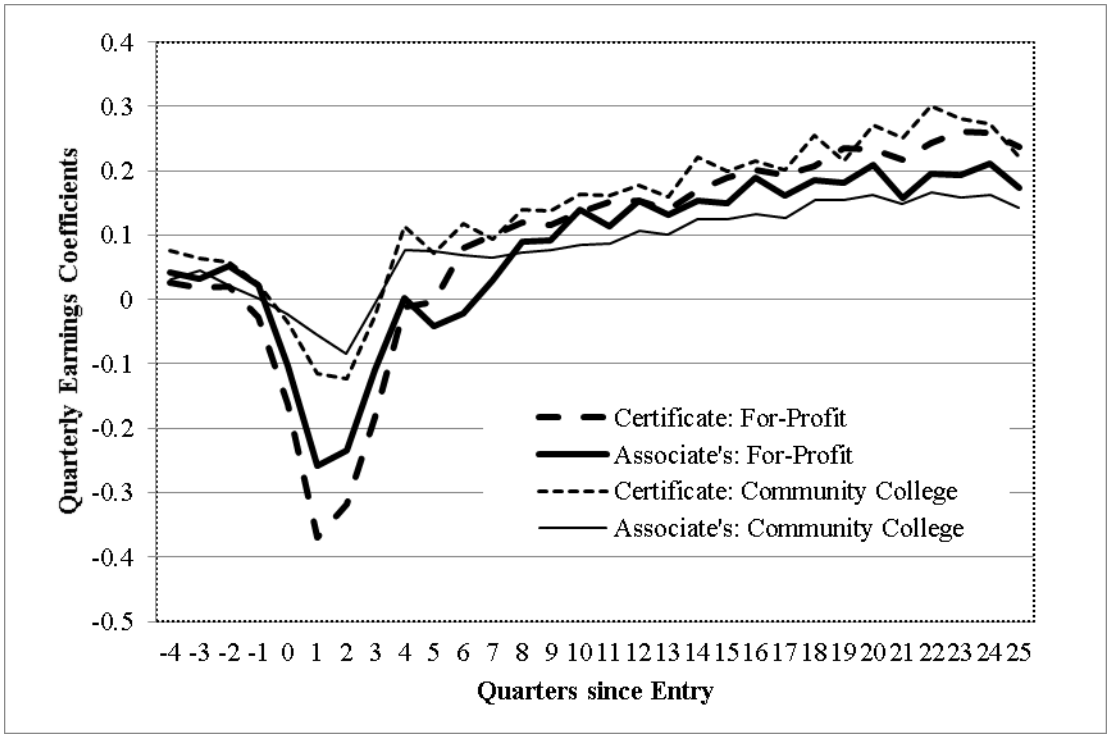
Note: The figure shows the average quarterly earnings for women pursuing associate's degrees and women pursuing certificates. Earnings are not conditional on employment, except for the exclusion of strings of quarters of zero earnings of length 10 or more through quarter 30 following initial enrollment. Earnings are measured in first quarter 2010 dollars.

Figure 2a – Effect of Attendance on Earnings by Quarter and School and Program Type, Men



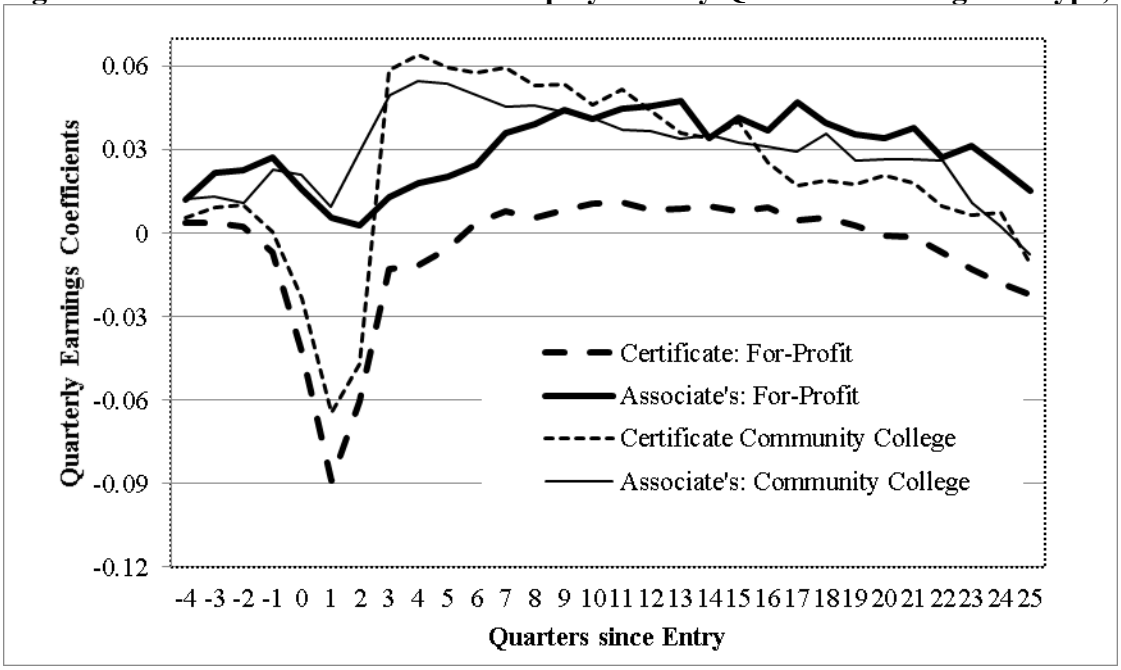
Note: Each data point is the effect estimate for quarterly earnings from the earnings regression shown in Appendix Table A1a. The return is adjusted for enrollment during the quarters after entry, based on the coefficient for the enrollment variable, with the period of enrollment taken as the mean for each group (see text).

Figure 2b – Effect of Attendance on Earnings by Quarter and School and Program Type, Women



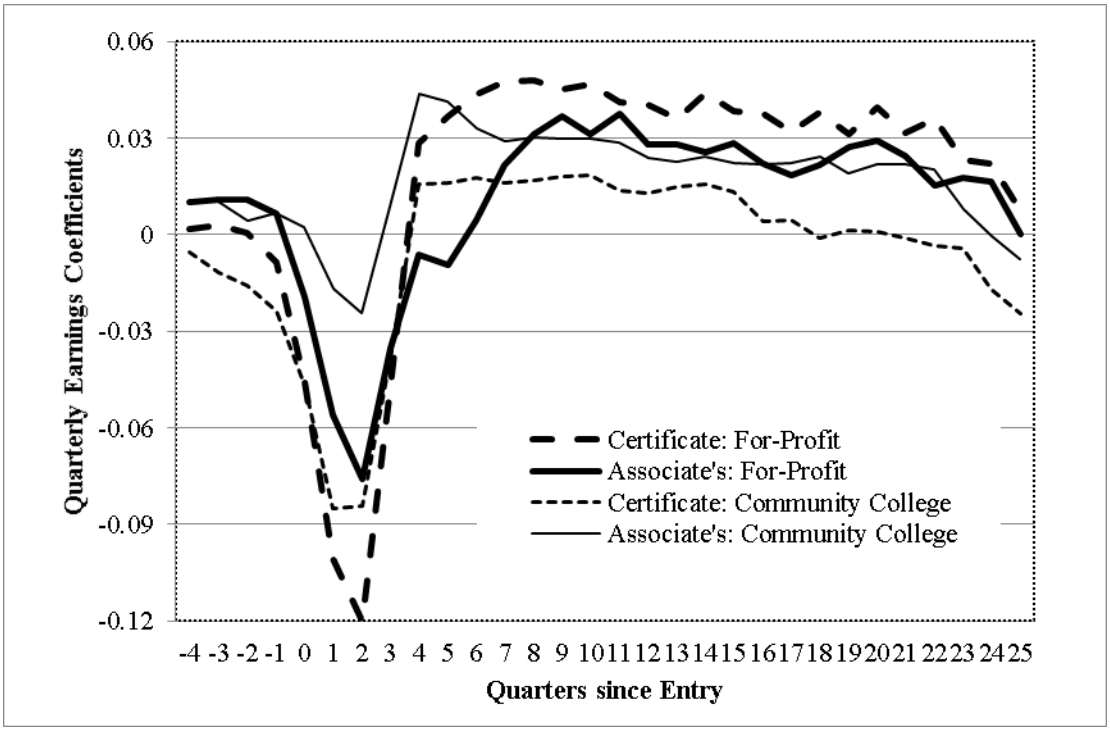
Note: Each data point is the effect estimate for quarterly earnings from the earnings regression shown in Appendix Table A1b. The return is adjusted for enrollment during the quarters after entry, based on the coefficient for the enrollment variable, with the period of enrollment taken as the mean for each group (see text).

Figure 3a – Effect of Attendance on Employment by Quarter and Program Type, Men



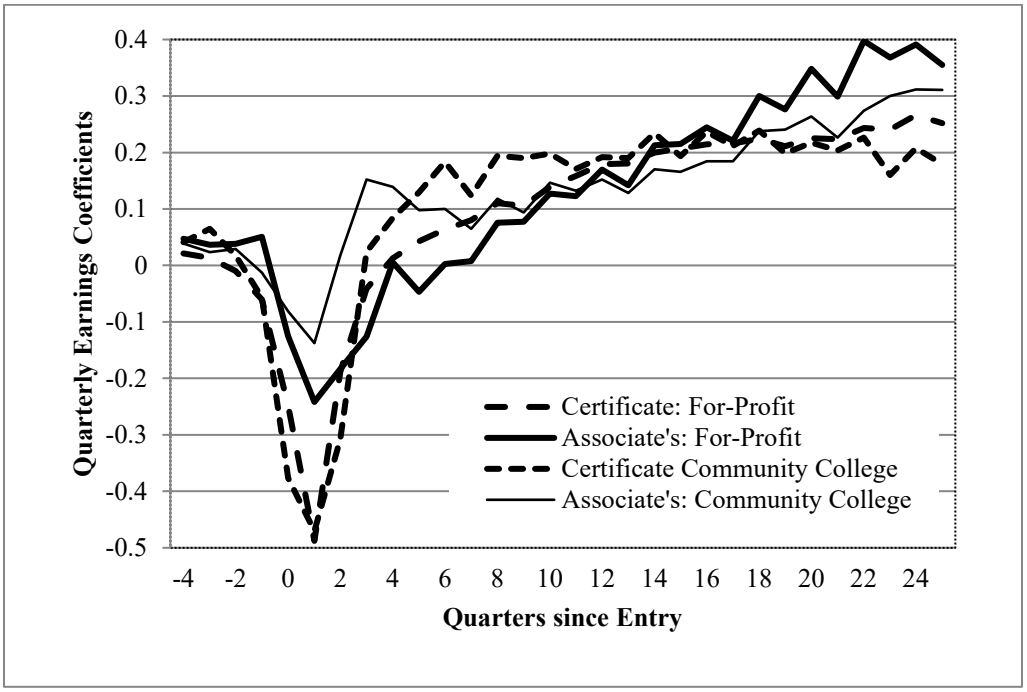
Note: Each data point is the effect estimate for quarterly employment based on equation (4). The return is adjusted for enrollment during the quarters after entry, based on the coefficient for the enrollment variable, with the period of enrollment taken as the mean for each group (see text).

Figure 3b – Effect of Attendance on Employment by Quarter and School and Program Type, Women



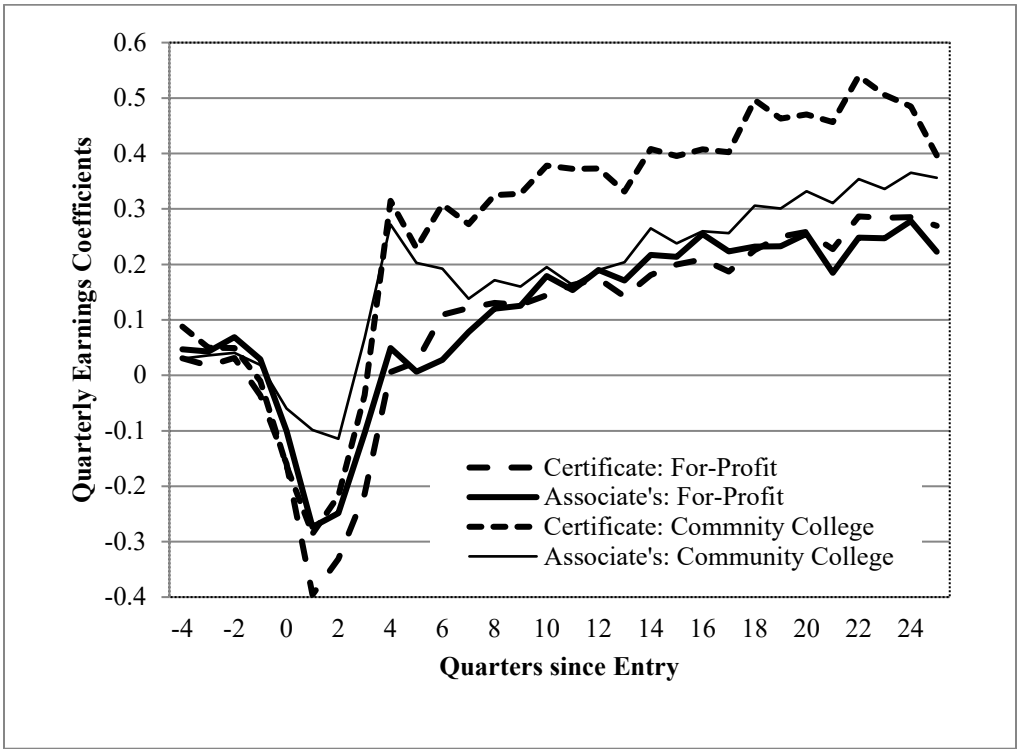
Note: Each data point is the effect estimate for quarterly employment based on equation (4). The return is adjusted for enrollment during the quarters after entry, based on the coefficient for the enrollment variable, with the period of enrollment taken as the mean for each group (see text).

Figure 4a – Effect of Completion on Earnings by Quarter, School and Program Type, Men



Note: Each data point is the effect estimate for log quarterly earnings based on equation (3), estimated for the sample of people who complete the degree they pursued.

Figure 4b – Effect of Completion on Earnings by Quarter, School and Program Type, Women



Note: Each data point is the effect estimate for log quarterly earnings based on equation (3), estimated for the sample of people who complete the degree they pursued.

Table 1 - Descriptive Statistics by Gender and Program Type

	For-Profit				Community College			
	Men		Women		Men		Women	
	Certificate	Associate's	Certificate	Associate's	Certificate	Associate's	Certificate	Associate's
Variable	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
Demographics and Schooling Information								
White	0.642	0.601	0.544	0.626	0.764	0.697	0.768	0.673
Black	0.279	0.263	0.374	0.281	0.090	0.141	0.100	0.179
Other / Missing Race	0.079	0.136	0.082	0.093	0.146	0.163	0.132	0.148
Age at time of entry	32.7	27.6	29.5	28.1	28.5	24.8	28.9	26.8
	(10.7)	(8.3)	(10.0)	(8.8)	(10.5)	(8.4)	(10.5)	(9.6)
Less than high school	0.063	0.013	0.067	0.021	0.002	0.003	0.003	0.004
High school	0.718	0.775	0.766	0.806	0.727	0.799	0.802	0.812
GED	0.199	0.205	0.154	0.164	0.043	0.050	0.051	0.056
Missing education	0.020	0.008	0.014	0.010	0.229	0.148	0.145	0.128
Major Urban	0.496	0.802	0.667	0.735	0.522	0.626	0.406	0.651
Small Metro	0.141	0.127	0.163	0.161	0.282	0.187	0.309	0.147
Nonmetro	0.357	0.071	0.170	0.104	0.196	0.187	0.285	0.202
Missing metro	0.006	0.000	0.001	0.000	0.000	0.000	0.000	0.000
Schooling Information								
Studying business	0.039	0.099	0.069	0.119	0.065	0.038	0.086	0.057
Studying computers	0.044	0.283	0.015	0.047	0.063	0.050	0.021	0.013
Studying health	0.154	0.180	0.763	0.635	0.159	0.024	0.438	0.070
Studying trades	0.310	0.033	0.012	0.002	0.151	0.057	0.005	0.003
Studying transport	0.294	0.000	0.023	0.000	0.063	0.000	0.004	0.000
Studying Vocational	0.143	0.356	0.103	0.147	0.380	0.134	0.226	0.072
Studying Academic/Other	0.016	0.049	0.014	0.051	0.120	0.697	0.220	0.786
Completed certificate	0.630	0.012	0.525	0.024	0.196	0.011	0.097	0.010
Completed associate's	0.007	0.416	0.013	0.470	0.041	0.099	0.089	0.123
Missing completion info	0.363	0.572	0.462	0.506	0.764	0.891	0.814	0.867
Number of Entries	32,117	12,979	39,830	21,115	9,789	113,259	14,371	153,533

Note: The standard deviation for age is in parentheses.

Table 2a - Descriptive Statistics for Earnings by Gender, School and Program Type

	For-Profit								Community College							
	Men				Women				Men				Women			
Men, Certificate	Certificate		Associate's		Certificate		Associate's		Certificate		Associate's		Certificate		Associate's	
Variable	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Mean Earnings																
5-24 qtrs before entry	4546	8986	2982	4256	2942	4245	2896	3690	4905	6837	3746	5673	3359	4291	3355	4807
4 quarters before entry	4240	8875	2916	3880	2711	4244	2755	3598	4365	5792	3237	5779	3301	4672	3158	17113
3 quarters before entry	4293	7098	3038	4200	2745	4068	2803	3471	4361	6196	3142	7338	3227	4212	3091	3974
2 quarters before entry	4151	8655	2893	4366	2674	6341	2738	4101	4196	8176	2912	5842	3000	4380	2881	4354
1 quarter before entry	4131	9982	2937	5555	2625	5045	2721	4609	3892	6757	2837	5364	2908	3876	2813	6017
Quarter of entry	3687	10692	2646	5320	2293	5342	2401	4575	3424	6186	2698	4681	2623	3428	2661	3845
1 quarter after entry	2925	7721	2461	3661	1943	3704	2120	3172	3338	5339	2731	5519	2618	3407	2694	3458
2 quarters after entry	3226	7935	2457	3720	1986	4253	2076	2953	3603	5658	2748	4562	2636	3698	2678	3579
3 quarters after entry	3459	7164	2572	3506	2119	3879	2173	3182	3913	5144	2953	4398	2789	3533	2812	3771
4 quarters after entry	3577	7407	2627	3969	2281	3954	2180	3194	4123	4951	3046	4277	2869	5088	2849	3554
5-8 quarters after entry	3860	7226	2858	3779	2752	3711	2569	3246	4466	5501	3238	4706	3092	3620	2987	3617
9-15 qtrs after entry	4131	6707	3410	4103	3026	3784	3246	3635	4939	5624	3738	4972	3584	3982	3357	4184
16-25 qtrs after entry	4402	8168	3920	4644	3160	4035	3464	3900	5571	6218	4462	5526	4202	4476	3898	4354

Note: Earnings are measured first quarter 2010 dollars. Observations with zero earnings are included in the means except for the exclusion of quarters when individuals have 10 or more consecutive quarters after enrollment of missing earnings at the end of the observed time period.

Table 2b - Descriptive Statistics for Employment by Gender, School and Program Type

	For-Profit				Community College			
	Men		Women		Men		Women	
	Certificate	Associate's	Certificate	Associate's	Certificate	Associate's	Certificate	Associate's
	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
Mean Employment								
5-24 quarters before entry	0.622	0.578	0.624	0.648	0.663	0.607	0.655	0.659
4 quarters before entry	0.634	0.606	0.627	0.660	0.670	0.618	0.688	0.672
3 quarters before entry	0.641	0.617	0.639	0.668	0.664	0.613	0.681	0.673
2 quarters before entry	0.633	0.611	0.630	0.660	0.655	0.598	0.671	0.657
1 quarter before entry	0.630	0.621	0.629	0.662	0.661	0.632	0.680	0.673
Quarter of entry	0.593	0.616	0.591	0.637	0.654	0.651	0.676	0.689
1 quarter after entry	0.568	0.617	0.565	0.621	0.637	0.650	0.665	0.690
2 quarters after entry	0.588	0.621	0.565	0.613	0.679	0.670	0.682	0.696
3 quarters after entry	0.621	0.631	0.593	0.623	0.716	0.701	0.696	0.712
4 quarters after entry	0.637	0.641	0.622	0.623	0.743	0.726	0.712	0.725
5-8 quarters after entry	0.686	0.675	0.703	0.688	0.757	0.735	0.735	0.732
9-15 quarters after entry	0.730	0.728	0.747	0.757	0.791	0.766	0.779	0.763
16-25 quarters after entry	0.757	0.772	0.770	0.786	0.821	0.809	0.816	0.804

Table 3 – Difference between For-Profit and Community College Coefficients for Students Seeking a Certificate, by Gender

	Men		Women	
	Separate Regressions	Pooled Regressions	Separate Regressions	Pooled Regressions
4 quarters prior to entry	-0.008	-0.045	-0.049	-0.048
3 quarters prior to entry	-0.014	-0.046	-0.045	-0.050
2 quarters prior to entry	-0.020	-0.066	-0.038	-0.040
1 quarter prior to entry	-0.038	-0.076	-0.051	-0.062
Quarter of entry	-0.096	-0.124	-0.104	-0.130
1 quarter after entry	-0.280	-0.349	-0.211	-0.270
2 quarters after entry	-0.134	-0.217	-0.150	-0.196
3 quarters after entry	-0.098	-0.168	-0.134	-0.185
4 quarters after entry	-0.090	-0.162	-0.126	-0.160
5 quarters after entry	-0.076	-0.139	-0.075	-0.109
6 quarters after entry	-0.097	-0.166	-0.038	-0.077
7 quarters after entry	-0.050	-0.118	0.008	-0.053
8 quarters after entry	-0.086	-0.159	-0.020	-0.064
9 quarters after entry	-0.072	-0.146	-0.023	-0.075
10 quarters after entry	-0.069	-0.146	-0.029	-0.071
11 quarters after entry	-0.021	-0.097	-0.009	-0.078
12 quarters after entry	-0.024	-0.101	-0.024	-0.078
13 quarters after entry	-0.006	-0.085	-0.019	-0.085
14 quarters after entry	-0.030	-0.106	-0.053	-0.112
15 quarters after entry	-0.006	-0.088	-0.010	-0.106
16 quarters after entry	-0.044	-0.123	-0.014	-0.094
17 quarters after entry	0.007	-0.080	-0.009	-0.106
18 quarters after entry	-0.013	-0.094	-0.048	-0.122
19 quarters after entry	0.016	-0.073	0.021	-0.100
20 quarters after entry	0.001	-0.086	-0.038	-0.140
21 quarters after entry	0.025	-0.070	-0.034	-0.147
22 quarters after entry	0.004	-0.083	-0.058	-0.145
23 quarters after entry	0.064	-0.034	-0.021	-0.157
24 quarters after entry	0.021	-0.068	-0.014	-0.131
25 quarters after entry	0.058	-0.038	0.016	-0.110
Enrolled	0.049	-0.230	-0.044	-0.282

Table 4 - Index of Dissimilarity between For-Profit and Community College Students

	Men		Women	
	Certificates	Associate's Degrees	Certificates	Associate's Degrees
Field of study (7 areas)	0.390	0.673	0.352	0.736
Race	0.190	0.122	0.274	0.102
Age (4 categories)	0.197	0.197	0.038	0.099
Region within the state	0.467	0.233	0.453	0.202
Propensity score (deciles)	0.762	0.797	0.703	0.863

Note: We also calculated the Gini coefficient as an alternative measure of dissimilarity. Although numerical values where always higher (by as much as 0.15), the rankings were essentially the same.

Table 5: Internal Rate of Return

	For-Profit		Community Colleges	
	Certificates	Associate's	Certificates	Associate's
Men	13.6%	5.4%	39.2%	20.5%
Women	12.2%	17.6%	29.1%	24.9%

Appendix: Matching Algorithm

Using the sample that includes students in both types of schools, we estimate the probability that an individual enrolls in a for-profit school, using a logit controlling for age,[26] dummy variables indicating prior education (less than high school, GED, high school graduate), dummy variables indicating race (white, black, missing/other), a series of dummy variables indicating the location of the school, dummy variables indicating the field of study (academic/other, business, computers, health, trades, transportation, vocational) as well as dummy variables controlling for the year/quarter of entry into school. We also interact all the variables with race and education except the year/quarter of entry variables. We do not include prior earnings in the matching measures given the potential bias that matching on prior values of the dependent variable may produce in difference-in-difference models (Daw and Hatfield, 2018).

We impose three sample restrictions in order to make the two groups of students as similar as possible. First, we omit any student whose characteristics or field of study are unique to either for-profit schools or community college, as such characteristics/fields perfectly predict school type. Once we estimate the logit, we impose a common support condition by dropping for-profit students whose estimated probability of enrollment in a for-profit school lies above the maximum estimated probability among community-college students and dropping community college students whose estimated probability lies below the smallest estimated probability among for-profit students. Finally, we drop cases with probability ranges where one of the school types has very low density.[27]

[26] We control for age at time of entry into school by including both age and age squared, along with a series of dummy variables for: less than 20 years old; 20 years old and older but less than 25; 25 years old and older but less than 30; 30 years old and older but less than 40; and 40 years old and older.

[27] Where the density of treated cases is low, we might have retained these cases because matches for such cases are likely to be available. The advantage of our approach is that it permits us to use the same propensity scores for both treatments, and to avoid complications in the inverse probability weighting process. In fact, fewer than 1 percent of treated cases were omitted by this rule.

The procedure described above was modified in the case of women seeking certificates because the balancing test indicated that matches were poor. For this group, after eliminating the cases as described above, we re-estimated the logit model, and

Our preferred matching technique is inverse probability weighting. We use estimated propensity scores to calculate probability weights for the community college sample that reproduces the observed characteristics and field of study for for-profit students. The returns for enrollment are then estimated separately for for-profit students and the weighted sample of community college students using our fixed effects model. The latter is our best estimate of what the return would be for community college students if they had the same characteristics and fields of study as for-profit students, and it therefore provides a comparison with the for-profit school taken as the treatment. We also use the propensity scores to construct weights for the for-profit student sample so it reproduces the characteristics and field of the community college sample, producing estimates that take the community college as the treatment.[28] The proportion of treated cases retained in the matched samples are presented in Appendix Table A5.

The success of any matching technique depends on details of specification. In order to determine whether the matching methods were successful, we undertook balancing tests on all the independent variables used in the matching process, testing whether differences in variable means were reduced by the matching. This involved eight comparisons between treatment and matched comparison samples (four gender-degree combinations, by treatment defined by type of school). We calculated the standardized difference before and after the inverse probability weighting. Prior to such weighting, the average absolute value of the difference of the 60-65 variables was between 0.19 and 0.21. When weights were used to produce matched samples, the average difference was between 0.02 and 0.09. The maximum standardized differences are substantially greater in the unmatched comparison, in each case. Although, even with matching, there are differences in the means of these measures, it is clear that the matching is successful at producing much more similar samples.

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again eliminated cases off the common support or with very low density before using the propensity scores to calculate probability weights.

[28] Each retained case in the comparison sample is weighted by $p(X)/(1-p(X))$, where $p(X)$ is the estimated probability (as a function of case characteristics X) that the case in question would be a treated, based on the logit regression.

Appendix Table A1a – Effect of School Attendance on Log Quarterly Earnings: Men

	For-profit				Community College			
	Certificate		Associate's		Certificates		Associate's	
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.
4 quarters prior to entry	0.011	(0.007)	0.032	(0.012)	0.019	(0.012)	0.031	(0.004)
3 quarters prior to entry	0.006	(0.007)	0.040	(0.012)	0.020	(0.012)	0.035	(0.004)
2 quarters prior to entry	-0.014	(0.007)	0.043	(0.012)	0.007	(0.013)	0.016	(0.004)
1 quarter prior to entry	-0.075	(0.008)	0.025	(0.013)	-0.037	(0.014)	-0.016	(0.004)
Quarter of entry	-0.178	(0.012)	-0.051	(0.017)	-0.082	(0.021)	0.026	(0.006)
1 quarter after entry	-0.318	(0.015)	-0.104	(0.024)	-0.038	(0.025)	0.076	(0.007)
2 quarters after entry	-0.125	(0.012)	-0.048	(0.022)	0.010	(0.019)	0.060	(0.006)
3 quarters after entry	-0.061	(0.011)	-0.009	(0.021)	0.037	(0.017)	0.073	(0.006)
4 quarters after entry	-0.018	(0.010)	-0.010	(0.018)	0.072	(0.016)	0.079	(0.005)
5 quarters after entry	0.012	(0.009)	-0.029	(0.016)	0.088	(0.016)	0.084	(0.005)
6 quarters after entry	0.028	(0.009)	0.012	(0.016)	0.125	(0.015)	0.081	(0.005)
7 quarters after entry	0.051	(0.009)	0.016	(0.015)	0.101	(0.015)	0.089	(0.005)
8 quarters after entry	0.067	(0.009)	0.072	(0.015)	0.153	(0.015)	0.090	(0.005)
9 quarters after entry	0.072	(0.009)	0.078	(0.015)	0.144	(0.015)	0.103	(0.005)
10 quarters after entry	0.094	(0.009)	0.126	(0.015)	0.163	(0.015)	0.120	(0.005)
11 quarters after entry	0.117	(0.009)	0.113	(0.015)	0.138	(0.015)	0.123	(0.005)
12 quarters after entry	0.144	(0.009)	0.154	(0.015)	0.168	(0.016)	0.123	(0.006)
13 quarters after entry	0.149	(0.009)	0.148	(0.015)	0.156	(0.016)	0.131	(0.006)
14 quarters after entry	0.156	(0.009)	0.202	(0.015)	0.186	(0.016)	0.156	(0.006)
15 quarters after entry	0.165	(0.009)	0.182	(0.015)	0.171	(0.017)	0.150	(0.006)
16 quarters after entry	0.165	(0.010)	0.220	(0.016)	0.209	(0.017)	0.156	(0.006)
17 quarters after entry	0.175	(0.010)	0.187	(0.017)	0.168	(0.018)	0.155	(0.006)
18 quarters after entry	0.189	(0.010)	0.278	(0.017)	0.201	(0.020)	0.183	(0.007)
19 quarters after entry	0.184	(0.010)	0.255	(0.017)	0.168	(0.020)	0.172	(0.006)
20 quarters after entry	0.200	(0.011)	0.309	(0.018)	0.199	(0.023)	0.179	(0.007)
21 quarters after entry	0.206	(0.011)	0.245	(0.019)	0.182	(0.022)	0.167	(0.007)
22 quarters after entry	0.225	(0.011)	0.313	(0.020)	0.222	(0.023)	0.201	(0.008)
23 quarters after entry	0.220	(0.012)	0.292	(0.020)	0.156	(0.024)	0.190	(0.008)
24 quarters after entry	0.240	(0.012)	0.337	(0.022)	0.219	(0.025)	0.204	(0.008)
25 quarters after entry	0.231	(0.012)	0.287	(0.023)	0.173	(0.026)	0.189	(0.008)
Enrolled	-0.135	(0.015)	-0.105	(0.020)	-0.183	(0.026)	-0.146	(0.007)
Constant	0.001	(0.000)	0.002	(0.000)	0.000	(0.000)	0.002	(0.000)
Observations	761,300		263,191		194,341		1,746,373	

Note: Coefficient estimates are from equation (3). Standard errors are clustered at the individual level.

Appendix Table A1b – Effect of School Attendance on Log Quarterly Earnings: Women

	For-profit				Community College			
	Certificates		Associate's		Certificates		Associate's	
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.
4 quarters prior to entry	0.026	(0.006)	0.042	(0.008)	0.075	(0.010)	0.031	(0.003)
3 quarters prior to entry	0.019	(0.007)	0.031	(0.009)	0.064	(0.010)	0.046	(0.003)
2 quarters prior to entry	0.020	(0.007)	0.052	(0.009)	0.058	(0.011)	0.021	(0.003)
1 quarter prior to entry	-0.027	(0.007)	0.022	(0.009)	0.024	(0.011)	0.001	(0.003)
Quarter of entry	-0.014	(0.011)	0.028	(0.013)	0.090	(0.015)	0.059	(0.004)
1 quarter after entry	-0.073	(0.015)	0.004	(0.019)	0.138	(0.019)	0.110	(0.006)
2 quarters after entry	-0.021	(0.013)	0.027	(0.017)	0.129	(0.017)	0.081	(0.005)
3 quarters after entry	-0.034	(0.012)	0.021	(0.016)	0.100	(0.016)	0.077	(0.005)
4 quarters after entry	-0.012	(0.010)	0.003	(0.014)	0.113	(0.015)	0.077	(0.004)
5 quarters after entry	-0.003	(0.009)	-0.041	(0.013)	0.073	(0.015)	0.075	(0.004)
6 quarters after entry	0.080	(0.008)	-0.022	(0.013)	0.118	(0.014)	0.068	(0.004)
7 quarters after entry	0.101	(0.008)	0.031	(0.011)	0.093	(0.014)	0.065	(0.004)
8 quarters after entry	0.119	(0.008)	0.090	(0.011)	0.139	(0.014)	0.072	(0.004)
9 quarters after entry	0.115	(0.008)	0.092	(0.011)	0.138	(0.013)	0.077	(0.004)
10 quarters after entry	0.135	(0.008)	0.139	(0.011)	0.164	(0.014)	0.086	(0.004)
11 quarters after entry	0.152	(0.008)	0.114	(0.011)	0.161	(0.014)	0.087	(0.004)
12 quarters after entry	0.154	(0.008)	0.154	(0.011)	0.178	(0.015)	0.106	(0.004)
13 quarters after entry	0.140	(0.008)	0.132	(0.011)	0.159	(0.015)	0.101	(0.004)
14 quarters after entry	0.169	(0.009)	0.155	(0.012)	0.222	(0.015)	0.125	(0.005)
15 quarters after entry	0.190	(0.009)	0.149	(0.012)	0.200	(0.015)	0.125	(0.005)
16 quarters after entry	0.202	(0.009)	0.190	(0.013)	0.215	(0.017)	0.132	(0.005)
17 quarters after entry	0.193	(0.009)	0.161	(0.013)	0.202	(0.017)	0.127	(0.005)
18 quarters after entry	0.207	(0.009)	0.185	(0.014)	0.255	(0.018)	0.154	(0.005)
19 quarters after entry	0.235	(0.009)	0.182	(0.015)	0.215	(0.018)	0.155	(0.005)
20 quarters after entry	0.233	(0.010)	0.210	(0.015)	0.271	(0.019)	0.162	(0.006)
21 quarters after entry	0.218	(0.010)	0.157	(0.016)	0.252	(0.020)	0.148	(0.006)
22 quarters after entry	0.242	(0.011)	0.195	(0.017)	0.300	(0.021)	0.167	(0.006)
23 quarters after entry	0.261	(0.011)	0.193	(0.016)	0.281	(0.021)	0.159	(0.006)
24 quarters after entry	0.259	(0.011)	0.211	(0.018)	0.273	(0.023)	0.163	(0.007)
25 quarters after entry	0.237	(0.012)	0.173	(0.018)	0.222	(0.024)	0.143	(0.007)
Enrolled	-0.296	(0.014)	-0.262	(0.016)	-0.252	(0.018)	-0.164	(0.006)
Constant	0.001	(0.000)	0.002	(0.000)	-0.022	(0.001)	0.002	(0.000)
Observations	887,934		473,377		284,890		2,893,457	

Note: Coefficient estimates are from equation (3). Standard errors are clustered at the individual level.

Appendix Table A2a – Effect of School Attendance on Quarterly Employment: Men

	For-profit				Community College			
	Certificate		Associate's		Certificate		Associate's	
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.
4 quarters prior to entry	0.004	(0.002)	0.012	(0.004)	0.006	(0.004)	0.012	(0.001)
3 quarters prior to entry	0.004	(0.002)	0.022	(0.004)	0.009	(0.005)	0.013	(0.002)
2 quarters prior to entry	0.002	(0.003)	0.023	(0.004)	0.010	(0.005)	0.011	(0.002)
1 quarter prior to entry	-0.007	(0.003)	0.027	(0.004)	0.000	(0.005)	0.023	(0.002)
Quarter of entry	-0.009	(0.004)	0.024	(0.006)	0.023	(0.007)	0.039	(0.002)
1 quarter after entry	-0.022	(0.006)	0.023	(0.009)	0.027	(0.010)	0.045	(0.003)
2 quarters after entry	-0.026	(0.005)	0.021	(0.009)	0.045	(0.008)	0.048	(0.003)
3 quarters after entry	-0.013	(0.004)	0.022	(0.008)	0.059	(0.007)	0.050	(0.002)
4 quarters after entry	-0.011	(0.004)	0.018	(0.007)	0.064	(0.007)	0.054	(0.002)
5 quarters after entry	-0.006	(0.003)	0.020	(0.006)	0.060	(0.006)	0.054	(0.002)
6 quarters after entry	0.004	(0.003)	0.024	(0.006)	0.057	(0.006)	0.049	(0.002)
7 quarters after entry	0.008	(0.003)	0.036	(0.006)	0.060	(0.006)	0.045	(0.002)
8 quarters after entry	0.006	(0.003)	0.039	(0.006)	0.053	(0.006)	0.046	(0.002)
9 quarters after entry	0.008	(0.003)	0.044	(0.006)	0.053	(0.006)	0.043	(0.002)
10 quarters after entry	0.011	(0.003)	0.041	(0.006)	0.046	(0.006)	0.041	(0.002)
11 quarters after entry	0.011	(0.003)	0.045	(0.005)	0.051	(0.006)	0.037	(0.002)
12 quarters after entry	0.008	(0.003)	0.046	(0.006)	0.044	(0.007)	0.037	(0.002)
13 quarters after entry	0.009	(0.003)	0.047	(0.006)	0.036	(0.007)	0.034	(0.002)
14 quarters after entry	0.010	(0.004)	0.034	(0.006)	0.034	(0.007)	0.035	(0.002)
15 quarters after entry	0.008	(0.004)	0.042	(0.006)	0.040	(0.007)	0.032	(0.002)
16 quarters after entry	0.009	(0.004)	0.037	(0.006)	0.025	(0.007)	0.031	(0.002)
17 quarters after entry	0.005	(0.004)	0.047	(0.006)	0.017	(0.008)	0.029	(0.002)
18 quarters after entry	0.006	(0.004)	0.040	(0.007)	0.019	(0.008)	0.036	(0.003)
19 quarters after entry	0.003	(0.004)	0.036	(0.007)	0.018	(0.008)	0.026	(0.003)
20 quarters after entry	-0.001	(0.004)	0.034	(0.007)	0.021	(0.009)	0.027	(0.003)
21 quarters after entry	-0.001	(0.004)	0.038	(0.007)	0.018	(0.009)	0.026	(0.003)
22 quarters after entry	-0.007	(0.004)	0.027	(0.008)	0.010	(0.010)	0.026	(0.003)
23 quarters after entry	-0.013	(0.004)	0.031	(0.008)	0.006	(0.010)	0.011	(0.003)
24 quarters after entry	-0.018	(0.005)	0.023	(0.009)	0.007	(0.010)	0.003	(0.003)
25 quarters after entry	-0.022	(0.005)	0.015	(0.009)	-0.011	(0.010)	-0.008	(0.003)
Enrolled	-0.067	(0.006)	-0.018	(0.009)	-0.092	(0.011)	-0.036	(0.003)
Constant	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)
Observations	1,200,008		431,969		282,902		2,721,522	

Note: Coefficient estimates are from equation (4). Standard errors are clustered at the individual level.

Appendix Table A2b – Effect of School Attendance on Quarterly Employment: Women

	For-profit				Community College			
	Certificates		Associate's		Certificates		Associate's	
	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.	Coeff.	Std. Err.
4 quarters prior to entry	0.002	(0.002)	0.010	(0.003)	-0.005	(0.004)	0.011	(0.001)
3 quarters prior to entry	0.003	(0.002)	0.011	(0.003)	-0.012	(0.004)	0.011	(0.001)
2 quarters prior to entry	0.001	(0.002)	0.011	(0.003)	-0.016	(0.004)	0.005	(0.001)
1 quarter prior to entry	-0.008	(0.002)	0.007	(0.003)	-0.024	(0.004)	0.007	(0.001)
Quarter of entry	0.030	(0.004)	0.029	(0.005)	0.007	(0.006)	0.038	(0.002)
1 quarter after entry	0.051	(0.005)	0.040	(0.007)	0.023	(0.008)	0.054	(0.002)
2 quarters after entry	0.031	(0.005)	0.021	(0.006)	0.024	(0.007)	0.046	(0.002)
3 quarters after entry	0.029	(0.004)	0.013	(0.006)	0.016	(0.006)	0.044	(0.002)
4 quarters after entry	0.028	(0.003)	-0.006	(0.005)	0.016	(0.006)	0.044	(0.002)
5 quarters after entry	0.037	(0.003)	-0.009	(0.005)	0.016	(0.006)	0.041	(0.002)
6 quarters after entry	0.044	(0.003)	0.004	(0.004)	0.018	(0.005)	0.033	(0.002)
7 quarters after entry	0.048	(0.003)	0.022	(0.004)	0.016	(0.005)	0.029	(0.002)
8 quarters after entry	0.048	(0.003)	0.031	(0.004)	0.017	(0.005)	0.030	(0.002)
9 quarters after entry	0.045	(0.003)	0.037	(0.004)	0.018	(0.005)	0.030	(0.002)
10 quarters after entry	0.047	(0.003)	0.031	(0.004)	0.018	(0.005)	0.030	(0.002)
11 quarters after entry	0.041	(0.003)	0.038	(0.004)	0.014	(0.005)	0.029	(0.002)
12 quarters after entry	0.040	(0.003)	0.028	(0.004)	0.013	(0.006)	0.024	(0.002)
13 quarters after entry	0.036	(0.003)	0.028	(0.004)	0.015	(0.006)	0.023	(0.002)
14 quarters after entry	0.044	(0.003)	0.026	(0.004)	0.016	(0.006)	0.024	(0.002)
15 quarters after entry	0.038	(0.003)	0.029	(0.004)	0.013	(0.006)	0.022	(0.002)
16 quarters after entry	0.038	(0.003)	0.022	(0.005)	0.004	(0.006)	0.022	(0.002)
17 quarters after entry	0.032	(0.003)	0.018	(0.005)	0.005	(0.006)	0.022	(0.002)
18 quarters after entry	0.038	(0.003)	0.022	(0.005)	-0.001	(0.007)	0.024	(0.002)
19 quarters after entry	0.031	(0.003)	0.027	(0.005)	0.001	(0.007)	0.019	(0.002)
20 quarters after entry	0.040	(0.004)	0.029	(0.005)	0.001	(0.007)	0.022	(0.002)
21 quarters after entry	0.032	(0.004)	0.024	(0.005)	-0.001	(0.007)	0.022	(0.002)
22 quarters after entry	0.036	(0.004)	0.015	(0.006)	-0.003	(0.008)	0.020	(0.002)
23 quarters after entry	0.023	(0.004)	0.018	(0.006)	-0.004	(0.008)	0.008	(0.002)
24 quarters after entry	0.022	(0.004)	0.016	(0.006)	-0.017	(0.009)	0.000	(0.002)
25 quarters after entry	0.007	(0.004)	0.000	(0.006)	-0.024	(0.009)	-0.008	(0.003)
Enrolled	-0.152	(0.005)	-0.096	(0.007)	-0.108	(0.008)	-0.070	(0.002)
Constant	0.001	(0.000)	0.000	(0.000)	0.021	(0.001)	0.001	(0.000)
Observations	1,391,966		717,489		419,884		4,227,248	

Note: Coefficient estimates are from equation (4). Standard errors are clustered at the individual level.

Appendix Table A3 – Difference between For-Profit and Community College Coefficients for Students Seeking an Associate's Degree, by Gender

	Men		Women	
	Separate Regressions	Pooled Regressions	Separate Regressions	Pooled Regressions
4 quarters prior to entry	0.002	-0.032	0.001	-0.024
3 quarters prior to entry	0.005	-0.023	0.000	-0.046
2 quarters prior to entry	0.026	-0.012	0.000	-0.008
1 quarter prior to entry	0.041	0.001	0.000	-0.019
Quarter of entry	-0.077	-0.108	0.001	-0.126
1 quarter after entry	-0.180	-0.223	0.003	-0.183
2 quarters after entry	-0.108	-0.161	0.002	-0.130
3 quarters after entry	-0.081	-0.134	0.001	-0.132
4 quarters after entry	-0.089	-0.155	-0.001	-0.150
5 quarters after entry	-0.113	-0.171	-0.002	-0.174
6 quarters after entry	-0.069	-0.140	-0.003	-0.155
7 quarters after entry	-0.073	-0.137	-0.003	-0.094
8 quarters after entry	-0.018	-0.101	-0.003	-0.051
9 quarters after entry	-0.024	-0.099	-0.006	-0.042
10 quarters after entry	0.006	-0.081	-0.008	-0.004
11 quarters after entry	-0.010	-0.094	-0.009	-0.028
12 quarters after entry	0.030	-0.075	-0.010	-0.017
13 quarters after entry	0.017	-0.071	-0.011	-0.012
14 quarters after entry	0.046	-0.064	-0.014	-0.027
15 quarters after entry	0.032	-0.059	-0.011	-0.033
16 quarters after entry	0.064	-0.063	-0.002	-0.033
17 quarters after entry	0.033	-0.063	-0.008	-0.031
18 quarters after entry	0.095	-0.031	-0.016	-0.037
19 quarters after entry	0.083	-0.021	-0.009	-0.048
20 quarters after entry	0.130	-0.011	-0.012	-0.045
21 quarters after entry	0.078	-0.034	-0.015	-0.055
22 quarters after entry	0.112	-0.030	-0.031	-0.036
23 quarters after entry	0.102	-0.018	-0.028	-0.024
24 quarters after entry	0.133	-0.023	-0.019	-0.042
25 quarters after entry	0.098	-0.029	-0.022	-0.030
Enrolled	0.041	-0.146	-0.004	-0.166

Appendix Table A4a – Difference in Earnings Returns for Matching Estimators Certificate Seeking Students, Men

	For-Profit Treatment		Comm. College Treatment	
	Coefficient	Std. Error	Coefficient	Std. Error
4 quarters prior to entry	-0.005	(0.091)	-0.053	(0.047)
3 quarters prior to entry	-0.107	(0.049) **	-0.011	(0.043)
2 quarters prior to entry	-0.087	(0.089)	-0.075	(0.090)
1 quarter prior to entry	-0.121	(0.076)	-0.054	(0.062)
Quarter of entry	-0.099	(0.129)	0.032	(0.075)
1 quarter after entry	-0.437	(0.105) ***	0.000	(0.097)
2 quarters after entry	-0.227	(0.102) **	-0.029	(0.072)
3 quarters after entry	-0.240	(0.091) ***	-0.080	(0.062)
4 quarters after entry	-0.230	(0.084) ***	-0.063	(0.079)
5 quarters after entry	-0.158	(0.167)	-0.170	(0.072) **
6 quarters after entry	-0.277	(0.084) ***	-0.263	(0.116) **
7 quarters after entry	-0.095	(0.130)	-0.089	(0.089)
8 quarters after entry	-0.235	(0.064) ***	-0.134	(0.091)
9 quarters after entry	-0.309	(0.072) ***	-0.139	(0.098)
10 quarters after entry	-0.077	(0.126)	-0.191	(0.112) *
11 quarters after entry	-0.160	(0.074) **	-0.092	(0.127)
12 quarters after entry	-0.099	(0.083)	-0.041	(0.077)
13 quarters after entry	-0.103	(0.078)	0.027	(0.058)
14 quarters after entry	-0.100	(0.067)	-0.002	(0.066)
15 quarters after entry	-0.179	(0.058) ***	0.030	(0.050)
16 quarters after entry	0.083	(0.211)	0.014	(0.047)
17 quarters after entry	-0.153	(0.064) **	0.009	(0.048)
18 quarters after entry	-0.180	(0.077) **	0.037	(0.050)
19 quarters after entry	0.027	(0.180)	0.092	(0.052) *
20 quarters after entry	-0.114	(0.080)	0.033	(0.059)
21 quarters after entry	-0.182	(0.057) ***	0.004	(0.064)
22 quarters after entry	-0.184	(0.063) ***	-0.011	(0.061)
23 quarters after entry	-0.066	(0.073)	0.026	(0.074)
24 quarters after entry	-0.161	(0.067) **	-0.123	(0.129)
25 quarters after entry	-0.167	(0.070) **	0.040	(0.075)

Note: The reported results are the difference in coefficients from estimating equation (3) for the matched sample.

Appendix Table A4b – Difference in Earnings Returns for Matching Estimators
Certificate Seeking Students, Women

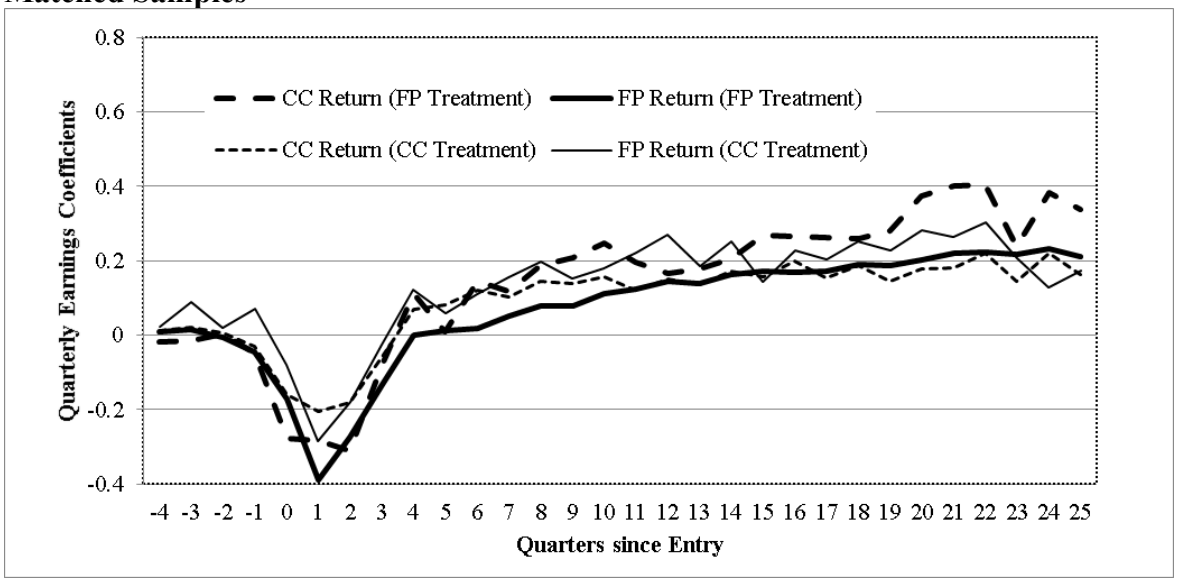
	For-Profit Treatment		Comm. College Treatment	
	Coefficient	Std. Error	Coefficient	Std. Error
4 quarters prior to entry	-0.122	(0.044) ***	-0.076	(0.061)
3 quarters prior to entry	-0.093	(0.050) *	-0.106	(0.072)
2 quarters prior to entry	-0.083	(0.052)	-0.030	(0.038)
1 quarter prior to entry	-0.083	(0.054)	-0.088	(0.048) *
Quarter of entry	-0.020	(0.067)	-0.182	(0.065) ***
1 quarter after entry	-0.125	(0.072) *	-0.281	(0.092) ***
2 quarters after entry	-0.133	(0.063) **	-0.464	(0.263) *
3 quarters after entry	-0.124	(0.065) *	-0.188	(0.066) ***
4 quarters after entry	-0.224	(0.050) ***	-0.172	(0.058) ***
5 quarters after entry	-0.103	(0.053) *	-0.139	(0.053) ***
6 quarters after entry	-0.159	(0.048) ***	-0.038	(0.049)
7 quarters after entry	-0.130	(0.053) **	-0.018	(0.048)
8 quarters after entry	-0.159	(0.050) ***	-0.093	(0.055) *
9 quarters after entry	-0.128	(0.044) ***	-0.140	(0.059) **
10 quarters after entry	-0.144	(0.050) ***	-0.100	(0.054) *
11 quarters after entry	-0.186	(0.059) ***	-0.098	(0.052) *
12 quarters after entry	-0.208	(0.057) ***	-0.075	(0.046)
13 quarters after entry	-0.179	(0.079) **	-0.143	(0.063) **
14 quarters after entry	-0.286	(0.061) ***	-0.116	(0.054) **
15 quarters after entry	-0.294	(0.054) ***	-0.068	(0.054)
16 quarters after entry	-0.230	(0.055) ***	-0.111	(0.063) *
17 quarters after entry	-0.225	(0.063) ***	-0.094	(0.053) *
18 quarters after entry	-0.230	(0.065) ***	-0.097	(0.069)
19 quarters after entry	-0.230	(0.052) ***	-0.036	(0.059)
20 quarters after entry	-0.183	(0.073) **	-0.180	(0.077) **
21 quarters after entry	-0.241	(0.063) ***	-0.166	(0.075) **
22 quarters after entry	-0.158	(0.067) **	-0.171	(0.115)
23 quarters after entry	-0.096	(0.070)	-0.037	(0.081)
24 quarters after entry	-0.154	(0.064) **	-0.042	(0.084)
25 quarters after entry	-0.081	(0.064)	-0.021	(0.081)

Note: The reported results are the difference in coefficients from estimating equation (3) for the matched sample.

Appendix Table A5 - Match Rate for Treated Cases by Gender, Degree, and School Type

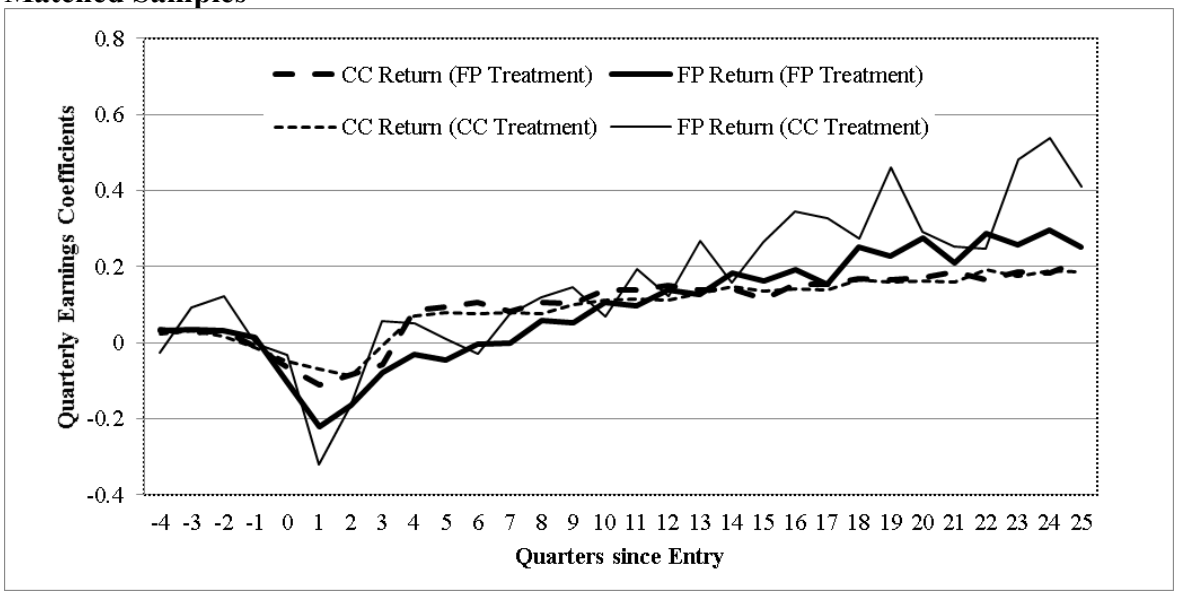
Men		Women	
Seeking Certificates	Seeking Associate's Degrees	Seeking Certificates	Seeking Associate's Degrees
Treatment: For-profit Schools			
49%	88%	72%	85%
Treatment: Community Colleges			
80%	54%	35%	54%

Appendix Figure A1a –Effect of Attendance on Quarterly Earnings, Men Pursuing Certificates, Matched Samples



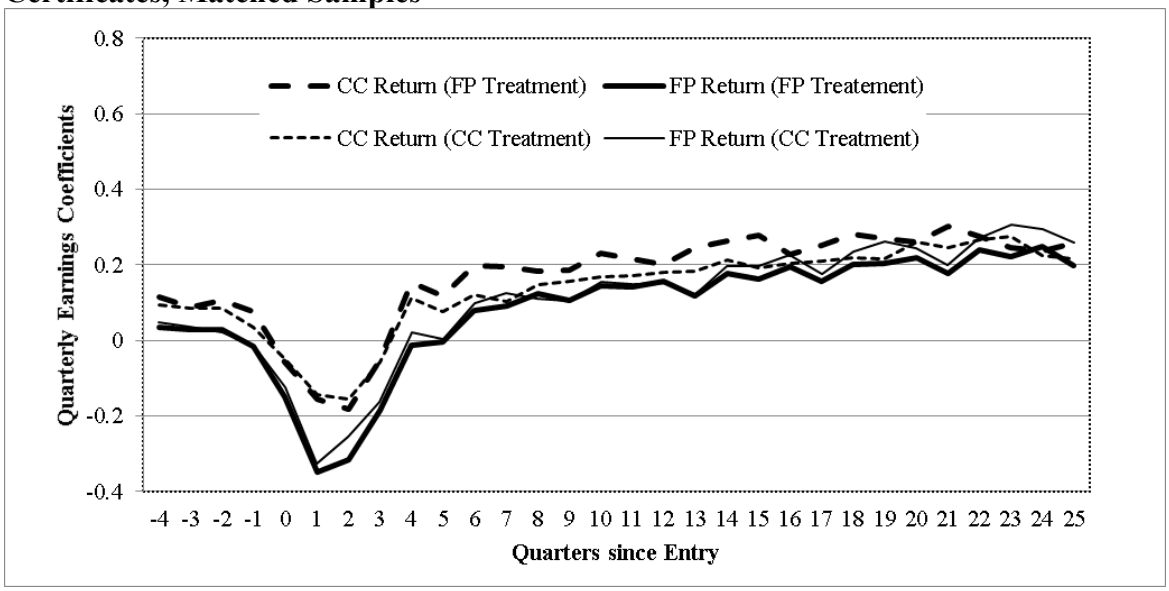
Note: Each data point is the estimate log quarterly earnings gain based on equation (3), estimated for the matched sample.

Appendix Figure A1b –Effect of Attendance on Quarterly Earnings, Men Pursuing Associate's, Matched Samples



Note: Each data point is the estimated log quarterly earnings gain based on equation (3), estimated for the matched sample.

Appendix Figure A1c –Effect of Attendance on Quarterly Earnings, Women Pursuing Certificates, Matched Samples



Appendix Figure A1d –Effect of Attendance on Quarterly Earnings, Women Pursuing Associate's, Matched Samples