Panacea or Pariah: The Labor Market Returns of Private For-profit Institutions and Community Colleges

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ABSTRACT

Over the past five years, the labor market returns of private for-profit institutions and community colleges have become an increasingly salient policy question, and one that has been largely unanswered by the current literature. Using novel data released in September 2015 by the Department of Education, this paper uses several different multivariable regression models to examine the earnings and costs differentials between students of either community colleges or private for-profit schools, at both the two- and four-year levels. Conditional on basic student characteristics, community colleges have higher expected earnings than two-year for-profit programs. The differences are accompanied by much higher costs and debt burdens associated with two-year private for-profit institutions, as well as by these schools educating, on average, more low-income and high-need students. However, community colleges underperform their private four-year counterparts. A significant portion of this earnings gap is unobserved, indicating that four-year for-profit schools have capabilities or practices that boost mean earnings of their attendees after controlling for common institutional parameters and even when considering the longer duration of a four-year degree and the opportunity costs of abbreviated time in the labor market. Thus, any policy change to the for-profit industry must not fully restrict the growth of four-year programs, and nor should it place complete faith in the success of universal two-year public education.

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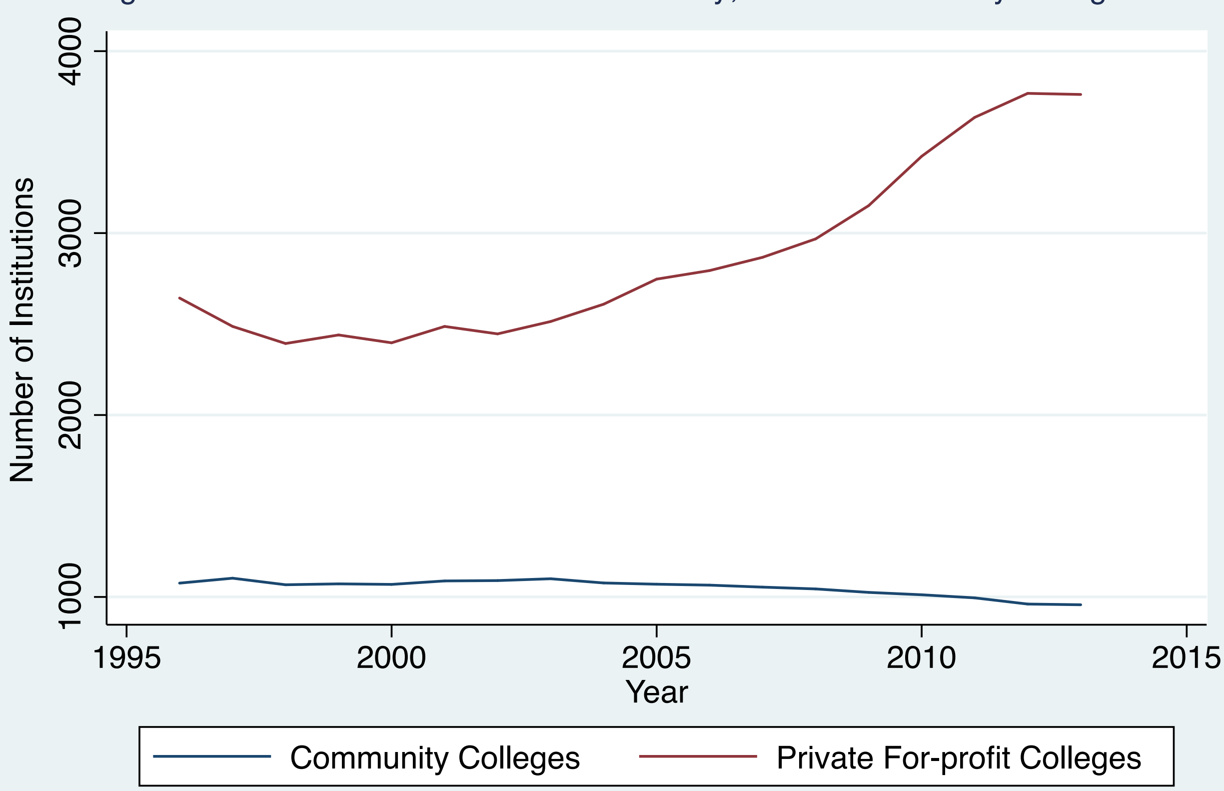
I. Introduction

Though they have not been historically central elements of higher education, community colleges and private for-profit institutions have become much more prominent as the number of Americans pursuing postsecondary degrees has grown, the demographics of those students have changed, and policymakers have sought to mitigate rising tuition rates. Between 2001 and 2014, the number of persons aged 25 or older who attained a postsecondary degree grew by nearly 21 percent (U.S. Census Bureau; author's calculations). Today, over two out of every five Americans have an associate's degree or higher, compared to only one in three at the turn of the 21st century. And together, community colleges and private for-profit institutions educate a high percentage of non-traditional students — a definition that includes low-income, minority, and older enrollees. However, this expansion has come at a cost. Over that same period, outstanding federal student debt quadrupled to $1.1 trillion, and after the Great Recession, for-profit and community college debtors came to account for half of all borrowers and for a staggering 70 percent of all defaults (Looney and Yannelis 2015).

Community colleges and private for-profit institutions arose in the late 19th century to occupy the educational niche between high school and traditional four-year colleges. While early community colleges were extensions of high school curricula that often served as foundations for a transition to bachelor-degree granting colleges, the first for-profits were vocationally oriented, offering services in typing, business, and accounting. Since that time, community colleges and private for-profits have undergone much evolution, and both industries can claim positive contributions to the administration of higher education. For example, the for-profit school Walden University pioneered online coursework for working adults (Deming 2012), and many community colleges have low-cost liberal arts options (Bailey 2001), certainly a rarity within an increasingly expensive postsecondary sector. Today, the private for-profit industry is quite lucrative, and the major providers like the Apollo Group, which owns the University of Phoenix, and Graham Holdings Company, which owns Kaplan University, are publicly traded, quite profitable, and offer executive compensation packages in the $10 million range (Bennett, Lucchesi, and Vedder 2010). Community colleges, meanwhile, have seen widespread budget cuts as state and federal expenditures on two-year higher education programs have fallen (Kahlenberg 2015).

Over the last half-century, the growth trends of the private for-profit and community college sectors have bifurcated. Between 1963 and 2006, enrollment in community colleges grew 8-fold to reach 6.2 million students, representing 35 percent of all postsecondary students (National Center for Education Statistics, *Special Supplement*, 2008, Figure 4). However, over the span 1970-2009, enrollment in private for-profit institutions grew *100-fold*, from 18,333 students to 1.85 million (Deming 2012). And when focus is refined to post-2000, the for-profit industry has continued to proliferate while community colleges have declined, both in number of campuses and in total enrollment (see Figure 1; Juszkiewicz 2015). Yet, as the for-profits multiplied, so did inquiries into the industry from regulatory agencies. Conversely, a stagnant community college sector has been tasked by the White House to remedy a crisis in postsecondary tuition costs and changing employment demands.

Figure 1. Growth in Private For-Profit Industry; Stall in Community College Sector



Source: Department of Education

The divergent fates of these postsecondary groups are best illustrated by two examples. The for-profit chain ITT Technical Institute has 130 campuses in 38 states, educating an aggregate population of over 45,000 students. But after allegations of predatory loan practices and reports of exorbitant default rates among its students, the Consumer Financial Protection Bureau sued the company. It currently faces fraud charges from the Securities and Exchange Commission, and it is under investigation from 16 attorneys general (Grasgreen 2015).[1] Far from an outlier, the litigation against ITT Tech is paradigmatic for much of the industry. For example, the mammoth for-profit company Corinthian Colleges, Inc. was shut down in 2015 after federal investigations revealed illegal marketing and lending campaigns that targeted individuals near the poverty line (Green 2015); the for-profit operator Education Affiliates was fined $13 million by the Justice Department for falsifying financial aid claims and diplomas (Grasgreen 2015); and in January, the Federal Trade Commission filed suit against DeVry University for misleading advertising practices.

Conversely, fully subsidized community college has been viewed as a panacea against rising tuition costs and as a direct intervention to prepare young Americans for careers that increasingly require postsecondary degrees.[2] President Barack Obama formally presented the plan, called "America's College Promise," in the January 2015 State of the Union Address, which immediately elevated the policy idea to national attention. In the address, he said, "We still live in a country where too many bright, striving Americans are priced out of the education they need … That's why I'm sending this Congress a bold new plan to lower the cost of community college — to zero … Whoever you are, this plan is your chance to graduate ready for the new economy without a load of debt." Though the initiative has little chance to pass through a conservative Congress, it illustrates how community colleges are now seen by many policymakers to be critical sources of potential in American higher education.

In this way, the comparative study of these two sectors of higher education is framed by two coincident, yet distinct, contexts: (1) the rapid proliferation of a for-profit industry beset by regulatory challenges, and (2) the growing political appeal of turning to a flagging community college system to offer high-quality, low-cost degrees. Are these realities justified by economic analyses? Is it prudent to advocate universal public two-year education as a means to improve future employment options? Or should the rise of the for-profit industry be leveraged instead? To answer these questions in a robust manner, this paper uses a subset of the novel panel data released by the Department of Education that includes, *inter alia*, average earnings, debt, and demographic information between 1996 – 2013 for federally-aided students from 957 community colleges; 2,485 two-year for-profit institutions; and 511 four-year for-profit schools. The data are used to determine whether attendees of community colleges or private for-profit institutions have better labor market

[1] In response, ITT Technical Institute President Gene Feichtner said, "'We've come to expect these unjust assaults … Let there be no presumption here that we believe we'll be treated fairly.'"
[2] The White House claims that by 2020, 30 percent of jobs will require some college experience or at least an associate's degree (Hudson 2015).

outcomes, and the paper sheds new, empirical light on the relative worth of either higher education sector.

I quantify the relative labor market payoff of community colleges versus two- and four-year private for-profit institutions by calculating the earnings and cost gaps between these two postsecondary groups, contingent upon a host of covariates and fixed effects. I use multivariable regression models to adjust for a common set of explanatory variables and decomposition techniques to ascertain the portion of the earnings difference that can be explained by the included variables. Net present value calculations are included to further compare earnings streams between these postsecondary groups. Broadly, I find that conditional on basic student characteristics, community colleges have higher expected earnings and lower predicted costs than two-year for-profit programs. However, community colleges underperform their private four-year counterparts, and I conclude that four-year for-profit schools have capabilities or practices that boost mean earnings after controlling for common institutional parameters.

I organize this paper into three remaining sections. First, Section II articulates the importance of models that estimate labor market outcomes of postsecondary institutions and describes the databases and specific data used. Then, Section III describes the three econometric models this paper employs to quantify those labor market outcomes, represented by the earnings and cost gaps between community colleges and two- and four-year private for-profit institutions. Section III. i.-v. shows the models' results and estimates the net present value of community colleges, two-year for-profits, and four-year for-profits with counterfactual scenarios. Section IV concludes.

II. i. The Importance of Value-Added and Payoff Models for Community Colleges and For-profit Institutions

Recently, colleges have been pressured to demonstrate the value they confer to their students (Cunha and Miller 2014). This quantity — known in the literature as a school's "value-added" or "payoff" — measures the causal impact a school has on its graduates. A small body of research has centered on the value-added of for-profit institutions, and the literature on the impact of community colleges is even scarcer (largely limited to Kane and Rouse 1995; Bailey 2001). The most recent, well-cited earnings study on the labor market outcomes of community college graduates is Marcotte (2005) — now over a decade old. As tuition rates at traditional state and four-year colleges continue to increase (Oliff 2013), forcing prospective students to consider part-time, abbreviated, and non-traditional programs, the pressure to show payoff measures for for-profits and community colleges will only mount. Therefore, this paper fills a critical gap in the economic literature.

To construct a payoff model, the measured outcome is usually an employment or financial indicator — typically earnings, average debt, or default rate — and the explanatory variables control for a set of observed common characteristics across institutions. From such a model, it is possible to determine whether private for-profit institutions or community colleges produce graduates with better economic outcomes. As a host of literature suggests, computing these value-added measures is a critical element of any subsequent policy (Dale and Krueger 2002; Cunha and Miller 2014; Hoxby 2015; Rothwell and Kulkarni 2015). Before subsidies or tax-credits can be given to community colleges, for example, a robust understanding of the institutions' impacts on its students is needed. To ensure the fiscal responsibility of these policies, their costs would have to be offset by the benefits that arise from the colleges' value-added (Hoxby 2015). Specifically, the causal impact that institutions have on their graduates is used in "evaluating the deductibility of student loan interest," untaxed scholarships, "tax-preferred education savings accounts," "the deductibility of charitable contributions to colleges," government grants to postsecondary schools, and whether the Treasury "will recover outstanding student debt."[3] More generally, the employment and earnings gains produced by institutions of higher education offer invaluable clues to future economic growth and the financial sustainability of federal investment in education.

Though these are critically important issues to address at the macroeconomic and policy scales, the payoff model can also be used to inform school choice at the individual level. In other words, understanding whether community colleges' or private for-profit schools' graduates have higher incomes, on average, can uniquely inform a student's enrollment decision. School choice can be framed in a strictly economic sense where students consume education to maximize their utility and future earnings. By attending an institution of higher education, students are increasing their human capital — inclusive of their productivity, marketable skills, and innate abilities. As such, the economic benefits of education can be measured against the cost of the initial investment and years of lost earnings, or even the benefits of an alternative investment altogether (Borjas 2010).

[3] Hoxby, C. (2015). "Computing the Value-Added of American Postsecondary Institutions." Stanford University and the National Bureau of Economic Research. Page 1.

Normally, value-added approaches use student-level data to control for a set of covariates that capture baseline student characteristics prior to entry at a given institution (Deming 2012; Hoxby 2015). Student-level data is often preferable over institution-level information to account for both vertical and horizontal selection biases. As described by Hoxby (2015), vertical selection bias arises when more or less able students select into certain institutions over others. For example, Kane (1998) found that attendance in a college with a 100-point higher SAT average conferred greater lifetime earnings by 3 percent. However, it is entirely possible that students who attend better schools would have higher earnings regardless of where they actually matriculate (Dale and Krueger 2002). Admissions committees, after all, select smarter, harder-working, and more ambitious students — characteristics that would likely be rewarded in the labor market even without that specific institution's degree (Dale and Krueger 2002). Horizontal selection bias, on the other hand, occurs when student characteristics differ based on geography. For example, if more or less able students are concentrated in different regions, earnings gaps that should be attributed to geographic advantages or disadvantages would be improperly assigned to the postsecondary institutions attended (Hoxby 2015). Therefore, the vertical and horizontal differentiation of individual students could result in the overestimation of value-added (e.g. earnings differences) between institutions.

A variety of innovative economic experiments have been used to mitigate these biases (most notably in Dale and Krueger 2002; Hoekstra 2009; Zimmerman 2014; and Hoxby 2015). Although a description of their methods is beyond the scope of this paper, it is important to note that a common theme of these analyses is to use individual-level data to parse out pre-entry differences in student characteristics, thus accounting for vertical and horizontal variations. Because I utilize novel data from the Department of Education, which does not include any student-level information, it was much harder to eliminate vertical and horizontal selection biases. However, while no micro-data is provided, school averages are available, and this paper only assesses sector-level differences in outcomes after controlling for observable differences in students who attended either community colleges or private for-profit institutions. I also use counterfactual scenarios where the mean characteristics of one sector are held fixed while regression coefficients are allowed to vary between groups. Thus, to the extent that it is possible, I try to account for these two sources of unobserved differentiation, albeit necessarily imperfectly.

This paper does not compute specific value-added measures for each institution. Instead, I assess the relative payoff of community colleges versus two- and four-year private for-profit institutions by calculating the earnings and cost gaps between these two sectors of higher education, contingent upon a host of covariates and fixed effects. I use several multivariable regression models to adjust for a common set of explanatory variables and Blinder-Oaxaca decompositions to ascertain the portion of the earnings difference that can be explained by the included variables. Net present value calculations are included to further compare earnings streams between these postsecondary groups, and the computations account for both varying discount rates and opportunity costs.

Conditional on basic student characteristics, community colleges have higher expected earnings than two-year for-profit programs. The differences are accompanied by much higher predicted costs and average debt burdens associated with two-year private for-profit institutions, as well as to these schools educating, on average, more low-income and high-need students. However, community colleges underperform their private four-year counterparts. A significant portion of the earnings gap between these two postsecondary sectors is unobserved, indicating that four-year for-profit schools have capabilities or practices that boost mean earnings after controlling for common institutional parameters.

II. ii. A Description of the Data Set

The panel data set used in this paper represents one of the most comprehensive compilations of national data on higher education (U.S. Department of Education 2015). Released by the Department of Education in September 2015 as part of the Obama Administration's College Scorecard program,[4] the data includes information from well-researched sources like the Integrated Postsecondary Education Data System (IPEDS) and the National Student Loan Data System (NSLDS), as well as novel earnings records from the Treasury Department. The IPEDS, which itself is collected from surveys administered by the DOE's National Center for Education Statistics (NCES), contains data, *inter alia*, on graduation, retention, and admission rates, as well as on cost of attendance, net price, Pell Grants, and enrollment factors (EOPUS 2015). Under the Higher Education Act, all institutions that receive Title IV funding[5] must submit IPEDS questionnaires. In 2013, the most recent date of IPEDS completion, there were 7,253 institutions in 50 states and Washington, D.C. that received Title IV funding and therefore were included in IPEDS surveys (EOPUS 2015).

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[4] An interactive tool designed to provide citizens with a non-partisan, reliable source of school-specific education statistics (https://collegescorecard.ed.gov).

[5] Title IV federal aid includes loans (e.g. the Federal Family Education Loan {FFEL} and the Federal Perkins Loan), grants (e.g. Pell Grants and Academic Competitiveness Grants), and the federal work-study program.

The NSLDS is the primary national database used to monitor student aid — mainly from federal student loans and Pell Grants. It is the major repository for information on loan disbursements and the repayment status of debtors, including data on default and deferment rates and remaining balance values. Its key reported metrics are the median cumulative loan debt of a given institution for students who receive federal loans and the institution cohort repayment rate (the percentage of students who have left the school and have been making payments on their outstanding loan balance) (EOPUS 2015).

The true novelty of the data set, however, lies in the inclusion of earnings data from the Treasury Department alongside the data from IPEDS and NSLDS. In this segment of the full data set, an individual's earnings are extracted from their W-2 form, matched to their alma mater, and then summed for all the school's graduates for a given year to produce annual institutional earnings data. Earnings are defined as the total of wages and deferred compensation for each W-2 received, and self-employment earnings data are also included from Schedule SE forms (EOPUS 2015). Because all U.S. employers submit W-2 forms, they offer national — rather than state-specific — salary data. This subset of the data is used to estimate the labor market outcomes of former attendees of colleges, including data on the mean earnings of workers six to 10 years after first enrolling, the fraction of former students earning over $25,000 (in 2014 dollars), and the percentiles of earnings distributions (EOPUS 2015).

Taken together, these three databases are aggregated in the Department of Education's September 2015 release, spanning the period 1996 – 2013. It is important to note that much of the NSLDS data are derived from the undergraduate students receiving federal aid, and the earnings data are only tracked for federally-supported enrollees (EOPUS 2015). Additionally, school-specific measures of debt repayment and default rates are based upon the fraction of students with federal loans (EOPUS 2015). In terms of evaluating the influence that institutions have on students who receive federal support, this limitation is not problematic. However, the institution-level statistics for colleges that have few students on federal aid might not be as robust. Still, according to the Department of Education (2015), about 70 percent of graduating postsecondary students receive federal aid, thus reducing the constraining effect of this qualification across the data set. Furthermore, the federal government analyzed the entire data set and concluded that for a given institution, the Title IV population is demonstrably similar to the school's overall population, as defined by a range of characteristics, including average SAT and ACT scores, race, age, and marital and dependency status (EOPUS 2015).

At the institutional level, data are obtained from all schools of higher learning in the United States who enroll Title IV federal aid recipients, possess a positive number of undergraduate students, and have a six-digit OPEID. In total, this amounts to 6,794 institutions. Given the size and novelty of the aggregate data set, this information is "likely to be a significant improvement … relative to other publicly available data sources that have their own limitations."[6] In particular, the NSLDS data matched with earnings information have "the potential to significantly expand our understanding of the performance of higher education institutions."[7]

This paper uses a subset of the full data release; in total, 312 variables are included to cover 124,699 observations, culled from the full Department of Education set of 1,729 variables.[8]

II. iii. Basic Profiles of Community Colleges versus Private For-profit Institutions

Before any meaningful comparison between community colleges and private for-profit institutions could be conducted, their baseline differences were studied. A dummy variable was encoded to focus upon only the community colleges and private for-profit institutions in the panel data set.[9] Another dummy variable was created to separate four-year for-profit institutions from their two-year counterparts.[10] The raw data reveals substantial differences between community colleges and private for-profit schools on selected variables (See Table 12 in the Appendix). In particular, community colleges produce far fewer graduates with degrees in STEM than do four-year private for-profit institutions, but slightly more graduates in STEM than do two-year for-profits. Private for-profits also educate a greater share of minority and low-income students; their percentage of white undergraduates is 10 points lower than for community colleges, and at both the two-year and four-year levels, roughly 60 percent of the private for-profit schools' populaces are Pell Grant recipients, compared to only 37 percent for community colleges. Across both sectors of higher education, the percentage of first generation students and the percentage of students whose parents' highest level of education is high school are roughly similar.

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[6] EOPUS (2015), page 26.

[7] EOPUS (2015), page 25.

[8] The full 312-variable list is available upon request (for concision it is not included here), but selected variable definitions are included in the Appendix (see Table 14).

[9] From the configuration of the Department of Education, the only way to encode community colleges was to define them as public institutions whose highest degree offered was an associate's. There was already a separate category for private for-profit institutions. Representatives from the Department of Education confirmed this methodology.

[10] Only 1.7 percent of community colleges were designated as four-year schools, and they were excluded from further analysis.

The raw differences in dependent variables are perhaps more striking. When the private for-profit sector is viewed as a whole, the mean earnings of their students who are employed 10 years after first enrolling are less than the mean earnings of community college students by nearly $2,000. However, the average earnings of graduates of four-year private for-profit institutions are roughly $42,000, which is $8,000 more than community college students and $14,000 more than two-year private for-profit institutions. Additionally, two- and four-year private for-profit institutions cost nearly twice as much as community colleges, and four-year for-profit graduates have nearly 170 percent more debt. It is no surprise, therefore, that their three-year default rate is 30 percent higher than that of community college students.

According to the data set, only a quarter of community college students complete their studies within 150 percent of the standard time, whereas 65 percent of two-year private for-profit students and 39 percent of four-year private for-profit student do finish on that schedule. Interestingly, the unemployment rates among graduates of community colleges and two- and four-year for-profit institutions are roughly similar. It is interesting to note that the average graduate debt associated with community colleges ($7850) and two-year for-profits ($8301) is relatively similar, and their three-year default rates are almost identical (16 percent). Yet, when looking at attendees of community colleges and two-year for-profits — a definition that includes non-completers and graduates — for-profit students have 33 percent more debt than community college students, on average. This shows that when non-completers, which are far greater in community colleges, are included in the calculations, the relative difference between two-year public and two-year private for-profit schools' median debt burdens increases. Since "attendees" is a more comprehensive designation than "graduates," it is appropriate to state that two-year for-profit students have significantly more mean debt than community college students.

III. Econometric Models and Results

To analyze this raw data in a more sophisticated, robust manner, the general methods of Deming (2012), Rothwell and Kulkarni (2015), and Cunha and Miller (2014) were followed. The econometric analyses rely upon ordinary least squares and fixed effects regressions of log earnings and log costs on a set of baseline institution characteristics and a dummy variable indicating either a community college or for-profit institution. These value-added and payoff approaches attempt to identify the causal influence that schools have on their students, and are thus essential before any conclusion about a specific institution's worth can be made. The models often use earnings or average debt levels as the outcome variables because of their empirical, objective nature. However, it should be noted that those measures are not necessarily the best way to evaluate an education. For example, an institution that produces a large share of students who pursue public service, the arts, or teaching may not have high average earnings even though its graduates benefit society greatly (Hoxby 2015). Yet, it is beyond the scope of an economist to assign numerical weights to professions, and in the absence of alternative data sources, earnings and costs are the dependent variables used in the analyses for this paper.

To operationalize the payoff model at the institutional level, several multiple regressions are used to quantify and examine the gap between the earnings associated with community colleges and the earnings produced by private for-profit schools. These regressions are separated into two comparison cohorts: (1) community colleges and two-year private for-profit schools and (2) community colleges and four-year private for-profit schools. The models are then repeated to use average annual cost of attendance as the dependent variable. In total, this yields four sections of comparison. For each section, three different econometric models are used: an intercept-shift OLS regression, a counterfactual decomposition technique, and fixed effects regressions.

The first model allows the intercept to differ between private for-profit schools and community colleges but constrains the other coefficients to be the same. The model is,

$$y = a_e + \gamma CommunityCollege + \sum_{j=1 \dots k} \beta_j X_j + \mu \tag{1}$$

$$E(\mu | X_1 \dots X_k) = 0$$

where y is the dependent variable of interest, and $CommunityCollege = 1$ if the institution measured is a community college and $CommunityCollege = 0$ if the institution is a private for-profit school. The sum represents a collection of explanatory variables used in the multivariable regressions.

For private for-profit institutions, this model predicts that the mean value of the dependent variable will be:

$$\overline{y}_p = a_e + \sum_{j=1 \dots k} \beta_j \overline{X}_{j_p} + 0 \tag{2}$$

where $\overline{X}_{j_p}$ is the mean of variable j for a private for-profit school.

For community colleges, on the other hand, this model predicts that their mean outcome value will be:

$$\overline{y}_{cc} = a_e + \gamma + \sum_{j=1\ldots k} \beta_j \overline{X}_{j_{cc}} + 0 \tag{3}$$

Therefore, the difference in the mean value of the outcome variable between the two groups can be expressed as,

$$\overline{y}_p - \overline{y}_{cc} = (a_e - a_e - \gamma) + \sum_{j=1\ldots k} \beta_j \left(\overline{X}_{j_p} - \overline{X}_{j_{cc}}\right) \tag{4}$$

To identify $\overline{y}_p - \overline{y}_{cc}$, an OLS multiple regression in the form of equation (1) is run, and then equations (2) and (3) are used to compute $\overline{y}_p$ and $\overline{y}_{cc}$, respectively. Equation (4) is the expanded form of this calculation, where the second term represents the gap in the outcome variable that is attributable to differences in the observed characteristics by institution type. The first term, on the other hand, is the gap in the outcome variable that is unexplained by the included model.

The second procedure is a counterfactual decomposition technique known in the economic literature as a Blinder-Oaxaca decomposition (Blinder 1973; Oaxaca 1973). It is widely used to examine mean differences in outcome variables between two groups, and in this paper, the two groups represent either (1) community colleges and two-year for-profit schools or (2) community colleges and four-year for-profit schools. For example, when the log earnings are taken to be the dependent variable, performing a Blinder-Oaxaca decomposition separates the difference in mean earnings between attendees of community colleges and for-profit schools into two components: (1) a part that "explains" the earnings differential by inter-group differences in school characteristics, such as the share of white students and percentage of students on federal aid, and (2) a second term that represents the element of the earnings differential that cannot be explained by the inter-group differences in school characteristics (Jann 2008). This unexplained term captures the difference in the effectiveness of the two types of schools as well as unobserved differences in the characteristics of the students that they serve.

In practical terms, the decomposition begins with separate linear regressions for community colleges and private for-profit institutions,

$$y_p = a_p + \sum_{j=1\ldots k} \beta_j X_{jp} + \mu \tag{5}$$

$$E(\mu|X_1 \dots X_k) = 0$$

$$y_{cc} = a_{cc} + \sum_{j=1\dots k} \beta_j X_{jcc} + \mu \quad (6)$$

$$E(\mu|X_1 \dots X_k) = 0$$

Then, the procedure involves considering the counterfactual scenario. In the case where the outcome variable, y, is log earnings, for example, the counterfactual situation represents the earnings produced by a community college if the school had the same earnings parameters as a private for-profit school:

$$y_{cc}{}^{*} = a_p + \sum_{j=1\dots k} \beta_{jp} X_{jcc} \quad (7)$$

Algebraic techniques are used to express Equation (7) in known quantities. Mathematically, the Blinder-Oaxaca decomposition in this case can be expressed as:

$$\overline{y}_p - \overline{y}_{cc} = \left(\overline{y}_p - \overline{y}_{cc}{}^{*}\right) + (\overline{y}_{cc}{}^{*} - \overline{y}_{cc})$$

$$\overline{y}_p - \overline{y}_{cc} = \left[\left(a_p + \sum_{j=1\dots k} \beta_{jp} \overline{X}_{jp}\right) - \left(a_p + \sum_{j=1\dots k} \beta_{jp} \overline{X}_{jcc}\right)\right] + \left[\left(a_p + \sum_{j=1\dots k} \beta_{jp} \overline{X}_{jcc}\right) - \left(a_{cc} + \sum_{j=1\dots k} \beta_{jcc} \overline{X}_{jcc}\right)\right]$$

$$\overline{y}_p - \overline{y}_{cc} = \sum_{j=1\dots k} [\beta_{jp}(\overline{X}_{jp} - \overline{X}_{jcc})] + \left[(a_p - a_{cc}) + \sum_{j=1\dots k} (\beta_{jp} - \beta_{jcc})\overline{X}_{jcc}\right] \quad (8)$$

"Explained by X" "Unexplained"

When the Blinder-Oaxaca decomposition is expressed in the form of Equation (8), the "Explained by X" portion can clearly be understood as the portion of the outcome variable gap attributable to inter-group characteristics differences. Conversely, the "Unexplained" portion represents the outcome variable gap that is due to the difference between the intercepts and slope coefficients. It is worth noting that Equation (8) can be weighted with community college coefficients instead.

While these institution-level models[11] are attractive for the ease with which they can be manipulated, they may not offer accurate measurements of earnings payoffs when studying a heterogeneous set of institutions (EOPUS 2015). The problem is that unobserved differences in the characteristics of the students, or the labor market that they operated in, might be correlated with the type of institution they attended. To mitigate this difficulty — along with the concept of horizontal selection articulated by Hoxby (2015) — this paper's third econometric technique is the use of several different fixed effects (FE) models. The three FE models use different regional constraints for a given institution: (1) its three-digit ZIP code, (2) its city, and (3) its state. The model can generally be described as,

$$y_s = \beta_0 + \delta_1 Community_{College} + \sum_{z=1}^{Z} \alpha_z D_{zs} + \sum_{j=1}^{J} \beta_j X_j + \mu \tag{9}$$

$$E(\mu | X_1 \dots X_k) = 0$$

where $\sum_{z=1}^{Z} \alpha_z D_{zs}$ represents the geographic fixed effects term.

Given that there are multiple observations for each institution across time, these FE models allow us to focus on earnings changes at intra-regional levels, thus reducing the potential for omitted variable bias (Wooldridge 2016). While the state FE model is not that constraining — in most states, there are hundreds of institutions — the city and three-digit ZIP code models more effectively hone in on metropolitan-specific effects. Importantly, the three digit-ZIP codes, technically defined as the geographical area served by a Sectional Center Facility, can be viewed as proxies for commuting zones. In this way, the ZIP code FE model focuses on comparisons between community colleges and private for-profit institutions that are in geographical proximity and thus could have been reasonably selected by the same set of prospective students, diminishing vertical selection as well.

Each model described above incudes the following seven explanatory variables:

- The total enrollment share of undergraduate degree-seeking students who are white
- Percentage of total degrees granted in STEM fields (see Appendix, Table 12, for definition of STEM fields)
- Percentage of students who receive Pell Grants
- Percentage of first-generation students
- Percentage of students whose parents' highest educational level is high school

[11] Specifically referring to Equations (1), (5), (6) and (8).

- Percentage of students who submitted applications to three or more different schools
- Percentage of part-time students

These variables were included because they represent important background characteristics of postsecondary institutions and are not affected by any school's value-added measure. For example, while community colleges' average percentages of part-time or white students certainly affect earnings, they do not capture the influence of the community college itself on those earnings. In other words, conditional on a set of common characteristics that are unaffected by a given institution, how do mean earnings vary between groups?

The STEM variable was included primarily to track how a school's curriculum was shaped towards science and mathematics majors. By adding a variable that tracked these degree shares, which are associated with higher wages (Altonji, Blom, and Meghir 2012), the resultant earnings gaps reflected the impact of STEM-oriented programs. Therefore, unlike the other explanatory variables, the STEM covariate certainly captures a part of the influence that a postsecondary institution has on future earnings. While that suggests the variable should not be included, I do retain it in all of my models to more "fairly" compare community colleges with for-profits. Since the for-profit industry offers far more STEM-oriented vocational programs than community colleges, withholding the variable from my analyses would likely have resulted in large, positive earnings gaps between the two groups that were due to for-profits just conferring degrees in lucrative fields. Such differentials, while important, offer little insight to the actual quality or value-added of those degrees and could be inherently biased towards the for-profit sector.

It is equally important to mention why several variables were not included in this regression model. Because many community colleges and private for-profit institutions have essentially open admissions policies (Deming 2012; Bailey 2001), SAT and ACT scores were not included in the model. Attempting to include them would have also drastically limited the number of observations. Furthermore, completion rates and average debt of graduates were not included in the model so as to avoid controlling for vectors that may be a reflection of earnings differentials between community colleges and private for-profit institutions rather than a source of them. Other variables, such as faculty salaries, may capture education inputs that contribute to earnings differences. Controlling for them in the model, therefore, would underestimate the true gap in mean earnings between community colleges and private for-profit institutions.

III. i. Earnings Differences between Community Colleges vs. Four-year Private For-profit Schools

As displayed in Table 1, Model (1) shows that the community college dummy variable is negative and thus associated with 27.8 percent lower earnings, on average, where, $\gamma = -0.278$. According to Equation (2), $\overline{earnings}_p$ can be calculated using the coefficients from Table 1 Column (1) and the mean values of characteristics from Appendix Table 12.

$$\overline{earnings}_p = 10.615$$

Similarly, $\overline{earnings}_{cc}$ can be calculated according to Equation (3):

$$\overline{earnings}_{cc} = 10.395$$

Thus, the difference in mean log earnings produced by four-year private for-profit schools versus community colleges is:

$$\overline{earnings}_p - \overline{earnings}_{cc} = (a_e - a_e - \gamma) + \sum_{j=1\ldots k} \beta_j \left(\overline{X}_{j_p} - \overline{X}_{j_{cc}}\right) = 0.220$$

This intercept-shift model shows that community colleges negatively impact earnings; and, when considering the sector-wide level, community colleges perform worse than four-year private for-profit institutions. Looking more closely at $\overline{earnings}_p - \overline{earnings}_{cc}$, the first term is the unexplained gap that may be due to unobserved characteristics that make community colleges worse than four-year private for-profit schools. The second term is the difference between the observed characteristics of community colleges and four-year private for-profit institutions. Since the first term is equal to $-\gamma = 0.278$, it can be concluded that the earnings gap is over-explained by features of the model. In other words, the large and positive value of the unexplained term indicates that four-year private for-profit institutions have a favorable impact on earnings, though it is unobserved by the model. The second term has a value of $\sum_{j=1\ldots k} \beta_j \left(\overline{X}_{j_p} - \overline{X}_{j_{cc}}\right) = -0.058$, indicating that four-year private for-profit institutions suffer from worse baseline characteristics than community colleges.

Table 1.

OLS Earnings Models for Community Colleges and 4-year Private For-Profit Institutions

VARIABLES	(1) Intercept-shift OLS Model	(2) Community College OLS	(3) 4-year Private For-Profit OLS
Community college dummy	-0.278***	---	---
	(0.00944)		
Share of white students	-0.0164	0.0280***	-0.166***
	(0.0105)	(0.00784)	(0.0319)
Share of degrees granted in STEM	0.147***	0.00650	0.138***
	(0.0206)	(0.0319)	(0.0333)
Share of Pell Grant recipients	-0.526***	-0.429***	-0.692***
	(0.0208)	(0.0173)	(0.0552)
Share of 1st gen. students	-0.139	-0.373***	0.263
	(0.108)	(0.0806)	(0.402)
Share of students whose parents' highest ed. is H.S.	-0.0995	-0.422***	0.766*
	(0.133)	(0.0999)	(0.460)
Share of students who submitted ≥3 applications	0.523***	0.541***	0.553**
	(0.0559)	(0.0427)	(0.159)
Share of part-time students	-0.101***	0.0337*	-0.133***
	(0.0179)	(0.0178)	(0.0356)
Constant	10.96***	10.84***	10.50***
	(0.0312)	(0.0253)	(0.0773)
Observations	2,759	1,949	810
R-squared	0.364	0.450	0.269

The dependent variable is mean earnings, measured on a logarithmic scale, for attendees of an institution 10 years after initial entry. Column (1) represents the model articulated by Equation (1) whereas Columns (2) and (3) represent the models shown by Equations (5) and (6), respectively. The variables come IPEDS and the U.S. Treasury, aggregated together by the Department of Education in its September 2015 release. *** p<0.01, ** p<0.05, * p<0.1

To analyze these claims further, the differences in log earnings between graduates of community colleges and four-year private for-profit institutions were subdivided according to the Blinder-Oaxaca decomposition shown in Equation (8) and adapted here, along with calculations from the initial linear regressions shown in Table 1, Columns (2) and (3).

$$\overline{earnings}_p - \overline{earnings}_{cc} = \underbrace{\sum_{j=1\ldots k} \left[\beta_{jp}\left(\overline{X}_{jp} - \overline{X}_{jcc}\right)\right]}_{\text{“Explained by X”}} + \underbrace{\left[\left(a_p - a_{cc}\right) + \sum_{j=1\ldots k} \left(\beta_{jp} - \beta_{jcc}\right)\overline{X}_{jcc}\right]}_{\text{“Unexplained”}}$$

Based on the data from Table 1, this becomes:

$$\text{"}Explained\ by\ \text{X"} = \sum_{j=1\ldots k} \left[\beta_{jp}\left(\overline{X}_{jp} - \overline{X}_{jcc}\right)\right] = -0.0981$$

$$\text{"}Unexplained\text{"} = \left(a_p - a_{cc}\right) + \sum_{j=1\ldots k} \left(\beta_{jp} - \beta_{jcc}\right)\overline{X}_{jcc} = 0.2982$$

Therefore, the difference between the observed characteristics of four-year private for-profit institutions and those of community colleges predicts lower mean earnings for the for-profits. However, the coefficients of four-year private institutions fight the earnings gap, indicating that the sector is responsible for some value-added that increases the mean earnings of their students beyond what is estimated given the average characteristics of the for-profit institutions. This illustrates that the students at four-year private institutions are quite different than those at community colleges and that for-profit institutions are doing something —unobserved by the model — to boost earnings of their students. In other words, if the private institutions had the same baseline features as community colleges, they would produce even higher earnings. It is possible that the positive effect is due instead to differences in the unobserved characteristics of the students that four-year for-profits serve rather than a result of greater efficacy within the four-year sector. However, this is viewed as unlikely since the included explanatory variables control for a wide range of demographic parameters.

Alternatively, I can weight the gap with the community college coefficients,

$$\sum_{j=1\ldots k} \left[\beta_{jcc}\left(\overline{X}_{jp} - \overline{X}_{jcc}\right)\right] = -0.0876$$

$$\left(a_p - a_{cc}\right) + \sum_{j=1\ldots k} \left(\beta_{jp} - \beta_{jcc}\right)\overline{X}_{jp} = 0.2877$$

This result offers further evidence that four-year private for-profit institutions perform better than expected, given the baseline characteristics of their students.

To show these figures with the proper standard errors, the Oaxaca statistical program written by Jann (2008) was used. Because Jann calculates the counterfactual situations slightly differently than I do, the gap between the log earnings of four-year private for-profit institutions and community colleges in Table 2 is slightly different from the calculations above, even though the exact same number and type of institutions were used in this program, and the same initial regressions were used by the software. However, the explained and unexplained portions of the decomposition are similar in magnitude and show robust standard errors.

Table 2.

Blinder-Oaxaca Decomposition of Earnings Gap between Community Colleges and 4-year Private For-Profit Institutions

	(1)
VARIABLES	Blinder-Oaxaca Decomposition
4-yr private for-profit earnings	10.59***
	(0.00971)
Community colleges earnings	10.41***
	(0.00342)
Difference	0.178***
	(0.0103)
Explained	-0.0997***
	(0.00819)
Unexplained	0.278***
	(0.0121)
Observations	2,759

Source: Department of Education, College Scorecard data. Standard errors in parentheses. STATA program from Jann (2008). *** $p<0.01$, ** $p<0.05$, * $p<0.1$

The fixed effects model in Table 3 further illustrates that the community college dummy variable is negative, indicating that community colleges have a detrimental effect — ranging from an 11 to 25 percent reduction — on future earnings, when compared to four-year for-profits. The community college dummy in Model (C) is similar to the dummy in the intercept-shift OLS model (Table 1, Column 1) (-0.249 versus -0.278). This makes sense, since Model C only focuses on earnings changes at the intra-state level, and because each state has hundreds of institutions, the aggregate outcomes of each state are expected to parallel those at the national level. However, when using the three-digit ZIP code FE model, the dummy rises to -0.113. This suggests that once comparisons are limited to four-year private for-profit institutions and community colleges within the same metropolitan area, community colleges do not perform as badly as they are otherwise predicted to. This could be because community colleges and for-profits in proximity to each other are closer in quality than for those farther away. Models (A) – (C) also show that the effects on earnings of more federally aided and first generation students vary considerably by geographic constraints.

Table 3.
Fixed Effects Models on Earnings Differences between Community Colleges and 4-year Private For-Profit Institutions

VARIABLES	(1) Model A — ZIP	(2) Model B — City	(3) Model C — State
Community college dummy variable	-0.113***	-0.227***	-0.249***
	(0.0185)	(0.0150)	(0.0102)
Share of white students	-0.00795	-0.0186	-0.0322***
	(0.0145)	(0.0126)	(0.0108)
Share of degrees granted in STEM	0.204***	0.122***	0.136***
	(0.0250)	(0.0256)	(0.0198)
Share of Pell Grant recipients	-0.178***	-0.378***	-0.443***
	(0.0339)	(0.0309)	(0.0238)
Share of 1st gen. students	-0.947***	-0.0979	-0.0663
	(0.228)	(0.202)	(0.128)
Share of students whose parents' highest ed. is H.S.	0.858*** (0.275)	0.388 (0.252)	-0.154 (0.161)
Share of students who submitted ≥3 applications	0.356*** (0.0920)	0.417*** (0.0838)	0.416*** (0.0592)
Share of part-time students	0.0928***	-0.118***	-0.129***
	(0.0292)	(0.0246)	(0.0185)
Constant	10.57***	10.64***	10.93***
	(0.0560)	(0.0490)	(0.0372)
Observations	1,198	2,759	2,759
R-squared	0.185	0.223	0.312
Number of 3-digit ZIP codes	397		
Fixed Effects Variable	3 digit ZIP	City	State
Number of cities		1,029	
Number of states			56

The dependent variable is mean earnings, measured on a logarithmic scale, for attendees of an institution 10 years after initial entry. Column (1) represents the FE model where variation is restricted to 3-digit ZIP codes. Column (2) represents the FE model where variation is restricted to cities. Column (3) represents the FE model where variation is restricted to states (there are 56 "states" because U.S. territories are included). The variables come IPEDS and the U.S. Treasury, aggregated together by the Department of Education in its September 2015 release. *** p<0.01, ** p<0.05, * p<0.1

To estimate the earnings gap between community colleges and four-year private for-profit institutions using the FE parameters, Blinder-Oaxaca decompositions were run using FE Model (A) (three digit ZIP codes), according to an adaptation of Equation (9):

$$earnings_s = \beta_0 + \delta_1 Community_{College} + \sum_{z=1}^{Z} \alpha_z D_{zs} + \sum_{j=1}^{J} \beta_j{}^p (X_j{}^p) + \sum_{j=1}^{J} \beta_j{}^c (X_j{}^{cc} \times Community_{college}) + \mu$$

$$\overline{earnings}_{cc} = \beta_0 + \delta_1 + \sum_{z=1}^{Z} \alpha_z \overline{D}_{zcc} + \sum_{j=1}^{J} \left(\beta_j{}^{c} + \beta_j{}^{p}\right) \overline{X}_j{}^{cc}$$

$$\overline{earnings}_{p} = \beta_0 + \sum_{z=1}^{Z} \alpha_z \overline{D}_{zp} + \sum_{j=1}^{J} \beta_j{}^{p}\, \overline{X}_j{}^{p}$$

$$\text{Explained portion} = \sum_{j=1}^{J} \beta_j{}^{p} \left(\overline{X}_j{}^{p} - \overline{X}_j{}^{cc}\right) + \sum_{z=1}^{Z} \alpha_z \left(\overline{D}_z{}^{p} - \overline{D}_z{}^{cc}\right)$$

This analysis was conducted by creating interaction variables for the initial seven explanatory variables through linking them with the community college dummy variable. For an example with only two explanatory variables:

$$y_s = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 (x_1 \times Community_{college}) + \beta_4 (x_2 \times Community_{college})$$

Therefore, $\beta_1{}^{cc} = \beta_1 + \beta_3$ and $\beta_1{}^{p} = \beta_1$. The same explanatory variables used in Model (A) (Table 3) are applied here.[12] Following these calculations,

$$\overline{earnings}_{cc} = 10.378$$

$$\overline{earnings}_{p} = 10.510$$

Thus, from the ZIP code-fixed effects model, I find that community colleges have lower mean earnings than four-year for-profit institutions, a result which agrees with the previous calculations.

Decomposing the gap,

$$\overline{earnings}_{p} - \overline{earnings}_{cc} = 0.132$$

$$= \sum_{j=1}^{J} \beta_j{}^{p} \left(\overline{X}_j{}^{p} - \overline{X}_j{}^{cc}\right) + \sum_{z=1}^{Z} \alpha_z \left(\overline{D}_z{}^{p} - \overline{D}_z{}^{cc}\right) + Unexplained\ Portion$$

$$\overline{earnings}_{p} - \overline{earnings}_{cc} = 0.132 = -0.0290 + 0.160$$

This shows that within three-digit ZIP codes, four-year for-profits have characteristics that would predict lower earnings than for community colleges, but again, the unexplained portion fights this gap. This result agrees with the calculations derived from Table 1. Four-year for-profits are adding some value — unobserved by our models — to counteract the detrimental effect of their student populations on earnings.

If the FE decomposition is instead weighted by community colleges coefficients,

[12] These coefficients are shown in the Appendix (see Table 15, Column {1}).

$$\overline{earnings}_p - \overline{earnings}_{cc} = 0.132$$

$$= \sum_{j=1}^{J} \beta_j^{cc} \left(\overline{X}_j^{\,p} - \overline{X}_j^{\,cc} \right) - \sum_{z=1}^{Z} \alpha_z \left(\overline{D}_z^{\,p} - \overline{D}_z^{\,cc} \right) + Unexplained\ Portion$$

$$\overline{earnings}_p - \overline{earnings}_{cc} = 0.132 = 0.0533 + 0.0787$$

This time, the explained term has switched sign to become slightly positive, which occurs only because the community college coefficients are negative,[12] offsetting the negative differences between group characteristics to produce a positive value.

Thus, the above models, to varying degrees, show that four-year private for-profit institutions are associated with higher mean earnings than community colleges. This gap is not due to a higher average quality of for-profit students — quite the contrary. In fact, at the four-year level, for-profit institutions perform better than what is predicted, given the baseline characteristics of their students. It is worth noting that four-year programs by definition last longer than the two-year community colleges and therefore have high opportunity costs that arise from choosing to pursue a bachelor's degree rather than begin work after an associate's degree. Because these immediate opportunity costs must be offset to prevent permanent indebtedness, it is no grand surprise that by 10 years after matriculation, the earnings of four-year for-profits are higher than for community colleges.

III. ii. Cost Differences between Community Colleges vs. Four-year Private For-profit Schools

This analysis is repeated exactly as described and calculated in Section III. i., except now average annual cost of attendance, on a logarithmic scale, is the dependent variable. As displayed in Table 4, Model (1) shows that the community college dummy variable is negative and thus associated with 90.4 percent lower costs, on average. According to Equation (2), $\overline{cost}_p$ can be calculated using the coefficients from Table 4 Column (1) and the mean values of characteristics from Appendix Table 12,

$$\overline{cost}_p = 10.184$$

Table 4.

OLS Cost Models for Community Colleges and 4-year Private For-Profit Institutions

VARIABLES	(1) Intercept Shift OLS Model for 4-year Institutions & Community Colleges	(2) Cost of Community Colleges	(3) Cost of 4-year Private for-profit institutions
Community college dummy variable	-0.904***	--	--
	(0.00775)		
Share of white students	0.0856***	0.124***	-0.000473
	(0.00986)	(0.0121)	(0.0164)
Share of degrees granted in STEM	0.0325*	-0.0871**	0.0874***
	(0.0167)	(0.0410)	(0.0164)
Share of Pell Grant recipients	-0.0648***	0.0746***	-0.282***
	(0.0171)	(0.0220)	(0.0271)
Share of 1st gen. students	-0.405***	-0.470***	-0.0179
	(0.0896)	(0.106)	(0.191)
Share of students whose highest ed. is H.S.	-0.401***	-0.355***	-0.734***
	(0.111)	(0.132)	(0.223)
Share of students who submitted ≥3 applications	0.390***	0.303***	0.711***
	(0.0403)	(0.0478)	(0.0731)
Share of part-time students	-0.0159	0.118***	-0.0739***
	(0.0146)	(0.0232)	(0.0170)
Constant	10.52***	9.514***	10.60***
	(0.0258)	(0.0334)	(0.0379)
Observations	7,051	4,890	2,161
R-squared	0.770	0.082	0.210

The dependent variable is mean average annual cost of attendance, measured on a logarithmic scale, for attendees of an institution. Column (1) represents the model articulated by Equation (1) whereas Columns (2) and (3) represent the models shown by Equations (5) and (6), respectively. The variables come IPEDS and the U.S. Treasury, aggregated together by the Department of Education in its September 2015 release. *** p<0.01, ** p<0.05, * p<0.1

Similarly, $\overline{cost_{cc}}$ can be calculated according to Equation (3):

$$\overline{cost_{cc}} = 9.277$$

$$\overline{cost_p} - \overline{cost_{cc}} = (a_e - a_e - \gamma) + \sum_{j=1\ldots k} \beta_j \left(\overline{X}_{j_p} - \overline{X}_{j_{cc}}\right) = 0.907$$

Since the first, unexplained, term is equal to $-\gamma = 0.904$, it can be concluded that the cost gap is essentially entirely unexplained by the model. In other words, the unexplained term has a value of 0.904, which indicates that four-year private for-profit institutions have a positive impact on cost, controlling for other factors.

Performing another Blinder decomposition,

$$\overline{cost_p} - \overline{cost_{cc}} = \sum_{j=1\ldots k} \left[\beta_{jp}\left(\overline{X}_{jp} - \overline{X}_{jcc}\right)\right] + \left[\left(a_p - a_{cc}\right) + \sum_{j=1\ldots k} \left(\beta_{jp} - \beta_{jcc}\right)\overline{X}_{jcc}\right]$$

"Explained by X" "Unexplained"

Based on the data from Table 4 Columns (2) and (3), and the mean values of characteristics from Appendix Table 12, this becomes:

$$\text{"}Explained\ by\ \text{X"} = \sum_{j=1\dots k} [\beta_{jp}(\overline{X}_{jp} - \overline{X}_{jcc})] = -0.017$$

$$\text{"}Unexplained\text{"} = (a_p - a_{cc}) + \sum_{j=1\dots k} (\beta_{jp} - \beta_{jcc})\overline{X}_{jcc} = 0.940$$

Weighted by community college coefficients, this yields,

$$\sum_{j=1\dots k} [\beta_{jcc}(\overline{X}_{jp} - \overline{X}_{jcc})] = -0.024$$

$$(a_p - a_{cc}) + \sum_{j=1\dots k} (\beta_{jp} - \beta_{jcc})\overline{X}_{jp} = 0.946$$

These results directly echo those from the basic intercept-shift model. Four-year for-profits are associated with significantly higher costs than community colleges, and this gap is almost entirely unrelated to differences between group characteristics. These unexplained terms account for roughly a 160 percent increase in average annual costs.

Table 5.

Blinder-Oaxaca Decomposition of Cost Gap between Community Colleges and 4-year Private For-Profit Institutions

VARIABLES	(1) Blinder-Oaxaca Decomposition
Costs of 4-year private for-profit schools	10.18***
	(0.00456)
Costs of community colleges	9.307***
	(0.00346)
Difference	0.870***
	(0.00572)
Explained	-0.0342***
	(0.00752)
Unexplained	0.904***
	(0.00970)
Observations	7,051

Source: Department of Education, College Scorecard Data. Standard errors in parentheses. STATA program from Jann (2008). *** p<0.01, ** p<0.05, * p<0.1

Using the same regression-level data, Jann's software computes similar explained and unexplained terms of the decomposition with robust standard errors.

The FE models shown in Table 6 illustrate that even when cost variation is restricted to intra-three-digit ZIP code, intra-city, or intra-state focuses, community colleges are still associated with substantially lower expected attendance costs. The only coefficients that are above a 0.10

magnitude are those for the share of 1st generation students and the share of students who submitted applications to three or more schools.

Table 6.

Fixed Effects Models on Cost Differences between Community Colleges and 4-year Private For-Profit Institutions

VARIABLES	(1) Model A — ZIP	(2) Model B — City	(3) Model C — State
Community college dummy variable	-0.797***	-0.839***	-0.831***
	(0.0148)	(0.00930)	(0.00793)
Share of white students	0.0504***	0.0348***	0.0228**
	(0.0146)	(0.00923)	(0.00977)
Share of degrees granted in STEM	0.0646***	0.0212	0.0426***
	(0.0205)	(0.0159)	(0.0153)
Share of Pell Grant recipients	0.0732***	0.0825***	0.0859***
	(0.0274)	(0.0189)	(0.0183)
Share of 1st gen. students	-0.852***	-0.923***	-0.833***
	(0.182)	(0.124)	(0.0985)
Share of students whose parents' highest ed. is	0.0674	-0.0572	-0.0889
H.S.	(0.223)	(0.154)	(0.124)
Share of students who submitted ≥3 applications	0.323***	0.278***	0.284***
	(0.0648)	(0.0432)	(0.0403)
Share of part-time students	0.0385*	-0.0115	-0.0675***
	(0.0234)	(0.0148)	(0.0141)
Constant	10.40***	10.56***	10.54***
	(0.0461)	(0.0301)	(0.0286)
Observations	3,171	7,051	7,051
R-squared	0.658	0.750	0.783
Number of 3-digit ZIP codes	433		
Fixed Effects Variable	3 digit ZIP	City	State
Number of cities		1,079	
Number of states			57

The dependent variable is average annual cost of attendance, measured on a logarithmic scale. Column (1) represents the FE model where variation is restricted to 3-digit ZIP codes. Column (2) represents the FE model where variation is restricted to cities. Column (3) represents the FE model where variation is restricted to states (there are 57 "states" because U.S. territories are included). The variables come IPEDS and the U.S. Treasury, aggregated together by the Department of Education in its September 2015 release. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Higher shares of 1st generation students are associated with far lower attendance costs, which could arise because those students are searching for the lowest cost options and thus the lowest economic risk choice. The application share coefficients are large and positive perhaps because those students who apply to multiple schools are higher quality students themselves or can afford to pay multiple application fees, which either way make them more likely to choose a more expensive institution.

To estimate the cost gap between community colleges and four-year private for-profit institutions using the FE parameters, Blinder-Oaxaca decompositions were run using the FE Model (A) (three digit ZIP codes) and the same theory as in Section III. i.,

$$cost_s = \beta_0 + \delta_1 Community_{College} + \sum_{z=1}^{Z} \alpha_z D_{zs}$$

$$+ \sum_{j=1}^{J} \beta_j{}^p (X_j{}^p) + \sum_{j=1}^{J} \beta_j{}^c (X_j{}^{cc} \times Community_{college}) + \mu$$

Following these calculations (coefficients shown in Table 15, column {3}):

$$\overline{cost}_{cc} = 9.278$$

$$\overline{cost}_p = 10.18$$

Thus, from the ZIP code-fixed effects model, I find that the expected cost of community colleges is far lower than for-profit institutions, a result which agrees with the previous calculations.

Decomposing the gap,

$$\overline{cost}_p - \overline{cost}_{cc} = 0.902$$

$$= \sum_{j=1}^{J} \beta_j{}^p \left(\overline{X}_j{}^p - \overline{X}_j{}^{cc}\right) + \sum_{z=1}^{Z} \alpha_z \left(\overline{D}_z{}^p - \overline{D}_z{}^{cc}\right) + Unexplained\ Portion$$

$$\overline{cost}_p - \overline{cost}_c = 0.902 = 0.0618 + 0.840$$

If instead weighted by community colleges,

$$\overline{cost}_p - \overline{cost}_{cc} = 0.902$$

$$= \sum_{j=1}^{J} \beta_j{}^{cc} \left(\overline{X}_j{}^p - \overline{X}_j{}^{cc}\right) - \sum_{z=1}^{Z} \alpha_z \left(\overline{D}_z{}^p - \overline{D}_z{}^{cc}\right) + Unexplained\ Portion$$

$$\overline{cost}_p - \overline{cost}_c = 0.902 = 0.0735 + 0.829$$

Both of these decompositions show that the vast majority of the cost difference is unexplained, which agrees with the previous calculations. However, at the three-digit ZIP code level, roughly 7 percent of the cost gap is due to explained features of the model. Thus, four-year private for-profit institutions do have higher costs partially because of the difference in average characteristics between their students and those who attend community colleges. However, this explained portion is small, and the above data quite convincingly show that four-year for-profits are dramatically more expensive, and this disparity is almost entirely unrelated to differences between group characteristics.

In this sense, when compared against community colleges, the four-year for-profits are adding cost beyond what is predicted by the profiles of their students. The "devalue-added" of four-year for-profits could be represented by these higher-than-expected price tags.

III. iii. Earnings Differences between Community Colleges vs. Two-year Private For-profit Schools

This section of the paper repeats the analysis used in Sections III i. and ii., except community colleges are now compared against two-year private for-profit programs and schools.

Table 7.

OLS Earnings Models for Community Colleges and 2-year Private For-Profit Institutions

VARIABLES	(1) Intercept-shift OLS Model	(2) Community College OLS	(3) 2-year Private For-Profit OLS
Community college dummy	0.130***	---	---
	(0.0102)		
Share of white students	-0.00431	0.0280***	-0.00647
	(0.00988)	(0.00784)	(0.0160)
Share of degrees granted in STEM	0.430***	0.00650	0.475***
	(0.0243)	(0.0319)	(0.0315)
Share of Pell Grant recipients	-0.309***	-0.429***	-0.208***
	(0.0179)	(0.0173)	(0.0261)
Share of 1st gen. students	-0.0423	-0.373***	-0.278***
	(0.0714)	(0.0806)	(0.100)
Share of students whose parents' highest ed. is H.S.	-0.493***	-0.422***	-0.110
	(0.0867)	(0.0999)	(0.119)
Share of students who submitted ≥3 applications	-0.0638	0.541***	-0.915***
	(0.0569)	(0.0427)	(0.101)
Share of part-time students	-0.0533***	0.0337*	-0.115***
	(0.0179)	(0.0178)	(0.0256)
Constant	10.65***	10.84***	10.62***
	(0.0276)	(0.0253)	(0.0405)
Observations	4,666	1,949	2,717
R-squared	0.314	0.450	0.158

The dependent variable is mean earnings, measured on a logarithmic scale, for attendees of an institution 10 years after initial entry. Column (1) represents the model articulated by Equation (1) whereas Columns (2) and (3) represent the models shown by Equations (5) and (6), respectively. The variables come IPEDS and the U.S. Treasury, aggregated together by the Department of Education in its September 2015 release. *** p<0.01, ** p<0.05, * p<0.1

Table 7, Model (1), shows that the community college dummy variable is positive and thus associated with 13 percent higher earnings, on average. This effect at the two-year comparative level differs from what was found at the four-year level (see Table 1). According to Equation (2), $\overline{earnings}_{2-yr-p}$ can be calculated using the coefficients from Table 7 Column (1) and the mean values of characteristics from Appendix Table 12,

$$\overline{earnings}_{2-yr-p} = 10.203$$

Similarly, $\overline{earnings}_{cc}$ can be calculated according to Equation (3):

$$\overline{earnings}_{cc} = 10.415$$

$$\overline{earnings}_{2-yr-p} - \overline{earnings}_{cc} = -0.130 - 0.082 = -0.212$$

Since the second, explained, term has a value of $\sum_{j=1...k} \beta_j \left(\overline{X}_{jp} - \overline{X}_{jcc}\right) = -0.082$, two-year private for-profit institutions suffer from worse baseline characteristics than community colleges. The poorer nature of their average students partially contributes to lower earnings. However, the first, unexplained, term is equal to $-\gamma = -0.130$, and therefore two-year private for-profit institutions have an additional negative impact on earnings, though it is unobserved by the model. Stated differently, the negative value of the unexplained term indicates that two-year private for-profit institutions have lower mean earnings than community colleges, even when accounting for baseline inter-group differences that also lower earnings for the private schools.

As before, the differences in log earnings between graduates of community colleges and two-year private for-profit institutions were subdivided according to the Blinder-Oaxaca decomposition shown in Equation (8) and adapted here, along with calculations from the initial linear regressions shown in Table 7, Columns (2) and (3). The Blinder-Oaxaca FE coefficients are shown in the Appendix (see Table 15).

$$\overline{earnings}_{2-yr-p} - \overline{earnings}_{cc}$$

$$= \sum_{j=1...k} \left[\beta_{jp}\left(\overline{X}_{jp} - \overline{X}_{jcc}\right)\right] + \left[\left(a_p - a_{cc}\right) + \sum_{j=1...k} \left(\beta_{jp} - \beta_{jcc}\right)\overline{X}_{jcc}\right]$$

"Explained by X" "Unexplained"

Based on the data from Table 7, and using the two-year for-profit weights, this becomes:

$$\text{"}Explained\ by\ \text{X"} = -0.014$$

$$\text{"}Unexplained\ by\ X\text{"} = -0.187$$

However, when I weight the gap with the coefficients for community colleges,

$$\text{"}Explained\ by\ \text{X"} = -0.158$$

$$\text{"}Unexplained\ by\ X\text{"} = -0.043$$

This result shows that both explained and unexplained terms contribute to the earnings gap between the two groups, but unlike the previous Blinder-Oaxaca decompositions shown in Sections

III. i. and III. ii., the explained and unexplained terms vary significantly in magnitude when the coefficient weights are changed. When the coefficients for two-year for-profits are used, the obvious conclusion is that only slightly lower mean earnings are predicted by the inter-group characteristics differences. Instead, the coefficients of two-year private institutions and the difference in constants are largely responsible for the earnings gap, indicating that this for-profit sector is responsible for some value-decrease that reduces the mean earnings of their students below what is estimated given the average characteristics of the for-profit institutions. Yet, when community college weights are used, the explained term is larger than the unexplained term, suggesting that the community college coefficients are larger in magnitude than those for two-year for-profits. In either case, two-year for-profits perform worse than expected, even given the average baseline characteristics differences between the two groups. However, the exact size of this unexplained quantity is unclear from the decompositions. Again, using the same regression outputs shown in Table 7, Columns (2) and (3), Jann's model reports explained and unexplained terms of similar magnitude and robust standard errors.[13]

The FE models in Table 8 convincingly show that community colleges are associated with higher mean earnings. The magnitude of this positive boost ranges from 23 to 35 percent, depending on the geographic fixed effects used. Even when variation is restricted to the intra-three-digit ZIP code, intra-city, or intra-state level, community colleges are still associated with substantially higher expected earnings. Beyond the increase in the community college dummy and the varied effect of parents' educational level, Models (A) – (C) generally parallel the basic OLS regression shown in Table 7, Column (1).

To estimate the earnings gap between community colleges and two-year private for-profit institutions using the FE parameters, Blinder-Oaxaca decompositions were run using the FE Model (A) (three digit ZIP codes) and the same theory as in Section III. i.. The Blinder-Oaxaca FE coefficients are shown in the Appendix (see Table 15, Column {2}). Following those calculations:

$$\overline{earnings}_{cc} = 10.381$$

$$\overline{earnings}_{2-yr-p} = 10.171$$

[13] Not shown for concision. Available upon request.

Table 8.
Fixed Effects Earnings Models for Community Colleges and 2-year Private For-Profit Institutions

VARIABLES	(1) Model A — ZIP	(2) Model B — City	(3) Model C — State
Community college dummy	0.351***	0.309***	0.232***
	(0.0183)	(0.0135)	(0.0100)
Share of white students	0.0261*	0.0311***	-0.0226**
	(0.0143)	(0.0106)	(0.00954)
Share of degrees granted in STEM	0.423***	0.427***	0.427***
	(0.0295)	(0.0254)	(0.0221)
Share of Pell Grant recipients	-0.0655***	-0.0984***	-0.140***
	(0.0239)	(0.0197)	(0.0175)
Share of 1st gen. students	-0.883***	-0.640***	-0.561***
	(0.123)	(0.0962)	(0.0761)
Share of students whose parents' highest ed. is H.S.	0.331** (0.154)	0.00839 (0.116)	-0.253*** (0.0957)
Share of students who submitted ≥3 applications	-0.683*** (0.0896)	-0.713*** (0.0686	-0.302*** (0.0569)
Share of part-time students	-0.230***	-0.159***	-0.129***
	(0.0245)	(0.0204)	(0.0169)
Constant	10.60***	10.64***	10.74***
	(0.0446)	(0.0355)	(0.0299)
Observations	2,772	4,666	4,666
R-squared	0.308	0.364	0.366
Number of 3-digit ZIP codes	575		
Fixed Effects Variable	3 digit ZIP	City	State
Number of cities		1,374	
Number of states			56

The dependent variable is mean earnings, measured on a logarithmic scale, for attendees of an institution 10 years after initial entry. Column (1) represents the FE model where variation is restricted to 3-digit ZIP codes. Column (2) represents the FE model where variation is restricted to cities. Column (3) represents the FE model where variation is restricted to states (there are 56 "states" because U.S. territories are included). The variables come IPEDS and the U.S. Treasury, aggregated together by the Department of Education in its September 2015 release. *** p<0.01, ** p<0.05, * p<0.1

Thus, from the ZIP code-fixed effects model, I find that the expected earnings of community colleges are far higher than for two-year for-profit institutions, a result which agrees from the previous calculations derived from Table 7.

Decomposing the gap using the same theory from Section III. i.,

$$\overline{earnings}_{2-yr-p} - \overline{earnings}_{cc} = -0.210 = \text{"}Explained\text{"} + \text{"}Unexplained\ Portion\text{"}$$

$$\overline{earnings}_{2-yr-p} - \overline{earnings}_{cc} = -0.210 = 0.136 - 0.346$$

If instead weighted by community colleges,

$$\overline{earnings}_{2-yr-p} - \overline{earnings}_{cc} = -0.210 = 0.017 - 0.227$$

Both of these decompositions show that within three-digit ZIP codes, the baseline inter-group characteristics differences predict that two-year for-profits would have higher earnings than community colleges, albeit to varying degrees. However, the large unexplained terms indicate that two-year for-profits have some unobserved effect to lower mean earnings below what is expected given their student profiles. As a result, two-year for-profits can be viewed as offering "devalue-added" when compared against community colleges.

III. iv. Cost Differences between Community Colleges vs. Two-year Private For-profit Schools

This analysis is repeated exactly as described and calculated in Section III. ii., except now the comparison is between community colleges and two-year private for-profit schools. As shown in Table 9, Model (1) shows that the community college dummy variable is negative and thus associated with 84 percent lower costs, on average. According to Equation (2), $\overline{cost}_{2-yr-p}$ can be calculated using the coefficients from Table 9 Column (1) and the mean values of characteristics from Appendix Table 12,

$$\overline{cost}_{2-yr-p} = 10.023$$

Similarly, $\overline{cost}_{cc}$ can be calculated according to Equation (3):

$$\overline{cost}_{cc} = 9.265$$

$$\overline{cost}_{p} - \overline{cost}_{cc} = 0.838 - 0.081 = 0.757$$

Since the first, unexplained, term is equal to $-\gamma = 0.838$, the cost gap is more than unexplained by the model. In other words, the value of the unexplained term indicates that two-year private for-profit institutions have a positive impact on cost, though it is entirely unobserved by the model. However, the explained portion is slightly negative, suggesting that group characteristics differences are partially responsible for lowering costs below what they are predicted to be for two-year for-profits.

Table 9.

OLS Cost Models for Community Colleges and 2-year Private For-Profit Institutions

VARIABLES	(1) Intercept Shift OLS Model for 2-year Institutions & Community Colleges	(2) Cost of Community Colleges	(3) Cost of 2-year Private for-profit institutions
Community college dummy variable	-0.838***	--	--
	(0.0103)		
Share of white students	0.120***	0.124***	0.0274
	(0.0105)	(0.0121)	(0.0203)
Share of degrees granted in STEM	-0.0251	-0.0871**	0.0476
	(0.0237)	(0.0410)	(0.0306)
Share of Pell Grant recipients	-0.0816***	0.0746***	-0.400***
	(0.0182)	(0.0220)	(0.0329)
Share of 1st gen. students	-0.583***	-0.470***	-0.333**
	(0.0865)	(0.106)	(0.154)
Share of students whose highest ed. is H.S.	0.110	-0.355***	0.572***
	(0.108)	(0.132)	(0.188)
Share of students who submitted ≥3 applications	0.608***	0.303***	1.937***
	(0.0451)	(0.0478)	(0.115)
Share of part-time students	0.0560***	0.118***	0.0403
	(0.0185)	(0.0232)	(0.0313)
Constant	10.23***	9.514***	9.972***
	(0.0279)	(0.0334)	(0.0464)
Observations	6,904	4,890	2,014
R-squared	0.651	0.082	0.199

The dependent variable is mean average annual cost of attendance, measured on a logarithmic scale, for attendees of an institution. Column (1) represents the model articulated by Equation (1) whereas Columns (2) and (3) represent the models shown by Equations (5) and (6), respectively. The variables come IPEDS and the U.S. Treasury, aggregated together by the Department of Education in its September 2015 release. *** p<0.01, ** p<0.05, * p<0.1. It should be noted that the low R-squared value of Model (2) could indicate a poor choice of covariates.

Performing a Blinder Oaxaca decomposition as in Section III.ii., and using the data from Table 9 Columns (2) and (3), and the mean values of characteristics from Appendix Table 12, this becomes:

$$\text{"}Explained\ by\ \text{X"} = -0.162$$

$$\text{"}Unexplained\ by\ X\text{"} = 0.942$$

Weighted by community college coefficients, this yields:

$$\text{"}Explained\ by\ X\text{"} = -0.062$$

$$\text{"}Unexplained\ by\ X\text{"} = 0.842$$

These results directly echo those from the basic intercept-shift model. Not only are two-year for-profits associated with significantly higher costs than community colleges, but their costs are even higher than what is predicted given the baseline differences between group characteristics.[14]

The FE models shown in Table 10 illustrate that even when cost variation is restricted to the intra-three-digit ZIP code, intra-city, or intra-state level, community colleges are still associated with substantially lower expected attendance costs, offering roughly 70-80 percent discounts.

Table 10.

Fixed Effects Models on Cost Differences between Community Colleges and 2-year Private For-Profit Institutions

VARIABLES	(1) Model A — ZIP	(2) Model B — City	(3) Model C — State
Community college dummy	-0.755***	-0.787***	-0.793***
	(0.0178)	(0.0121)	(0.0103)
Share of white students	0.0341**	0.0325***	0.0243**
	(0.0145)	(0.00936)	(0.0101)
Share of degrees granted in STEM	-0.0285	0.0302	0.0527**
	(0.0269)	(0.0226)	(0.0208)
Share of Pell Grant recipients	0.0553**	0.0626***	0.0888***
	(0.0246)	(0.0186)	(0.0183)
Share of 1st gen. students	-1.230***	-1.062***	-0.989***
	(0.138)	(0.118)	(0.0907)
Share of students whose parents' highest ed. is H.S.	0.992*** (0.177)	0.482*** (0.145)	0.386*** (0.118)
Share of students who submitted ≥3 applications	0.542*** (0.0704)	0.651*** (0.0480)	0.459*** (0.0445)
Share of part-time students	-0.0351	-0.0364*	-0.0140
	(0.0255)	(0.0187)	(0.0176)
Constant	10.12***	10.27***	10.29***
	(0.0472)	(0.0323)	(0.0312)
Observations	3,475	6,904	6,904
R-squared	0.589	0.674	0.700
Number of 3-digit ZIP codes	465		
Fixed Effects Variable	3 digit ZIP	City	State
Number of cities		1,126	
Number of states			57

The dependent variable is average annual cost of attendance, measured on a logarithmic scale. Column (1) represents the FE model where variation is restricted to 3-digit ZIP codes. Column (2) represents the FE model where variation is restricted to cities. Column (3) represents the FE model where variation is restricted to states (there are 57 "states" because U.S. territories are included). The variables come IPEDS and the U.S. Treasury, aggregated together by the Department of Education in its September 2015 release. *** p<0.01, ** p<0.05, * p<0.1

[14] Jann's model reports explained and unexplained terms of similar magnitude and robust standard errors. Not included for concision. Available upon request.

The only coefficients that are above a 0.10 magnitude are those for the share of 1st generation students, the share of students who submitted applications to three or more schools, and the share of students whose parents' highest education is high school. Higher shares of 1st generation students are associated with far lower attendance costs for reasons stated in Section III. ii. Application share coefficients are large and positive for reasons postulated in Section III. ii. as well. It is not obvious why students with poorly educated parents are associated with higher costs. Yet, a plausible explanation could be that because their parents did not attend college, the students are more unaware of differently priced postsecondary options and just choose schools closest to them, which could be why the ZIP-code FE model has the largest coefficient for this term.

To estimate the cost gap between community colleges and two-year private for-profit institutions using the FE parameters, Blinder-Oaxaca decompositions were run using the FE Model (A) (three digit ZIP codes) and the same theory as in Section III. ii. The Blinder-Oaxaca FE coefficients are shown in the Appendix (see Table 15, Column {4}). Following those calculations,

$$\overline{cost}_{cc} = 9.271$$

$$\overline{cost}_{2-yr-p} = 10.008$$

Thus, from the ZIP code-fixed effects model, I find that the expected cost of community colleges is far lower than for-profit institutions, a result which agrees with the previous calculations.

Decomposing the gap using the same theory from Section III. ii.,

$$\overline{cost}_{2-yr-p} - \overline{cost}_{cc} = 0.737 = "Explained" + "Unexplained\ Portion"$$

$$\overline{cost}_{2-yr-p} - \overline{cost}_{cc} = 0.737 = -0.024 + 0.761$$

If instead weighted by community colleges,

$$\overline{cost}_{2-yr-p} - \overline{cost}_{cc} = 0.737 = -0.050 + 0.787$$

Both of these decompositions show that two-year for-profits cost more than expected given the baseline characteristics differences between groups. The explained terms in the decompositions fight the cost gap whereas the unexplained portions over-estimate the average disparity. The above data quite convincingly show that two-year for-profits are more expensive, and significantly, that this gap is in spite of differences between group characteristics. Because the explained term for the four-year for-profit versus community college cost analysis was positive, we can conclude that two-year for-profits offer comparatively more "devalue-added" than their four-year counterparts when considering costs.

III. v. Present Value Calculations

The earnings gap between community colleges and private for-profit institutions can be also viewed in the context of the Schooling Model (Borjas 2010). Under a purely wage-driven decision, a student would choose to attend a school that maximizes the present value of his or her earnings stream (Borjas 2010):

$$PV_{earnings\ w/\ college} = \underbrace{-C - \frac{C}{(1+r)} - \frac{C}{(1+r)^2} - \frac{C}{(1+r)^3}}_{\text{Costs of attending 4-year college}} + \underset{\text{Post-college aggregate earnings}}{\sum_{k=4}^{n} \frac{earnings_{college}}{(1+r)^k}}$$

In this model, the first four terms represent the present value of the costs of attending college, and the remaining *n* years of wage-earning years represent the present value of post-college earnings, assuming that the individual graduates. The variable, *r*, represents the rate of discount of future earnings. At the most basic level, a degree is a good investment if the second element of the sum exceeds the direct costs of attendance by some margin. For example, compared to individuals with only a high school diploma, those with bachelor's degrees earn $580,000 more over their careers, and those with associate's degrees earn $245,000 more (Rothwell and Kulkarni 2015).

However, for present purposes, a more instructive description of the relative value of a private for-profit education versus one from a community college would be to compute the present value of a private for-profit education net-of-cost using adapted community college vectors as the counterfactual,

$$\begin{aligned} PV_{4-yr\ for-profits} \\ &= -\left[\left(C_p + \frac{C_p}{(1+r)} + \frac{C_p}{(1+r)^2} + \frac{C_p}{(1+r)^3}\right) - \left(C_c{}^* + \frac{C_c{}^*}{(1+r)}\right)\right] \\ &+ \left[\left(\sum_{k=4}^{44} \frac{e_p - e_c{}^*}{(1+r)^k}\right) - \left(\frac{e_c{}^*}{(1+r)^2} + \frac{e_c{}^*}{(1+r)^3}\right)\right] \end{aligned}$$

where C_p is the annual cost of going to a four-year private for-profit school, $C_c{}^*$ is the annual cost of going to a community college, but calculated using four-year for-profit variable means; e_p are the yearly earnings of graduates from four-year private for-profit schools, and $e_c{}^*$ are the yearly earnings of graduates from community colleges, but calculated using for-profit variable means. This methodology minimizes vertical selection because the same variable means are used for the entire calculation. By including the second term in the earnings sum, this equation also accounts for the opportunity cost that attendees of four-year institutions incur, since had they gone to a community college, they could have begun work in year two or three.

Using the same methodology, comparisons for community colleges and two-year private for-profit schools can be determined:

$$PV_{2-yr\ for-profits\ vs.\ community\ colleges} = -\left[\left(C_p + \frac{C_p}{(1+r)}\right) - \left(C_c{}^* + \frac{C_c{}^*}{(1+r)}\right)\right] + \sum_{k=2}^{44} \frac{e_p - e_c{}^*}{(1+r)^k}$$

$$PV_{Community\ Colleges\ vs.\ 2-yr\ for-profits} = -\left[\left(C_c + \frac{C_c}{(1+r)}\right) - \left(C_p{}^* + \frac{C_p{}^*}{(1+r)}\right)\right] + \sum_{k=2}^{44} \frac{e_c - e_p{}^*}{(1+r)^k}$$

$$PV_{Community\ Colleges\ \ vs. 4-yr\ for-profits}$$
$$= -\left[\left(C_c + \frac{C_c}{(1+r)}\right) - \left(C_p{}^* + \frac{C_p{}^*}{(1+r)} + \frac{C_p{}^*}{(1+r)^2} + \frac{C_p{}^*}{(1+r)^3}\right)\right] + \sum_{k=2}^{44} \frac{e_c - e_p{}^*}{(1+r)^k}$$

Table 1, Columns (2) and (3); Table 4, Columns (2) and (3); Table 7, Columns (2) and (3); and Table 9, Columns (2) and (3) show the OLS regression outputs needed to calculate the $C_p, C_p{}^*, C_c, C_c{}^*, e_p, e_p{}^*, e_c\ and\ e_c{}^*$ values. From these tables, the following equations were used:

$$\overline{earnings}_p = a_p + \sum_{j=1\ldots k} \beta_{jp}\,\overline{X}_{jp}$$

$$\overline{earnings}_{cc} = a_{cc} + \sum_{j=1\ldots k} \beta_{jcc}\,\overline{X}_{jcc}$$

$$\overline{earnings}_{cc}{}^* = a_{cc} + \sum_{j=1\ldots k} \beta_{jcc}\,\overline{X}_{jp}$$

$$\overline{cost}_p = a_p + \sum_{j=1\ldots k} \beta_{jp}\,\overline{X}_{jp}$$

$$\overline{cost}_{cc} = a_{cc} + \sum_{j=1\ldots k} \beta_{jcc}\,\overline{X}_{jcc}$$

$$\overline{cost}_{cc}{}^* = a_{cc} + \sum_{j=1\ldots k} \beta_{jcc}\,\overline{X}_{jp}$$

Both average annual costs and mean earnings were converted from a logarithmic scale to an arithmetic one just by taking the anti-log of the values.[15]

Table 11.

Summary of Net Present Value Calculations for Community Colleges and Private For-profit Institutions

Discount Rate	(1) $PV_{\text{4-yr for-profits vs. cc}}$	(2) $PV_{\text{cc vs. 4-yr for-profits}}$	(3) $PV_{\text{2-yr for-profits vs. cc}}$	(4) $PV_{\text{cc vs. 2-yr for-profits}}$
0.01	$179,940	-$282,063	-$66,956	$224,815
0.05	$16,174	-$87,789	-$45,524	$125,451
0.10	-$47,453	-$6,899	-$35,790	$81,519

"PV" represents the present value of future earnings, net-of-costs. Column (1) compares four-year for-profit institutions against the counterfactual situation where those students attended community college instead. Column (2) compares community colleges against the counterfactual situation where those students attended four-year for-profits. Column (3) compares two-year for-profit institutions against the counterfactual situation where those students attended community college. Column (4) compares community colleges against the counterfactual situation where those students attended two-year for-profits.

These present value calculations, summarized in Table 11, show that four-year private for-profit institutions outperform community colleges and have the highest earnings when individuals have low discount rates, even when considering the longer duration of a four-year degree and the opportunity costs associated with not working sooner. At low discount rates, individuals do not discount future earnings very much, and thus highly value them. Therefore, those considering either four-year for-profit schools or community colleges should choose, on average, the for-profit option, particularly if they highly value future earnings. Conversely, community colleges outperform two-year private for-profits at each discount rate. When vertical selection was minimized by only exchanging the slope parameters of community colleges with those of the for-profits, the present value of future earnings was maximized for (1) four-year private for-profit institutions compared against community colleges, and (2) when community colleges were compared to two-year private for-profit institutions.

IV. Conclusions

Neither community colleges nor four-year for-profit institutions are panaceas for the problems facing American higher education. Two-year for-profits might, however, be the pariah.

[15] While a more precise technique would have accounted for the root-mean-squared error through the log normal distribution, this paper is more concerned with comparative analysis rather than absolute values. Therefore, that procedure was not used.

Given the results of Section III, simply increasing oversight on for-profit institutions or lowering the cost of community colleges will not adequately improve future earnings of students. I found that conditional on a host of basic characteristics, community colleges have greater earnings and costs payoffs than two-year for-profit institutions but have smaller earnings than four-year for-profits. Much of these gaps can reasonably be attributed to differences in observed characteristics between the two sectors — the for-profit industry educates a far greater percentage of low-income and minority students, and the four-year institutions confer a higher percentage of lucrative STEM degrees. Furthermore, both two-year and four-year for-profits cost between 106 and 137 percent more than community colleges, respectively, and debt burdens of enrollees at for-profits are considerably greater than for community college students. Still, there is no raison d'être for community colleges out-performing two-year for-profits or four-year schools' associations with higher mean earnings. Table 13 (shown in the Appendix) offers one partial explanation, however, by showing that increased completion rates have negative impacts on future earnings for two- and four-year for-profits but positive boosts for community colleges. Because completion rates for two-year for-profits vastly outsize those for community colleges and earnings lag behind, it is possible that a degree from a two-year for-profit is not valued in the labor market as much as a degree from a community college.

Yet, it is critical to note that in most of the models shown in Section III, the earnings and cost gaps include large unexplained terms, especially for the four-year schools. Thus, there are some unobserved practices or capabilities within the four-year for-profit industry that have raised future earnings above the counterfactual predictions as well as unobserved practices of the two-year for-profits that reduce earnings and increase costs. It would be a poor policy move to stifle the four-year for-profit industry with excessive regulation and federal oversight. Similarly, it is not fully obvious why community colleges outperform private two-year schools, but since they do not exceed four-year private schools, it would be a mistake to universally impugn the for-profit industry and exalt the two-year public sector.

Instead, this paper recommends two directions for future research: (1) identify exceptionally high- and low-performing for-profit and community colleges and deduce explanations for their outlier status, and (2) leverage past policies to understand how students are most effectively motivated to attend community colleges over two-year for-profits. To expand upon point (1), I re-ran earnings regressions for the two- and four-year for-profit sectors, estimated institution-level mean earnings, and identified schools whose residuals were two standard deviations above or below the mean. The analysis yielded Capella University, a four-year for-profit institution with particularly high average earnings ($72,468) after adjusting for its students' baseline characteristics, and Georgia Career Institute, a two-year for-profit institution with unusually low average earnings ($16,681). Understanding why such schools are outliers may offer important lessons that could be extrapolated to the sector-wide level. Additionally, identifying these remarkably poor-performers could predict which institutions will be affected by the federal government's new Gainful Employment Regulation (2015).

To address point (2), policies that might push students who are otherwise on the margin between community colleges and two-year for-profits to enroll in community college should be examined and replicated. This paper shows that community colleges add-value relative to two-year for-profits at both the earnings- and cost-levels. Additionally worrisome is recent research that has concluded two-year for-profits are particularly exploitative of Pell Grant revenues, choosing to earmark it for profit rather than reinvest it in educational resources (EOPUS 2015). Therefore, policies that might incentivize marginal students, especially low-income and non-traditional students, to choose community colleges over two-year for-profits are critically important (for examples, see Wachen 2012; Cohodes and Goodman 2012; and Hoxby and Turner 2013).

Still, both for-profits and community colleges lag far behind the public four-year schools and private non-profit institutions in terms of mean earnings and borrowing rates (EOPUS 2015). However, given that for-profits and community colleges increasingly occupy central positions in the policymaking of higher education, their contributions cannot be ignored or ridiculed. In particular, economists and educators must ensure that the low-income and high-need students currently most served by the for-profit industry would continue to benefit under a community college system before any realignment of federal funding priorities occurs. This turns out to be a far from simple caveat.

V. Appendix

Table 12.

Baseline differences between Community Colleges and Private For-Profit Institutions at the Two-year and Four-year level

VARIABLES	Community College Variable Mean	Private For-Profit Variable Mean	Four-year Private For-Profit Variable Mean	Two-year Private For-Profit Variable Mean
Share of white students	0.4394	0.3757	0.3416	0.3851
Share of degrees granted in STEM	0.0913	0.0928	0.2775	0.0665
Share of Pell Grant recipients	0.3737	0.6103	0.5887	0.6198
Share of 1st gen. students	0.5297	0.5576	0.5041	0.5694
Share of students whose parents' highest ed. is H.S.	0.4651	0.4834	0.4479	0.4917
Share of students who submitted ≥3 applications	0.1378	0.1138	0.1328	0.1126
Share of part-time students	0.4879	0.1710	0.2521	0.1463
Completion rate (within 150% of expected time)	0.2447	0.6234	0.3943	0.6555
Average cost of attendance	$11336	$25351	$26913	$23359
Average debt upon entering repayment for graduates	$7850	$10860	$21063	$8301
Average debt among attendees (graduates and non-completers)	$5025	$7591	$11140	$6717
Three-year default rate	0.1627	0.1662	0.2117	0.1602
Unemployment rate among graduates	0.0395	0.0415	0.0383	0.0418
Mean earnings of employed students 10 years after entry	$34178	$32363	$41894	$27781

Source: Department of Education, College Scorecard Data. STEM degrees were defined as the combination of degrees awarded in natural resources and conservation, computer and information technology sciences, engineering and engineering-related fields, biological and biomedical sciences, mathematics, and physical sciences.

Table 13.

Fixed Effects Models on Earnings Differences between Two-year and Four-year Institutions, by Completion Rate

VARIABLES	(1) Two-year Institutions	(2) All Institutions
Community College dummy variable	-0.0246	-0.0974***
	(0.0339)	(0.0318)
For-profit | 1st quintile completion rate	-0.174***	-0.0309
	(0.0265)	(0.0238)
For-profit | 2nd quintile completion rate	-0.198***	-0.116***
	(0.0246)	(0.0190)
For-profit | 3rd quintile completion rate	-0.199***	-0.163***
	(0.0199)	(0.0185)
For-profit | 4th quintile completion rate	-0.199***	-0.176***
	(0.0201)	(0.0185)
For-profit | 5th quintile completion rate	-0.236***	-0.209***
	(0.0230)	(0.0220)
Community college | 1st quintile comp. rate	0.230***	0.121***
	(0.0303)	(0.0306)
Community college | 2nd quintile comp. rate	0.268***	0.232***
	(0.0345)	(0.0306)
Community college | 3rd quintile comp. rate	0.302***	0.294***
	(0.0451)	(0.0397)
Community college | 4th quintile comp. rate	0.232***	0.265***
	(0.0687)	(0.0692)
Community college | 5th quintile comp. rate	0.344***	0.376***
	(0.0759)	(0.0822)
Share of white students	0.0219	0.0280**
	(0.0145)	(0.0140)
Share of degrees granted in STEM	0.396***	0.424***
	(0.0298)	(0.0230)
Share of Pell grant recipients	-0.102***	-0.116***
	(0.0349)	(0.0346)
Share of 1st gen. students	-0.737***	-0.714***
	(0.184)	(0.181)
Share of students whose parents' highest ed. is H.S.	0.120	0.118
	(0.222)	(0.225)
Share of students who submitted ≥3 applications	-0.422***	-0.147
	(0.119)	(0.105)
Share of part-time students	-0.0515	0.0278
	(0.0347)	(0.0331)
Constant	10.82***	10.76***
	(0.0698)	(0.0639)
Observations	3,192	3,622
R-squared	0.291	0.290
Number of ZIP codes	590	609
Fixed Effects Variable	3 Digit ZIP	3 Digit ZIP
Cluster Control	Yes	Yes

Source: Department of Education, College Scorecard Data. Robust standard errors in parentheses. Cluster control was added to ensure only one observation is taken from an institution per year.
*** p<0.01, ** p<0.05, * p<0.1

Table 14.
Variable Definitions

VARIABLES	Variable Definition
Share of white students	Distilled from IPEDS, and self-reported by the institution. Represents the total enrollment of undergraduate degree- or certificate-seeking undergraduates who are white.
Share of degrees granted in STEM	The percentage of degrees awarded in natural resources and conservation, computer and information technology sciences, engineering and engineering-related fields, biological and biomedical sciences, mathematics, and physical sciences.
Share of Pell Grant recipients	Distilled from IPEDS. Represents the share of undergraduate students who received Pell Grants in a given year.
Share of 1st gen. students	The percentage of federal-aided students at an institution that report they are first-generation on the FAFSA form.
Share of students whose parents' highest ed. is H.S.	The percentage of federal-aided students at an institution that report their parents' highest education level is high school on the FAFSA form.
Share of students who submitted ≥3 applications	Distilled from FAFSA forms. Represents the percentage of students who submitted applications to at least different schools.
Share of part-time students	The percentage of first-time, part-time students enrolled in an institution who are seeking a certificate or degree.
Completion rate (within 150% of expected time)	Distilled from IPEDS. Represents the completion rates for first-time, full-time students who begin school in the fall and finish within 150 percent of the expected time (e.g. for community colleges this would be three years).
Average cost of attendance	Includes tuition and fees, books and supplies, and living expenses for all first-time undergraduates seeking a certificate or degree.
Average debt upon entering repayment for graduates	The median loan debt accumulated by student borrowers of federal loans who graduated from the institution, measured at the point of first repayment. Repayment is defined as making positive contributions against the outstanding balance.
Average debt upon entering repayment	The median loan debt accumulated by student borrowers of federal loans who either withdrew or graduated from the institution, measured at the point of first repayment.
Three-year default rate	Reported by the institution. Represents the percentage of borrowers who defaulted within three fiscal years after entering repayment. For example, the FY 2011 three-year default rates denote the share of borrowers who entered repayment on their federal loans between October 1, 2010 and September 30, 2011, and who defaulted before September 30, 2013.
Unemployment rate among graduates	The unemployment rate of graduates of an institution, as measured by the U.S. Census Bureau.
Mean earnings of employed students 10 years after entry	Average earnings for federally-aided students who are employed, but not enrolled, 10 years after entry to the institution. Earnings are defined to be the sum of wages and deferred compensation and are taken from each W-2 form received from an individual. Self-employment earnings are also included via Schedule SE. Data are available from four cohorts: 2003-2004; 2001-2002; 1999-2000; and 1996-1997. The 2001-2002 cohort had their earnings measured in the 2011-2012 calendar years; the 2003-2004 cohort had their earnings measured in the 2013-2014 calendar years; etcetera. Tracked by the Treasury Department.

Definitions adapted from the Department of Education, College Scorecard Data Documentation. 2015.

Table 15.

Blinder-Oaxaca Coefficients for Fixed Effects Models

		Earnings		Cost	
		(1)	(2)	(3)	(4)
	VARIABLES	4-yr & CC	2-yr & CC	4-yr & CC	2-yr & CC
A	Community college dummy	0.531***	0.444***	-1.053***	-0.981***
		(0.100)	(0.110)	(0.0855)	(0.0894)
B	Share of white students	0.0496*	0.0441**	-0.0150	-0.0461**
		(0.0291)	(0.0175)	(0.0270)	(0.0228)
C	Share of degrees granted in STEM	0.219***	0.452***	0.0582**	-0.0439
		(0.0274)	(0.0307)	(0.0231)	(0.0314)
D	Share of Pell Grant recipients	-0.264***	-0.0181	-0.0580	-0.0347
		(0.0486)	(0.0256)	(0.0399)	(0.0320)
E	Share of 1st gen. students	-0.224	-0.980***	-0.206	-1.544***
		(0.347)	(0.125)	(0.291)	(0.156)
F	Share of students whose parents' highest ed. is H.S.	0.567	0.476***	-0.583*	1.410***
		(0.405)	(0.155)	(0.345)	(0.202)
G	Share of students who submitted ≥3 applications	0.328**	-1.123***	0.281***	0.452***
		(0.138)	(0.109)	(0.105)	(0.126)
H	Share of part-time students	0.182***	-0.238***	0.00177	-0.0998***
		(0.0340)	(0.0264)	(0.0277)	(0.0316)
BB	*d_ugds_white*	-0.0612*	-0.0255	0.0749**	0.0999***
		(0.0322)	(0.0280)	(0.0299)	(0.0269)
CC	*d_stem*	-0.172**	-0.397***	0.0109	0.0972
		(0.0710)	(0.0949)	(0.0579)	(0.0643)
DD	*d_pctpell*	0.0645	-0.230***	0.229***	0.202***
		(0.0637)	(0.0617)	(0.0521)	(0.0491)
EE	*d_par_ed_pct_1stgen*	-1.099**	-0.393	-0.935***	0.972***
		(0.431)	(0.313)	(0.354)	(0.250)
FF	*d_par_ed_pct_hs*	0.119	0.0822	1.069**	-1.170***
		(0.519)	(0.382)	(0.430)	(0.311)
GG	*d_appl_sch_pct_ge3*	-0.0394	1.178***	0.103	0.133
		(0.163)	(0.181)	(0.122)	(0.148)
HH	*d_pptug_ef*	-0.289***	0.0886	0.156***	0.210***
		(0.0636)	(0.0700)	(0.0519)	(0.0564)
	Constant	10.33***	10.60***	10.50***	10.21***
		(0.0677)	(0.0469)	(0.0581)	(0.0561)
	Observations	1,198	2,772	3,171	3,475
	R-squared	0.251	0.338	0.663	0.597
	Number of 3-digit ZIP codes	397	575	433	465

Source: Department of Education, College Scorecard data. Column (1) shows the coefficients for the FE Blinder-Oaxaca model used to compare the mean earnings between four-year private for-profit institutions and community colleges. Column (2) shows the coefficients for the FE Blinder-Oaxaca model used to compare the mean earnings between two-year private for-profit institutions and community colleges. Column (3) shows the coefficients for the FE Blinder-Oaxaca model used to compare the mean attendance costs between four-year private for-profit institutions and community colleges. Column (4) shows the coefficients for the FE Blinder-Oaxaca model used to compare the mean attendance costs between two-year private for-profit institutions and community colleges. The interaction variables represent the rows encoded by *d_varname*. The private for-profit coefficients represented just those in B-H whereas the community college coefficients were the sum of B+*BB*, C+*CC*, etcetera, in addition to the community college dummy.
*** p<0.01, ** p<0.05, * p<0.1

VI. References

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