




Original Article

The Community College Pathway: An Analysis of the Costs Associated with Enrolling Initially at a Community College Before Transferring to a 4-Year Institution

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The study examines the direct and indirect costs of enrolling initially at a community college before transferring to a 4-year institution for baccalaureate-degree-seeking students in the USA. Using nationally generalizable data, this study employs propensity score weighting to identify the influence of initial community college enrollment on baccalaureate degree attainment, cumulative student loan debt, and time-to-degree. Our findings show that students who enrolled initially at a community college before transferring to a 4-year institution were less likely to obtain their baccalaureate degree, accrued \$2221 less in cumulative student loan debt, and took about three months longer to graduate than their peers who began at 4-year colleges and universities. We provide empirical evidence of the potential trade-off associated with direct savings in cumulative loan debt and indirect costs of community college enrollment related to decreases in the likelihood of baccalaureate degree attainment and increases in time-to-degree. Given these findings, we suggest that 4-year institutions should alter their institutional policies to better accommodate vertical transfer students and ensure that these historically underrepresented students are able to succeed academically.

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Introduction

Higher education in the USA is typically regarded as a good investment for individuals seeking to overcome underprivileged socioeconomic circumstances. As open-access institutions located near the homes and workplaces of their students, community colleges are uniquely positioned to stimulate social mobility by offering affordable entry into American higher education (Belfield and Bailey,



2011; Kahlenberg, 2004). Previous research has shown that enrolling initially at a community college before transferring to a 4-year institution may be a more affordable route to the baccalaureate degree (American Association of Community Colleges, 2016; Fonte, 2011; Gonzalez and Hilmer, 2006; Xu *et al.*, 2016). Despite the well-documented financial benefits of starting at a community college before transferring to a 4-year institution (Baum *et al.*, 2014), inconsistent policies across institution types throughout the USA may exacerbate academic challenges facing vertical transfer students and diminish any financial advantages associated with the community college pathway to the baccalaureate degree.

The most pressing academic challenge facing vertical transfer students is that the decision to transfer from a community college to a 4-year institution could have a negative impact on their baccalaureate degree attainment. Although some previous researchers have shown that beginning at a community college, as opposed to a 4-year institution, reduces the likelihood of obtaining a baccalaureate degree (Alfonso, 2006; Dougherty, 1992; Doyle, 2009; Kienzl *et al.*, 2012; Long and Kurlaender, 2009; Melguizo, 2009; Monaghan and Attewell, 2015; Monk-Turner, 1995; Reynolds, 2012; Reynolds and DesJardins, 2009), other scholars have found that there is no significant difference between starting at a community college or 4-year institution (Dietrich and Lichtenberger, 2015; Melguizo and Dowd, 2009; Melguizo *et al.*, 2011). Even if a student successfully obtains a baccalaureate degree after transferring from a community college, the student's time-to-degree may be delayed as a result of various transfer barriers associated with beginning at a community college. For example, divergent institutional policies between community colleges and destination 4-year institutions may lead to a loss of credits for community college transfer students (Xu *et al.*, 2016). Students who enroll initially at community colleges before transferring to 4-year institutions could therefore offset any financial savings by failing to graduate or taking longer to earn their degree. While prior literature has suggested that students who transfer from community colleges before attending 4-year institutions are making a financially prudent choice, additional outcomes, such as students' baccalaureate degree attainment rate and time-to-degree, should also be considered when examining the costs of the community college pathway. By comparing community college transfer students and their peers with similar characteristics who began at 4-year institutions, we aim to answer the following research questions:

Research Question 1: What is the relationship between transferring from a community college and baccalaureate degree attainment?

Research Question 2: What is the relationship between transferring from a community college and student loan debt?

Research Question 3: What is the relationship between transferring from a community college and students' time-to-degree?

Literature Review

We review empirical literature on the impact of transferring from a community college to a 4-year institution by including studies related to (a) the price-conscious choice between enrolling initially at a community college or public 4-year institution and (b) the impact of transferring from a community college on students' academic outcomes. While many studies have indicated that students often choose to save money by enrolling at a community college before transferring to a 4-year institution, such a decision should also consider the impact of the community college pathway on students' academic outcomes, such as their likelihood to earn the baccalaureate degree and their overall time-to-degree.

The choice between community colleges and public 4-year institutions

The choice to enroll initially at a community college is widely considered a financially savvy choice for postsecondary students in the USA (AACC, 2016; Belfield and Bailey, 2011; Fonte, 2011; Provasnik and Planty, 2008), but extant literature is limited and appears to lack consensus. In a descriptive study, Baum and Ma (2014) reported the average tuition and fees for full-time undergraduates to be \$18,943 for resident students at public 4-year institutions and only \$11,052 at community colleges, which provides some evidence that community colleges may be more affordable starting points for postsecondary students. Several other studies have suggested that price-conscious students should turn to community colleges as their first postsecondary institution to reduce their cost of attendance (Barreno and Traut, 2012; Goldhaber and Peri, 2007; Somers *et al.*, 2006; Wood and Harrison, 2014). Stokes and Somers (2009) used data from the National Postsecondary Student Aid Study (NPSAS) and found that the lower tuition at community colleges was a primary motivating factor for students who decided to enroll initially at a community college as opposed to a 4-year institution.

However, tuition and fees alone do not take into account individual students' ability to pay. Additional research has examined the total loan debt accumulated during students' college years as another indicator of college affordability. Gonzalez Canche (2014) used data from the National Education Longitudinal Study of 1988 (NELS: 88) to conduct a rigorous empirical analysis on the financial impact of transferring from a community college to a 4-year institution. The author found that enrolling initially at a community college before transferring to a 4-year institution did not reduce total loan debt for baccalaureate degree holders when compared to similar students who began at a 4-year institution. Given the lack of consensus in the literature related to the financial benefit of the community college pathway, this study will move beyond analyses focusing solely on tuition and fees and use more recent data than Gonzalez Canche to compare the total student loan debt between baccalaureate-degree-seeking students who enrolled initially at a



community college versus a 4-year institution. Much more literature has examined the relationship between the community college pathway and students' academic outcomes, but several questions related to the academic challenges associated with the community college pathway remain unanswered.

Transferring from community college and students' academic outcomes

According to Jenkins and Fink (2016), roughly 33% of community college students transfer to a 4-year institution within 6 years. Among those transfer students, 42% obtained their baccalaureate degree. Previous research on the impact of enrolling initially at a community college before transferring to a 4-year institution typically focuses on students' baccalaureate degree attainment rate as the primary outcome of interest. Numerous scholars found that attending a community college reduced the likelihood of obtaining a baccalaureate degree when compared to their peers who enrolled initially at a 4-year institution, and this difference can be due to both individual and institutional characteristics (Alfonso, 2006; Dougherty, 1992; Doyle, 2009; Kienzl *et al.*, 2012; Long and Kurlaender, 2009; Melguizo, 2009; Monaghan and Attewell, 2015; Monk-Turner, 1995; Reynolds, 2012; Reynolds and DesJardins, 2009).

However, other studies reported that the community college is an effective pathway toward baccalaureate degree attainment, particularly for students at the margin of the decision to enroll in college or enter the labor market (Ehrenberg and Smith, 2004; Gonzalez and Hilmer, 2006; Handel, 2013; Hilmer, 1997; Kane and Rouse, 1999; Rouse, 1995). After controlling for selection biases, additional studies showed no significant difference in baccalaureate degree attainment between community college transfer students and native 4-year students (Dietrich and Lichtenberger, 2015; Melguizo and Dowd, 2009; Melguizo *et al.*, 2011). Although these studies have contributed to the growing body of literature comparing baccalaureate degree attainment between community college transfer students and native 4-year students, more evidence is needed to unpack the indirect costs associated with transferring from a community college to a 4-year institution, such as the students' time-to-degree.

For students considering the merits of the community college pathway to the baccalaureate degree, any financial benefits associated with savings generated by enrolling initially at community colleges can be offset if transferring from a community college to a 4-year institution delays graduation and entry into the labor market. Due to data restrictions, Gonzalez Canche (2014) was unable to empirically examine time-to-degree to add greater nuance to the costs of the community college pathway. The author speculated, however, that enrolling initially at a community college before transferring to a 4-year institution would likely increase the time needed to earn a baccalaureate degree and therefore reduce any financial

advantage related to enrolling initially at a community college before transferring to a 4-year institution.

Several other researchers have suggested that starting at a community college may be associated with longer time-to-baccalaureate-degree. Bound *et al.* (2012) noted that increased time-to-baccalaureate-degree is most common among graduates beginning higher education at community colleges and less-selective public universities due to declined institutional resources and increased student employment. These challenges may be exacerbated for transfer students who need to overcome transition difficulties and non-enrollment spells between institutions (Monaghan and Attewell, 2015). Demographic characteristics (Mooring and Mooring, 2016), non-transferrable credits (Xu *et al.*, 2016), and a lack of academic integration (Townsend and Wilson, 2006) or social integration (Ishitani and McKittrick, 2010; Roberts and McNeese, 2010) may also explain why community college transfer students could take longer to earn their baccalaureate degree than native 4-year students. Despite repeated suggestions that the community college pathway may lengthen students' time-to-degree, extant research has yet to empirically examine the time required to earn a baccalaureate degree after enrolling initially at a community college.

Conceptual Framework

This study draws from the microeconomic concept of opportunity costs, which highlights the cost of forgone alternatives when making a decision (Mankiw, 1998). For baccalaureate-degree-seeking students, the decision to enroll initially at a community college before transferring to a 4-year institution has been identified as the financially savvy choice for those aiming to save money on tuition and fees to limit student loan debt (Gonzalez Canche, 2014; Xu *et al.*, 2016). However, this decision may carry high opportunity costs for students if the community college pathway decreases their likelihood of baccalaureate degree attainment or delays their time-to-baccalaureate-degree (and entry into the labor market) when compared to similar students who began at a 4-year institution.

The concept of opportunity costs is typically applied to higher education when discussing forgone earnings during the period in which a student attends college. Although such an application has relevance to this study, we extend this binary notion of opportunity costs by considering the direct costs of student loan debt and the indirect costs of the likelihood of earning a baccalaureate degree and time-to-baccalaureate-degree. This framework provides a more complete lens through which to examine the merits of the community college pathway by considering both financial and academic outcomes associated with transferring from a community college in pursuit of a baccalaureate degree.

Several scholars have outlined the institutional policies and environmental factors that serve as barriers for community college transfer students seeking to obtain their



baccalaureate degree. Xu *et al.* (2016) compared outcomes between students who enrolled initially at community colleges before transferring and native 4-year students and found that community college transfer students typically lost transfer credits and were required to take additional major-specific credits at their destination 4-year institution. Given that many community college students are referred to developmental education (Bailey *et al.*, 2010), the vertical transfer path for community college students could be long and costly, as developmental education courses extend the time spent at community colleges before transfer and many of these courses are not transferrable to the destination 4-year institution (Melguizo *et al.*, 2011). In addition, community college transfer students are less likely to be engaged at their destination 4-year institutions relative to native 4-year students (Ishitani and McKittrick, 2010; Roberts and McNeese, 2010). Due to these potential barriers, the probability of attaining a baccalaureate degree and time-to-degree should be included as outcomes of interest when studying students who transfer from community colleges to 4-year institutions. This study will consider the direct and indirect costs associated with the community college pathway to the baccalaureate degree, adding nuance to this growing body of higher education literature.

Hypothesis 1 Consistent with previous literature, the decision to enroll initially at a community college before transferring to a 4-year institution will decrease the likelihood of baccalaureate degree attainment.

Hypothesis 2 Baccalaureate degree recipients who enroll initially at community colleges will have less cumulative student loan debt than their peers.

Hypothesis 3 Enrolling initially at community colleges before transferring to 4-year institutions will increase time-to-degree.

Methodology

Data and samples

This study uses data from the *Beginning Postsecondary Students Longitudinal Study for 2004–2009* (BPS: 04/09) to estimate the direct and indirect costs of enrolling initially at a community college, as opposed to a public 4-year institution, in pursuit of the baccalaureate degree. Conducted by the U.S. Department of Education (2016), the BPS: 04/09 surveyed a large cohort of first-time-in-college students at the end of their first year (2003–2004), third year (2005–2006), and sixth year (2008–2009). This nationally representative dataset provides information on students' debt, persistence, completion, demographic characteristics, and additional indicators.

For our analytical sample, we aim to construct comparable groups of students who are community college transfer students and native 4-year students at public

institutions. We excluded 6490 students who started at private 4-year institutions, leaving the 10,190 students who attended public 2-year or public 4-year institutions as their first institution. The 3140 postsecondary students who did not attend a public 4-year institution were also removed to exclude community college students who did not transfer to a public 4-year institution. Our final sample included 2410 “treated” students who enrolled initially at a community college before transferring to a 4-year institution and 4640 “control” students who started their postsecondary education at a public 4-year institution (7060 students in the final sample). In line with previous scholarship (outlined above), we limited our sample for the time-to-degree outcome to those who completed a baccalaureate degree within the time period of our analytical sample.

Because the design of the BPS survey was not a random sample, this study utilized the base panel weights for student data (WTB000) in all descriptive and regression analyses. As mentioned earlier, extant literature suggests that students who enrolled initially at a community college have differences in background characteristics relative to students who enrolled initially at a public 4-year institution, but our empirical strategy is designed to significantly reduce the pre-college differences between students in the treated and control groups. Table 1 provides descriptive statistics for the treated group, unweighted (naïve) control group, and weighted control group.

Empirical strategy

Ideally, we would be able to test the causal impact of starting at a community college by randomly assigning students to begin their postsecondary education at a community college or public 4-year institution. Since random assignments are not feasible in this context, we utilize regression-based techniques by generating robust point estimates and various regression approaches to estimate the potential trade-offs associated with enrolling initially at a community college as opposed to a public 4-year institution.

To examine the likelihood of baccalaureate degree completion, we utilize a logistic regression approach to account for the binary, rather than the continuous, nature of our outcome. We ran model specifications with a linear probability model and found that our results are conditional on the assumptions of a logistic framework. To identify the influence of initial community college enrollment on cumulative loan debt and time-to-degree, we also estimate a linear model by ordinary least squares (OLS):

$$\gamma_i = \alpha_i + \beta_1 Treat_i + \beta_2 X_i + \varepsilon_i, \quad (1)$$

where $Treat_i$ is a dichotomous indicator equal to 1 if a student began at a community college and 0 if the student started at a public 4-year institution. β_1 is the parameter estimate associated with our treatment effect. X_i represents vectors of



Table 1 Sample characteristics (weighted and unweighted control group)

	<i>Pooled sample</i>			<i>Baccalaureate completer subsample</i>		
	<i>Treated</i>	<i>Control</i>		<i>Treated</i>	<i>Control</i>	
		<i>Unweighted</i>	<i>Weighted</i>		<i>Unweighted</i>	<i>Weighted</i>
Demographic characteristics						
Gender						
Male	42.90%	44.80%	43.80%	46.14%	42.37%	49.09%
Female	57.10%	55.20%	56.20%	53.86%	57.63%	50.91%
Race/ethnicity						
Caucasian/White	62.30%	70.30%	63.50%	71.06%	73.03%	71.28%
African American	14.60%	8.91%	14.70%	6.89%	7.14%	7.41%
Hispanic/Latino	12.00%	9.49%	11.50%	7.88%	8.97%	8.34%
Asian/Pacific Islander	6.75%	7.14%	6.34%	9.21%	8.05%	9.55%
Other/multi-racial	4.39%	4.19%	3.94%	3.79%	3.89%	3.42%
Age						
Below 24	90.20%	95.50%	90.80%	95.82%	98.57%	95.86%
24 and older	9.77%	4.48%	9.21%	4.18%	1.43%	4.14%
Married in 2003–2004	5.91%	2.74%	6.15%	4.22%	0.83%	3.35%
Dependent child(ren) in 2003–2004	9.16%	3.62%	9.51%	2.09%	0.96%	2.90%
Parental/family income and education						
Family income in 2003–2004	52,897	71,016	53,760	65,162	80,779	67,566
Expected family contribution (EFC)	8230	12,729	8300	11,247	15,062	11,595
Father's highest education level						
Do not know	6.55%	4.19%	6.43%	3.06%	3.02%	3.61%
High school or below	44.70%	34.00%	46.20%	41.00%	26.47%	39.49%
Associate or tech training	17.00%	15.70%	17.30%	16.95%	15.54%	17.35%
Bachelor's or more than 2-year college	20.00%	26.80%	18.90%	27.11%	31.42%	24.93%
Master's degree	8.54%	12.70%	8.32%	9.65%	15.08%	9.74%
Doctoral or professional degree	3.21%	6.61%	2.84%	2.23%	8.47%	4.88%
Mother's highest education level						
Do not know	3.17%	2.33%	3.68%	2.02%	2.09%	1.39%
High school or below	42.60%	33.30%	42.20%	36.53%	27.54%	35.22%
Associate or tech training	24.50%	20.40%	25.20%	26.48%	20.04%	27.27%
Bachelor's or more than 2-year college	21.30%	30.20%	21.00%	25.53%	34.04%	24.17%
Master's degree	7.17%	11.30%	6.60%	8.45%	13.48%	10.00%
Doctoral or professional degree	1.28%	2.40%	1.29%	0.99%	2.81%	1.95%

Table 1 *continued*

	<i>Pooled sample</i>			<i>Baccalaureate completer subsample</i>		
	<i>Treated</i>	<i>Control</i>		<i>Treated</i>	<i>Control</i>	
		<i>Unweighted</i>	<i>Weighted</i>		<i>Unweighted</i>	<i>Weighted</i>
Pre-college academic performance and educational aspirations						
High school math level						
Below algebra	16.80%	5.26%	15.80%	11.80%	2.43%	7.74%
Algebra	57.30%	40.70%	57.50%	53.85%	35.22%	52.93%
Pre-calculus/ calculus	25.90%	54.00%	26.70%	34.34%	62.35%	39.33%
Earned college credits in HS	21.40%	38.40%	21.30%	32.66%	45.39%	30.32%
Attended private high school	6.89%	10.20%	6.61%	6.36%	10.96%	6.95%
SAT composite score	912.6	1045.3	912.6	963.0	1082.5	952.8
High school GPA						
HS GPA: 2.5 or below	41.20%	17.20%	39.10%	32.46%	10.32%	31.64%
HS GPA: 3.0 to 3.4	37.40%	36.50%	40.20%	42.36%	33.59%	40.40%
HS GPA: 3.5 or greater	21.40%	46.30%	20.80%	25.18%	56.08%	27.95%
Educational aspiration						
Bachelor's degree	38.70%	26.50%	39.50%	32.23%	21.73%	31.98%
Post-baccalaureate or Master's degree	44.70%	47.40%	44.60%	48.23%	49.81%	49.92%
Doctoral or professional degree	16.50%	26.10%	15.90%	19.54%	28.46%	18.10%

student-level covariates that include demographics (age, race/ethnicity, gender), pre-college characteristics (student's educational aspiration, highest level of high school math, high school GPA, whether the student attended a private high school, SAT scores, whether the student obtained college credits in high school), and family background (total family income, expected family contribution, father's highest education level, mother's highest education level, student's marital status, and whether the student has dependent children). ε_i is our idiosyncratic error term. γ_i represents each our outcomes: (1) baccalaureate degree completion; (2) cumulative loan debt in \$1000; and (3) time-to-degree.

Addressing selection bias

Choosing whether to enroll initially at a community college or public 4-year institution would appear to be subject to students' preferences and beliefs, access to financial capital, and prior academic success. As a result, any differences in outcomes between community college transfer students and native 4-year students

may be due to their preexisting differences as opposed to the treatment. To attempt to reduce selection bias between community college transfers and native 4-year students, this study incorporates a matching approach. Propensity score models (PSMs) do not permit causal estimates or completely eliminate selection bias, but they can be used to ensure overlap and comparability between the treatment group and the control group (Guo and Fraser, 2015; Rosenbaum and Rubin, 1983; Rubin, 1997). Higher education scholars have used matching techniques to estimate the difference between campus residency and college student retention (Schudde, 2011), college attendance pattern and degree attainment (Monaghan and Attewell, 2015; Reynolds and DesJardins, 2009), and financial aid and student persistence (McKinney and Burrige, 2015).

While the primary goal of PSMs is to reduce bias, the parameter of interest is often the average treatment effect on the treated (ATT) (Rubin, 1997; Shadish *et al.*, 2002). In this case, the true treatment effect reveals what the outcomes *would have been* for students attending a community college first had they chosen to attend a public 4-year institution initially. The ATT is defined as the difference between the proportions of subjects experiencing the event in the two groups (Austin, 2011), as follows:

$$ATT \equiv E(y_1 - y_0 \mid W = 1). \quad (2)$$

Following conventional notation, let y_{1i} be the outcome of individual i if the individual is subjected to treatment (initial institution is a community college). Let y_{0i} be the effect on the outcome without treatment (initial institution is a public 4-year institution) for individual i . Further, let W_i be a treatment indicator, taking a value of 0 if individual i has received no treatment (initial enrollment at a public 4-year institution) and value of 1 if treated (initial enrollment at a community college).

Within this study, our PSMs and selection process contribute to the student's matriculation and sector decision information. The propensity score is simply the probability of treatment given a number of covariates. In this case, the score sums the probability of initial enrollment at a community college into one number. The set of covariates used to predict the propensity score was based on the previous empirical findings outlined within the literature review (Caliendo and Kopeinig, 2008), including the student characteristics accounted for in previous work: Gender, age, race, total family income, expected family contribution (EFC), father's highest education level, mother's highest education level, student's educational aspiration, high school GPA, highest level of high school math, whether the student attended a private high school, SAT scores, whether the student obtained college credits in high school, student's marital status, and whether the student has dependent children. To this end, the propensity score presents the extent to which a student in our control group is similar to a student within our treated group, considering the set of observables used to estimate the propensity score. We

estimated propensity scores for individuals in the full sample and the subsample of degree completers, respectively.

Unlike “the nearest neighbor” or other propensity score approaches in which the second step is to remove cases (i.e., non-overlap), the second step in our propensity score weighting (PSW) method is to assign corresponding weights based on treatment probabilities. Thus, one advantage of PSW over other PSMs is that it does not further reduce sample size (Guo and Fraser, 2015). Because we are primarily interested in the effect of initial matriculation at community colleges, we applied an ATT weight (Caliendo and Kopeinig, 2008).

$$ATT - W = Treatment + (1 - Treatment) * (p / (1 - p)), \quad (3)$$

where *Treatment* is a same dichotomous indicator where 1 equals a treated student and 0 a non-treated student and *p* represents the predicted probability of receiving treatment. Based on their similarities to treated students, the resulting weights produce a 1 for treated students and varying for non-treated students. To this end, some control units will count more in the analysis than others. Higher propensity scores in the control units will generate larger ATT weights. The ATT weights will be multiplied with sampling weights, divided by the mean of the weights, and then applied to the weighted regression models in order to achieve unbiased treatment effect estimates that are generalizable to the population (DuGoff *et al.*, 2014). To ensure a valid design assumption, we show the overlap between the likelihood of receiving the treatment for those who did and did not receive the treatment (Figures 1, 2) and employ a covariate balancing approach that utilized both standardized mean difference and variance ratio (Table 2). For robustness and sensitivity

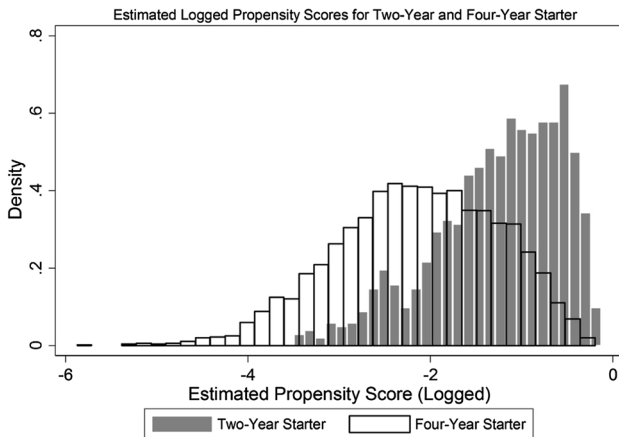


Figure 1. Overlap in estimated propensity scores between the treatment and control groups in the pooled sample.

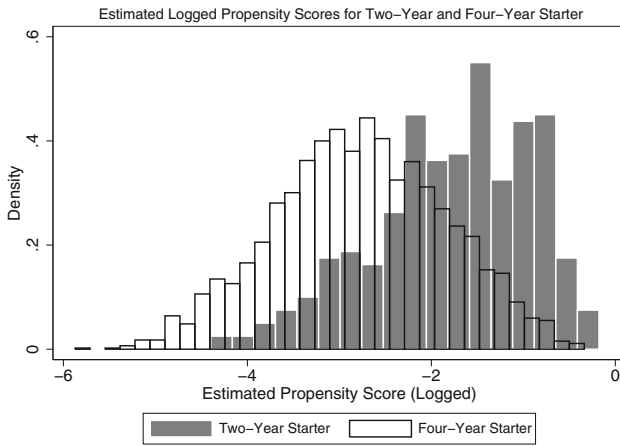


Figure 2. Overlap in estimated propensity scores between the treatment and control groups in the completer-only sample.

Table 2 Standardized differences and variance ratio of the weighted sample

	<i>Pooled sample</i>		<i>Baccalaureate completer subsample</i>	
	<i>Standardized differences</i>	<i>Variance ratio</i>	<i>Standardized differences</i>	<i>Variance ratio</i>
Female	0.005	0.999	0.050	0.958
Race/ethnicity	0.011	0.996	-0.020	0.990
Family income in 2003–2004	-0.073	1.039	-0.040	1.030
EFC	-0.089	0.899	-0.020	0.850
Father’s highest education level	-0.053	1.009	-0.080	0.990
Mother’s highest education level	-0.069	0.903	-0.016	0.990
Educational aspiration	-0.012	0.911	-0.004	1.020
High school math level	-0.018	1.018	-0.033	1.070
Earned college credits in HS	-0.085	0.964	-0.010	0.948
Married in 2003–2004	0.007	1.094	0.025	0.964
Dependent Child(ren) in 2003–2004	0.009	1.101	0.003	0.972
Attended private HS	-0.074	0.818	-0.029	0.826
SAT	-0.045	0.969	-0.018	1.204
High school GPA	-0.027	1.026	-0.023	1.070

checks, we specify multiple matching strategies (e.g., nearest neighbor, kernel matching) and conduct a series of sensitivity analyses to test for the presence of hidden observables (Rosenbaum, 2002).

Limitations

This study aims to minimize preexisting subject differences by applying ATT weights to subjects based on their probability of choosing to enroll at a community college as their first postsecondary institution. If the sample reflects the fact that community college students and native 4-year students are systematically different, the unweighted samples will indicate inconsistencies with the weighted samples across regression models. Though imbalance checks, multiple matching approaches, and sensitivity analyses indicate that the bias is corrected by weighting students' pre-college characteristics, "unobserved variables" that were not captured in the data are not taken into account. Without including these variables, such as parental support in completing a baccalaureate degree, treatment biases still exist between treatment and control groups. Additionally, due to only 6 years of available data for the analysis, the impact of the first matriculation sector on the outcome variables could be underestimated or overestimated due to the limited period of time. Kienzl *et al.* (2012) used BPS: 04/09 and indicated that, if observed longer, the impact of community college matriculation on baccalaureate degree attainment could have been smaller. Similarly, if observed longer, its impact on cumulative loans and time-to-degree may be altered.

Results

Initial community college enrollment and baccalaureate degree completion

Tables 3 and 4 provide estimates of the influence of initial community college enrollment on baccalaureate degree completion. Descriptively, Table 3 illustrates that the baccalaureate degree completion rate within our sample for students starting at a community college was 29%, while the baccalaureate degree completion rate for students who began at a public 4-year institution was 59.5%. After considering pre-college factors associated with college choice, such as race, socioeconomic status, and the intent to earn a baccalaureate degree, our weighted control group shows a baccalaureate degree completion rate of 43.2%, suggesting

Table 3 Descriptive results for degree completion (%)

	<i>Unweighted</i>			<i>Weighted</i>		
	<i>Treated (2-Year)</i>	<i>Control (4-Year)</i>	<i>Difference</i>	<i>Treated (2-Year)</i>	<i>Control (4-Year)</i>	<i>Difference</i>
Bachelor degree completion	0.290 (0.454)	0.595 (0.491)	-0.305	0.290 (0.454)	0.432 (0.495)	-0.142

Standard deviation in parentheses.

Table 4 Likelihood of bachelor degree completion

	<i>Logit</i>	<i>PSW</i>	<i>NN</i>	<i>Kernel</i>
First institution: 2-year	0.581*** (0.088)	0.626*** (0.069)	0.651*** (0.046)	0.712*** (0.016)
Number of observations	6630	6630	3360	6630
Weighted observations	No	Yes	No	No
Pre-college covariates	Yes	Yes	Yes	Yes

Note: Odds ratios presented; *logit* logistic regression, *PSW* propensity score weighting, *NN* nearest neighbor matching. Sample includes students starting a public 2-year or public 4-year institutions initially and received a bachelor degree within 6 years. Standard errors in parentheses.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

that pre-college characteristics explain much of the difference in degree attainment rates between the two groups.

Table 4 provides the empirical results related to the influence of initial community college enrollment on baccalaureate degree completion. Although our analyses include the naïve model, propensity score weighting model, nearest neighbor matching, and kernel matching, this section focuses primarily on results derived from our PSW model, as other PSM approaches were used primarily for the purpose of robustness checks. Table 4 shows that initial community college enrollment is negatively related to the likelihood of baccalaureate degree completion, with the community college pathway being associated with a 37.4% decrease in the likelihood of baccalaureate degree attainment. Results from both Tables 3 and 4 provide point estimates aligned with previous research on the negative influence of initial community college enrollment on the likelihood of baccalaureate degree completion — even after accounting for pre-college differences — which suggests that institutional policies and procedures may play a role in these findings.

Table 5 Descriptive results for time-to-degree and cumulative loan debt

	<i>Unweighted</i>			<i>Weighted</i>		
	<i>Treated (2-Year)</i>	<i>Control (4-Year)</i>	<i>Difference</i>	<i>Treated (2-Year)</i>	<i>Control (4-Year)</i>	<i>Difference</i>
Time-to-degree (months)*	50.7	45.6	5.1	49.8	47.4	2.4
Cumulative loan debt (\$)						
Baccalaureate degree completers	14,530	12,986	1544	14,839	16,539	−1700
Pooled sample	12,518	12,780	−262	13,328	15,694	−2366

Note: TTD sample includes students starting a public 2-year or public 4-year institutions initially and received a baccalaureate degree within 6 years.

Baccalaureate degree completers

Similar to the work of previous scholars, we now examine the role of initial community college enrollment on cumulative loan debt (Gonzalez Canche, 2014) and time-to-degree (Kurlaende *et al.*, 2014) for students who completed their baccalaureate degree. Table 5 provides the descriptive results for cumulative student loan debt and time-to-degree. Mean differences in cumulative loan debt were negative for the treatment group, with the weighted sample yielding a lower overall loan debt for the community college transfer students (\$13,328) than those who enrolled initially at a public 4-year institution (\$15,694). For the subgroups of degree completers, community college transfer students borrowed \$1700 less than native 4-year students after incorporating the propensity score weights. In both the unweighted and weighted samples, baccalaureate degree recipients who enrolled initially at a community college took between 2.4 and 5.1 months longer to complete their baccalaureate degree relative to native 4-year enrollees. These descriptive statistics provide some preliminary evidence of potential trade-offs associated with enrolling initially at a community college rather than enrolling initially at a public 4-year institution.

Tables 6 and 7 show the empirical finding related to the influence of initial community college enrollment on time-to-degree and cumulative student loan debt, respectively. With covariates held constant, enrolling initially at a community college significantly ($p < 0.001$) increases time-to-degree by about three months for baccalaureate degree recipients, which equates to slightly less than one traditional academic semester. This significant increase in time-to-degree for community college transfer students is in congruence with each of our model specifications, indicating that the finding is not sensitive to propensity score methods. This finding further suggests indirect costs for community college transfer students in terms of longer time spent in college, which will lead to higher college expenses and larger amount of forgone income.

Table 6 Coefficients of initial institution effect on time-to-degree

	<i>OLS</i>	<i>PSW</i>	<i>NN</i>	<i>Kernel</i>
First institution: 2-year	3.300*** (0.640)	2.423*** (0.517)	2.458*** (0.733)	2.575*** (0.541)
Number of observations	3130	3130	660	3130
Weighted observations	No	Yes	No	No
Pre-college covariates	Yes	Yes	Yes	Yes

Note: Sample includes students starting a public 2-year or public 4-year institutions initially and received a bachelor degree within 6 years. Standard errors in parentheses.

OLS ordinary least squares regression, *PSW* propensity score weighting; *NN* nearest neighbor matching.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.



Table 7 Coefficients of initial institution effect on cumulative debt (\$1000)

	<i>Baccalaureate degree completers</i>				<i>Pooled</i>			
	<i>OLS</i>	<i>PSW</i>	<i>NN</i>	<i>Kernel</i>	<i>OLS</i>	<i>PSW</i>	<i>NN</i>	<i>Kernel</i>
First institution:	0.243	-1.679	-0.491	-1.538	-0.777	-2.221	-2.458	-2.249
2-year					*	*	*	*
	(1.681)	(1.298)	(1.907)	(1.121)	(0.915)	(0.876)	(1.147)	(0.846)
Number of observations	3130	3130	660	3130	4250	4250	970	4250
Weighted observations	No	Yes	No	No	No	Yes	No	No
Pre-college covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Sample includes students starting a public 2-year or public 4-year institutions initially and did not drop out within 6 years. Standard errors in parentheses.

OLS ordinary least squares regression, *PSW* propensity score weighting, *NN* nearest neighbor.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Consistent with previous work by Gonzalez Canche (2014), we also find no statistically significant difference in the cumulative amount of student loan debt for baccalaureate degree completers who enrolled initially at a community college as opposed to a public 4-year institution. The mean difference suggested that baccalaureate degree completers who begin at community colleges graduate with \$1679 less in cumulative student loan debt relative to native 4-year students, but the finding was not statistically significant. However, for the pooled sample, we found a statistically significant difference in the level of cumulative student loan debt for students who began at a community college. Regardless of their degree attainment, students who started at a community college borrowed \$2221 less than students who started at public 4-year institution. This finding suggests that the direct cost of higher education is lower for baccalaureate-degree-seeking students who begin their postsecondary coursework at a community college rather than a public 4-year institution.

Discussion and Conclusions

Historically, community colleges in the USA have provided access to affordable postsecondary education for historically underrepresented, academically underprepared, and working students who may not have enrolled in higher education otherwise (Bailey and Morest, 2006; Cohen *et al.*, 2014; Dougherty, 1994; Grimes and David, 1999). Price-conscious postsecondary students may opt to enroll initially at a community college before transferring to a 4-year institution and earning their baccalaureate degree (Barreno and Traut, 2012; Goldhaber and Peri,

2007; Somers *et al.*, 2006; Stokes and Somers, 2009; Wood and Harrison, 2014), but inconsistent institutional policies between community colleges and 4-year institutions may create additional challenges for many already-disadvantaged students. For example, vertical transfer students often lost transfer credits and were required to take additional major-specific credits after transferring to their destination 4-year institution (Melguizo *et al.*, 2011; Xu *et al.*, 2016), which may decrease the likelihood of baccalaureate degree attainment or delay these transfer students' time-to-baccalaureate-degree.

This study, which is framed by the microeconomic concept of opportunity costs, adds greater nuance to the conversation related to the costs of the community college pathway by considering both direct and indirect costs of beginning at a community college rather than a 4-year institution. To achieve that aim, we examine the influence of the community college pathway for baccalaureate-degree-seeking students on the likelihood of obtaining a baccalaureate degree, time-to-degree, and cumulative student loan debt. With respect to our framework, our findings reveal that the community college pathway can be associated with lower direct costs in the form of lower student loan debt, but these direct cost savings should be considered alongside the high opportunity costs of enrolling initially at a community college rather than a 4-year institution. More specifically, baccalaureate-degree-seeking students who enroll initially at a community college, rather than a public 4-year institution, are less likely (and take roughly three months longer) to obtain their baccalaureate degree.

Across model specifications, our hypotheses are supported with empirical evidence. First, we find that enrolling initially at a community college is negatively associated with a 37.4% decrease in the likelihood of obtaining a baccalaureate degree. This finding is in line with the majority of previous empirical work on the topic (e.g., Doyle, 2009; Kienzl *et al.*, 2012; Long and Kurlaender, 2009; Melguizo, 2009; Monaghan and Attewell, 2015; Reynolds, 2012; Reynolds and DesJardins, 2009); however, a few studies have indicated no significant difference in the likelihood of baccalaureate degree attainment when comparing students who began at a community college and 4-year institution (Dietrich and Lichtenberger, 2015; Melguizo and Dowd, 2009; Melguizo *et al.*, 2011). One possible explanation for the distinction in findings between our study and the previous studies finding no significant difference is that those studies either used data from a single state or older national data (e.g., NELS:88). The high opportunity cost of a lower likelihood of baccalaureate degree attainment can have a negative influence on the long-term earning potential of students who begin at community colleges, as individuals who obtain a baccalaureate degree earn significantly more in the labor market than their peers who obtain an associate's degree (Carnevale *et al.*, 2011; Jaeger and Page, 1996).

Second, we show decreases of \$2221 in cumulative student loan debt for baccalaureate-degree-seeking students who began at a community college when



compared to similar students who entered higher education at a public 4-year institution. This finding appears to provide empirical evidence to support anecdotal suggestions that community college transfer students benefit from the lower tuition and fees at community colleges and therefore relied less on student loans than their peers who began at 4-year institutions (Baum *et al.*, 2014; Baum and Ma, 2014). However, no significant impact was found for the subgroup of baccalaureate degree completers, which reinforces previous empirical work by Gonzalez Canche (2014), suggesting that students who began at a community college obtained their baccalaureate degree with a similar level of debt when compared to those who began at public 4-year institutions. We believe our finding associated with students' time-to-degree can help to explain why individuals who began at community colleges (with lower tuition and fees) would not obtain significantly less student loan debt after completing their baccalaureate degree.

Finally, our findings reveal that students who enrolled initially at a community college rather than a public 4-year institution appeared to take about three months longer to earn their baccalaureate degree. This study did not aim to investigate the causal mechanisms associated with increases in time-to-degree for those who enrolled initially at a community college, but previous literature attributes such delays to a variety of issues related to inconsistent institutional policies, such as the loss of credits during the transfer process (Xu *et al.*, 2016), ineffective pathways between community colleges and 4-year institutions (Goldrick-Rab, 2010), and curricular rigidity at both community colleges and 4-year institutions (Grites, 2004; Prager, 2001). This particular finding (longer time-to-degree) can help to explain why the community college pathway may not necessarily lead to significantly less student loan debt among baccalaureate degree completers.

The results of this study offer an important contribution to higher education literature by providing evidence of the direct and indirect costs of enrolling initially at a community college instead of a public 4-year institution. Community colleges appear to offer a useful pathway for baccalaureate-degree-seeking students aiming to reduce the direct cost of college attendance in the form of student loan debt, but this finding loses its statistical significance when restricting the sample to students who earned their baccalaureate degree, suggesting that increases in time-to-degree may mitigate these direct cost savings. The indirect costs of enrolling initially at a community college before transferring to a 4-year institution are relatively high and associated with a decreased likelihood of baccalaureate degree attainment and increased time-to-degree. Given that community college transfer students require more assistance at the destination 4-year institution than their peers (Townsend and Wilson, 2006), 4-year institutions should follow calls made by Dougherty (1992) to alter their institutional policies to better accommodate vertical transfer students, focusing specifically on the need for “better packaged financial aid, greater social integration of transfer students, more rigorous pre-transfer academic preparation, and greater acceptance of credits” (pp. 204–205).

Our findings related to baccalaureate degree attainment and time-to-degree should underscore the importance of providing vertical transfer students with relevant information and clear pathways for transferring from community colleges to 4-year institutions. These pathways may come in the form of articulation agreements or the alignment of general education curricula to ensure that credit hours completed at community colleges will be accepted at 4-year institutions. Previous researchers have suggested that delayed entry into the labor market can be negatively associated with job placement and lifetime earnings (Aina and Casalone, 2011). Because a formal cost–benefit analysis of the community college pathway is beyond the scope of this study, future research should extend this study by examining the cost per completer and exploring the direct financial impact of a lower probability of degree attainment and delay in time-to-degree in the form of lost wages in the labor market. Although Xu *et al.* (2016) found no labor market differences for baccalaureate degree recipients who enrolled initially at a community college instead of a 4-year institution, their findings were not generalizable to US colleges and universities and did not consider long-term wage implications.

Notions of affordability and open access are critical to the core mission of community colleges in the USA (Ayers, 2002; AACC, 2016; Fonte, 2011; Levin, 2000; Provasnik and Planty, 2008; Shannon and Smith, 2006), but the costs associated with the community college pathway to the baccalaureate degree are typically viewed through a narrow lens. For example, regarding low-income students, the upfront savings on tuition and fees by enrolling initially at a community college may be critical for their ability to gain access to higher education and eventually earn their baccalaureate degree, as community college students are more likely to borrow to address immediate liquidity constraints (McKinney *et al.*, 2015). Such a dynamic is rarely considered and would effectively minimize the effect of increases in time-to-degree given that initial enrollment at a more expensive 4-year institution was not a viable alternative because many students who enroll initially at a community college may not have attended college otherwise. Community college leaders throughout the USA should be cognizant of the direct and indirect costs of enrolling initially at a community college as opposed to a public 4-year institution to provide the appropriate resources for students seeking to obtain a baccalaureate degree. In doing so, these institutional leaders can ensure that any financial savings accrued by enrolling initially at a community college are not offset by issues associated with inconsistencies in institutional policies that eventually lead to dropouts or delays in time-to-degree.

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