Community College: A Cost Effective Path to a Bachelor's or a Short Sighted Educational Investment

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ABSTRACT. Rising four-year university tuition and graduate indebtedness in the United States has made two-year community colleges a potentially cost effective path to a bachelor's degree by allowing students to transfer community college credit hours into a four-year university. However, courses at community colleges may not be perfect substitutes for the four-year college courses they replace and may potentially have adverse effects on academic performance, indebtedness and future income. Using the Baccalaureate and Beyond Longitudinal Survey we find that bachelor's degree graduates that transferred in credit hours from community colleges experience some adverse academic outcomes. Although these graduates had similar cumulative and major GPAs, they had an increased likelihood of repeating a course or having to withdraw from a class because of failure. In spite of these adverse academic outcomes, graduates that transferred credit hours from community colleges graduated with less student debt and had slightly higher post-graduation incomes than their fellow graduates. (I21, I23, J24)

I. Introduction

In recent years, parents, students, and government policy makers at the state and federal level in the United States have paid increased attention to the cost of earning a college degree. Media reports on the burdens of recent graduates' debt load have resulted in some questioning whether a college degree's benefits are worth the high financial cost. At the same time, most state governments, facing greater fiscal constraints, have reduced their support to public universities, leaving more of the educational costs to be borne by students. While empirical evidence still shows positive returns to a college degree, community colleges can potentially offer cost conscious students an opportunity to acquire the benefits of a bachelor's degree (higher earnings, lower unemployment, and more career options) at a lower cost by taking advantage of the transfer role of community colleges. On the other hand, transferred lower

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division courses from community colleges could lower the returns to the educational investment if the courses are not perfect substitutes for the four-year university courses they replace. As a result, transferring credit hours from a community college could have adverse effects on a student's academic performance, indebtedness, and future income. Using the 2000/2001 Baccalaureate and Beyond Longitudinal Survey (B&B), this paper examines the financial and academic impact that transferring community college credits into four-year colleges has on students graduating with a bachelor's degree in 2000. This paper examines the impact of transferring credits on total student debt, GPA, and income one year after graduation. The paper also examines the impact on the probability of a student graduating with honors, withdrawing from a course because of failure, having to repeat a course, or receiving an incomplete for a course.

II. Community Colleges' Role in US Higher Education

Although community colleges do not enjoy the spotlight garnered by four-year universities, their role in higher education is significant. According to the Digest of Educational Statistics 2011 (NCES 2013), public two-year colleges accounted for 28% of full-time equivalent (FTE) enrollment in 2010, with public and private non-profit four-year institutions accounting for 42% and 20% of FTE enrollment respectively (Table 1).

TABLE 1–Enrollment by Institution Type

Institution Type	FTE Enrollment	% of Total
Four-Year, Public	6,636,175	42%
Four-Year, Private, Non-Profit	3,235,803	20%
Two-Year, Public Community Colleges	4,384,577	28%
Four-Year, Private, For-Profit	1,254,174	8%
Two-Year, Private, For-Profit	405,718	3%
Total	15,916,447	100%

Source: Digest of Education Statistics, 2011

Table 2 shows the states in which community colleges have the highest and lowest shares of FTE enrollment. The two states with the largest enrollments in postsecondary education, California and Texas, both rely heavily on community colleges, as they account for 46% and 37% of enrollment, respectively. Florida, on the other hand, is less reliant on community colleges, as its' two-year colleges account for only 9% of total enrollment. Although for many of these students community colleges may represent the highest intended level of educational attainment, a large portion of students receiving their bachelor's degrees have taken advantage of the opportunity to earn some of their credit hours from community colleges. In the 2000/2001 B&B survey utilized in this paper, 28% of bachelor's degree recipients had transferred credit hours from a community college.

TABLE 2–Community College Share of FTE Enrollment by State

State	% Enrollment at 2-Year Public Community Colleges	State	% Enrollment at 2-Year, Public Universities
Wyoming	53%	North Dakota	10%
California	46%	Florida	9%
Mississippi	45%	Vermont	8%
New Mexico	44%	Nevada	7%
Texas	37%	Alaska	2%

Source: Digest of Education Statistics, 2011

The standard model of educational investment highlights why transferring credits from community colleges may represent a wise cost-effective strategy for students. In this model, the cost of attainting a college degree comes in two forms. The first cost is the direct cost of tuition and fees and the second cost is the foregone earnings from postponing entry into the labor force.[1] The benefit to earning a bachelor's degree is the higher lifetime income college graduates earn over high school graduates. For a student working towards a bachelor's degree, taking courses at a community college has the potential to both positively and negatively influence their education investment. First,

credit hours earned at community colleges come at a much lower student cost than those at both public and private, four-year universities. Table 3 summarizes data from the College Board's Trends in College Pricing (2012) showing the published tuition and fees for four-year private, four-year public, and community colleges, along with the net tuition (published tuition and fees less grant aid and tax benefits).

TABLE 3–Tuition by Institution Type

Institution Type	Tuition and Required Fees (2011-12)	Net Tuition[a] (2011-12)
Four-Year Public	$8,370	$2,620
Four-Year Private, Non-Profit	$28,280	$12,600
Two-Year Public Community Colleges	$3,000	-$1,350

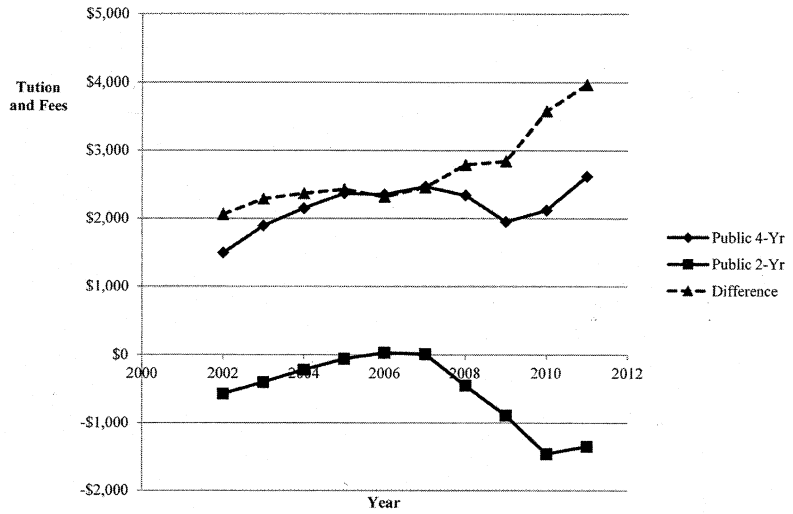
Source: The College Board, Annual Survey of Colleges; Trends in Student Aid 2012;
Note: In 2012 dollars
a: Net Tuition = Published Tuition and Required Fees Less Total Grant Aid and Tax Benefits

For the 2011-12 academic year, published tuition rates at community colleges were $3,000 per year for full-time students, versus $8,370 at four-year public universities and $28,280 at four-year private, non-profit universities. The actual net tuition paid by students is significantly lower than the published rates as a result of institutional and government grants. Although four-year institutions offer larger grants to students, community colleges still offer significant savings over four-year universities. Net tuition is $2,620 and $12,600 at public, four-year and private, non-profit four-year universities, respectively. Whereas net tuition at community colleges is -$1,350; that is average grants and tax benefits exceed the published tuition rate by $1,350.

Community colleges' cost advantage has been persistent over time. Figure 1 shows the net tuition of community colleges and four-year public universities along with the difference in net tuition between the two institution types from the 2002-03 to 2011-12 academic years. Although most of the growth in net tuition at four-year public universities occurs from the 2002-03 to 2005-06 academic years, the $2,620 net tuition at four-year public universities represents a 76% increase from

2002-03. Over the same time period, the net tuition faced by students at community colleges fell from -$570 to -$1,350. As result, the cost difference between the two types of public universities has increased from $2,060 in 2002-03 to $3,970 in 2011-12.

Figure 1. Net Tuition 2002-03 to 2011-12



Source: College Board, Trends in College Pricing
Note: In 2012 dollars

The cost savings offered by credit hours taken at community colleges are only one side of the cost-benefit analysis. Although a four-year university may accept the credit hours transferred from a community college towards meeting the requirements of its bachelor's degree, those credit hours may not represent the same acquisition of human capital as a similar course earned at the four-year university. Since one role of community colleges is to serve students not initially prepared to attend four-year institutions, it is possible that community college courses are not as academically rigorous as comparable courses populated by higher ability students at four-year institutions. Community colleges' lower utilization of full-time tenured professors could also potentially impact the substitutability of community college and four-year university courses. Tenured and tenure-track faculty comprise 72% of faculty at four-year public universities and only 55% of faculty at community

colleges (NCES 2013). In addition, community college faculty positions have lower salaries and are less desirable in the academic labor market. Community colleges are also more reliant on hiring instructional staff without terminal degrees or those unable to obtain an academic position at a four-year university. The average salaries of full-time instructional staff at four-year public and four-year private universities are $76,985 and $78,574, respectively, whereas, the average salaries are $61,065 at community colleges (NCES 2013). If reliance on full-time, tenured/tenure-track faculty and higher paid faculty leads to increased instructional quality, then community college and four-year university courses will be less substitutable in terms of human capital acquisition.

The consequence of poor substitutability on student investment in a bachelor's degree is ambiguous. Under certain circumstances, transferred credit hours from a community college course with relatively little human capital development could adversely affect both academic and post-graduation labor market outcomes. If the material from the transferred class is the foundation upon which other courses at the four-year university build upon, then poor substitutability would adversely impact academic performance. Low human capital development in the transferred course could also impact post-graduation labor market outcomes either directly, via the decreased human capital from the transferred course, or indirectly, if the course decreases the acquisition of human capital in subsequent courses. Additionally, if poor substitutability of transferred courses has a significant enough impact on academic performance, it could offset some of community colleges' cost effectiveness by resulting in students having to repeat courses at their four-year institution as a result of failing grades. On the other hand, if the material in the transferred course covers general knowledge that is neither valued by labor markets or relied upon for further studies, there would be no adverse effects on academic performance or labor market outcomes, even if the transferred course is not perfectly substitutable with comparable courses at the four-year institution.[2]

III. Previous Literature

Following Mincer's (1974) seminal work on the relationship between schooling and earnings, an extensive body of literature has developed establishing a positive return to earning a bachelor's degree. Most of the literature on the value of higher education has delved into the extent to which variables such as school quality (Brewer, Eide and Ehrenberg

1999; Thomas 2000; Dale and Krueger 2002; Black and Smith 2004 & 2006), major (Day and Newburger 2002; Thomas 2000; Rumberger and Thomas 1993), and other socio-economic variables impact the returns to earning a bachelor's degree.

The literature on the financial impact of community college similarly focuses on the economic returns to an associate's degree or credit hours at community colleges (Kane and Rouse 1995 & 1999; Marcotte 2010, Kolesnikova 2010). Although a portion of students enrolled at community colleges certainly view associate's degrees as their educational attainment goal, for others community colleges are viewed as preparation for attending a four-year university and earning a bachelor's degree. Adelman (2006) reports that 24 percent of high school graduates that first attended community college transferred to a four-year university and 58 percent of those had earned a bachelor's degree within eight years. Moore and Shulock (2007), examining a cohort of students enrolled at California community colleges, find that 18 percent of community college degree seekers eventually transfer to a university. The hypothesis that community college cost savings influence students' academic path is supported by Nutting's (2008) finding that community college tuition has a substantial impact on enrollment in academic programs meant to facilitate transfer to four-year universities.

As a result of its role as a pathway to a bachelor's degree role for many students, most empirical work examining the connection between community college attendance and educational outcomes focuses on the extent to which community colleges facilitate the attainment of a bachelor's degree. Rouse (1995) finds that attending community colleges increase total years of schooling slightly and does not change the likelihood of receiving a bachelor's degree. Similarly, Sandy, Gonzalez, and Hilmer (2006) find that lower rates of education attainment by students first attending community colleges is entirely explained by those students' lower abilities.

Long and Kurlaender (2008),[3] using a comprehensive administrative dataset from Ohio, find that even after accounting for significant selection bias, students initially entering post-secondary education at community colleges were 14.5 percent less likely to complete a bachelor's degree within nine years. Doyle (2009) finds similar results utilizing a propensity score matching approach on data from the Beginning Postsecondary Students Survey, finding that attending community colleges decreases the likelihood of earning a bachelor's degree. Nutting

(2008) found that community college transfers had significantly lower graduation rates than non-transfers at the same point in their academic careers and had a longer right tail on time-to-degree indicating the possibility of costly academic struggles at four-year universities. Nutting's (2011) study of New York State's higher education system also suggests a lack of substitutability between community college and four-year university courses, as students that transferred from community colleges to four-year universities with fewer fellow transfer students had lower graduation rates.

Although, previous studies have examined the impact of attending community colleges on completing a bachelor's degree, little research has be done assessing the impact of how attending community college may influence the returns to the bachelor's degrees earned by community college transfers. Kolesnikova (2009, 2010) are two of the only papers that examine whether attending community colleges may have adverse labor market outcomes for bachelor's degree recipients. Kolesnikova (2010) finds that having an associate's degree in addition to a bachelor's degree decreases earnings by $2,269, on average, even when controlling for field of study, experience, and race. However, unlike our paper, Kolesnikova recognizes that the paucity of controls for other worker characteristics that impact both earnings and the decision to attend community colleges would lead to biased estimates and minimal confidence on the validity of these estimated impacts. Using the rich data available in the B&B survey, this paper controls for differences in ability and socio-economic characteristics of students who transfer credit hours from community colleges and examines the impact that transferring credit hours from community colleges has on three factors influencing the value of a bachelor's degree: academic performance, student indebtedness, and one-year post-graduation income.

IV. Model and Hypothesis

This paper estimates the impact of ability, demographics, and community college attendance on various academic and financial outcomes. The general form of our models of interest that this paper estimates are:

$$OUTCOME = \beta_0 + \beta_1 MAJOR + \beta_2 Test\ Score + \beta_3 DEMO + \beta_4 CC\ Transfer + \varepsilon \qquad (1)$$

where *OUTCOME* is one of the academic or financial outcome-

dependent variables on which we hypothesize the right hand side variables are influencing. The models that estimate the impact of transferring credit hours on academic outcomes test the substitutability of community college credit hours with four-year university credit hours. These dependent variables include: cumulative GPA (*CGPA*), major GPA (*MGPA*), whether a student graduated with academic honors (*Honors*), received an incomplete grade while in college (*Incomplete*), repeated a course for a higher grade (*Repeat*), or withdrew from a course because they were failing (*Withdrawal*). Financial outcomes include both the graduate's student loan debt (*Loan*) and income in 2001 (*Income*), the first full year after graduation. Both *Loan* and *Income* are scaled by natural logs in the model. The first financial outcome tests the theory that transferring credit hours from a community college is cost effective for students, thereby lowering overall student loan debt at graduation. The second financial outcome measures whether any lack of academic substitutability between community college and four-year university credit hours impacts labor market outcomes one year after graduation. Although it would be ideal to examine income with a longer lag after graduation, the B&B survey only has income data one year after graduation.

MAJOR is a set of dummy variables indicating a student's college major, *Test Score* is the student's SAT score used to proxy student ability,[4] *DEMO* are demographic and socio-economic variables that influence the dependent variable, such as race, gender or working during college, and *CC Transfer* is an indicator variable measuring whether the student transferred credit hours from a community college. Since B&B does not indicate the exact number of credit hours transferred, we are limited to using a dummy variable indicating if any credit hours were transferred. This limitation in not unique to this study, as Rouse (1995), Sandy, Gonzalez, and Hilmer (2006), Long and Kurlaender (2008) and Doyle (2009) each used dummy variables for community college attendance. The income model also includes dummy variables for occupation and job sector, whether a graduate's current job represents the start of their career (*Start Career*) and whether the graduate is enrolled full-time in a post-Bachelor's degree seeking program (*Enrolled*). The model of total student loan debt also includes as independent variables: family income in their year of graduation (*Family Income*) from financial aid records and whether the student received assistance from parents in paying tuition (*Parent Support*).

Although the B&B survey contains detailed characteristics on graduates, the possibility remains that an omitted variable may bias OLS estimates. In particular, if an omitted variable impacts both a student's decision to attend or take credits at a community college and an outcome variable, such as GPA or post-graduation income, then the error term (ϵ) will be correlated with CC Transfer, violating the assumptions of the OLS model and biasing the model's estimated coefficients. In the presence of such an omitted variable, the instrumental variable (IV) approach can generate consistent estimates of the coefficients. In the first stage of the IV approach, instrumental variables that are correlated with the decision to transfer credit hours but uncorrelated with the dependent variable in equation (1) are used to estimate the predicted values of the decision to transfer. The omitted variable bias is corrected for in the second stage by estimating equation (1) with the predicted values from the first stage.[5]

We use instrumental variables in the first stage to estimate the likelihood that a student transferred credit hours from a community college:

$$CC\ Transfer = \alpha_0 + \alpha_1 Tuition\ Ratio + \alpha_2 PopPerCC + u \quad (2)$$

Tuition Ratio is the potential cost savings of taking credit hours at community college, measured as the ratio of a state's average four-year public university to community college tuition rates. As *Tuition Ratio* increases, the larger the potential costs savings are to transferring credit hours, and therefore the more we would expect students to transfer credit hours. Nutting (2004) finds that higher community college tuition resulted in lower enrollment in community college academic programs, which supports the use of *Tuition Ratio* as an instrument. *PopPerCC* is the state population divided by the number of community colleges in the state. Card (1993) finds that proximity to a university increases the likelihood of earning a degree, and Jepsen and Montgomery (2009) find that proximity to a community college increases the likelihood of attendance. Following this logic, students that reside in a state with a larger number of community colleges have greater opportunity to transfer credit hours.

In the second stage of the IV model, we use the predicted values (*CC Transfer*)$\hat{}$ in place of *CC Transfer* to yield consistent estimates of the impact of transferring community college credit hours on academic outcomes (GPA, graduating with honors, repeating or withdrawing from courses, and receiving incompletes) and financial outcomes (2001

income and student loans). The estimated models are:

$$OUTCOME = \beta_0 + \beta_1 MAJOR + \beta_2 Test\ Score + \beta_3 DEMO + \beta_4\ (CC\ Transfer)\hat{} + \varepsilon \quad (3)$$

As discussed above, transferring credit hours from a community college has two potential influences on the returns to earning a bachelor's degree: cost savings and acquisition of human capital. Since community college credit hours are less expensive for students, transferring credits from community colleges should lead to a reduction in total student borrowing, so long as these savings are not fully offset by the repeating of classes as a result of poor substitutability of transferred courses. Furthermore, if community colleges and four-year courses are perfect substitutes, then we would anticipate that transferring credit hours from a community college would have no impact on academic and labor market outcomes such as GPA, academic honors, failures, repeats, incompletes, and post-graduation income. However, if community colleges and four-year courses are poor substitutes, we would anticipate lower GPAs, lower rates of earning academic honors, higher rates of withdrawals for failure, repeats for higher grades, and incompletes. In addition, repeating classes may offset savings from earning credit hours at the lower community college tuition rates. Furthermore, poor substitutability may diminish human capital that is valued by labor markets resulting in lower post-graduation incomes.

V. Data

The primary data comes from two sources: the Baccalaureate and Beyond Longitudinal Survey 2000/2001 and Integrated Postsecondary Education Data System (IPEDS). State population, used to generate the population per community college instrumental variable, comes from the 2000 US Census. The B&B survey follows students who received a bachelor's degree during the 1999-2000 academic year and includes administrative and financial aid information from their degree granting university, including GPA, major, financial aid records, and standardized test scores. It also indicates whether each student transferred credits from a community college. The survey also includes financial aid information for each student from administrative records, including the total amount borrowed through student loans. Graduates are also surveyed one-year after graduation on their employment status, occupation, industry, and income. In addition to the data from B&B, the measures of relative community college and four-year university tuition are created using

IPEDS data by matching state-wide mean data on tuition to students' state variable in the B&B data.

The descriptive statistics for our data are presented in Table 4.[6] The average student was 22.7 years old, took just over five years to complete their bachelor's degree after graduating from high school, and had a SAT score of approximately 1,080. Net tuition and fees averaged $5,028. In order to pay for college 14.8% of these students worked full-time while in college, 67.1% worked part-time, 38.7% received support from their parents, and the average student borrowed $11,008 in student loans and earned $29,865 in 2001. At the time of graduation, 38.8% earned academic honors, 11.7% received an incomplete grade at some point during college, 31.2% repeated classes in order to earn a higher grade, 18.9% withdrew from a class because they were failing, and they earned an average cumulative GPA of 3.18 and a major GPA of 3.33. Table 5 gives the sample means for both the full sample and for sub-samples grouped by whether students transferred credit hours from community colleges. Students that transferred credit hours on average had lower GPAs, were less likely to receive honors, and were more likely to receive an incomplete, withdraw from, or repeat a course. They tended to be older, were more likely to have a child present in the home, were less likely to receive parental support with tuition, were less likely to have parents with college degrees, and paid less net tuition than students that did not transfer credit hours. They were also more likely be residents of a state with a larger gap between tuition at public, four-year universities and community colleges, and with more community colleges per capita. Each of these differences were statistically different at the 5% or 1% levels. Students that transferred credit hours from community colleges also took out more student loans and had lower incomes one year after graduation, however, these differences were both economically and statistically insignificant.[7]

VI. Regression Results

A. FIRST STAGE

Table 6 shows the coefficients for our instruments in the first stage of our IV regressions. As expected, the potential cost savings to attending a community college has a significant impact on the likelihood that a graduate transferred credit hours from a community college, as the coefficient of *Tuition Ratio* is positive and significant at the 1% level in all of the first-stage regressions.

TABLE 4–Descriptive Statistics

Variable Name	Description	Mean	St. Dev.
DEPENDENT VARIABLES			
CGPA	Cumulative GPA, in points	3.175	0.463
MGPA	GPA in major, in points	3.333	0.466
Honors	= 1 if student graduated with any type of academic honors	0.388	0.487
Incomplete	= 1 if student received an incomplete grade while in college	0.117	0.322
Fail	= 1 if student ever withdrew from a course because he/she was failing	0.189	0.391
Repeat	= 1 if student repeated a course while in college to earn a higher grade	0.312	0.463
Loan	Total amount borrowed in loans, in $	$11,008	12,314
Income	Annual wage income in 2001, in $	$29,865	21,607
INDEPENDENT VARIABLES			
CC Transfer	= 1 if student ever transferred credit hours from a community college	0.282	0.450
Test Score	SAT score or derived score from ACT scores, in points	1,079.72	179.934
HS Lag	Time between HS graduation and receiving a BA, in months	61.689	36.211
Age	Age as of 12/31/99, in years	22.669	3.121
Child	= 1 if the student has children	0.399	0.490
Male	= 1 if student is Male	0.106	0.308
African-American	= 1 if student is African American	0.068	0.251
Hispanic	= 1 if student is Hispanic	0.042	0.201

TABLE 4–Descriptive Statistics (continued)

Variable Name	Description	Mean	St. Dev.
Asian	= 1 if student is Asian	0.031	0.174
Net Tuition	Tuition and fees after institutional grants during the 99-00 school year	$5,028.00	5,480.67
Parent Support	= 1 if parents paid all or some of student's tuition during the 99-00 school year	0.387	0.487
Family Income	Income of parents of dependent students, measured in dollars	$73,341.47	49,940.96
Parent Education	= 1 if either parent has a BA or higher degree	0.560	0.496
Worked FT	= 1 if the student worked full-time while in school	0.148	0.355
Worked PT	= 1 if the student worked part-time while in school	0.671	0.470
Disability	= 1 if the student has a disability or learning difficulty	0.049	0.217
MAJOR			
Humanities	= 1 if Humanities major	0.123	0.328
Social Science	= 1 if Social/Behavioral Sciences major	0.191	0.393
Life Science	= 1 if Life Sciences major	0.089	0.284
Phy Sci	= 1 if Physical Sciences major	0.021	0.142
Math	= 1 if Math major	0.013	0.114
Comp. Sci.	= 1 if Computer/Information Science major	0.032	0.176
Engineering	= 1 if Engineering major	0.057	0.232
Education	= 1 if Education major	0.169	0.375
Business	= 1 if Business/Management major	0.103	0.304

TABLE 4–Descriptive Statistics (continued)

Variable Name	Description	Mean	St. Dev.
Health	= 1 if Health major	0.084	0.278
Vocational	= 1 if Vocational/Technical (missing Other Technical/Professional)	0.025	0.158
Other	= 1 if Other Technical/Professional	0.093	0.290
Grad Rate	Graduation rate of university enrolled in during 2000, in decimal	53.418	17.681
Public Doc	= 1 if enrolled institution is a Public Doctoral granting institution	0.380	0.485
Private Doc	= 1 if enrolled institution is a Private Doctoral granting institution	0.142	0.350
Private Non Doc	= 1 if enrolled institution is a Private Non-Doctoral granting institution	0.179	0.384
PopPerCC	= Population per community college in state (in millions)	0.384	0.371
Tuition Ratio	Ratio of the average tuition for public 4-year university to public 2-year university in the state	2.565	1.441
Start Career	Graduate is employed at a job in 2001 that represents the start of his/her career	0.726	0.446
Enrolled	Graduate is enrolled in an education program in 2001	0.199	0.400

TABLE 5–Descriptive Statistics by Transfer Status

Variable Name	CC Transfers		Non-Transfers	
	Mean	St. Dev.	Mean	St. Dev.
Dependent Variables				
CGPA	3.129***	0.486	3.192	0.452
MGPA	3.315	0.465	3.339	0.467
Honors	0.361**	0.481	0.399	0.490
Incomplete	0.139**	0.344	0.110	0.312
Fail	0.249***	0.433	0.165	0.371
Repeat	0.391***	0.488	0.281	0.449
Loan	$10,679	$11,388	$11,137	$12,658
Income	$29,840	$20,379	$29,875	$22,074
Independent Variables				
Test Score	1,021.61***	170.522	1,102.53	178.425
HS Lag	72.947***	50.960	57.269	27.166
Age	23.583***	4.314	22.310	2.410
Male	0.379*	0.485	0.407	0.491
Child	0.168***	0.374	0.082	0.274
African-American	0.066	0.248	0.068	0.252
Hispanic	0.047	0.213	0.040	0.196
Asian	0.032	0.176	0.031	0.174
Net Tuition	$3,835.83***	$3,989.32	$5,495.99	$5,900.19
Parent Support	0.309***	0.462	0.417	0.493
Family Income	$72,312	$53,020	$73,660	$48,956
Parent Education	0.509***	0.500	0.580	0.494
Worked FT	0.177***	0.382	0.136	0.343

TABLE 5–Descriptive Statistics by Transfer Status (continued)

Variable Name	CC Transfers		Non-Transfers	
	Mean	St. Dev.	Mean	St. Dev.
Worked PT	0.631***	0.483	0.686	0.464
Disability	0.060*	0.238	0.045	0.208
Grad Rate	0.496***	0.152	0.549	0.183
Public Doc	0.441***	0.497	0.356	0.479
Private Doc	0.091***	0.288	0.163	0.369
Private Non Doc	0.167	0.373	0.184	0.388
PopPerCC	0.315***	0.243	0.412	0.408
Tuition Ratio	2.699***	1.508	2.512	1.411
Start Career	0.742	0.438	0.719	0.449
Enrolled	0.195	0.397	0.201	0.401

Note: ***, ** and * indicate that the t-test for differences in sample means is significant at the 1%, 5% and 10% level, respectively.

TABLE 6–First-Stage of IV Regressions

Coefficients	Academic Outcomes IV	Student Loans IV	Post-Graduation Income IV
PopPerCC	-0.128***	-0.126***	-0.129***
	(0.013)	(0.014)	(0.015)
Tuition Ratio	0.022***	0.017***	0.022***
	(0.004)	(0.005)	(0.005)
Minimum Eigenvalue Statistic	36.702	29.449	36.414
Hausman Test of Endogeneity	a	9.048***	3.917**
Joint F-Test of Instruments	58.282***	50.235***	54.964***

Notes: The table above shows the regression results for the first stage of our analysis. The dependent variable is *CC Transfer*. The standard errors are in parenthesis and *** indicates the independent variable is significant at a 1% level, ** at a 5% significance level, and * at a 10% level.
a: For each of the six academic outcome regressions the null hypothesis that *CC Transfer* is exogenous could not be rejected.

The number of state residents per community college is also significant at the 1% level and has the expected sign, as students from states with more residents per community colleges are less likely to transfer credit hours. The joint F-test for both instruments is highly significant for all of the first-stage regressions and the minimum eigenvalue statistic (Stock and Yogo, 2005) rejects the hypothesis that the instruments are weak. The Hausman Test of Endogeneity tests whether our assumed endogenous variable is instead exogenous. This hypothesis is rejected at the 1% level for the student borrowing regression and is rejected at the 5% level for post-graduation income regressions. However, exogeneity could not be rejected for the academic outcome regressions indicating that for these regressions standard OLS and probit estimations are unbiased.

B. ACADEMIC OUTCOMES

Table 7 gives the second stage regressions of the impact of transferring credit hours from community colleges on a graduating student's cumulative and major GPA. For the OLS regressions, *CC Transfer* is a dummy variable indicating whether a student transferred credit hours from a community college. For the IV regressions, *CC Transfer* is the predicted value of the variable from the first stage regression. Since the Hausman test does not reject exogeneity of *CC Transfer*, the OLS estimates can be considered unbiased. The second and fourth regressions give the OLS estimates with cumulative GPA and major GPA as the dependent variables, respectively.

For the OLS model, *Test Score* has the expected positive and statistically significant coefficient with a one standard deviation (or 180 point) increase in *Test Score* resulting in a 0.187 point increase in cumulative GPA and a 0.12 point increase in major GPA. Male students have cumulative GPAs 0.148 points lower and major GPAs 0.114 points lower than female students. Students with learning disabilities have cumulative GPAs 0.096 lower than those without; however, learning disability does not have a significant effect on major GPA.

Parent Education does not have a significant impact on cumulative GPA but has a positive impact on major GPA, although the impact is only significant at the 10% level. Students that receive financial support from parents have cumulative GPAs that are 0.033 points below and major GPAs that are 0.029 points below students that do not, although the impact on major GPA is again only significant at the 10% level.[8]

TABLE 7–Impact of Transferring Credit Hours on GPA

	Cumulative GPA (CGPA)		Major GPA (MGPA)	
	(1) IV	(2) OSL	(3) IV	(4) OLS
CC Transfer	-0.141	0.000934	-0.0651	0.00450
	(0.106)	(0.0157)	(0.122)	(0.0158)
Test Score	0.000975***	0.00104***	0.000645***	0.000675***
	(6.13e-05)	(4.22e-05)	(6.91e-05)	(4.47e-05)
HS Lag	0.00147**	0.00104*	0.00135	0.00114
	(0.000629)	(0.000538)	(0.000886)	(0.000812)
Age	-0.0145**	-0.0121**	-0.00994	-0.00876
	(0.00639)	(0.00614)	(0.00972)	(0.00954)
Male	-0.149***	-0.148***	-0.114***	-0.114***
	(0.0148)	(0.0146)	(0.0157)	(0.0157)
Black	-0.163***	-0.149***	-0.126***	-0.119***
	(0.0321)	(0.0300)	(0.0327)	(0.0305)
Hispanic	-0.0302	-0.0286	-0.0266	-0.0258
	(0.0308)	(0.0301)	(0.0338)	(0.0339)
Asian	-0.0732*	-0.0811**	-0.0621	-0.0660*
	(0.0382)	(0.0374)	(0.0408)	(0.0400)
CHLD	0.0296	0.0207	0.00473	0.000365
	(0.0266)	(0.0252)	(0.0276)	(0.0262)
Parent Support	-0.0388***	-0.0330**	-0.0317**	-0.0288*
	(0.0147)	(0.0140)	(0.0157)	(0.0150)
Parents Education	-0.00306	-0.00384	0.0282*	0.0278*
	(0.0141)	(0.0139)	(0.0149)	(0.0150)
Worked PT	-0.00385	-0.000502	0.00353	0.00517
	(0.0180)	(0.0178)	(0.0189)	(0.0187)
Worked FT	-0.0694***	-0.0682***	0.0134	0.0140
	(0.0249)	(0.0246)	(0.0255)	(0.0255)
Disability	-0.0920***	-0.0960***	-0.0243	-0.0263
	(0.0338)	(0.0337)	(0.0348)	(0.0349)

TABLE 7–Impact of Transferring Credit Hours on GPA (cont.)

	Cumulative GPA (CGPA)		Major GPA (MGPA)	
	(1) IV	(2) OSL	(3) IV	(4) OLS
MAJOR				
Humanities	0.135***	0.145***	0.0868***	0.0914***
	(0.0284)	(0.0274)	(0.0299)	(0.0295)
Social Science	0.0157	0.0248	0.0207	0.0251
	(0.0272)	(0.0261)	(0.0283)	(0.0272)
Life Science	0.0588*	0.0620**	-0.118***	-0.116***
	(0.0307)	(0.0303)	(0.0336)	(0.0335)
Phys Sci.	-0.0222	-0.0176	-0.264***	-0.262***
	(0.0521)	(0.0520)	(0.0624)	(0.0626)
Math	0.0257	0.0372	-0.125*	-0.119*
	(0.0523)	(0.0514)	(0.0665)	(0.0656)
Comp. Sci.	-0.0208	-0.0155	-0.0209	-0.0183
	(0.0484)	(0.0482)	(0.0453)	(0.0450)
Engineering	-0.0483	-0.0446	-0.174***	-0.173***
	(0.0386)	(0.0388)	(0.0402)	(0.0404)
Education	0.238***	0.237***	0.201***	0.201***
	(0.0262)	(0.0257)	(0.0270)	(0.0269)
Business	-0.00206	0.00517	-0.0590*	-0.0554*
	(0.0296)	(0.0289)	(0.0316)	(0.0310)
Health	0.0904***	0.0934***	-0.0104	-0.00895
	(0.0306)	(0.0302)	(0.0327)	(0.0326)
Vocational	0.104**	0.122***	0.0749	0.0839
	(0.0498)	(0.0470)	(0.0574)	(0.0542)
Constant	2.433	2.289	2.831	2.761
R-squared	0.214	0.231	0.128	0.133

Note: Robust standard errors are in parentheses and *** indicates the independent variable is significant at a 1% level, ** at a 5% significance level, and * at a 10% level.

Older students and students that worked full-time also had lower cumulative GPAs, with being one-year older lowering cumulative GPA by 0.012 points and working full-time lowering cumulative GPA by 0.068 points. Neither of these variables impacted major GPA.

In regards to the primary result of interest, the coefficient of *CC Transfer* is insignificant in both the cumulative and major GPA regressions indicating that graduating students with transferred credit hours had similar GPAs as students without. The results in Table 7 are consistent with the theory that community college courses are good substitutes for four-year university courses, and as such could be an avenue of cost savings for students. Although university policies on whether community college transfer credit hours count towards a student's GPA varies by institution, it is possible that community college courses may be graded more leniently. This could result in higher grades for these courses offsetting the impact of lower grades in four-year university courses on cumulative GPA. However, there exist fewer opportunities to transfer community college courses in a student's major. Therefore, the lack of a significant effect on major GPA is stronger evidence of substitutability between courses.

Whereas GPA may be influenced by the grades earned in transferred course, the presence of an incomplete, withdrawal, or repeat on a graduate's transcript is not directly influenced by transferred courses. Table 8 shows the impact of transferring credit hours on the likelihood that a student graduated with honors, withdrew from a course because of failure, received an incomplete for a course or repeated a course to earn a better grade. Both probit and IV estimates are shown, however, the failure to reject exogeneity of *CC Transfer* suggests the use of the probit estimation.

Higher test scores increase the likelihood of a student receiving honors with a 10% increase in Test Score increasing the probability of receiving honors by 1.77% at the sample mean. Male students and students working full-time are all less likely to receive honors, with 24.8% and 15.6% decreases in receiving honors, respectively. As was the case with GPAs, transferring credit hours from a community college does not significantly impact a student's likelihood of graduating with honors, supporting the substitutability between community college and four-year courses. Columns (3) and (4) show the IV and probit estimates for the likelihood of students receiving an incomplete in the course. Older students, students with disabilities, and students that worked during their studies were all more likely to receive an incomplete for a course.

TABLE 8–Impact of Transferring Credit Hours on Honors, Incompletes, Withdrawals and Repeats

	Honors		Incomplete		Withdrawal		Repeat	
	(1) IV	(2) Probit	(3) (IV)	(4) Probit	(5) IV	(6) Probit	(7) IV	(8) Probit
CC Transfer	-0.227	-0.00703	-0.126	0.0683	0.366	0.176***	0.543	0.136***
	(0.359)	(0.0488)	(0.455)	(0.0611)	(0.425)	(0.0536)	(0.370)	(0.0491)
Test Score	0.00177***	0.00186***	-0.000110	-2.49e-05	-0.00113***	-0.00121***	-0.00151***	-0.00169***
	(0.000208)	(0.000139)	(0.000260)	(0.000169)	(0.000242)	(0.000155)	(0.000216)	(0.000143)
HS Lag	0.00117	(0.000511)	-0.00219	-0.00278	-0.00181	-0.00123	0.000392	0.00162
	(0.00219)	(0.00191)	(0.00249)	(0.00207)	(0.00235)	(0.00197)	(0.00225)	(0.00194)
Age	0.000542	0.00416	0.0775***	0.0808***	0.0560**	0.0528**	0.0220	0.0150
	(0.0233)	(0.0225)	(0.0258)	(0.0246)	(0.0243)	(0.0232)	(0.0239)	(0.0228)
Male	-0.285***	-0.283***	0.0622	0.0640	0.293***	0.292***	0.168***	0.164***
	(0.0462)	(0.0460)	(0.0579)	(0.0577)	(0.0517)	(0.0515)	(0.0477)	(0.0472)
Black	0.0182	0.0396	0.268**	0.286***	0.260***	0.241***	0.327***	0.288***
	(0.0954)	(0.0887)	(0.110)	(0.100)	(0.0993)	(0.0904)	(0.0937)	(0.0858)
Hispanic	0.00790	0.0106	0.174	0.176	0.363***	0.361***	0.311***	0.306***
	(0.107)	(0.106)	(0.125)	(0.125)	(0.109)	(0.108)	(0.106)	(0.105)
Asian	-0.244*	-0.257**	0.0573	0.0456	0.0512	0.0615	0.244*	0.267**
	(0.128)	(0.126)	(0.161)	(0.158)	(0.142)	(0.140)	(0.126)	(0.123)
CHLD	-0.00404	-0.0177	0.0681	0.0567	-0.0618	-0.0501	0.0767	0.102
	(0.0805)	(0.0771)	(0.0939)	(0.0899)	(0.0865)	(0.0824)	(0.0793)	(0.0753)

TABLE 8–Impact of Transferring Credit Hours on Honors, Incompletes, Withdrawals and Repeats

	Honors		Incomplete		Withdrawal		Repeat	
	(1) IV	(2) Probit	(3) (IV)	(4) Probit	(5) IV	(6) Probit	(7) IV	(8) Probit
Parent Support	-0.0867*	-0.0778*	-0.0708	-0.0628	-0.0781	-0.0860	-0.0459	-0.0626
	(0.0479)	(0.0455)	(0.0625)	(0.0596)	(0.0560)	(0.0531)	(0.0504	(0.0477)
Parents Education	-0.0118	-0.0132	0.0779	0.0768	0.0949*	0.0961*	0.0132	0.0153
	(0.0449)	(0.0447)	(0.0573)	(0.0571)	(0.0511)	(0.0510)	(0.0464)	(0.0459)
Worked PT	-0.106*	-0.100*	0.193**	0.198**	0.0122	0.00783	0.113*	0.103*
	(0.0570)	(0.0562)	(0.0784)	(0.0777)	(0.0664)	(0.0656)	(0.0610)	(0.0599)
Worked FT	-0.170**	-0.168**	0.277***	0.279***	0.0773	0.0757	0.176**	0.173**
	(0.0765)	(0.0762)	(0.0969)	(0.0967)	(0.0845)	(0.0843)	(0.0784)	(0.0776)
Disability	-0.00719	-0.0132	0.366***	0.361***	0.200*	0.205**	0.171*	0.182*
	(0.0985)	(0.0978)	(0.109)	(0.108)	(0.105)	(0.104)	(0.0996)	(0.0983)
MAJOR								
Humanities	0.295***	0.309***	0.0955	0.109	-0.134	-0.147	-0.166	-0.192**
	(0.0952)	(0.0920)	(0.116)	(0.111)	(0.110)	(0.106)	(0.101)	(0.0978)
Social Science	0.0632	0.0774	0.00722	0.0197	0.0285	0.0165	-0.0746	-0.101
	(0.0885)	(0.0852)	(0.107)	(0.103)	(0.0976)	(0.0936)	(0.0914)	(0.0876)
Life Science	-0.116	-0.112	-0.211	-0.207	-0.126	-0.131	0.147	0.139
	(0.101)	(0.101)	(0.129)	(0.128)	(0.115)	(0.114)	(0.104)	(0.102)
Phys. Sci.	-0.0318	-0.0247	-0.224	-0.218	0.111	0.105	0.265	0.251
	(0.162)	(0.161)	(0.220)	(0.220)	(0.181)	(0.180)	(0.168)	(0.166)

TABLE 8–Impact of Transferring Credit Hours on Honors, Incompletes, Withdrawals and Repeats (cont.)

	Honors		Incomplete		Withdrawal		Repeat	
	(1) IV	(2) Probit	(3) (IV)	(4) Probit	(5) IV	(6) Probit	(7) IV	(8) Probit
Math	0.00242	0.0198	-0.0931	-0.0779	0.194	0.179	0.466**	0.433**
	(0.199)	(0.196)	(0.250)	(0.247)	(0.222)	(0.219)	(0.203)	(0.199)
Engineering	-0.265**	-0.260**	-0.283*	-0.278*	-0.109	-0.114	0.314***	0.304***
	(0.120)	(0.119)	(0.153)	(0.152)	(0.131)	(0.130)	(0.119)	(0.117)
Education	0.408***	0.407***	-0.162	-0.163	-0.230**	-0.228**	-0.163*	-0.160*
	(0.0881)	(0.0879)	(0.111)	(0.110)	(0.0995)	(0.0992)	(0.0913)	(0.0905)
Business	-0.144	-0.133	-0.273**	-0.263**	-0.138	-0.148	0.0207	0.00101
	(0.0999)	(0.0979)	(0.126)	(0.124)	(0.110)	(0.107)	(0.100)	(0.0976)
Health	0.159	0.164	-0.254*	-0.250*	-0.0440	-0.0473	0.0793	0.0721
	(0.101)	(0.101)	(0.131)	(0.131)	(0.113)	(0.112)	(0.104)	(0.102)
Vocational	0.255	0.283*	-0.0277	-0.00279	-0.118	-0.142	-0.234	-0.286*
	(0.158)	(0.150)	(0.188)	(0.179)	(0.172)	(0.163)	(0.162)	(0.154)
Constant	-2.071	-2.294	-2.856	-3.055	-1.100	-0.906	0.217	0.633

Notes: The table presents probit regressions of college performance measures including graduating with honors (Honors), receiving an incomplete while in college (Incomplete), withdrawing from classes because of failure (Withdrawal), and repeating a class to get a better grade (Repeat). The standard errors are in parentheses and *** indicates the independent variable is significant at a 1% level, ** at a 5% significance level, and * at a 10% level.

Similar to previous results, transferring credit hours from a community college did not have a significant impact on students receiving an incomplete on their transcripts. The last four regressions show the results for whether a student withdrew from a course because of failure or had to repeat a course for a better grade. As expected, lower test scores increase the likelihood of both of these events with a 10% decrease in a student's test score increasing the probability of having a withdrawal on one's transcript by 1.13% and increasing the probability of having to repeat a course by 1.51%. Male students were more likely to withdraw from a class (34.0% higher probability) and to repeat a class for a higher grade (18.3% higher probability). Older students and students with disabilities were more likely to withdraw from a class with 8.4% and 43.5% higher probabilities, respectively. Students that worked full-time during their studies were more likely to have to repeat a course. Unlike in the previous examples, there is evidence that transferring credit hours from a community college has an adverse impact academic outcomes, as transferring credit hours increases the probability that a student will withdraw from a course because of a failing grade by 19.2% and increases the probability of repeating a course for a higher grade by 14.6%. The increased likelihood of failure and repeating are evidence of imperfect substitutability between credit hours from a community college to a four-year university.

C. ECONOMIC OUTCOMES

The previous section provides mixed evidence on the substitutability between community college and four-year university credit hours. Students that transfer credit hours have similar GPAs to students that did not transfer credit hours and were just as likely to receive honors. However, students that transfer credit hours from community colleges were more likely to withdraw from a class and to repeat a course for a higher grade. Poor substitutability can call into question the prudence of utilizing community colleges as a cost effective path to earning a bachelor's degree in two ways. First, the increased probabilities of withdrawing from courses because of failure and repeating courses for a higher grade results in additional tuition costs for students, which may offsets savings from taking credit hours at community colleges. Second, the poor acquisition of human capital that results in inferior academic outcomes could also result in graduates receiving lower labor market

returns to a bachelor's degree.

Table 9 shows the regression results for the models of total amount borrowed in student loans and income one-year after graduation.[9] The first two columns of Table 9 show the OLS and IV results for the models of student borrowing. As mentioned earlier, the Hausman test rejects the hypothesis that the OLS is unbiased, supporting the use of IV. As one would expect, *Net Tuition* increases student borrowing with a 1% increase in net tuition resulting in a 0.279% increase in total student loan balance. Parental support significantly decreases student borrowing and students working either full-time or part-time have higher student loan balances. As for the impact of transferring community college credit hours on student borrowing, transferring credit hours had a negative and statistically significant impact on student borrowing. Since *CC Transfer* is the predicted probability of transferring credit hours from the first stage regression, the coefficient indicates that a 1% change in the probability of transferring credit hours from a community college results in a 3.995% decline in student loan balances. Therefore, in spite of the increased likelihood of repeating courses and withdrawing from courses because of failure, transferring credit hours from community colleges still results in cost savings for students in terms of smaller student loan balances at graduation. The lower loan balances are presumably a result of community colleges' lower tuition rates.

The third and fourth columns in Table 9 show the models of annual income in 2001, the first full year after graduation. Dummy variables for major and occupation have statistically significant impacts on graduate income. Graduates that majored in the physical sciences, computer/information science, engineering, education, business, health, and vocational majors earned between 9.3% and 30.0% more than students majoring in the omitted category, humanities. Furthermore, graduates in occupations categorized as business and management, engineering/software and computer science earned 12.0%, 28.1% and 31.0% more than the omitted category, educators. In addition, graduates who view their jobs as the start of their careers earn 31.0% more than those who do not and students enrolled in a degree granting program earn 40.0% less than those who are not. Higher student test scores had a significantly positive impact on income with a one standard deviation (179.9) increase in *Test Score* resulting in a 4.9% increase in income.

TABLE 9–Impact of Transferring Credit Hours on Economic Outcomes

	$Loan^L$		$Income^L$	
	(1) IV	(2) OLS	(3) IV	(4) OLS
CC Transfer	-3.995***	-0.0545	0.334**	0.0176
	(1.390)	(0.155)	(0.166)	(0.0213)
Test Score			0.000272***	0.000135**
			(0.000104)	(6.80e-05)
Age			0.000541	0.00664***
			(0.00396)	(0.00252)
Male			0.0664***	0.0629***
			(0.0210)	(0.0210)
Black			0.0861*	0.0564
			(0.0500)	(0.0457)
Hispanic			0.0930**	0.0892**
			(0.0448)	(0.0413)
Asian			0.0627	0.0818*
			(0.0471)	(0.0440)
GPA Cumulative			-0.0499**	-0.0485**
			(0.0236)	(0.0230)
Net $Tuition^L$	0.279***	0.300***		
	(0.0401)	(0.0375)		
Family Support	-3.272***	-2.944***		
	(0.200)	(0.153)		
Family $Income^L$	0.0368	0.00952		
	(0.117)	(0.110)		
Worked PT	0.899***	1.031***	-0.0199	-0.0274
	(0.213)	(0.191)	(0.0263)	(0.0253)
Worked FT	0.742***	0.660***	0.0685**	0.0669**
	(0.275)	(0.251)	(0.0323)	(0.0314)
Graduation Rate			0.153**	0.108*
			(0.0718)	(0.0652)
Public Doc			-0.0148	0.0187
			(0.0282)	(0.0228)
Private Doc			0.0148	0.0369
			(0.0395)	(0.0373)
Private Non Doc			-0.0114	0.00346
			(0.0315)	(0.0303)

TABLE 9–Impact of Transferring Credit Hours on Economic Outcomes (cont.)

	$Loan^L$		$Income^L$	
	(1) IV	(2) OLS	(3) IV	(4) OLS
MAJOR				
Social Science			0.0401	0.0386
			(0.0402)	(0.0397)
Life Science			-0.0140	-0.00167
			(0.0515)	(0.0512)
Phys Sci.			0.175***	0.187***
			(0.0631)	(0.0622)
Math			0.111	0.108
			(0.102)	(0.101)
Comp. Sci.			0.300***	0.311***
			(0.0489)	(0.0477)
Engineering			0.257***	0.265***
			(0.0512)	(0.0511)
Education			0.0934**	0.114***
			(0.0416)	(0.0400)
Business			0.230***	0.235***
			(0.0422)	(0.0417)
Health			0.134**	0.152***
			(0.0544)	(0/0525)
Vocational			0.154**	0.130**
			(0.0616)	(0.0572)
Other			0.0385	0.0568
			0.0450	(0.0440)
Sector			Included[a]	Included[a]
Occupation			Included[b]	Included[b]
Career Start			0.275***	0.271***
			(0.0270)	(0.0265)
Enrolled			-0.422***	-0.415***
			(0.0309)	(0.0303)
Constant	5.216	4.019	9.482	9.589
R-Squared		0.105	0.231	0.275

Notes: Superscript-L indicated that the variable has been scaled by the natural log. Robust standard errors are in parenthesis and *** indicates the independent variable is significant at a 1% level, ** at a 5% significance level, and * at a 10% level.

a: These sectors were statistically significant at a 10% significance level or below: For Profit (positive), State Government (positive). Sectors not significant: Nonprofit, Federal government (including military), self-employed, other (omitted category)

b: These occupations were statistically significant at a 5% level or below: Business and management (positive), Engineering/software engineer/architecture (positive), computer science (positive) and administrative/clerical/legal (negative). The omitted occupational category is educators.

Surprisingly, there is a negative relationship between GPA and income with a one standard deviation (0.463) change in cumulative GPA resulting in a 2.3% decline in income. The negative relationship between GPA and income could result from students focused on finishing college as quickly as possible sacrificing a marginal increase in GPA for a higher workload. Employers could place a greater premium on these students' other positive characteristics than on the students' slightly lower GPA.

In addition to representing cost savings for students, transferring credit hours from community colleges does not adversely affect graduates labor market outcomes. In fact, transferring credit hours from a community college has a small, but statistically significant positive impact on income. The coefficient indicates that a 1% change in the probability of transferring credit hours from a community college increases income by 0.33%. Taken as a whole, this results would suggest that while courses taken at community colleges may result in less knowledge acquisition, thus having some adverse effects on students' academic performance, labor markets do not appear to penalize these students for any resulting dearth of human capital. Furthermore, students may strategically choose to take community college courses that have a minimal impact on the development of skills valued by employers and require less of a time commitment than comparable courses at a four-year university. As such, transferring credit hours could allow students to more efficiently allocate their time to the developing the human capital that is most valued by labor markets resulting in higher post-graduation income.

VII. Conclusion

As the cost of earning a college degree and student indebtedness faces greater scrutiny by households and policy makers, community colleges potentially offer students a cost effective means of offsetting higher tuition at four-year universities. Community colleges represent a substantial part of the United States' investment in higher education, accounting for 28% of FTE enrollment in 2011, making the current lack of research on the economic outcomes for students utilizing it as part of their investment in a bachelor's degree disconcerting. Results in this paper find evidence that community colleges can offer a cost effective path to a bachelor's degree. Although results show some evidence of poor

substitutability of credit hours earned at community colleges, as they lead to more course withdrawals and repeats, these students graduate with similar GPAs and are just as likely to graduate with honors. In addition, transferring credit hours from a community college has a positive effect on student finances, as it both lowers student indebtedness and increases income following graduation. These findings should influence the perspective of both students and policy makers considering the more cost effective means of investing in education.

References

Adelman, Clifford. 2006. *The Toolbox Revisited: Paths to Degree Completion From High School Through College*. Washington, D.C.: U.S. Department of Education.

Bodvarsson, Orn B., and Rosemary L Walker. 2004. "Do parental cash transfers weaken performance in college?" *Economics of Education Review* 23: 483-95.

Black, Dan A., and Jeffrey A. Smith. 2004. "How robust is the evidence on the effects of college quality? evidence from matching." *Journal of Econometrics* 121 (1-2): 99-124.

Black, Dan A., and Jeffrey A. Smith. 2006. "Estimating the returns to college quality with multiple proxies for quality." *Journal of Labor Economics* 24 (3): 701-28.

Brewer, Dominic J., Eric R. Eide, and Ronald G. Ehrenberg. 1999. Does it pay to attend an elite private college? Cross-cohort evidence on the effects of college type on earnings. *Journal Of Human Resources* 34 (1): 104-23.

Card, David. 1993. Using geographic variation in college proximity to estimate the return to schooling. NBER Working Paper 4483.

College Board. 2012. "Trends in college pricing 2012." Trends in Higher Education Series. https://trends.collegeboard.org/college-pricing

Dale, Stacy, and Alan B. Krueger. 2002. "Estimating the payoff to attending a more selective college: An application of selection on observables and unobservables." *Quarterly Journal of Economics* 117 (4): 1491-1527.

Day, Jennifer C., and Eric Newburger. 2002. "The big payoff: Educational attainment and synthetic estimates of work-life earnings." U.S. Census Bureau, Current Population Reports, P23-210, July. http://www.census.gov/prod/2002pubs/p23-210.pdf.

Doyle, William R. 2009. "The effect of community college enrollment on Bachelor's degree completion." *Economics of Education Review* 28 (2): 199-206.

Jepsen, Christopher, and Mark Montgomery. 2009. "Miles to go before I learn: The effect of travel distance on the mature person's choice of a community college." Journal of Urban Economics 65 (1): 64-73.

Kane, Thomas J., and Cecilia Rouse. 1995. "Labor-market returns to two- and four-year college." *American Economic Review* 85 (3): 600-14.

Kane, Thomas J., and Cecilia Rouse. 1999. "The community college: Educating students at the margin between college and work." *Journal of Economic Perspectives* 13 (1): 63-84.

Kolesnikova, Natalia A. 2009. "From community college to a Bachelor's degree and

beyond: How smooth is the road?" *Federal Reserve Bank of St. Louis The Regional Economist*, July: 10-11.

Kolesnikova, Natalia A. 2010. "Community colleges and economic mobility." *Federal Reserve Bank of St. Louis Review* 92 (1): 27-53.

Long, Bridget, and Michal Kurlaender. 2008. "Do community colleges provide a viable pathway to a Baccalaureate degree?" NBER Working Paper 14367.

Marcotte, Dave E. 2010. "The earnings effect of education at community colleges." *Contemporary Economic Policy* 28 (1): 36-51.

Mincer, Jacob. 1974. "Progress in human capital analysis of the distribution of earnings." NBER Working Paper 0053.

Moore, Colleen, and Nancy Shulock. 2007. *Beyond the open door: Increasing student success in the California community colleges*. Sacramento, CA: Institute for Higher Education Leadership & Policy.

National Center for Education Statistics (NCES). 2012. *Digest of Education Statistics 2011*. NCES 2012-001. Washington, DC: U.S. Department of Education.

National Center for Education Statistics (NCES). 2013. *Integrated postsecondary education data system* (IPEDS) [Data file]. Washington, DC: U.S. Department of Education.

Nutting, Andrew W. 2004. "Time-of-transfer and the outcomes of attending a four-year college: evidence from SUNY." CHERI Working Paper #54. http://digitalcommons.ilr.cornell.edu/student/9/

Nutting, Andrew W. 2008. "Costs of attendance and the educational programs of first-time community college students." *Economics of Education Review* 27 (4): 450-9.

Nutting, Andrew W. 2011. "Community college transfer students' probabilities of Baccalaureate receipt as a function of their prevalence in four-year colleges and departments." *Education Economics* 19 (1): 65-87.

Rouse, Cecilia. 1995. "Democratization or diversion? The effect of community colleges on educational attainment." *Journal of Business and Economic Statistics* 13 (2): 217-24.

Rumberger, Russell W., and Scott L Thomas. 1993. "The economic returns to college major, quality and performance: A multilevel analysis of recent graduates." *Economics of Education Review* 12 (1): 1-19.

Sandy, Jonathan, Arturo Gonzalez, and Michael J. Hilmer. 2006. "Alternative paths to college completion: Effect of attending a 2-year school on the probability of completing a 4-year degree. *Economics of Education Review* 25, (5): 463-71.

Stock, James. H., and Motohiro Yogo. 2005. "Testing for weak instruments in linear IV regression." In *Identification and Inference for Econometric Models: Essays in Honor of Thomas Rothenberg*, edited by Donald W. K. Andrews and James H. Stock, 80–108. New York: Cambridge University Press.

Thomas, Scott L. 2000. "Deferred costs and economic returns to college major, quality, and performance." *Research in Higher Education* 41, No. 3: 281-313.

Endnotes

1. Although the basic model assumes the student does not earn any income during college, foregone earnings may simply consist of the decreased earnings resulting from working students cutting back hours or choosing more flexible and lower

paying positions during college. In addition, the direct tuition costs can be incurred during four years a student attends college or be spread out over the time via repayment of student loans.

2. Courses that are neither valued by labor markets, nor necessary for further studies could be required by universities as a result of the institution's political economy. Faculty in these particular disciplines could be capturing economic rents by requiring students to take these courses.
3. Adelman (2006) and Long and Kurlaender (2008) use different windows for examining time to completion, because they used different data sets.
4. For students with only an ACT score, B&B survey converts the ACT score into an equivalent SAT score.
5. The models are estimated using STATA's ivreg and ivprobit commands.
6. The sample used for all regressions excluded observations that had missing data for any of the variables used in any of the regressions and for students that reported no earned income one year following graduation. Given that B&B surveyed students one year after graduation, we excluded graduates reporting zero income under the assumption that these students had either delayed entering the labor force or were continuing their education. The most common factor that excluded observations from our sample were missing observations for family income and test scores.
7. NCES prohibits researchers using the restricted use B&B data from indicating exact sample sizes. Our sample size was over 3,500 individuals.
8. Bodvarsson and Walker (2004) find the presence of moral hazard in education when parents pay some of the costs of college education. In their paper, they show that the parental support results in significantly more course failures, probationary status, receiving D or F grades, and lower GPA in their 2SLS model.
9. The models are corrected for heteroskedasticity.