DISCUSSION PAPER SERIES

IZA DP No. 2334

The Earnings Effect of Education at Community Colleges

Dave E. Marcotte

September 2006

Forschungsinstitut
zur Zukunft der Arbeit
Institute for the Study
of Labor

The Earnings Effect of Education at Community Colleges

Dave E. Marcotte
University of Maryland Baltimore County
and IZA Bonn

Discussion Paper No. 2334
September 2006

IZA

P.O. Box 7240
53072 Bonn
Germany

Phone: +49-228-3894-0
Fax: +49-228-3894-180
E-mail: iza@iza.org

IZA Discussion Paper No. 2334
September 2006

ABSTRACT

The Earnings Effect of Education at Community Colleges

In this paper, I make use of data from the 2000 follow-up of the National Education Longitudinal Survey (NELS) post-secondary education transcript files to extend what is known about the value of education at community colleges. I examine the effects of enrollment in community colleges on students' subsequent earnings. I estimate the effects of credits earned separate from credentials because community colleges are often used as a means for students to engage in study not necessarily leading to a degree or certificate. I find consistent evidence of wage and salary effects of both credits and degrees, especially for women. There is no substantial evidence that enrollment in vocational rather than academic coursework has a particularly beneficial effect, however.

JEL Classification: I2, J24, J31

Keywords: community college, training, earnings, human capital

Corresponding author:

Dave E. Marcotte
Department of Public Policy
University of Maryland Baltimore County
1000 Hilltop Circle
Baltimore, MD 21250
USA
E-mail: marcotte@umbc.edu

Since the early 1980s, the earnings of workers with a post-secondary education have grown substantially, relative to those of their high school educated peers (Autor et al. (2005)). Economists explain the bulk of this increase in relative earnings as the result of shifts in the structure of demand in the labor market that have favored workers with more skill (e.g. Levy and Murnane (1992), Bound and Johnson (1992), and Autor et al. (2005)). This explanation resonates with industry groups and policy makers, whose response has been to demand accountability in secondary education, and to encourage high school students (and workers looking to re-tool) to attend college.

While they receive less attention than 4-year institutions, community colleges are one potentially important set of institutions providing access to post-secondary education, among both recent high school graduates, and older workers attempting to upgrade their skills.[1] Nearly 40 percent of all students enrolled in post-secondary education are at two-year institutions.[2] Further, enrollment at two-year institutions has grown relative to enrollment at four-year institutions: In 1970, about 27 percent of all students enrolled in post-secondary education are at two-year institutions.[3]

As enrollment has grown, we have come to learn more about the earnings effects of education at community colleges. But, as with the policy makers, researchers have focused less on enrollment at these institutions than on enrollment at four-year colleges and universities. So, while some work has been done to understand the effect of community colleges on employment

[1] Community colleges are two-year post-secondary institutions that award associate degrees as their highest degrees. This includes junior colleges and community colleges, but not proprietary schools. Here, I will use the terms two-year college and community college synonymously..

[2] National Center for Education Statistics, *Digest of Education Statistics* (2005), Table 168.

[3] National Center for Education Statistics, *Digest of Education Statistics* (2005), Table 169.

and earnings of students, we have much to learn about the role of community colleges in shaping the economic futures of students.[4]

Improving our understanding of the economic returns to community college education is important for several reasons. First, community colleges provide educational opportunities to students who are typically economically disadvantaged, and whose academic preparation is typically not as strong. These are the students most at risk of being left behind by on-going changes in the labor market. Second, community colleges are a principal mechanism for upgrading skills of those already in the workforce, because of their universal admissions policies and flexible courses of study, which include degree programs, certificates, and non-degree courses. Finally, as others have argued, community college enrollment is likely to be particularly amenable to policy intervention, because they enroll a larger share of students affected by state and federal financial aid (Rouse (1994)).

In this paper, I make use of data from the 2000 follow-up of the National Education Longitudinal Survey (NELS) to extend what is known about the value of education at community colleges. I examine the effects of enrollment in community colleges on students' subsequent earnings. My first objective it to estimate the earnings effects of varying levels of credits earned in community colleges, separate from any credentials earned while enrolled. I do so because community colleges are often used as a means for students to engage in study not necessarily leading to a degree or certificate. My second objective is to examine whether credits earned in courses that are principally occupational or vocational provide a different return than

credit hours earned in academic courses.

Below, I briefly describe what is known about the returns to community college education. I then describe the NELS data and the methods employed to assess the value of enrollment and degrees from community colleges. Finally I present my results and discuss their implications.

Community College Education and Economic Outcomes

There has been a substantial amount of research over the past many decades to identify the effect of post-secondary education on earnings and employment. Consistent with the Mincerian model, the evidence supports the view that more schooling leads to higher earnings. Young people have responded to those incentives, enrolling in college after high school in increasing numbers.[5]

The bulk of the work on this topic has focused on the four-year level, despite the substantial level of enrollment in community colleges. While some early papers found that community college education appeared to have little or no positive effect on subsequent earnings (e.g. see Dougherty (1987)), subsequent research has uniformly found substantial positive earnings effects. Using the National Longitudinal Survey Class of 1972 data (NLS-72), Grubb (1993) found that students completing the associate degree earned significantly more that did their high school educated counterparts, while those who did not complete the degree fared no better. Similarly, Grubb (1997), using the Survey of Income and Program Participation (SIPP) data for the various years in the 1980s and in 1990, reported positive earnings effects of sub-

[5] In 1972, about half (49 percent) of all high school completers between the ages 16 to 24 years old enrolled in a two- or four-year college immediately after high school. A generation later, the proportion of young adults in college increased to 63 percent (U.S. Department of Commerce, 2001).

baccalaureate credentials, but very low benefits for those failing to earn a credential or degree.

Kane and Rouse (1995) use data from the NLS-72 and National Longitudinal Survey of the Labor Market Experience of Youth, 1979 (NLSY79), and found that students who attain a baccalaureate degree experience a 10 to 20 percent increase in earnings as compared to an associate degree holder. Additionally, Kane and Rouse found the economic returns to a community college degree to be roughly 15 to 25 percent higher than a high school diploma. They also examined the return to coursework not leading to a degree, at both community colleges and four-year institutions. They found similar returns to such coursework at both types of institutions, with one year's coursework associated with approximately a 5 to 8 percent increase in earnings. Gill and Leigh (1997) found similar results using the NLSY79 data.

Grubb (2002) reviews the research on the returns to sub-baccalaureate degrees and coursework at community colleges not leading to degrees. He reports most estimates find that individuals who complete associate degrees earn about 20 to 30 percent more than high school graduates with estimates for men being somewhat lower while estimates for women are somewhat higher. He also concludes that one year of coursework (without completing a degree) at either a two- or a four-year school increases earnings by about 5 to 10 percent. Returns to certificates are varied and often not measurable, likely because of small sample sizes and small effect sizes.

Marcotte et al. (2005) use the 2000 follow-up of the National Education Longitudinal Survey, to estimate earnings effects of community college education. They estimate that full-time enrollment in a community college increases earnings between 5-8 percent for each year enrolled, even if no degree was received. They find, further, that earning an associate degree

increases earnings by about 15 to 30 percent. Finally, they find limited evidence that students enrolled in occupational areas earn more than those enrolled in academic programs.

While Marcotte et al. (2005) provide evidence that enrollment in community college has a positive earnings effect, that work is limited in an important respect. The authors made use of self-reported information on the timing and intensity of enrollment. Further, they attempt to identify the effect of enrollment in occupational versus academic courses of study using self-reported information on first-declared major. Using such self reported information limits confidence in conclusions about the effect of enrollment not leading to degrees, and the effects of study in vocational or academic areas.

Both of these limitations may be important. Study at community colleges often does not lead to degrees. Using the Integrated Postsecondary Education Data System, Bailey et al. (2006) find that between 10 and 30 percent of community college students earned degrees. Many students enroll in community colleges with the intent to learn a particular skill, not obtain a degree. So, much of the important variation in the "treatment" provided by a community college education is variation in courses, not degrees.

In this paper, I attempt to provide additional insight into the importance of course taking at community colleges for employment outcomes. I do so by using data from the post-secondary transcripts of the NELS cohort, to identify the total number of credit hours completed by students. From these, I estimate the value of credit hours on earning and employment. I also determine the proportion of credit hours taken in vocational versus academic courses, to examine whether taking vocational courses is especially advantageous. There has been a substantial focus on occupational education in community colleges over the past few decades, and the relative

earnings of enrollment in courses with a vocational rather than academic focuses is of special concern (Alfonso et al. (2005)).

Data and Empirical Approach

The NELS follows a nationally representative sample of students who were in the eighth grade in 1988. The original survey included nearly 25,000 students. But, several thousand students were subsequently dropped, due to budget constraints. Of those selected for follow-up, interviews were conducted in 1990, 1992, 1994 and 2000. By 2000, data were collected from 11, 559 of the original sample. In addition to the data collected on these students, the NELS also includes data collected from, parents, teachers and principals.

I restrict my analysis to NELS sample members who completed interviews in all years, and who were not still enrolled in a postsecondary institution in 1999 or at the time of the 2000 interview. I make this latter restriction to ensure that earnings were measured only for those respondents who had completed their education. I also eliminate those who reported earning a graduate or professional degree and those whose only postsecondary enrollment occurred *after* 1994. This was necessary because NELS provides very little information on the nature of enrollments for those who started their postsecondary education after 1994.

The NELS data provide much information about the experiences of this cohort as they left high school in 1992, engaged in post-secondary education, and subsequently entered the labor force. By 2000, the NELS cohort was between the ages of 25 and 27. During the 2000 interview, respondents were asked about their employment experiences, including earnings and occupation.

An important limitation of the NELS data is that respondents were not asked about their total work experience between 1994 and 2000. Work experience is known to affect observed labor market outcomes. Because students with no post-secondary education are likely to have more work experience in the early years after high school graduation, I anticipate that the failure to control for work experience would result in under-estimates of the true returns to post-secondary schooling.

To mitigate this problem, I made use of other information collected in the NELS survey. I divided the period between 1992 and 2000 into two distinct periods: time in school, and time out of school. For the period when a sample member was not in school, I assumed she or he worked the same number of hours that she reported during 1999, the most recent year for which detailed employment information is available. To estimate the work experience of a sample member during the years enrolled in school, I use the detailed employment information collected at the third follow up interview in 1994. At that interview, information on the monthly employment status of each respondent between the 1992 and 1994 interviews was collected. For those enrolled, I observe the number of months worked while enrolled. I then assume that the average annual months worked during this period while enrolled was the same as the average annual months during any enrollment periods following the 1994 interview. I then added the total work experience during all enrolled periods with the work experience in periods not enrolled, to obtain an estimate of each sample member's total work experience, in months.[6] I use

[6]By assuming that work experience during enrollment between 1992 and 1994 is representative of later work experience while enrolled, I may under-estimate such experience if students work more in the later years of their post-secondary education. At the same time, by assuming that the final survey year is representative of post-enrollment experience, I may over-estimate experience during these periods if young workers work more as they age. The net effect of any errors due to these assumptions cannot be ascertained. While a more direct measure of work experience is desirable, none is available.

this measure of work experience, in quadratic form, in all earnings analyses.

To identify the earnings effects of community college education, I estimate a series of models of the following form:

$$\ln w_i = \alpha + X_i\beta_1 + HD_i\beta_2 + CR_i\beta_3 + \varepsilon_i$$

where $\boldsymbol{lnw_i}$ is the natural log of an individual's labor earnings. I estimate models in which earnings are measured as the hourly rate of pay, and models in which I use annual wage and salary earnings during the calendar year 1999, in order to identify whether any effect of post-secondary education is principally on employment or on wages. $\boldsymbol{X_i}$ is a vector of standard demographic controls. $\boldsymbol{HD_i}$ is a vector of dummy variables measuring highest post-secondary degree/credential earned by a respondent. These included a certificate, an associate degree, or a bachelor's degree. $\boldsymbol{CR_i}$ is a measure of the full-time equivalent years of post-secondary education for those who never received a degree or certificate. Because I are able to measure completed degrees and years of post-secondary study among those not earning degrees, I can separately estimate returns to degrees and returns to post-secondary study.

Note that the coefficients on these terms must be interpreted with some care. The coefficients in the vector β_2 measure adjusted differences in earnings for those with post-secondary degrees and credentials compared to those with no post-secondary enrollment. These differences could be due to advantages of enrollment, or to earned degrees.[7] The coefficients in β_3 measure earnings differences associated with various levels of enrollment for those without degrees, and hence reflect only enrollment effects. To the extent degrees confer earnings benefits, one might expect the coefficients, β_2 to exceed the coefficients β_3 multiplied by the

[7] I discuss the role heterogeneity might play in shaping these differences below.

number of credit hours of study necessary for a degree. I test such hypotheses in the empirical section, below.

The difficulty involved in estimating the return to post-secondary degrees and study is controlling for possible unobserved heterogeneity between those who enroll in post-secondary institutions and those who do not, as well as among those completing different levels of post-secondary education. I exploit several features of the NELS data to attempt to control for any potential effects of such heterogeneity. First, I include scores on standardized math and reading tests administered to all respondents while still in high school, to control for any pre-existing differences in academic ability in core subjects. Second, I include measures of parental education to control for differences in the educational environment or expectations at home between respondents who enrolled in post-secondary institutions and those who did not. Third, I include measures of parental income during high school to control for average differences in the economic status of respondents, which might directly affect both educational attainment and later employment and earnings prospects.

Beyond making use of measures available in the data to control for observable differences between respondents, I make use of an additional feature of the NELS to attempt to limit the effect of any remaining unobservable differences. Because the NELS employed a clustered sampling design in which high schools were sampling units, the data contain multiple respondents who attended the same high schools. I make use of this fact, and estimate the returns to education at community colleges and four-year institutions, controlling for high school fixed effects. Because the academic culture of a high school can both affect post-secondary enrollment behavior and eventual economic outcomes, within-high school estimates can provide

a more direct estimate of the earnings effects of post-secondary education.

It is important to recognize that the NELS employed a stratified, clustered probability sampling design (Curtain et al. 2002). As a result, the estimates based on the NELS sample are less variable than if they were based on data from a simple random sample of the same size. This has an important consequence on significance testing because the standard errors will be smaller than expected if not adjusted for the sampling design and, thus increase the probability of a Type I error. Several procedures are available for calculating precise estimates of standard errors for stratified or complex samples. For all analyses reported below, I estimate standard errors that are robust for stratified clustered sampling designs.

Finally, to examine different earnings effects for enrollment in occupational versus academic courses, I make use of the Classification of Instructional Programs - CIP (NCES (2002)). Using the CIP taxonomy, I separate credits earned into two mutually exclusive groups. So, each student's total credits earned are then the sum of academic credits and occupational credits. To ascertain the earnings effect of one type of course-taking over the other, I estimate models in which credits are captured using these two separate measures.

Results

Descriptive Statistics

In Table 1 I present descriptive statistics, for the full NELS sample, and separately by gender. The basic demographic characteristics are not surprising. The sample is nearly equally comprised of men and women. 12 percent of the sample is African American, and 10 percent is Hispanic. Slightly more than one-third of respondents lived in the South, while about a quarter lived in the Midwest, with the remainder equally divided between the Northeast and West. 40

percent of the sample attended high schools in suburban areas, while just fewer than 34 percent attended schools in rural areas and 26 percent attended schools in large cities.

As is clear from the results in Table 1, the majority of the NELS cohort enrolled in some form of post-secondary study, with 66.4 percent of women, and 61.7 percent of men enrolling in post-secondary education. While some form of post-secondary study after high school was the norm, many did not earn an associate or bachelor's degree or credential. Only 30.1 percent of women and 26.5 percent of men earned a bachelor's degree, while 5.5 and 4.5 percent of women and men, respectively, earned an associate degree. Women were more likely to receive a certificate than men (7.7 percent versus 4.5 percent) as their highest credential.

To provide an initial, unconditional assessment of the relationship between a community college education and earnings, in Table 2 I present earnings and employment outcomes for young workers with different levels of enrollment in community colleges, compared to their peers with no education beyond high school. In the first column, I present mean annual wage and salary income among working high school graduates, along with their average hourly rate of pay and the proportion working full-time. In the next columns, I present similar data for workers who enrolled in community colleges overall, and then by the number of credits earned in community college.[8] Clearly, workers who enrolled in a community college earned more annually and hourly, and were more likely to work full-time. Noteworthy, students who enrolled in a very small number of credits look comparable to their high school educated peers. Nonetheless, earnings and wages rise with credits completed.

One explanation for this pattern is that students with more accumulated credits were

8 This excludes students who enrolled in a community college and a 4-year institution.

exposed to more, beneficial learning opportunities. Another explanation is that students with more credits also likely earned certificates and degrees. A third explanation is that these students are fundamentally different than those who completed only a few courses, and it is these differences that explain subsequent earnings. In the analyses that follow, I introduce controls for degrees, separate from credits earned. I also attempt to control for other differences between workers that might affect both their enrollment decisions and earnings.

Multivariate Estimates

To develop a more complete understanding of the economic effects of sub-baccalaureate education, I estimate a series of models to identify the returns to years of credits earned at postsecondary institutions among those not receiving post-secondary credentials, and to highest certificate or degree received among those earning credentials. I present these results in Table 3. In the first column of Table 3, I present estimates of the effect of years of post-secondary credits and degrees from community colleges and four-year institutions on annual earnings for men. I estimate models separately, by gender, because of the different influences that shape the schooling and work decisions of men and women.

Clearly, enrollment in post-secondary education and credentials earned from post-secondary institutions are associated with substantial earnings gains among this group of young men. I estimate that, on average, young men who enrolled in a community or technical college earned approximately 5.1 percent more annually for each year of full-time equivalent coursework completed, even though no degree was obtained.9 This is somewhat lower than the earnings advantage associated with one year of full-time equivalent enrollment in a four-year institution, though this difference is not statistically significant. I report p-values for the test of

differences in the return to a year of credits earned at a sub-baccalaureate and four-year institution at the bottom of the column.

I also estimate sizeable annual earnings advantages for men who obtain post-secondary credentials. I estimate that men who who obtain an associate degrees earn about 12.2 percent more annually ($\beta = 0.115$) than their high school educated peers. I find no significant difference between the average increased yearly earnings associated with two full years of enrollment at a community college (60 credit hours) and the increase attributable to completing an associate degree.[10]. Since most associate degrees require credit hours equivalent to two years of full-time study, this suggests the earnings advantage associated with certificates are not due to the value of the certificate as a credential, but to the value of enrollment and study alone. Similarly, there is no significant difference between Finally, I estimate that those completing bachelor's degrees earn 45.4 percent more annually ($\beta = 0.374$) than their high school educated peers.

In column 2, I present results for the model in which the dependent variable is the hourly wage, rather than annual wage and salary income. There is no evidence of an increase in hourly wages subsequent to earning credit from sub-baccalaureate institutions, without a degree, for men. This suggest that the observed relationship between enrollment in community colleges and labor market earnings is in large part the result of relatively more employment hours for workers who attended community college .

At the same time, I find the magnitude of the estimated returns to the associate degree for men to be very similar, regardless of which measure of labor market earnings is used. I

---

9 To estimate this, I assume that 30 credit hours is equivalent to one year of full-time enrollment

[10]The p-value for the test of this hypothesis is presented in the last row of Table 3.

estimate that men with an associate degree earn an hourly wage that is 13.2 percent higher (β = 0.124) than comparable high school educated peers. So, both in terms of hourly wage rates, and annual earnings, young male workers who complete an associate degree earn substantially more than their peers with a high school degree.

In columns 3 and 4 of Table 3, I present the results of comparable models, estimated for the sample of women who were employed at the time of the 2000 NELS follow-up. In general, I find larger returns to enrollment and degrees from community colleges for young women than for young men. For example, women earn 0.9 percent more per year for each credit earned at a community college. This implies an earnings increase of 1.2 percent for each three-credit course completed. On average, the hourly wage rate for women increases above that earned by high school educated women by 0.32 percent with each credit earned in a community college, a bit less than 1 percent per course completed. It is notable that the earnings effect of credits earned at community colleges are equal to, or higher than, the effect of credits earned at four-year institutions.

Women also earn higher returns on post-secondary degrees. I estimate that women who earn associate degrees earn about 45.8 percent more annually (β = 0.377) than similar high school educated women. Similar to the results for men, the hourly wage effect is smaller (27.3 percent (β = 0.242)), suggesting that for women, too, a major part of the earnings effect of a community college education is to increase work hours. I also estimate a significant earnings effect for certificates. Indeed, I estimate the earnings effect of a certificate for women exceeds the return to an associate degree for men. These differences in the returns to post-secondary education between men and women highlight the need for estimating empirical models

separately by gender.

Beyond practical implications for empirical analyses, these substantial differences in returns to post-secondary education suggest there are important differences in the educational and/or economic experiences of young men and women. One explanation for this pattern is that women who enroll in post secondary education more commonly enroll in programs that provide training for occupations where post-secondary study is particularly important. For example, in the context of community colleges, a common major for women is in nursing or other health fields, where post-secondary study can be important. At the same time, men may be more likely to enroll in occupational programs for which work experience or apprenticeship might be better substitutes, such as electronics or automotive technology.

An alternative explanation for this pattern is that the relatively high returns among women have nothing to do with programs of study, but with non-random selection, *ex post*. The NELS data measures wage outcomes when respondents are in their late 20s. Women with post-secondary education often delay having children until their late 20s, while the age of first birth for women with no postsecondary education is lower.[11] Because women who remain employed are likely to be those for whom the opportunity cost of time devoted to child rearing is relatively high, while these considerations are less important for men. So, among those with post-secondary education, women who remain employed are more likely to be relatively high earning.

In columns 5 through 8 in Table 3, I conduct additional analyses of the effects of

[11]First birth rates for women with high school degrees or less are twice as high as rates for women with a post-secondary education during the early 20s (National Center for Health Statistics (1997)). During the late 20s, rates for women with post-secondary education is twice that of less educated women.

enrollment in and degrees from community colleges on labor market earnings. The results reported in these columns are from models similar to those in the first four columns, except that I now include sets of control variables measuring students' family backgrounds, high school environments, disabilities, and performance in secondary school. To measure family background, I include measures of total family income at the time the child was in the 8th grade, a dummy variable measuring whether one parent had some college education, and a dummy measuring whether one parent had earned a bachelor's degree. To measure secondary school environment, I include separate measures of whether or not the high school a student attended was predominantly white; had more than 20 percent of 10th grade students enrolled in remedial math; or had more than 20 percent of 10th grade students enrolled in remedial reading. I include a dummy variables measuring whether a student attended a private school in the 8th grade. I also include a measure of whether a student's school offered foreign languages in the 8th grade, to attempt to control for resource differences. To measure disabilities, I include dummy variables measuring whether a student's parent reported that he or she was learning disabled, or had an emotional disability. Finally, I include scores on a standardized math and reading tests administered to the NELS sample during the10th grade**.** In Table 3, I present only coefficients on the main variables of interest.

For both men and women, estimates of the returns to post-secondary enrollment and degrees change very little after inclusion of these family, school, and individual characteristics. In fact, the conclusions drawn from the basic results presented in Columns 1-4 are not materially changed by the inclusion of family, school or student controls.

For men, inclusion of the extensive set of controls has virtually no impact on returns to

credits earned in community colleges, or on the returns to an associate degree or certificate earned at a community college. Once the full set of controls is added, 30 credit hours of enrollment in community college is estimated to increase men's earnings by 5.1 percent, identical to the estimate from model 1. The estimated effect on hourly wages is large upon including the full set of controls, but remains statistically insignificant for men. In models 5 and 6, an associate degree is estimated to increase men's earnings by 14.7 percent ($\beta = 0.137$) and hourly wages by 14.9 percent ($\beta = 0.139$).

For women, including these controls has a similar effect. I estimate that a credit hour earned at a community college increases a woman's annual earnings by 0.38 percent (about 1.1 percent per 3-credit course) and hourly wages by 0.25 percent (about 0.75 percent per course). Like the earlier models, upon including the full set of controls I estimate that an associate degree increases a woman's annual salary by 40.2 percent ($\beta = 0.338$) and hourly wages by 19.7 percent ($\beta = 0.18$).

The principal empirical fact resulting from including the full set of family, school, and individual controls is that returns to post-secondary education at both community colleges and four-year institutions are substantial, and do not appear to be an artifact of heterogeneity.

Fixed Effects

As a further test of the role of heterogeneity in driving the results presented in Table 3, I next estimate models that include high school level fixed effects. These models are presented in Table 4, and include all family and individual student-level controls (i.e. they are comparable to models 5-8 in Table 3). By including high school fixed-effects, I obtain estimates of the value of post-secondary education for individuals by comparing their earnings outcomes to those with no

post-secondary education who attended the same high school. This estimation strategy controls for any school or community level characteristics that may affect post-secondary enrollment behavior, as well as economic outcomes.

As is clear in Table 4, the within-school estimates of the effect of community college education are quite comparable to the effects estimated in Table 3. For men, I estimate that compared to other similar young men who attended the same high school, a young man who completed credits equivalent to a full year of study could expect to earn an additional 3.6 percent annually. This is similar to, and not statistically different from the estimate obtained in the comparable specification (Column 5) in Table 3. However, the standard error of the point estimate in the fixed effect is larger, hence the coefficient is no longer significant. The lack of significance here is due to the increase in standard errors associated with within-school estimates that rely on more than 800 high schools. I find virtually identical effects of associate degree receipt on men's annual salary, and hourly wage between the models reported in Table 3, and those that control for high school fixed effects.

For women, I estimate that compared to other young women from the same high school, a young woman who completed a year of FTE study at a community college could expect to earn an additional 9.6 percent annually. This is comparable to the 11.4 percent annual increase estimated from the full model in Table 3. Further, there is no appreciable decline in the effect of an associate degree on annual earnings for women.

The general consistency of the present the estimates across models with and without high school fixed effects increases confidence in the main findings on wage and salary effects of enrollment in and degrees from community colleges for this cohort of young workers.

Employing both the rich set of family, school, and demographic characteristics available in the NELS data, and high school fixed-effects, I often find substantial earnings advantages associated with community college education, especially for those who earn associate degrees, and especially for women.

Academic versus Occupational Credits

I also examine the earnings effects of credits earned in occupational versus academic courses at community colleges. The results of this analysis are presented in Table 5. Again, the models presented in Table 5 are directly comparable to models 5-8 in Table 3. For men, there is no significant effect of either academic or occupational credits earned on annual earnings or hourly wages. Recall that from Tables 3 and 4 the effects of total credit hours on men's earnings was less consistent and weaker than the effects observed for women. That no significant effects of either academic or occupation credits are observed here is likely due, in part, to this small effect size. Another source of the lack of significant finding is the substantial correlation between academic and occupational credits ($r = 0.64$). Most students at community colleges take a mix of academic and occupational courses, so students with more of one, have more of another. This introduces the possibility of multicollinearity, rendering coefficients on collinear variables more likely insignificant.

Similarly, there is weak ability to sort out the impact of academic course-taking from occupational course taking among women. I do find, in column 3 of Table 3, that academic credits increase annual earnings for women (about 1 percent per course ($\beta = 0.0034$)). But this effect does not hold up on hourly wages.

Conclusions

In this paper, I have attempted to advance understanding of the economic benefit of community college education for young Americans. I attempt to identify, separately, the effects of credits and credentials from community colleges. Using these data I find consistent evidence that average wages and salaries for young women and men who enroll in community colleges and those who earn associate degrees are substantially higher than their peers whose education extends no further than high school. The earnings advantage is larger for annual earnings than hourly wages, suggesting much of the earnings differences are due to more hours worked among those who had attended community colleges.

These results hold even after adjusting for a host of family, school, and individual characteristics. It is also true if I base the comparison on students who attended the same high schools, for whom many pre-existing institutional, community and cultural influences would have been similar. I find that the earnings benefits accrue both to those who fail to earn a credential, as well as to those who earn an associate degree. I find less consistent evidence of an earnings benefit due to earning a certificate from a two-year institution.

It is important to recognize that a minority of students in the NELS cohort who started college in a community college earned a certificate or an associate degree by 2000 (Table 1). This analysis suggests that students earn between five and ten percent more for each year of community college, even if they do not earn a degree, although this is not the case for hourly wage returns for men. Men who do not earn a degree get no significant hourly wage benefit from community college.

I do find, consistently, that the most substantial earnings benefits associated with

community college education, and post-secondary education in general, accrue to women. I estimate that the earnings effect of an associate degree for women is more than twice that of men. Women similarly earn larger returns on enrollment not leading to a degree. This pattern is consistent with findings in previous research (e.g. Kane and Rouse (1995)), and may result from real differences in returns due differences in courses of study, or from non-random differences in the manner in which women and men elect to enroll in higher education and work after entering the labor market.

For both women and men, I find that little of the observed wage premium associated with enrollment in and degrees from community college can be attributed to heterogeneity. Once I control for a large number of family, high school and individual characteristics, the estimated returns to education at two- and four-year institutions fall slightly, but remain substantial, while all the basic patterns remain. Also when I estimate models controlling for high school level fixed effects, the resulting point estimates change only negligibly. However, because of the associated increase in standard errors, estimates of the return to community college education for men were no longer significant.

Overall, the basic patterns of economic returns to community college education are generally consistent across models employed here. I view this as evidence of a positive return to community college education. It is important to note that the current estimates of the returns to enrollment in and degrees from community colleges are remarkably similar in magnitude and pattern to the those reported by Kane and Rouse. For example, using the NLSY data, they estimate that earning an associate degree results in an annual earnings increase of 36.1 percent (β = 0.309) for women, and 22.9 percent (β = 0.207) for men. This compares to 40.2 percent (β = 0.338) for women and 17.1 percent (β = 0.137) for men in the most comparable model. Recall

that Kane and Rouse base their estimates on one cohort graduating high school in the early 1970s, and another graduating in the late 1970s and early 1980s.

One interpretation of the similarity between the estimates based on the experiences of the NELS cohort and the earlier estimates based on the experiences of the NLS-72 and NLSY79 cohorts suggest a substantial amount of stability in the markets for which community colleges prepare students. However, these similar point estimates likely mask many important changes both in the community colleges as institutions and in students' experiences. For example, while estimates of returns to education at community colleges is comparable to that observed for the NLS-72 sample, the NELS cohort enrolled in community colleges at a higher rate than did this earlier cohort. Just under a third of the NELS sample enrolled in a community college following high school. Kane and Rouse report a comparable figure of about 20 percent for the NLS-72 sample. By itself, this large increase in the number of students attending community college and the subsequent supply shift in the labor market would be expected to suppress wages for workers with a sub-baccalaureate education.

It is possible that the relative wage advantage associated with community college education remained stable during this period of increasing supply because the growing demand for the skills learned in community colleges offset any effect of the supply shift. An alternative explanation is that during this period, community college education served only to prevent (or limit) the real wage stagnation and decline that their high school educated peers experienced.[12]

The current findings shed some light on one topic of particular interest among those administrators and policy makers, and little light on another. First, it has long been understood

[12] Using NLSY data, Bernhardt et al. (2001) find that the proportion of workers with some college in low paying jobs increased during the 1980s and 1990s, though they make no distinctions about institution type. This raises the possibility that students in community colleges are not better in absolute terms. Rather any growing wage

that many students at community colleges do not earn degrees, rather they take a small number of courses. How one interprets this is not clear. One line of thinking is that this is akin to dropping out. Another is that many students never intend to earn a degree, rather they enroll to take a particular course or set of courses they find relevant – and it is finishing these courses and learning the skills therein imparted that is the objective.

The findings in this course are suggestive of an interpretation that looks more like this second interpretation. For women, and for men, there is a substantial benefit for taking courses at community colleges. Indeed, there is no additional benefit for receiving degrees other than the benefit associated with the credits earned. So, students may likely make enrollment decisions about marginal courses, not degrees.

Second, the substantial correlation between academic and occupational credits earned makes it difficult to identify whether enrollment in one type of course or the other is particularly advantageous. This is disappointing, since there is substantial interest specifically in vocational education, especially for low income workers. This is evidenced by the 1998 Carl Perkins Vocational and Technical Education Act. Because of this, advancing knowledge about what works for whom is important for guiding policy in this area. The ability of the NELS transcript data to do this is limited.

Nonetheless, the findings illustrate that the labor market returns to education at community colleges are substantial. Moreover, I generally find substantial returns whether students complete degrees or not, although there are some differences between men and women. The positive returns to enrollment not leading to degrees should provide some comfort to community colleges, which regularly face criticism about low graduation rates.

---

premium might be due to declining earnings of the comparison group, those with no education beyond high school.

References

Alfonso, Mariana, Thomas Bailey, and Marc Scott. 2005. "The Educational Outcomes of Occupational Sub-Baccalaureate Students: Evidence from the 1990s" *Economics of Education Review*, v.24, pp. 197-212.

Autor, David, Lawrence Katz, and Melissa Kearney. 2005. "Trends in US Wage Inequality: Re-Assessing the Revisionists," NBER Working Paper #11627. Cambridge, MA.

Bailey, Thomas, Juan Carlos Calcagno, Davis Jenkins, Timothy Leinbach, and Gregory Kienzl. 2006. "Is Student-Right-to-Know All You Should Know: An analysis of community college graduation rates," *Research in Higher Education*, v 47(5).

Bernhardt, Annette, Mark Handcock, Marc Scott, and Martina Morris. 2001. *Divergent Paths: Economic Mobility in the New American Labor Market*. (New York: Russell Sage).

Bound, John, David Jaeger, and Regina Baker. 1995. "Problems with Instrumental Variables Estimation When the Correlation between the Instruments and the Endogenous Explanatory Variable Is Weak," *Journal of the American Statistical Association*, v90, n 430, pp. 443-50.

Bound, John, and George Johnson. 1992. "Changes in the Structure of Wages During the 1980s," *American Economic Review*. June, 82(3), pp. 371-392.

Dougherty, Kevin. 1987. "The Effects of Community College: Aid or Hindrance to Socio-Economic Attainment?" *Sociology of Education*. v60, n2, pp 86-103.

Ellwood, David T. 2001. "The Sputtering Labor Force of the 21st Century: Can Social Policy Help?" NBER working Paper # 8321.

Gill, A. and Duane. Leigh. 1997. "Labor Market Returns to Community Colleges: Evidence for Returning Adults, " *Journal of Human Resources*, v32, n2, pp. 334-53.

Grubb, Norton. 1993. "The Long-Run Effects of Proprietary Schools on Wages and Earnings: Implications for Federal Policy," *Educational Evaluation and Policy Analysis*, v. 15, n. 1, pp. 17-33.

Grubb, Norton. 1997. "The Returns to Education in the Sub-Baccalaureate Labor Market, 1984-1990," *Economics of Education Review*. v16, n3, pp. 231-45.

Grubb, Norton. 2002. "Learning and Earning in the Middle, Part I: National Studies of Pre-baccalaureate Education. *Economics of Education Review*, v. 21, n. 4, pp. 299-321.

Kane, Thomas, and Cecilia Rouse. 1999. "Labor-Market Returns to Two- and Four-Year College,"" *American Economic Review*, v85,n3, June, pp. 600-14.

Kane, Thomas, Cecilia Rouse. 1999. The Community College: Educating Students at the Margin Between College and Work. *Journal of Economic Perspectives,* v. 13, n.1, pp. 63-84.

Levy, Frank S., and Richard J. Murnane. 1992. "U.S. Earnings Levels and Earnings Inequality: A Review of Recent Trends and Proposed Explanations." *Journal of Economic Literature*. Sept. pp. 1332-81.

Marcotte, Dave E., Thomas Bailey, Carey Borkoski, and Greg S. Kienzl. 2005. "The Returns of a Community College Education: Evidence from the National Education Longitudinal Survey," *Educational Evaluation and Policy Analysis*, v 27, n.2, pp 157-176.

Murphy, Kevin M., and Finis Welch. 1992. "The Structure of Wages," *Quarterly Journal of Economics*. February, 107(1), pp. 215-226.

National Center for Education Statistics. 1999. *Digest of Education Statistics.* (Washington DC: US Govt. Printing Office).

National Center for Education Statistics. 2002. *Classification of Instructional Programs – 2000: (NCES 2002-165)* U.S. Department of Education. (Washington, DC: U.S. Government Printing Office).

National Center for Health Statistics. 1997.. *Birth and Fertility Rates by Educational Attainment: United States, 1994. Vol. 45 No. 10 supplement. 20 pp. (PHS) 97-1120*

Phillippe, K.A. 2000. *National Profile of Community Colleges: Trends and Statistics*. (Washington: American Association of Community Colleges).

Rouse, Cecilia E. 1994. "What to Do After College: The Two-Year versus Four-Year College Enrollment Decision," in R. Ehrenberg ed. *Choices and Consequences: Contemporary Issues in Education Policy*. (Ithaca, NY: Cornell University, ILR Press).

Table 1: Descriptive Statistics

	Full Sample		Men		Women	
	Mean	S.E.	Mean	S.E.	Mean	S.E.
Proportion Female	0.49	0.01	-	-	-	-
Proportion with parents attending some college	0.40	0.01	0.40	0.01	0.40	0.01
Proportion with parents earning a Bachelor's Degree	0.25	0.01	0.27	0.01	0.23	0.01
Income (1000)	37.82	0.85	39.07	1.14	36.54	0.96
Work Experience (in months)	71.33	0.44	73.13	0.67	69.27	0.59
Proportion Black	0.12	0.01	0.12	0.02	0.12	0.01
Proportion Hispanic	0.10	0.008	0.09	0.01	0.11	0.01
Proportion Non-native	0.04	0.004	0.05	0.006	0.04	0.004
Proportion attending high school in a suburban location	0.40	0.02	0.39	0.02	0.41	0.005
Proportion attending high school in an urban location	0.26	0.02	0.27	0.02	0.25	0.02
Proportion attending high school in a rural location	0.34	0.02	0.34	0.02	0.34	0.02
Proportion living in the South	0.37	0.01	0.38	0.016	0.38	0.014
Proportion living in the Northeast	0.19	0.01	0.20	0.013	0.19	0.012
Proportion living in the West	0.18	0.01	0.18	0.016	0.17	0.01
Proportion living in the Midwest	0.26	0.01	0.25	0.013	0.26	0.012
Proportion of High School Dropouts	0.11	0.009	0.10	0.014	0.11	0.01
Proportion with GED	0.08	0.006	0.07	0.006	0.08	0.006
Post-Secondary Education						
Degrees						
Proportion Earning Certificate	0.06	0.005	0.05	0.007	0.08	0.007
Proportion Earning Associate Degree	0.05	0.003	0.04	0.004	0.05	0.005
Proportion Earning Bachelor's Degree	0.28	0.01	0.27	0.013	0.30	0.012

Table 2: Employment and Earnings for Community College Students, Compared to H.S. Graduates

	High Shool Graduates	Community College Students[a]			
		All	12 Credits or less	13-48 Credits	>48 Credits
Wages & Salary Income (1999)	$23,619	$27,090	$23,143	$26,304	$29,652
	(503)	(623)	(635)	(742)	(835)
Hourly Rate of Pay	$12.15	$14.28	$13.38	$13.82	$15.04
	(0.30)	(0.38)	(0.86)	(0.49)	(0.43)
Proportion Employed FT (1999)	0.84	0.88	0.88	0.86	0.89
	(0.02)	(0.01)	(0.02)	(0.02)	(0.01)

[a] Includes only those never enrolled in 4-year institutions.

Note: Standard errors in parentheses

Table 3: Effects of Post-Secondary Enrollment and Degrees on Annual Salary and Hourly Wages, by Gender

	Males		Females		Males		Females	
	Dependent Variable		Dependent Variable		Dependent Variable		Dependent Variable	
	Log yearly Salary	Log hourly wage	Log yearly salary	Log hourly wage	Log yearly salary	Log hourly wage	Log yearly salary	Log hourly wage
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Credit Hours Completed at two-year schools	.0017 *	.0003	.004 **	.0032 **	.0017 *	.0012	.0038 **	.0025 **
	(.001)	(.001)	(.0009)	(.0006)	(.001)	(.0008)	(.0009)	(.0006)
Credit Hours Completed at four-year schools	.0023 **	.0019 **	.0046 **	.0023 **	.0028 **	.002 **	.0039 **	.0013 **
	(.0006)	(.006)	(.0006)	(.0005)	(.0006)	(.0006)	(.0007)	(.0006)
Earned Certificate	.055	-.030	.148 **	.111 *	.059	-.025	.184 *	.072
	(.044)	(.051)	(.070)	(.061)	(.046)	(.054)	(.061)	(.058)
Earned Associate Degree	.115 *	.124 *	.377 **	.242 **	.137 *	.139 **	.338 **	.180 **
	(.060)	(.044)	(.059)	(.048)	(.063)	(.051)	(.063)	(.049)
Earned Bachelor's Degree	.374 **	.292 **	.737 **	.447 **	.355 **	.252 **	.654 **	.354 **
	(.041)	(.035)	(.041)	(.027)	(.048)	(.037)	(.045)	(.034)
Experience	.026 **	.019 *	.043 **	.009 **	.024 **	.005	.037 **	0.009 *
	(.007)	(.012)	(.008)	(.004)	(.007)	(.003)	(.007)	(.004)
Experience squared	-.00015 **	-.0001	-.0002 **	-.0000	-.0001 **	-.0000	-.0002 *	-.0000
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Urban (Suburban is reference)	-.002	.070 **	-.072	-.049	-.025	.044	-.092 *	-.061
	(.037)	(.035)	(.041)	(.031)	(.042)	(.041)	(.044)	(.035)
Rural (Suburban is reference)	-.040	-.092 *	-.105 **	-.153 **	-.032	-.056 *	-.096 *	-.149 **
	(.030)	(.034)	(.031)	(.028)	(.031)	(.027)	(.032)	(.029)
Black (Non-Hispanic White is reference)	-.241 **	-.180 *	.019	-.041	-.240 **	-.176 *	.049	.029
	(.061)	(.060)	(.060)	(.034)	(.073)	(.067)	(.070)	(.042)
Hispanic (Non-Hispanic White is reference)	-.009	-.077	.081	.057	-.012	-.071	.107	.087 *
	(.056)	(.057)	(.062)	(.036)	(.060)	(.062)	(.060)	(.041)
Nonnative (Non-Hispanic White is reference)	-.055	-.005	.199 **	.177 **	-.048	-.008	.144	.185 **
	(.063)	(.055)	(.100)	(.057)	(.069)	(.058)	(.107)	(.054)
High School Dropout	-.251 *	-.131	-.378 **	-.214 **	-.236 *	-.114	-.369 *	-.165 *
	(.080)	(.093)	(.107)	(.053)	(.086)	(.094)	(.118)	(.055)
High School GED	-.032	.015	-.140	-.053	-.015	.049	-.022	.011
	(.055)	(.053)	(.084)	(.059)	(.056)	(.053)	(.073)	(.052)
Includes family background, ability and school controls?	No	No	No	No	Yes	Yes	Yes	Yes
Hypothesis Testing (p-values):								
H_0: Two-year credits = Four-year credits	p = .612	p = .216	p = .820	p = .237	p = .298	p = .352	p = .943	p = .153
H_0: 60 Credit Hours at two-year school = A.A.	p = .888	p = .116	p = .090	p = .402	p = .6517	p = .269	p = .122	p = .585
Number of Observations	2,541	2,584	2,465	2,580	2,305	2,334	2,249	2,354
Adjusted R-squared	0.157	0.138	0.364	0.21	0.167	0.146	0.379	0.235

Note: Standard errors in parentheses.

Table 4: High-School Fixed Effects Estimates of Post-Secondary Credits and Degrees on Annual Salary and Hourly Wages, by Gender

	Males		Females	
	Dependent Variable		Dependent Variable	
	Log yearly Salary (1)	Log hourly wage (2)	Log yearly salary (3)	Log hourly wage (4)
Credit Hours Completed at two-year schools	.0012	.0016	.0032 **	.0027 **
	(.0015)	(.0012)	(.0016)	(.0012)
Credit Hours Completed at four-year schools	.0027 **	.0022 **	.0029 **	.0009
	(.0009)	(.0007)	(.0012)	(.001)
Earned Certificate	.147	.086	.265 **	.005
	(.097)	(.076)	(.083)	(.084)
Earned Associate Degree	.163	.178 **	.350 **	.134 **
	(.122)	(.075)	(.083)	(.059)
Earned Bachelor's Degree	.313 **	.253 **	.587 **	.313 **
	(.070)	(.052)	(.069)	(.049)
Experience	.023	.005	.036 **	.014 **
	(.013)	(.006)	(.008)	(.006)
Experience squared	-.0001	-.0000	-.0002 **	-.0001 *
	(.000)	(.000)	(.000)	(000)
Black (Non-Hispanic White is reference)	-.123	-.140 *	.027	-.003
	(.110)	(.083)	(.090)	(.067)
Hispanic (Non-Hispanic White is reference)	.065	-.042	.142	.018
	(.081)	(.085)	(.124)	(.085)
Nonnative (Non-Hispanic White is reference)	.113	.113	.019	.039
	(.092)	(.104)	(.151)	(.066)
High School Dropout	-.188	-.108	-.409 **	-.107
	(.116)	(.084)	(.195)	(.108)
High School GED	-.033	.034	-.208	.026
	(.085)	(.066)	(.123)	(.088)
Includes family background, ability and school controls?	Yes	Yes	Yes	Yes
Number of Observations	2,305	2,334	2,249	2,354
Adjusted R-squared	0.235	0.252	0.471	0.281

Note: Standard errors in parentheses.

*** Significant at the 0.05 level*

** Significant at the 0.10 level*

Table 5: Effects of Community College Academic versus Occupational Credits and Degrees on Annual Salary and Hourly Wages, by Gender

	Males				Females			
	Dependent Variable				Dependent Variable			
	Log yearly Salary (1)		Log hourly wage (2)		Log yearly salary (3)		Log hourly wage (4)	
Academic Credit Hours Completed at two-year schools	.001		.0005		.0034	**	.0013	
	(.001)		(.0009)		(.0013)		(.0011)	
Occupational Credit Hours Completed at two-year schools	.0008		.0007		.0007		.0018	
	(.003)		(.0021)		(.0029)		(.003)	
Earned Certificate	.014		-.057		.103	*	.038	
	(.043)		(.054)		(.062)		(.05984)	
Earned Associate Degree	.089		.103	**	.260	**	.147	**
	(.062)		(.049)		(.062)		(.049)	
Earned Bachelor's Degree	.272	**	.193	**	.548	**	.314	**
	(.042)		(.034)		(.040)		(.031)	
Experience	.025	**	.005		.040	**	.010	**
	(.007)		(.003)		(.007)		(.004)	
Experience squared	-.0001	**	-.0000		-.0002	**	-.0001	*
	(.000)		(.000)		(.000)		(000)	
Black (Non-Hispanic White is reference)	-.248	**	-.183	**	.075		.037	
	(.073)		(.067)		(.070)		(.042)	
Hispanic (Non-Hispanic White is reference)	-.001		-.070		.122	**	.094	**
	(.059)		(.061)		(.060)		(.041)	
Nonnative (Non-Hispanic White is reference)	-.051		-.011		.137		.181	**
	(.071)		(.059)		(.106)		(.054)	
High School Dropout	-.264	**	-.135		-.412	**	-.185	**
	(.085)		(.093)		(.120)		(.055)	
High School GED	-.039		.028		-.066		-.007	
	(.055)		(.052)		(.072)		(.052)	
Includes family background, ability and school controls?	Yes		Yes		Yes		Yes	
Number of Observations	2,320		2,349		2,252		2,357	
Adjusted R-squared	0.159		0.139		0.369		0.228	

Note: Standard errors in parentheses.

*** Significant at the 0.05 level*

** Significant at the 0.10 level*