The Labor-Market Returns for Community College Degrees, Diplomas, and Certificates

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by

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Abstract

This paper provides the first estimates of the labor-market returns to community college diplomas and certificates. Using administrative data from Kentucky, we find earnings returns of around 30 percent for associate's degrees and diplomas for women, compared to returns of closer to 10 to 15 percent for men. Certificates have small positive returns for both women and men. Health is among the fields of study with the highest returns for associate's degrees and diplomas. All awards correspond with higher levels of employment.

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Introduction

Community colleges are an extremely popular form of post-secondary schooling, but they are often overlooked by policy makers, parents, and researchers. For example, in California, over a million students are enrolled in over 100 community colleges, more than are enrolled in the state's public and private four-year institutions. Recent research has focused on the labor market returns for community colleges. Although this research has looked at different aspects such as associate's degrees (Kane and Rouse, 1995; Leigh and Gill, 1997) and the amount of schooling in credits or years (Kane and Rouse, 1995; Jacobson, LaLonde, and Sullivan, 2005a), it has ignored other awards given by community colleges. Community colleges offer a variety of diplomas and certificates to students. Although the colleges emphasize the benefits of these awards, these benefits are based on anecdotal evidence rather than rigorous empirical analysis.

This paper provides the first detailed empirical evidence of the short-run returns to community college diplomas and certificates, as well as providing information on the returns to associate's degrees and credits earned. It uses administrative data from Kentucky, following the cohort of 17 to 60 year-old students who entered the state's community college system during the 2002-2003 school year. We find that short-run returns are almost twice as large for women as for men. On average, women receive nearly 30 percent returns for a degree or diploma, compared to returns of 12 to 17 percent for men. For both men and women, the largest returns for associate's degrees are for awards in health-related fields. The findings for associate's degrees are similar to the findings using decennial Census data for Kentucky. All award levels are associated with higher probabilities of employment.

Relation to Previous Work

Many researchers have studied the relationship between schooling and earnings. Census data show that workers with higher education levels have higher earnings. Card (1999) summarizes the vast literature on the private returns to schooling, with discussions of several of the econometric techniques used to control for potential endogeneity. Straightforward, single-equation estimates of the private returns to schooling find that an additional year of schooling raises yearly earnings between five and ten percent. More complex analyses that use instrumental variables or within-family estimators (such as identical twins) tend to find returns at or above ten percent per year.

The overall rate of return generally assumes that an additional year of schooling has a similar effect on earnings, whether that additional year is the 10th year of schooling or the 15th year of schooling.[1] Other researchers have looked specifically at the types of schooling received, focusing in particular on high school graduation and college degrees. Kane and Rouse (1995) find that an additional year of community college corresponds with an increase of four to seven percent in annual earnings, whereas an additional year at a four-year institution produces a six to nine percent increase in annual earnings. They also find that receiving a college degree raises earnings even when compared to having completed an equivalent amount of schooling (such as four-years) without completing a degree. Marcotte et al. (2005) obtain similar results for community colleges from a more recent cohort of students. Both studies use national data.

Jacobson, LaLonde, and Sullivan (2005a, 2005b) look only at the private returns for community college students. They look at a specific population, workers who have

[1] Card (1999) notes a couple of exceptions to this statement, such as the lower return to the 11th year of schooling.

been “displaced” because their employers have closed down or moved out of the state of Washington. They find that an additional year of community college increases long-term earnings by approximately nine percent for men and 13 percent for women, with slightly lower returns for older workers (age 35 or older). They also show that workers derived more benefits from technical courses and math/science courses and fewer benefits from less technical courses. Most of the increase in annual earnings came from additional hours of work rather than from higher hourly wages.

Another technique for studying private returns is to look at the highest degree received rather than the number of years of schooling. Kane and Rouse (1995) report that an associate’s degree is associated with earnings increases of 24 percent for men and 31 percent for women. Leigh and Gill (1997) find similar returns, and they find that the returns are similar between continuing students and returning students. For comparison, the returns for a bachelor’s degree are 42 percent for men and 51 percent for women (Kane and Rouse, 1995). The comparison group in all cases is a high school graduate.

The current paper contributes to the private returns literature in two ways. First, it provides the first estimates of labor market returns for community college outcomes other than degrees received or credits earned. Community colleges offer a large number of certificates and diplomas, in areas such as radiologic technologist or industrial electrician. Community colleges market these programs as providing valuable, marketable skills, but the labor market returns of these programs are not known. Second, we study the labor market returns for credits and degrees using a large administrative data set on the population of students in one state (Kentucky). Most previous work uses Census data or survey data. Although Jacobson, LaLonde, and Sullivan (2005a, 2005b) use

administrative data for the state of Washington, they only study displaced workers. It is unclear whether these workers are representative of the larger community college population or not.

Data

The administrative data are from the Kentucky Community and Technical College System (KCTCS). They contain several sources. The first source is the student demographic file, with student-level information on demographics such as age, race, and gender. The second source is the course level data. These data contain descriptive information on the type of course as well as the grade and the number of credits received. Data are available for each course taken by each student.

The third data source is the outcome file. These data identify each degree, certificate, and diploma awarded. Certificates are specialized programs where students can demonstrate a specific set of skills to potential employers. Schools offer certificates in several program areas. Diplomas tend to target broader areas than certificates and usually require more credits (often one year or more of full-time studies). For example, KCTCS offers a diploma titled medical office assistant, which requires 44 to 47 credits; a medical administrative certificate from KCTCS requires 33 to 35 credits. More generally, diplomas require between 36 and 68 credits, and certificates typically require between 12 to 36 hours. Around 30 credits is consider a full-time course load for one year.

The outcome data also contain transfer information from the National Student Clearinghouse. The transfer data identify the date and name of transfers to all participating four-year institutions from 2002 to 2006. The National Student

Clearinghouse contains nearly 90 percent of all students, including all four-year schools in Kentucky and most schools in neighboring states.[2]

KCTCS receives quarterly earnings data from the state's unemployment insurance program. Total wages are reported for each person and job. Data are from the first quarter of 2000 through the fourth quarter of 2006. Future drafts will include earnings from 2007 and 2008.

Our focus is on the cohort of students who started at KCTCS from summer 2002 to spring 2003. For evaluating the private returns to KCTCS, we exclude students who are in correctional institutions, less than 17 years old as of June 1, 2002, more than 60 years old as of June 1, 2002, or transferred to a four-year school. These students are excluded in order to study the labor market returns of individuals most likely to be in the labor market immediately after their KCTCS attendance.

Table 1 contains the descriptive statistics for the KCTCS sample. The average quarterly earnings over the entire period (2000 to 2006) is $7,449 for men and $4,560 for women (in 2006 dollars), illustrating quite a gender disparity in earnings. The average age (as of June 1, 2002) is 28.7 years, and approximately 20 percent of the sample is nonwhite. Over 10 percent of women receive associate's degrees as their highest degree, compared to only five percent for men. The percentage of women receiving diplomas (4.2 percent) is also higher than the percentage for men (3.0 percent), and women have a slightly higher percentage receiving certificates: 5.2 percent for women and 4.7 percent for men. Health is the most popular field of study for women, compared with vocational (and academics) for men.

[2] This information comes from the National Student Clearinghouse webpage (www.studentclearinghouse.org).

Method

The KCTCS database provides detailed information on the cohort of students who entered KCTCS during the 2002-2003 school year. We use these data to estimate the change in earnings for students associated with KCTCS attendance. Specifically, we compare the post-KCTCS earnings with the pre-KCTCS earnings for two groups, those who receive awards and those who do not. The major difference between the two groups is KCTCS awards. In terms of program evaluation, our estimation technique resembles a treatment-on-the treated model. Because we are using administrative data from KCTCS, we are unable to include individuals who did not attend KCTCS.

More formally, we estimate the multivariate regression given in equation (1) to measure the effect of KCTCS attendance on earnings.

(1) $$LOGEARN_{it} = \beta \cdot KCTCS_{it} + \delta \cdot DEMOG_{it} + \lambda \cdot ENROLL_{it} + \eta_i + \tau_t + \varepsilon_{it}.$$

In this equation, *i* denotes a person and *t* denotes a quarter.

LOGEARN is the log earnings for the quarter. Quarters with zero earnings have missing log earnings and are not included in the estimation. The spring semester is assigned a start date of the first quarter and an end date of the second quarter; the summer term is assigned a start date of the second quarter and an end date of the third quarter; and the fall semester is assigned a start date of the third quarter and an end date of the fourth quarter.

The input of interest is the KCTCS outcome. The vector *KCTCS* contains the three dichotomous variables (equal to zero or one): one for having an associate's degree as the highest degree, one for having a diploma as the highest degree, and one for having

a certificate as the highest degree. For each KCTCS outcome (degree, diploma, or certificate), the estimated change in earnings should be interpreted as the change relative to the same person's earnings before she completed the degree. This variable is discussed in more detail below.

DEMOG is a set of demographic variables that change over time. Specifically, the variables are age and age squared (at the start of the quarter), as well as interactions of these two variables with a dichotomous variable for nonwhite.

ENROLL contains four dichotomous variables: the first is equal to one when the individual is attending KCTCS and zero otherwise. This variable accounts for the opportunity cost (in terms of earnings) for students while they attend KCTCS. The second variable is equal to one after the individual has finished attending KCTCS. This variable accounts for any general post-schooling changes in earnings. The third variable is equal to one for the time period two quarters before KCTCS attendance, and the fourth variable is equal to one for the time period one quarter before KCTCS attendance. These two variables control for possible pre-KCTCS dips in earnings shortly before KCTCS attendance. Figure 1 shows earnings patterns relative to KCTCS enrollment. The figure illustrates that an "Ashenfelter dip" seems to occur for award recipients in the two quarters before KCTCS enrollment.[3]

Unlike most studies of labor-market returns to education, we include a set of person fixed effects (η). The person fixed effects, introduced by Jacobson, LaLonde, and Sullivan (2005a, 2005b), capture all person-specific components that are constant over

[3] We do not include additional controls beyond two quarters for two reasons. First, the data show little evidence of earnings declines beyond that period. Second, there are only three different quarters of initial enrollment for our cohort of KCTCS students: summer 2002, fall 2002, and spring 2003. The inclusion of additional pre-KCTCS enrollment controls would be perfectly collinear with our time fixed effects τ.

time, such as race/ethnicity or innate ability. In fact, the fixed effects can be thought of as the overall effect of all these time-invariant person characteristics. All such characteristics are captured in these variables, and they cannot be measured separately. The inclusion of the fixed effects has the advantage of controlling for time-invariant measures of ability and other factors that affect earnings and are correlated with community college schooling. It is a useful, alternative approach to other strategies such as instrumental variables for estimating the causal effect of education on earnings. The limitation of the fixed effects approach is the assumption that the pre- post-KCTCS earnings comparison is similar between students who received an award and students who did not receive an award.

The model contains controls for each quarter (τ). The last component (ε) is the unobservable component of earnings, often called an error term. There are 28 quarters, from the first quarter of 2000 through the last quarter of 2006. Separate equations are estimated for men and women.

Our primary interest is in δ, the coefficient on the three KTCS variables in equation (1). Again, these variables are defined as the highest degree received as of that time period. For individuals who do not receive a degree, diploma, or certificate during our observation period, these three variables are equal to zero in all time periods. For individuals with one of these outcomes, then the variable associated with the highest degree is equal to one after the degree is received, and the other two variables are equal to zero for all time periods. An associate's degree is considered the highest degree offered; a diploma is considered the second highest degree offered; and a certificate is considered the third highest degree offered. For example, a person with a certificate and a diploma

would have a value of one for diploma and a value of zero for associate's degree and for certificate.

As mentioned above, the KCTCS variables are only equal to one in the time periods after which the person has received the degree. In other words, if a person receives an associate's degree in May 2005, then the dichotomous variable for an associate's degree would equal zero for every quarter before May 2005 because the person has not yet received the degree. The associate degree variable is also zero for the period in which the person receives a degree, since the individual has only had the degree for part of the period. In our example, the associate's degree variable would equal zero in the quarter from April to June of 2005. Finally, our example person would have a value of one for the associate's degree variable for each quarter starting with the July to September quarter for 2005. The general strategy is that this highest degree variable is equal to one in quarters when the person has the highest degree for the entire quarter. It is equal to zero for quarters when the person does not have the highest degree for any part of the quarter.

We also estimate several additional specifications, based largely on the research for displaced workers by Jacobson, LaLonde, and Sullivan (2005a, 2005b). They include a variable that allows for short-run changes in earnings in the periods immediately following community college attendance. Specifically, they define the variable as equal to $1/(t-l_i)$ if $t>l_i$ and 0 otherwise, where t is the current time period and l_i is the last time period when enrolled in school. This variable is equal to 1 in the first quarter after leaving school, ½ in the second time period after leaving school, and so on. Because the variable approaches zero in the long-run, it captures any short-run deviation from the

long-run earnings equilibrium. Thus, we interpret this variable as a control for human capital depreciation, so that the KCTCS variables can be interpreted as the effect of human capital accumulation on earnings net of depreciation. In their preferred specification, Jacobson, LaLonde, and Sullivan (2005a, 2005b) also interact this variable with their measure of community college schooling, the number of credits earned (or some derivation of it). We follow their protocol and interact the human capital depreciation variable with the KCTCS variables in some specifications. Finally, we also follow their protocol and estimate additional models where KCTCS attendance is measured by credits earned rather than by the highest degree received.

Results

Table 2 contains the effects of the highest degree received on quarterly earnings. The first three columns are for men and the second three columns are for women. The first and fourth columns contain no controls for short-term earnings deviations. The second and fifth columns contain human capital depreciation (1/(t-l), as described above). The third and sixth columns contain human capital deprecation and its interaction with the three highest degree variables.

The table shows that associate's degrees are associated with large increases in earnings, particularly for women. The gain for women is 25.3 to 30.9 percent depending on the specification. In contrast, the returns for men are less than half that amount, with returns of 12.2 to 13.6 percent. The returns are slightly smaller in the specification that allows for human capital depreciation and its interactions. This result, coupled with the positive coefficient for the interaction term between human capital depreciation and the associate's degree, suggests that individuals receive an immediate boost to earnings from

associate's degrees, but that this boost depreciates over time. In addition to measuring human capital depreciation, such a result is also consistent with a signaling model with employer learning. In other words, the employer initially uses the degree as a signal of ability, but the employer learns the "true" ability of the worker over time.

Women also have higher returns from diplomas than men. The returns to diplomas are nearly as large as those from an associate's degree, nearly 30 percent for women. For men, the returns to diplomas are around 16 percent, somewhat larger than the returns for associate's degrees (around ten percent). This similarity in returns is somewhat unexpected because (as mentioned earlier) associate's degrees typically require an additional 6 to 12 months of coursework. Note that the gender difference in returns cannot be explained by differences in the number of credits earned. For both men and women, the average number of credits earned varies little between individuals earning diplomas and individuals earning associate's degrees.

Certificates have small positive returns for women and men. The returns for both women and men are around four percent. Certificates require the least amount of coursework (usually one year or less of full-time course work), so their lower returns are not surprising.

As illustrated in Table 1, men and women have different fields of study at KCTCS. Therefore, one explanation for the gender differences in returns (Table 2) is that returns vary by fields of study. Table 3 contains the results where the highest education level is divided into six fields: humanities, other academic subjects (i.e. social science and science), business, health, services, and vocational. No students received diplomas or certificates in academic subjects (humanities or otherwise). Except for the highest

degree received variables, the models used to estimate the results in Table 3 are identical to the models used to estimate the results in Table 2.

The table shows that, for both men and women, the highest returns are from associate's degrees in health. The returns are quite large: 55 to 67 percent for women and 38 to 48 percent for men. The returns for associate's degrees in academic subjects other than the humanities are also positive: around 24 percent for women and 17 percent for men. Vocational associate's degrees are associated with higher earnings of 18 percent for women and 12 percent for men, although the finding for women is only statistically significant in column (6) where we include controls for human capital depreciation and its interactions with highest degree. Women receive positive returns of around 14 percent for associate's degrees in business; for men, the result is not statistically different from zero (at 10 percent). The coefficients for associate's degrees in humanities and services fields of study generally are not statistically different from zero at the ten percent level.

Diplomas have mixed effects on earnings. Fewer than 20 men receive diplomas in either business or services, and fewer than 20 women receive diplomas in vocational studies. We do not discuss these coefficients because they are likely driven by small sample sizes. Health-related diplomas are associated with large increases in earnings: 10 to 14 percent for men and nearly 40 percent for women. Vocational diplomas have large, positive effects for men (18 to 19 percent), and services diplomas have sizable, positive effects for women (15 to 18 percent). In contrast, business diplomas have negative effects on earnings for women (around eight percent). Most of these diplomas are related to office administration, a low-paying field.

Certificates also have mixed effects on earnings and, in some cases, small samples sizes. There are not enough business and services certificates for men to produce reliable coefficients. For men, vocational certificates are associated with higher earnings of more than seven percent, whereas health certificates are associated with lower earnings of more than 12 percent. In contrast, women receive higher returns of roughly 12 percent for business-related certificates. The disparity for health certificates is not related to areas of study, as most of the health-related certificates are nursing-related for both men and women.[4]

Most people who attend KCTCS do not receive a degree, diploma, or certificate. In order to study whether KCTCS attendance affects their earnings, we estimate an earnings model where KCTCS attendance is measured by the number of credits earned. Two specifications are used. In the first, credits are constrained to have a linear effect on earnings. In other words, the first credit earned has the same effect as the fiftieth. In the second, the number of credits is divided into several categories, allowing for non-linear effects. For both specifications, the sample is limited to people who have not earned an associate's degree, a diploma, or a certificate.

Table 4 contains regressions using credits as the measure of KCTCS attendance. In the top panel, the measure of credits is simply the number of credits earned. In the bottom panel, the number of credits is divided into six categories: 1 to 5 credits, 6 to 10 credits, 11 to 20 credits, 21 to 35 credits, 36 to 50 credits, and 51 or more credits. Appendix Table 1 contains the frequency of number of credits earned. The first three columns of Table 4 are for men, and the second three columns are for women. The first

[4] One explanation we explored was that women and men receive similar levels of earnings after receiving health-related certificates. However, this explanation is not true: among those individuals who receive health-related certificates, men have higher earnings before and after receiving the certificate.

and fourth columns do not control for human capital depreciation (1/(t-l), as described above). The second and fifth columns control for human capital depreciation. The third and sixth columns contain human capital depreciation and its interaction with the number of credits earned.[5]

The results in the top panel show that the number of credits has a small positive association with earnings of approximately 0.1 to 0.2 percent for each credit earned. Under the assumption that a year's worth of full-time study is 30 credits (although few students achieve that number of credits in a single year), a year of full-time study is associated with earnings gains of four to seven percent for men and two to five percent for women. Similarly, Jacobson, LaLonde, and Sullivan (2005a) find a positive effect of credits earned for displaced workers in the state of Washington.

The results in the bottom panel are mixed. For men, most of the credit levels are not statistically significant; an exception is the positive effect of earning 21 to 35 credits, although the coefficient is not statistically significant in two of three specifications. For women, the workers who completed 36 to 50 credits had the highest returns of six to ten percent. Women with 21 to 35 credits also had an increase in earnings (five to eight percent). A counter-intuitive result that deserves more attention is that women who received one to five credits had higher earnings of three to four percent, whereas women who received six to ten credits had lower earnings of roughly the same amount. Overall, the results in Table 4 suggest that students who attend KCTCS but receive no degree, diploma, or certificate generally receive a positive short-run increase in earnings from the credits earned, particularly for 21 to 50 credits.

[5] We believe there is not sufficient variation in the data to identify human capital depreciation variables for each category of credits, so we only interact the depreciation variable with the total number of credits, even in the specification that includes categorical variables for the number of credits earned.

Our sample contains individuals from ages 17 to 60. We explore whether the earnings returns differ across this wide age group by estimating separate regressions for each age group and sex, where age is measured as of June 1, 2002. Table 5 contains the coefficients and t-statistics for highest degree earned. Returns vary greatly by age, award and sex. For men, the largest returns for all three awards are for teenagers. Returns to an associate's degree are above 20 percent, returns to a diploma are over 30 percent, and returns to a certificate are above 10 percent. There are no positive returns for men older than 30, and in some cases the returns are negative.[6]

For women, the highest returns occur at later ages. The returns for associate's degrees and diplomas are positive and significant for all but one age category. For certificates, the returns are only positive and significant for ages 22-24, 25-29, and 30-34. For all three awards, the largest returns are for ages 22-24: 44.2 percent for associate's degrees, 54.1 percent for diplomas, and 22.9 percent for certificates. Women in the 19 and 20-21 age categories also had returns in excess of 40 percent. Several age groups have returns to diplomas in excess of 30 percent (17, 19, 20-21, 25-29, and 30-34). The positive returns to certificates are concentrated in three age ranges: 22-24, 25-29, and 30-34.

In addition to studying the effect of community college awards on earnings, we also study their impact on employment. Higher earnings are a potential benefit of community colleges. Another potential benefit is increased employment, especially for individuals who, prior to entering KCTCS, face the possibility of losing their jobs. Therefore, we estimate models similar to those in equation (1), except that the dependent variable is now a dichotomous variable for having positive quarterly earnings. We refer

[6] In future work we will investigate the differences by age in returns to employment.

to this variable as employment, although the category of people with no reported earnings includes individuals who are employed in jobs that are not covered by the Kentucky Unemployment Insurance system.

Table 6 contains the regression results for employment. The first three columns contain results for men, and the second three contain results for women. As in earlier tables, the three columns differ in their controls for human capital depreciation. All three awards are associated with higher probabilities of employment for both men and women. The receipt of an Associate's degrees is associated with a ten percent increase for men and a 16 percent increase for women. Diplomas are associated with slightly larger increases for men, around 13 percent, and nearly identical 15 to 16 percent increases for women. This pattern is similar to the earnings results, where earnings returns are nearly as high for diplomas as they are for degrees. Certificates are associated with increased employment probabilities of approximately four percent for men and seven percent for women. Thus, community college awards are associated with higher employment and earnings.

The results in Tables 1 through 6 focus on the cohort of students who entered KCTCS during the 2002-2003 school year. They contain relatively short-run effects of community college outcomes on earnings for a single cohort of students. To see whether the results are representative of community college participants more generally, we estimate the earnings returns to community college for Kentucky residents using the 2000 Census. Table 7 contains earnings regressions for the Census sample of workers aged 20 to 60 (the same age range as the KCTCS sample). There are two specifications in the table: the first includes the variables in Kane and Rouse (1995) that are available in the

Census data, and the second specification also includes marital status. Because Census data contain a single-cross section, we estimate a Mincer-type regressions with one observation per individual rather than a person fixed effects model. We compare individuals with Associate's degrees to individuals with high school degrees (the omitted category), as Census data do include community-college diplomas or certificates.

In the table, long-run returns to an Associate's degree are approximately 30 percent for men and 47 percent for women. The point estimates are noticeably larger than our findings from the KCTCS data: 9 to 11 percent for men and 28 to 33 percent for women. The Census results are also larger than the returns of 24 percent for men and 31 percent for women found in Kane and Rouse (1995) using national data. The Census data have little if any controls for ability bias, so we expect them to be larger. The similarity of the KCTCS results with Kane and Rouse (1995) for women suggests that our short-run earnings results using KCTCS administrative data are reasonable estimates of the general increase in earnings associated with an associate's degree in Kentucky.[7] None of the previous work contains information on diplomas or certificates, and we are the first paper (of which we know) to look at the returns to these community college awards.

Discussion

This paper provides the first rigorous estimates of the short-run earnings returns to the certificates and diplomas offered by community colleges. We study the short-run returns for the cohort of students aged 17 to 60 who entered Kentucky's community college system during the 2002-2003 school year. For these students, Associate's

[7] Kentucky has one of the lowest labor force participation rates for prime-age males in the United States. This fact might explain why our short-run returns form KCTCS data are lower than the long-run returns in Kane and Rouse (1995) for men.

degrees and diplomas have short-run returns around 30 percent for women, compared with returns of 12 to 17 percent for men. Certificates have small positive returns for women and men. For all three awards, the highest returns are for health-related awards. All three awards are associated with higher likelihoods of employment, although – like earnings – the largest increases are for degrees and diplomas.

Our findings suggest that community college attendance has positive returns for students who receive diplomas and certificates, and we support earlier findings on the returns for receiving an associate's degree. Like Jacobson, LaLonde, and Sullivan's (2005a) work for displaced workers in the state of Washington, we find that earning credits at a community college without receiving an award has a positive effect on earnings.

There are several important extensions to this work that are needed. One which we plan to pursue is to add earnings data on additional post-schooling periods in order to consider longer-run earnings and employment returns. Future work should also look in more detail at the possibility of heterogeneous effects across the population. Finally, we would like to see this work extended to different time periods and geographic areas.

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Table 1: Descriptive Statistics, KCTCS Data

	Men		Women	
Variable	Mean	Std. Dev	Mean	Std. Dev
Quarterly Earnings	7449	7321	4560	9901
Age	28.7	11.0	28.7	10.5
Percentage Nonwhite	0.209	0.407	0.210	0.407
Associate's Degree	0.054	0.227	0.107	0.309
Diploma	0.030	0.170	0.042	0.201
Certificate	0.047	0.211	0.052	0.221
Associate's Degree Fields				
Business	0.002	0.045	0.014	0.117
Health	0.007	0.082	0.041	0.196
Humanities	0.011	0.105	0.022	0.143
Other Academics	0.016	0.125	0.017	0.128
Services	0.005	0.068	0.011	0.105
Vocational	0.013	0.114	0.002	0.044
Diploma Fields				
Business	0.0004	0.021	0.007	0.085
Health	0.003	0.056	0.031	0.173
Services	0.001	0.031	0.003	0.050
Vocational	0.025	0.157	0.001	0.032
Certificate Fields				
Business	0.001	0.033	0.006	0.077
Health	0.004	0.062	0.030	0.170
Services	0.001	0.035	0.013	0.112
Vocational	0.041	0.197	0.003	0.054
Number of Students	14,719		17,014	

Note: Earnings are conditional on employment (i.e. observations with zero earnings are excluded).

Table 2: Earnings Returns for Highest Degree Received, KCTCS Data

	Men			Women		
	(1)	(2)	(3)	(4)	(5)	(6)
Associate's Degree	0.133	0.136	0.122	0.296	0.309	0.253
	(8.82)	(9.00)	(7.28)	(25.41)	(26.19)	(19.21)
Diploma	0.158	0.160	0.166	0.280	0.287	0.265
	(8.43)	(8.53)	(8.07)	(17.13)	(17.56)	(14.77)
Certificate	0.043	0.045	0.046	0.041	0.045	0.039
	(2.82)	(2.90)	(2.79)	(2.76)	(3.02)	(2.44)
Human Capital		-0.029	-0.032		-0.086	-0.140
Depreciation		(2.51)	(2.63)		(7.25)	(10.63)
Associate's Degree *			0.080			0.317
Depreciation			(1.85)			(9.88)
Diploma *			-0.036			0.180
Depreciation			(0.63)			(3.60)
Certificate *			-0.010			0.082
Depreciation			(0.20)			(1.78)
Observations	278,400	278,400	278,400	308,431	308,431	308,431

Notes: Absolute values of t-statistics are in parentheses. All models also include demographics, controls for pre-school, in-school, and post-school periods, person fixed effects, and time fixed effects.

Table 3: Earnings Returns for Highest Degree Received by Field of Study, KCTCS Data

	Men			Women		
	(1)	(2)	(3)	(4)	(5)	(6)
Humanities Associate's Degree	-0.037	-0.033	-0.018	-0.031	-0.018	-0.022
	(1.08)	(0.96)	(0.47)	(1.13)	(0.67)	(0.74)
Other Academic Associate's	0.167	0.170	0.171	0.236	0.245	0.234
Degree	(6.33)	(6.43)	(5.82)	(9.21)	(9.55)	(8.30)
Business Associate's Degree	-0.042	-0.038	-0.068	0.141	0.153	0.135
	(0.52)	(0.48)	(0.77)	(4.72)	(5.12)	(3.98)
Health Associate's Degree	0.470	0.476	0.375	0.648	0.667	0.554
	(11.07)	(11.19)	(7.46)	(34.24)	(34.97)	(24.86)
Services Associate's Degree	0.026	0.029	0.048	-0.014	-0.0005	0.021
	(0.52)	(0.58)	(0.87)	(0.39)	(0.01)	(0.50)
Vocational Associate's Degree	0.123	0.125	0.122	0.123	0.130	0.184
	(4.10)	(4.18)	(3.68)	(1.54)	(1.64)	(2.07)
Business Diploma	-0.526	-0.527	-0.552	-0.084	-0.078	-0.074
	(2.78)	(2.78)	(2.73)	(2.28)	(2.13)	(1.85)
Health Diploma	0.139	0.142	0.097	0.390	0.400	0.369
	(2.52)	(2.59)	(1.61)	(20.66)	(21.12)	(17.68)
Services Diploma	-0.028	-0.025	-0.100	0.153	0.161	0.180
	(0.25)	(0.23)	(0.79)	(2.15)	(2.27)	(2.30)
Vocational Diploma	0.175	0.178	0.193	0.075	0.085	0.095
	(8.62)	(8.71)	(8.65)	(0.67)	(0.77)	(0.76)
Business Certificate	0.110	0.112	0.121	0.117	0.124	0.129
	(1.11)	(1.13)	(1.13)	(2.73)	(2.90)	(2.79)
Health Certificate	-0.126	-0.125	-0.122	0.032	0.034	0.023
	(2.34)	(2.31)	(2.12)	(1.62)	(1.74)	(1.12)
Services Certificate	-0.503	-0.502	-0.442	0.029	0.037	0.034
	(5.35)	(5.34)	(4.29)	(0.97)	(1.24)	(1.09)
Vocational Certificate	0.073	0.075	0.074	0.051	0.057	0.051
	(4.46)	(4.54)	(4.17)	(0.76)	(0.85)	(0.71)
Human Capital Depreciation	no	yes	yes	no	yes	yes
Depreciation * Highest Degree	no	no	yes	no	no	yes
Observations	278,400	278,400	278,400	308,431	308,431	308,431

Notes: Absolute values of t-statistics are in parentheses. All models also include demographics, controls for pre-school, in-school, and post-school periods, person fixed effects, time fixed effects, and – where indicated – human capital depreciation terms.

Table 4: Earnings Returns for Credits Earned, KCTCS Data
Excluding Students with Degrees, Diplomas, or Certificates

	Men			Women		
	(1)	(2)	(3)	(4)	(5)	(6)
Linear specification						
Credits	0.0014	0.0015	0.0022	0.0007	0.0011	0.0017
	(4.55)	(4.88)	(6.17)	(2.23)	(3.47)	(4.59)
Human Capital		-0.034	-0.001		-0.097	-0.062
Depreciation		(2.67)	(0.04)		(7.03)	(3.55)
Credits *			-0.003			-0.003
Depreciation			(3.87)			(3.14)
Observations	244,680	244,680	244,680	249,460	249,460	249,460
Non-linear specification						
1 to 5 credits	-0.065	-0.064	-0.064	0.034	0.036	0.036
	(5.65)	(5.56)	(5.57)	(2.76)	(2.86)	(2.89)
6 to 10 credits	-0.014	-0.013	-0.011	-0.037	-0.032	-0.031
	(1.06)	(0.94)	(0.78)	(2.64)	(2.31)	(2.21)
11 to 20 credits	0.013	0.015	0.021	0.001	0.009	0.012
	(0.85)	(1.04)	(1.41)	(0.05)	(0.58)	(0.85)
21 to 35 credits	0.024	0.028	0.041	0.054	0.065	0.075
	(1.43)	(1.66)	(2.36)	(3.35)	(4.01)	(4.48)
36 to 50 credits	0.008	0.014	0.040	0.064	0.081	0.101
	(0.36)	(0.59)	(1.62)	(2.71)	(3.43)	(4.10)
51+ credits	-0.010	-0.003	0.043	-0.002	0.021	0.061
	(0.35)	(0.11)	(1.35)	(0.06)	(0.72)	(1.86)
Human Capital		-0.034	-0.003		-0.094	-0.063
Depreciation		(2.70)	(0.20)		(6.82)	(3.58)
Credits *			-0.003			-0.002
Depreciation			(3.60)			(2.74)
Observations	244,680	244,680	244,680	249,460	249,460	249,460

Notes: Absolute values of t-statistics are in parentheses. All models also include demographics, controls for pre-school, in-school, and post-school periods, the average number of credits earned per quarter (in-school periods only), and person fixed effects, and time fixed effects.

Table 5: Earnings Returns for Highest Degree Received by Age, KCTCS Data

	Men			Women		
	Associate's Degree	Diploma	Certificate	Associate's Degree	Diploma	Certificate
Age 17	0.273	0.141	0.052	0.101	0.386	-0.076
	(3.70)	(1.82)	(0.96)	(2.02)	(4.84)	(1.18)
Age 18	0.258	0.337	0.101	0.345	0.292	0.011
	(5.56)	(6.27)	(2.10)	(9.53)	(4.62)	(0.23)
Age 19	0.388	0.560	0.130	0.440	0.379	0.106
	(4.41)	(6.23)	(2.00)	(6.98)	(4.80)	(1.48)
Age 20 - 21	0.114	0.106	0.048	0.427	0.421	0.075
	(1.53)	(1.39)	(0.62)	(7.29)	(6.49)	(1.42)
Age 22 - 24	0.264	-0.030	0.002	0.442	0.541	0.229
	(4.36)	(0.45)	(0.04)	(10.40)	(9.15)	(4.20)
Age 25 - 29	0.163	0.274	0.091	0.333	0.360	0.125
	(4.54)	(5.04)	(1.86)	(10.10)	(7.53)	(2.48)
Age 30 - 34	0.004	0.106	-0.049	0.298	0.397	0.131
	(0.09)	(1.89)	(1.13)	(8.46)	(8.77)	(3.28)
Age 35 - 39	-0.058	0.036	-0.058	0.286	0.182	0.036
	(1.03)	(0.60)	(1.40)	(7.41)	(3.45)	(0.81)
Age 40 - 49	0.053	-0.135	-0.007	0.042	0.105	-0.076
	(1.56)	(2.81)	(0.20)	(1.41)	(2.84)	(2.37)
Age 50 - 59	0.023	-0.110	-0.207	0.158	-0.186	-0.006
	(0.30)	(1.02)	(2.57)	(2.69)	(2.87)	(0.10)

Notes: Absolute values of t-statistics are in parentheses. All models also include demographics, controls for pre-school, in-school, and post-school periods, person fixed effects, and time fixed effects. Each regression coefficient and t-statistic is from a separate regression.

Table 6: Employment Returns for Highest Degree Received, KCTCS Data

	Men			Women		
	(1)	(2)	(3)	(4)	(5)	(6)
Associate's Degree	0.101	0.092	0.101	0.165	0.155	0.157
	(16.66)	(15.14)	(14.79)	(37.20)	(34.66)	(31.23)
Diploma	0.133	0.127	0.132	0.157	0.151	0.153
	(18.16)	(17.33)	(16.21)	(25.23)	(24.25)	(22.15)
Certificate	0.048	0.044	0.044	0.073	0.070	0.066
	(7.97)	(7.37)	(6.84)	(13.34)	(12.83)	(11.36)
Human Capital		0.077	0.081		0.063	0.063
Depreciation		(15.46)	(15.41)		(13.39)	(12.09)
Associate's Degree *			-0.055			-0.011
Depreciation			(2.91)			(0.79)
Diploma *			-0.034			-0.011
Depreciation			(1.36)			(0.51)
Certificate *			-0.004			0.037
Depreciation			(0.17)			(1.96)
Observations	412,132	412,132	412,132	476,392	476,392	476,392

Notes: Absolute values of t-statistics are in parentheses. All models also include demographics, controls for pre-school, in-school, and post-school periods, person fixed effects, and time fixed effects.

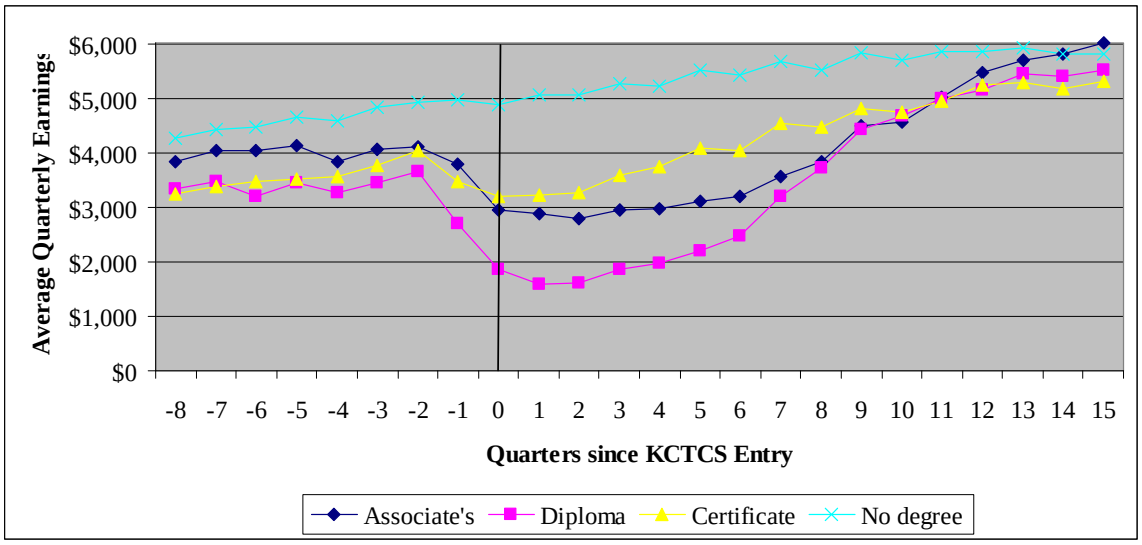
Table 7: Earnings Returns for Highest Degree Received, Census Data

	Men		Women	
	(1)	(2)	(3)	(4)
Less than high school	-0.329	-0.318	-0.338	-0.338
	(29.91)	(29.27)	(22.58)	(22.62)
<1 year college, no degree	0.179	0.172	0.173	0.173
	(11.48)	(11.12)	(10.41)	(10.41)
1+ years of college, no degree	0.210	0.203	0.241	0.241
	(17.23)	(16.88)	(17.59)	(17.58)
Associate's degree	0.310	0.296	0.470	0.471
	(16.47)	(15.92)	(27.07)	(27.11)
Bachelor's degree	0.602	0.582	0.673	0.673
	(48.88)	(47.71)	(45.71)	(45.69)
Master's degree	0.646	0.617	0.762	0.762
	(33.79)	(32.61)	(41.78)	(41.78)
Professional degree	1.061	1.018	1.028	1.029
	(46.80)	(45.36)	(31.68)	(31.70)
Black	-0.263	-0.207	-0.030	-0.036
	(16.05)	(12.71)	(1.73)	(2.08)
Hispanic	-0.191	-0.171	-0.178	-0.178
	(6.05)	(5.47)	(3.64)	(3.64)
Other race/ethnicity	-0.040	-0.029	-0.059	-0.060
	(1.51)	(1.13)	(1.76)	(1.79)
Potential experience	0.052	0.042	0.037	0.038
	(37.21)	(28.13)	(22.54)	(22.20)
Potential experience squarted	-0.001	-0.001	-0.001	-0.001
	(26.30)	(20.67)	(14.26)	(14.33)
Part-time worker	-1.125	-1.080	-1.090	-1.088
	(73.34)	(70.95)	(100.32)	(99.77)
Married		0.321		-0.026
		(28.43)		(1.85)
Widowed, divorced, separated		0.112		-0.016
		(7.69)		(1.01)
Intercept	9.483	9.388	9.151	9.162
	(620.96)	(607.43)	(508.72)	(478.42)
Observations	43,260	43,260	38,080	38,080

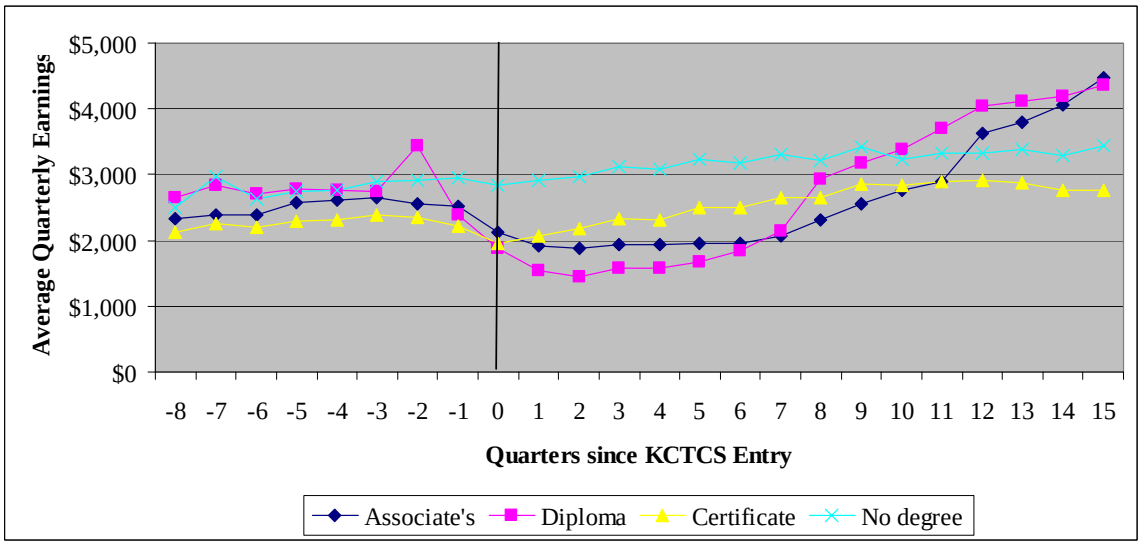
Notes: Absolute values of t-statistics are in parentheses.

Figure 1: Quarterly Earnings by Quarters since KCTCS Entry

Men



Women



Appendix Table 1: Number of Credits Earned
Excluding Students with Degrees, Diplomas, or Certificates

	Men		Women	
	Number	Percentage	Number	Percentage
No Credits	3,215	25.6%	3,382	25.5%
1 to 5 credits	4,871	38.8%	3,820	28.8%
6 to 10 credits	1,826	14.5%	2,187	16.5%
11 to 20 credits	1,357	10.8%	1,920	14.5%
21 to 35 credits	881	7.0%	1,388	10.5%
36 to 50 credits	414	3.3%	579	4.4%
51+ credits	263	2.1%	396	3.0%
TOTAL	12,827		13,672	