Difference of Percentiles: A New Look at the Ability Bias

Paul Lewicki

Department of Economics, UC Berkeley

Senior Honor's Thesis

Advisor: Adam Szeidl

Abstract:

By creating an intuitive model to approximate the high school graduate earnings of returning students, we are able to estimate differences in lifetime earnings between these returning students and the average bachelor's degree recipient for ten subgroups of males and females aged 25 to 64. The results of the model tell us that most females benefit tremendously from returning to college to obtain a bachelor's degree, even if the decision is initially delayed. In contrast, males do not fare as well, failing to overcome foregone wages and the initial hit in earnings that they take upon returning to the labor market. For both sexes, the opportunity costs of foregone wages overshadow the direct costs of tuition and school supplies in determining the financial benefit of returning to college. Although our results show many negative returns, individuals may have non financial reasons for returning. **Keywords:** ability bias, returning students, returns to schooling.

I would like to thank Professor Szeidl for helping me think through the creation of the model used to approximate earnings for returning students and also for giving me feedback on my working drafts. As a returning student I am also grateful to all of the individuals that have helped me along the way. Thank you!
Email: pllewicki@berkeley.edu

1 Introduction

Since it was first introduced in the 1960's by Zvi Griliches[1], the concept of the ability bias has grown to encompass the belief that individuals capable of completing higher education have more innate ability than those unable to continue past completion of high school. It is well understood among economists that college and high school graduates have different levels of ability, so that the income foregone during college by the former is not necessarily equal to observed earnings of the latter (Willis and Rosen 1979). Therefore, this theory proposes that the more talented individual's earnings will be higher then their high school graduate counterparts even without a college degree. However, the ability bias is special in that it is an unobserved phenomenon. We are unable to observe the high school graduate earnings of an individual that chooses to go to college. With this research I hope to contribute to the process of overcoming this obstacle by focusing on how the ability bias affects individuals contemplating a return to college.

Because most of these individuals choose to enter the workforce immediately upon high school graduation they face a tradeoff between their current wage and the expected earnings gain from completing a college degree. However, there are many uncertainties facing these individuals. As we will see, gender and race have a significant effect on the returns of individuals choosing to delay college enrollment. Most females benefit tremendously from returning to college to obtain a bachelor's degree, even if the decision is initially delayed. In contrast, males do not fare as well, failing to overcome foregone wages and the initial hit in earnings that they take upon returning to the labor market. For both sexes, the opportunity costs of foregone wages overshadow the direct costs of tuition and school supplies in determining the financial benefit of returning to college. By examining these and other questions

[1] Griliches published several papers during the 1960's attempting to produce various estimates of the contribution of schooling to economic growth. His work on the ability bias was organized and assembled for his 1977 paper *Estimating the Returns to Schooling: Some Econometric Problems.*

prospective returning students face in their quest to complete higher education, we hope to gain a better understanding of the ability bias and how it affects these individuals.

Although we cannot conduct the ideal experiment in which we calculate the earnings of a high school graduate who did not complete a bachelor's degree, but had the identical ability and motivation of a degree recipient, we will estimate the result using a model that allows us to use academic perseverance as a proxy for ability. Understanding that these calculations are speculative, we will then apply the results to determine an intuitive approximation for the high school graduate earnings percentile of a median returning student. We will then use current government income data to estimate lifetime earnings for these individuals. These lifetime earnings figures will then be compared to the median lifetime earnings a returning student would earn upon completion of a bachelor's degree. To consider how gender and race affect the lifetime earnings and monetary returns from returning to college, we will construct several possible earnings and education scenarios for ten chosen subgroups[2]. We will also use a separate model to calculate the age cut-off for a positive monetary return from returning to college for our ten subgroups. These calculations will demonstrate the impact that opportunity costs and direct costs have on returning students pursuing a bachelor's degree. But before we explore these issues let us see what the literature has to say regarding the ability bias, returning students, and returns to schooling.

2 Literature Review

Human Capital vs Signaling

The economic literature regarding returns to schooling has favored two prominent ways of looking at the subject. Labor economists have favored the Human Capital Model, introduced by

[2] (Male; "All", White, Black, Asian, Hispanic)
(Female; "All", White, Black, Asian, Hispanic)

Theodore Schultz and Gary Becker, which believes that students become more productive with each additional year of schooling by acquiring new skills and experience, thus leading to an increase in earnings (Sweetland 1996). In contrast, micro economists have preferred Spence's Signaling Theory in which they believe additional schooling does not improve productivity as much as it signals to the employer that the student is able to persevere through four years of school and thus has a low propensity to quit once hired by the company. Therefore, it is believed that firms use education choices to draw inferences about unobserved attributes that may be correlated with schooling (Weiss 1995). While Human Capital Theory specifies that continuing education has a direct and visible effect on employment productivity, Signaling Theory is more skeptical of this claim, proposing the existence of the sheepskin effect which shows that earnings tend to have a jump upon completion of twelve and sixteen years of education (Card 1999). Because of its belief that signaling serves to sort workers according to their unobserved abilities, Signaling Theory has become the preferred choice for proponents of the ability bias.

Omitted Variable Bias

Jacob Mincer was responsible for the creating the Mincer Human Capital Earnings Function[3], the first regression equation designed to estimate optimal levels of schooling using the assumption that individuals maximize the present discounted value of lifetime earnings. As economists began to use the Mincer earnings equation to estimate the impact of schooling on wages, they recognized that ability and schooling were likely to be correlated and that measures of ability were either incomplete, or missing from most available data. If ability affects earnings, the estimated return to education will be biased upwards if the omitted variable is not controlled for (Griliches 1977)[4]. Once economists controlled for this omitted variable, they generally agreed that it did place an upward bias on the

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[3] $Log(y) = a + bS + cX + dX^2 + e$; where S is years of completed schooling, X is work experience, and e is the error term.
[4] If $Y=B_0+B_1S+B_2A+u$ then $E[B_1]= B_1+Cov(SA)/varX$

earnings coefficient; however they could not agree on the size of the effect. Some researchers found evidence of significant ability bias, many found evidence of little ability bias while yet others found that the return to education is biased downward (Lang 1993). Card (1999) found a unifying theme in much of the work: "the return to education is not a single parameter in the population, but rather a random variable that may vary with other characteristics of individuals, such as family background, ability, or level of schooling" (p. 1803). Today, the common consensus is that earnings are a function of schooling attained, a constant that depends on ability, other observable characteristics, and an error term.

Twin Studies

Soon after its significance was determined, economists began looking for new ways to test for the ability bias. The twin study by Ashenfelter and Rouse (1998) was able to single out the bias and quantify it using within-family and between-family calculations. By surveying over 700 pairs of identical twins they determined that the within-twin estimate of the return to schooling is lower than the cross sectional estimate by about 30%, suggesting a positive and significant correlation between ability and the level of schooling. The researchers also determined that children's schooling outcomes are very highly correlated with the characteristics of their parents, and in particular with parent's education. Roughly 30% of the observed variation in education among the twins studied is explained by parental education.

Marginal Returns

A substantial amount of research focused on the marginal returns to education has found that the marginal value of a college education is unlikely to be the same for a low ability student as for that of a high ability student (Weisbrod and Karpoff 1968). They suggest that the marginal returns to schooling may be slightly lower for high ability individuals. Ashenfelter and Rouse (1998) point to a review of empirical results that confirms this finding, implying that abler individuals attain more schooling because they face lower marginal costs of schooling, not because of higher marginal benefits. Therefore it would seem that the optimal levels of schooling for individuals with high ability are slightly higher than those of lower ability individuals despite the lower returns.

Challenges of Succeeding As a Returning Student

We now focus on the literature that specifically outlines the challenges returning students face in completing a bachelor's degree. Since these challenges are overcome by very few individuals, it can be argued that those able to meet the challenge have a higher level of ability than those unable to do so. Dougherty (1987) refers to it as a tournament in which the individual must successfully complete a multitude of challenges in order to obtain a bachelor's degree. This process begins with high levels of attrition during the first two years of community college due to a lack of residential facilities, lower academic selectivity, and possible norms against academic success held by friends or family. The reality of community college leads teachers to concentrate on reaching only those that they feel are capable of advancing to the next level. The tournament then continues as the returning student faces the difficulty of the transfer process in an attempt to gain entry into a four-year university. There is evidence that four-year colleges are less willing to take in community college transfers than to pass on their own native students (Dougherty 1987). If able to make it through this trying experience, the returning student must still avoid attrition upon transferring. This means adjusting to a new school in the middle of the college years and surviving the sharp drop in grades that most transfer students face in the first semester or two after transferring. However there is evidence that these individuals have high levels of perseverance. In an interesting finding, Leppel (1984) reports that individuals with less supportive families achieve higher grades than those with more supportive families.

It is also important to look at community colleges because nearly all returning students that complete a bachelor's degree start their journey as community college transfers. As Dougherty (1987) points out, community colleges have become crucial for middle-class and minority students pursuing higher education, providing the possibility of social mobility. Unfortunately, the average community college student, though aspiring to a four-year degree upon entrance, receives neither an associates nor a bachelor's degree and the likelihood of persisting in higher education is negatively influenced by attending a community college (Dougherty 1987). The literature also tells us that returning students are more likely to work while attending school. Sauer (2002) has found that in-school work experience increases wages in the post graduation labor market and makes it easier to get a full-time job. Therefore, he reasons that the return from in-school work experience fully compensates for the loss in earnings due to lower scholastic achievement.

Transfer Same as Native?

Several studies tell us that older returning students outperform the eighteen to twenty-two year old students who continue from high school on several levels of academic success (Leppel 1984 and Hilmer 1999). This is somewhat predictable knowing the tournament that they have just completed and the self selection this creates. Leppel (1984) points out that "Not only is their greater self selection among the returning students, but more importantly, these students are in school because they choose to be" (p. 46). The returning students have had a greater opportunity to see the advantage derived from a higher education and thus are more likely to perceive higher education as beneficial. She also points out that the evidence indicates the average returning student will be more intelligent and harder working than the traditional continuing student.

Although this outperformance exists, it is possible that employers prefer to hirer younger college graduates because their young age makes it easier to mold them to fit the company culture.

Comparing two-year college transfers to non-transfers, two-year college transfers are an average of four and a half years older at graduation (Hilmer 1999). It is also possible that two-year transfers may be penalized in the early post graduation labor market relative to their fellow graduates who never attended two-year colleges. Hillmer (1999) refers to this as an "earnings penalty" that may occur if there is a stigma attached to two-year college attendance relative to four-year college attendance. However, in a later study, Hilmer (2002) found that the quality of the university from which a transfer student graduates has a positive affect on future earnings, while the quality of university initially attended has an insignificant negative effect. This evidence of employers only considering the graduating institution when determining entry-level wages is consistent with Signaling Theory rather than the Human Capital Theory. Hillmer (1999) has also found that two-year transfer students have the lowest average family incomes and high school grades, but the highest average test scores of all college graduates. He suggests that two-year transfers are primarily of two types: those who lack the financial resources to attend a four-year college for four years, and those who are of higher ability but perform poorly in high school and attend a two-year college to improve their academic record.

Earnings Expectations

We conclude our literature review by examining a study conducted by Dominitz and Manski (1994) in which they asked high school students to provide their earnings expectations. Although respondents varied considerably in these expectations, there was a common belief that the returns to a college education are positive and that earnings rise between ages 30 and 40. The respondents also believed that one's own future earnings are uncertain; however they all expected their earnings to increase with age and to increase more should they obtain a bachelor's degree than otherwise. They also share the common assumption of labor economists that the lifetime earnings for college graduates tend to be more steeply sloped than those of high school graduates.

As we have seen, economist's interest in returns to schooling has provided thorough research on the ability bias and returning students. The literature review verifies our original belief that those individuals able to persevere and complete the challenge of returning to college are likely to be of higher ability than the average high school graduate. Therefore we can move forward with our model to determine how this affects the monetary return of our ten subgroups pondering a return to college.

3 Data

NELS:88

To determine the appropriate percentile to use for the high school graduate earnings of the median returning student, we will use the National Education Longitudinal Study of 1988 (NELS:88). This longitudinal study started by surveying a nationally representative sample of eighth-graders in the spring of 1988. Follow-up samples from these respondents were taken in 1990, 1992, 1994, and 2000. The surveys consist of students reporting on an array of topics including: school, work, and home experiences; educational resources and support; the role in education of their parents and peers; neighborhood characteristics; educational and occupational aspirations; and other student perceptions[5].

This study was designed to provide vital trend data about transitions students face as they progress through high school into postsecondary institutions or into the work force. We will first focus on the initial follow-up to the study conducted in 1992, and then move onto the fourth follow-up conducted in 2000. This will give us a representation of what the cohort had accomplished in the twelve years since being enrolled in the eighth grade. By then most of the respondents had been out of high school for nearly eight years and had a chance to complete their college educations. Although the NELS:88 does not provide us with the precise earnings information we need for our percentile calculations, its college enrollment results are essential to the validity of our model. Because of the

[5] National Center For Education Statistics website: http://nces.ed.gov/surveys/nels88/

sample's large size and good representation, we use the results to generalize about the general student population. We will need to use another source of earnings data that can be easily manipulated using our results from the NELS: 88.

Current Population Survey (CPS)

The United States Census Bureau offers a data set that fits our specific requirements. Every month for the past fifty years, they have conducted The Current Population Survey (CPS) to obtain labor force characteristics of the civilian non-institutional population of the United States. The sample is comprised of 2,007 counties and independent cities with coverage in every state and in the District of Columbia[6]. In all, some 72,000 housing units or other living quarters are assigned for interview each month; about 57,000 of them containing approximately 112,000 persons 15 years old and over are interviewed. The respondents of the survey are interviewed to obtain information about the employment status of each member of the household. The CPS then uses these responses to estimate employment, unemployment, earnings, hours of work, and other indicators. These indicators are available for a variety of demographic characteristics including age, gender, race, marital status, and most important to us; educational attainment. Each household is interviewed once a month for four consecutive months one year, and then again for the corresponding time period a year later. This technique allows for month-to-month and year-to-year comparisons at a reasonable cost while minimizing the inconvenience to any one household. The statistics resulting from these questions are intended to update similar information collected once every ten years through the decennial census, and are used by Government policymakers as an important indicator of the state of our nation's economy, as well as for planning and evaluating many government programs.

Every March, the CPS is expanded to provide the usual monthly labor force data, but in addition, also provides supplemental data on work experience, income, noncash benefits, and

[6] United States Census Bureau website: http://www.census.gov/cps/

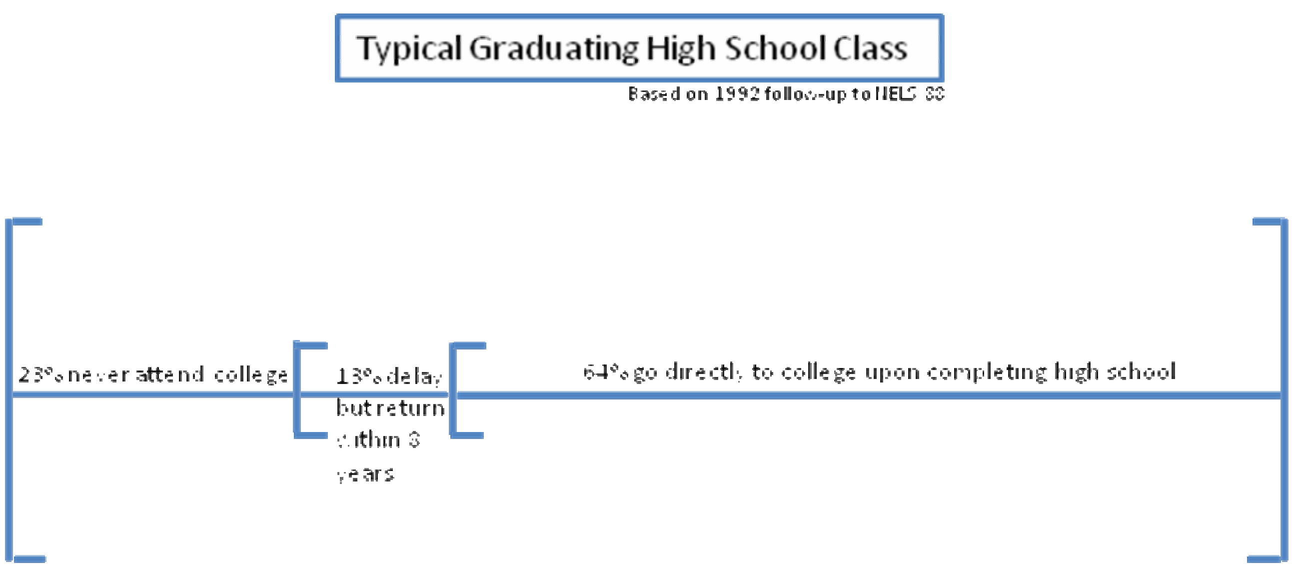
migration. This is known as the Annual Social and Economic Supplement (ASEC). This supplement provides previous year data for earnings, education, gender, and race. For the remainder of our model's calculations we use the 2007 ASEC because this data set provides the most recent earnings information needed, along with the demographic data necessary to make lifetime earnings comparisons for our ten subgroups. Specifically, we use the PINC-03: Educational Attainment--People 25 Years Old and Over, by Total Money Earnings in 2006.

4 Model

Calculating Correct Percentile

This is the foundation of our model and the basis for all further calculations. We must recognize that we are trying to capture an unobserved outcome, so determining an appropriate percentile of earnings to use for potential returning students must be supported by intuition. By allowing us to use academic perseverance as a proxy for ability, the following model enables us to make this approximation.

Figure 1a: Calculating Appropriate Percentile



Based on the 1992 follow-up to the NELS:88, it has been determined that 64% of high school graduates go directly to college, be it two or four-year institutions. Although we are using the NELS:88 for our assumptions, a recent follow-up to a different longitudinal study also confirms this 64% number[7]. However, we are unable to use this more recent longitudinal study because the remaining calculations needed for our model have yet to be observed[8]. Nevertheless, it is encouraging to see that this component of our model has external validity.

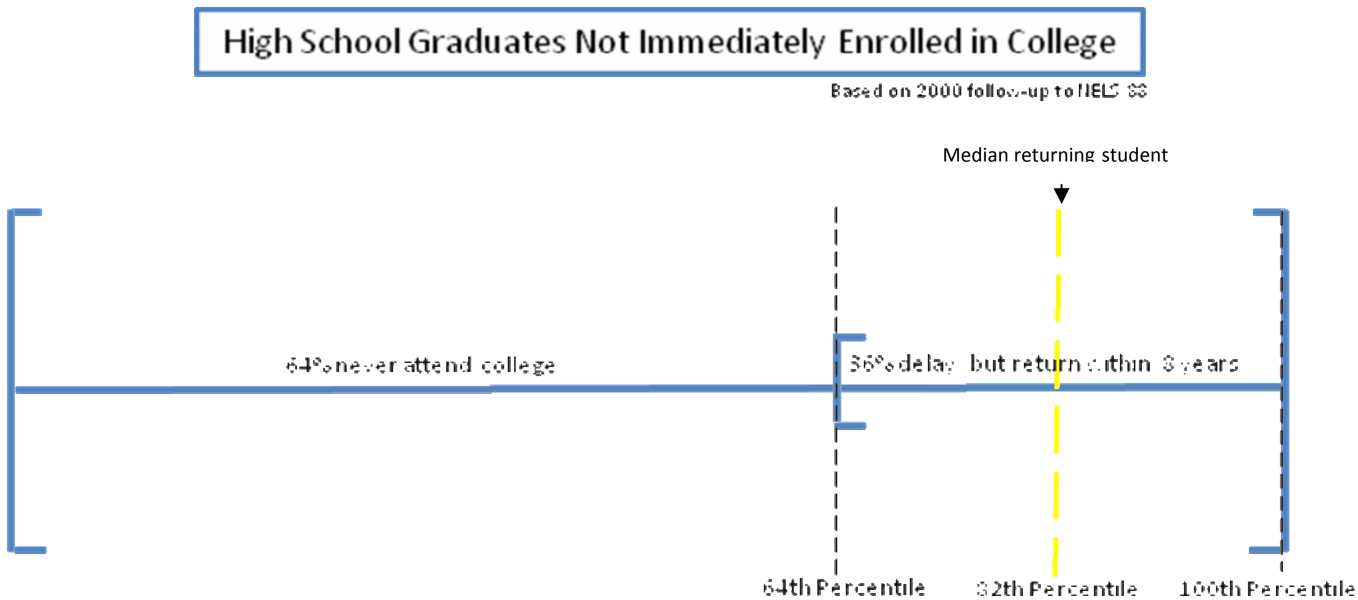
We must now determine how many individuals typically delay college enrollment and attempt to return later in life. The 2000 follow-up to the NELS:88 tells us that 77% of the high school class of 1992 enrolled in a postsecondary institution within eight years of completing high school. This result is similar to the one found by Goodman et al. (2000), in which three quarters (75%) of men in the 1958 cohort go on to get some kind of higher education qualification by the age of 33. Again, the external validity is a good sign and gives us reason to believe our intuition is correct. From this observation we can conclude that 13% of a typical graduating high school class does eventually enroll in a postsecondary institution within about eight years of graduation. Thus leaving 23% of that same graduating high school class, which is assumed, will never attend college. These two subgroups combine to represent 36% of the graduating high school class and will be crucial for the next calculation of our model. To summarize, in a typical graduating high school class, 64% go directly to college, 23% never go to college, and 13% delay their college entry. We will now focus on the remaining 36% of a typical graduating high school class that does not go directly to college upon

[7] 2006 Beginning Postsecondary Students (BPS:2006) follow-up to 2004 National Postsecondary Student Aid Study (NPSAS:04)

[8] The next follow-up will be in 2009, which will have given the high school class of 2004 five years to enroll in college. For now the most recent follow-up is 2006, which is not enough to use for our model.

completing high school. Using this group of individuals we can approximate the earnings percentile for the average high school graduate that has delayed their return to college.

Figure 1b: Calculating Appropriate Percentile



Again, this model uses intuition to justify the assumption that ability can be proxied by academic perseverance. We are assuming that the high school graduates who do not immediately enroll in college, but eventually do return, are drastically different than those students who choose to never enroll in any type of postsecondary institution. For our model, their higher level of perseverance directly translates into higher ability. It is likely that this simplification is not perfect in reality, however, based on the literature we know that students returning to school in pursuit of a bachelor's degree must have high ability to complete the tournament describe by Dougherty (1987). So intuitively, using our assumptions, the subgroup of returning students do possess more ability than their high school graduate counterparts that choose to never enroll in college. We use this assumption as the basis for our reasoning that the 13% of high school graduates that delay college comprise both, the corresponding upper 36% of ability, and the upper 36% of earnings of high school graduates that do not immediately enroll in a postsecondary institution. This implies that using academic perseverance to measure ability places high school graduates that never attend college of any type into the lower 64% of ability, and thus the lower 64% of earnings for the "high school only" CPS category. As shown in Figure 2, taking the median value of those individuals choosing to return to college, we conclude that the earnings of an average high school graduate that has delayed college and is returning to pursue a bachelor's degree represents the 82nd percentile of earnings for the "high school only" category in our CPS data.

The literature review confirmed our suspicions that those students that are able to not only return to college, but also obtain a bachelor's degree are unlike many in the population with regards to ability. Because of this we are confident in using the median earnings of all bachelor's degree holders as a measure of earnings for the average returning student that manages to obtain a degree. We can now turn to the CPS data and focus our analysis on three specific subgroups of earnings. First is the 50th percentile high school graduate $E_{HS}(.50,y)$, next the 82nd percentile high school graduate $E_{HS}(.82,y)$, and finally the 50th percentile bachelor's degree recipient $E_{BS}(.50,y)$[9].

Earnings Differences

Now that we have an intuitive reason for believing that the average high school graduate that has delayed college entry and is returning to pursue a bachelor's degree falls in the 82nd percentile of "high school only" earnings, we can start the process of determining how this affects the return to a bachelor's degree for these prospective students. Because the NELS:88 did not provide specific earnings information for our subgroup of returning students, we will take the percentile information from that study and apply it to the authority on employment and earnings in the U.S., the Current Population Survey. As previously mentioned, we believe that the Law of Large Numbers allows us to

[9] Denotes the annual earnings of a high school graduate (E_{HS}) or bachelor's degree holder (E_{BS}) who is at the p-th percentile and is y years old. For example $E_{BS}(.50,35)$ would be the earnings of a bachelor 's degree holder who is at the 50% percentile and who is 35 years old.

make this transformation without compromising accuracy. The Personal Income (PINC-03) table from the 2007 ASEC supplement provides data for the various demographic factors we will be examining. We begin creating our subgroups by first splitting up the subjects by gender (Male, Female). Next the groups are broken down by race ("All", White, Black, Asian, and Hispanic). The data is then broken down further by age. For the purpose of our research we focus only on the four relevant ten-year age segments that contain data for ages that an individual will work full-time, year round[10]. This brings the total calculations of earnings differentials between $E_{BS}(.50,y)$ and $E_{HS}(.82,y)$ to forty; twenty for each gender. It is now evident that the availability of such a wide demographic picture is one of the benefits of using the CPS and the major reason we chose to use it for our model.

For our calculations we use the "worked full-time, year round" restriction of the CPS to ensure that we are capturing the target population of our research. The PINC-03 table breaks each subgroup's earnings down into $2,500 segments[11]. The percentiles of these earnings are then calculated assuming that the respondents are evenly distributed throughout each individual $2,500 segment. The difference in earnings (D_{EARN}) between $E_{BS}(.50,y)$ and $E_{HS}(.82,y)$ then becomes a simple calculation:

$$\mathbf{D_{EARN} = E_{BS}(.50,y) - E_{HS}(.82,y)}$$

Lifetime Earnings Scenarios

Once we calculate the forty individual differences in earnings between $E_{BS}(.50,y)$ and $E_{HS}(.82,y)$, we can begin the process of calculating lifetime earnings differences for each of our ten subgroups. We accomplish this by summing each individual subgroup's earnings from age 25 to age

[10] Ten-year age segments start at age 25 and continue through age 64. The four age segments used in the model are 25-34, 35-44, 45-54, and 55-64.
[11] (Female, White, 25-34; $0-$2,499, $2,500-$4,999, etc.)

64. Earnings are assumed to be identical for each year of the ten-year age segments, from which they then adjust to the next ten-year age segment of earnings. The following calculations are used:

$$\sum_{y=25}^{y=64} E_{BS}(.50,y) - E_{HS}(.82,y)$$

and

$$\sum_{y=25}^{y=64} [E_{BS}(.50,y) - E_{HS}(.82,y)]/1.03^{(y-24)}$$

For nearly all eighteen scenarios $E_{BS}(.50,y)$ is negative for the first four years due to the cost of tuition. When this is combined with the foregone wages of attending college for four years, the accumulated difference between $E_{BS}(.50,y)$ and $E_{HS}(.82,y)$ begins to show its significance. In fact, as we will see it becomes a barrier to returning to college for many of our subgroups. The calculations for the remaining years assume that the returning student will start employment immediately upon completing a bachelor's degree. Knowing that nearly all returning students will have to first attend a community college before transferring into a four-year institution, we use this to establish our base scenario. This scenario assumes that the individual does not work while attending school, attends community college for two years at a cost of $2,000 per year, and then transfers to a four-year university for an additional two years at a cost of $5,000 per year.

Table 1: Scenarios

Scenarios		Work	Earnings per year	Transfer	Total Cost per year	Total Net Cost
*Base	Don't work, Attend community college for 2 years then transfer to state university (CSU) for 2 years	no	n/a	yes	$2K,$2K,$5K,$5K	$14,000
	Transfer					
1	Don't work, Attend community college for 2 years then transfer to state university (UC) for 2 years	no	n/a	yes	$2K,$2K,$10K,$10K	$24,000

2	Don't work, Attend community college for 2 years then transfer to out-of-state or private university for 2 years	no	n/a	yes	$2K,$2K,$30K,$30K	$64,000
Scenarios		**Work**	**Earnings per year**	**Transfer**	**Total Cost per year**	**Total Net Cost**
3	Work part-time during school year or full-time in summer, Attend community college for 2 years then transfer to state university (CSU) for 2 years	yes	$5K,$5K,$5K,$5K	yes	$2K,$2K,$5K,$5K	($6,000)
4	Work part-time during school year or full-time in summer, Attend community college for 2 years then transfer to state university (UC) for 2 years	yes	$5K,$5K,$5K,$5K	yes	$2K,$2K,$10K,$10K	$4,000
5	Work part-time during school year or full-time in summer, Attend community college for 2 years then transfer to out-of-state or private university for 2 years	yes	$5K,$5K,$5K,$5K	yes	$2K,$2K,$30K,$30K	$44,000
6	Work part-time during school year and full-time in summer, Attend community college for 2 years then transfer to state university (CSU) for 2 years	yes	$10K,$10K,$10K,$10K	yes	$2K,$2K,$5K,$5K	($26,000)
7	Work part-time during school year and full-time in summer, Attend community college for 2 years then transfer to state university (UC) for 2 years	yes	$10K,$10K,$10K,$10K	yes	$2K,$2K,$10K,$10K	($16,000)
8	Work part-time during school year and full-time in summer, Attend community college for 2 years then transfer to out-of-state or private university for 2 years	yes	$10K,$10K,$10K,$10K	yes	$2K,$2K,$30K,$30K	$24,000
	Non-Transfer					
9	Don't work, Attend state university (CSU) for 4 years	no	n/a	no	$5K,$5K,$5K,$5K	$20,000
10	Don't work, Attend state university (UC) for 4 years	no	n/a	no	$10K,$10K,$10K,$10K	$40,000
11	Don't work, Attend out-of-state or private university for 4 years	no	n/a	no	$30K,$30K,$30K,$30K	$120,000
12	Work part-time during school year or full-time in summer, Attend state university (CSU) for 4 years	yes	$5K,$5K,$5K,$5K	no	$5K,$5K,$5K,$5K	0
13	Work part-time during school year or full-time in summer, Attend state university (UC) for 4 years	yes	$5K,$5K,$5K,$5K	no	$10K,$10K,$10K,$10K	$20,000

14	Work part-time during school year or full-time in summer, Attend out-of-state or private university for 4 years	yes	$5K,$5K,$5K,$5K	no	$30K,$30K,$30K,$30K	$100,000

Scenarios		Work	Earnings per year	Transfer	Total Cost per year	Total Net Cost
15	Work part-time during school year and full-time in summer, Attend state university (CSU) for 4 years	yes	$10K,$10K,$10K,$10K	no	$5K,$5K,$5K,$5K	($20,000)
16	Work part-time during school year and full-time in summer, Attend state university (UC) for 4 years	yes	$10K,$10K,$10K,$10K	no	$10K,$10K,$10K,$10K	0
17	Work part-time during school year and full-time in summer, Attend out-of-state or private university for 4 years	yes	$10K,$10K,$10K,$10K	no	$30K,$30K,$30K,$30K	$80,000

From the base scenario we move on to seventeen common scenarios facing returning students to see how they affect the returns to a bachelor's degree for our ten subgroups of males and females. These scenarios manipulate two important variables: the cost of college and earnings while enrolled in college. First there is the cost of college, which includes tuition costs and school supplies such as books. Housing and food costs are not considered in the calculations because individuals would still have to pay for these expenses even if they did not choose to return to school. We use four different cost scenarios. Two years of community college will cost $2,000 per year. This includes $1,000 for tuition fees and another $1,000 for books and supplies[12]. A state University such as the CSU system will cost $5,000 per year[13]. A state University such as the UC system will cost $10,000 per year[14]. If a

[12] Tuition based on $28per unit cost of California community college, 16 units in Fall Semester, 16 units in Spring Semester, and 4 units in Summer Semester. Book and supply costs assume $400 for Fall and Spring Semesters, and $200 for Summer Semester.
[13] This includes $3,797 for tuition and $1,566 for books and supplies <http://www.californiacolleges.edu/finance/how-much-does-college-cost.asp>
[14] This includes $8,062 for tuition and $1,523 for books and supplies <http://www.californiacolleges.edu/finance/how-much-does-college-cost.asp>

student is from out-of-state this will increase tuition costs to $30,000 per year, which is the same as our final scenario, private universities, which also average about $30,000 per year in costs[15]. Because some, but not all, returning students can choose between immediately attending a four-year institution or transferring from a community college, the scenarios may contain one or two of the possible cost scenarios throughout the four years of college. Using the various scenarios the total net costs of college vary from -$26,000 to $120,000.

Next is the option of employment while attending college. The returning student has the option of focusing on their studies and or social life, and thus choosing not to work, which provides no earnings. However, if the student does choose to work while attending school we assume they earn $12.50 per hour and work 10 hours per week for the forty weeks that school is in session. This yields a yearly before tax income of $5,000[16]. This amount of income is about the same if the student works full-time during the summer break earning $12.50 per hour; working 40 hours per week, for 10 weeks[17]. If the student chooses both, working part-time during the school year and full-time during the summer break, they would earn about $10,000 per year before taxes. It is important to note that working ten hours per week can take time away from studying and thus prevent the individual from obtaining a bachelor's degree. Also, we do not consider any scenarios in which an individual, both enrolls in college full-time and works full-time. Although admittedly possible, we do not take this uncommon case into consideration for our study. This model also assumes that individuals will be employed full-time for all years in question. Failing to account for unemployment or even underemployment is another over-simplification of reality because it is likely that individuals with a bachelor's degree do not become or stay employed at the same rates as high school graduates. We will

[15] This includes $25,918 for tuition and $1,728 for books and supplies <http://www.californiacolleges.edu/finance/how-much-does-college-cost.asp>
[16] $12.50 per hour x10 hours per week=$125. $125 per week x 40 weeks=$5,000
[17] $12.50 per hour x40 hours per week=$500. $500 per week x 10 weeks=$5,000

look into this further when discussing the results from our research; however it deserves its own research to better understand its effects.

We also use discounting to see how the time value of money affects each of our subgroup's returns to obtaining a bachelor's degree. We use the long term average inflation rate of three percent (3%) as the discount rate. Obviously individuals with higher discount rates will have lower returns to education and individuals with lower discount rates will have higher returns to education.

Age Cut-off for Returning

Once we have determined the monetary return for each of our ten subgroups for returning to college at the age of twenty-five and their corresponding lifetime earnings differences, we can take this one step further and calculate the age cut-off for obtaining positive monetary returns to higher education. The following formula allows us to calculate the point at which it no longer makes economic sense to return to school:

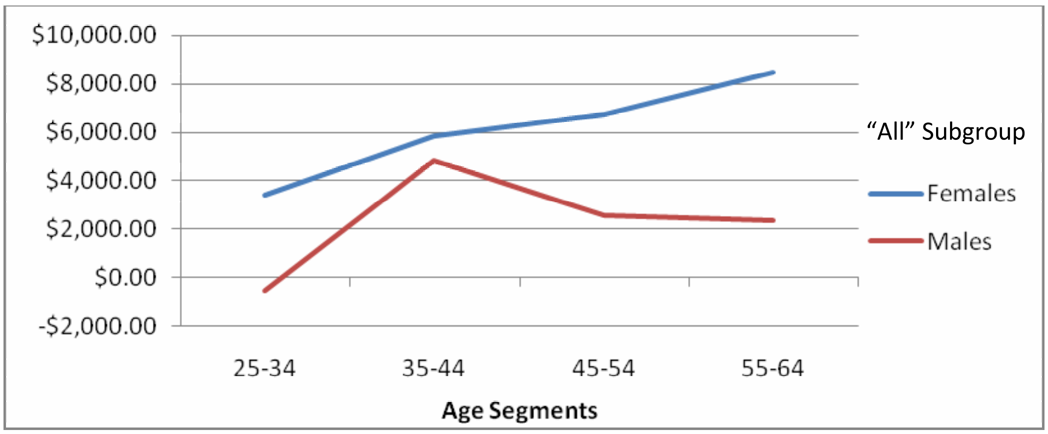
$$C_c=[(T-4)\{E_{BS}(.50,y)\} - T*E_{HS}(.82,y)] \quad \text{where } T= 65 - \text{age}$$

For these calculations we have chosen the base scenario, along with seven other scenarios used in the lifetime earnings model[18]. Since each of the ten subgroups already varies in $E_{BS}(.50,y)$ and $E_{HS}(.82,y)$, the only factor we can manipulate in the equation is the cost of college, C_c. For this reason, we have chosen scenarios that represent a full spectrum of total net costs ranging from -$16,000 to $120,000. It is likely that those subgroups who obtain the majority of their returns to a bachelor's degree late in their working years will have a later age cut-off than those individuals who obtain the majority of their returns early in their working years.

[18] Scenarios: 1,2,4,5,7,11,17

5 Results and Discussion

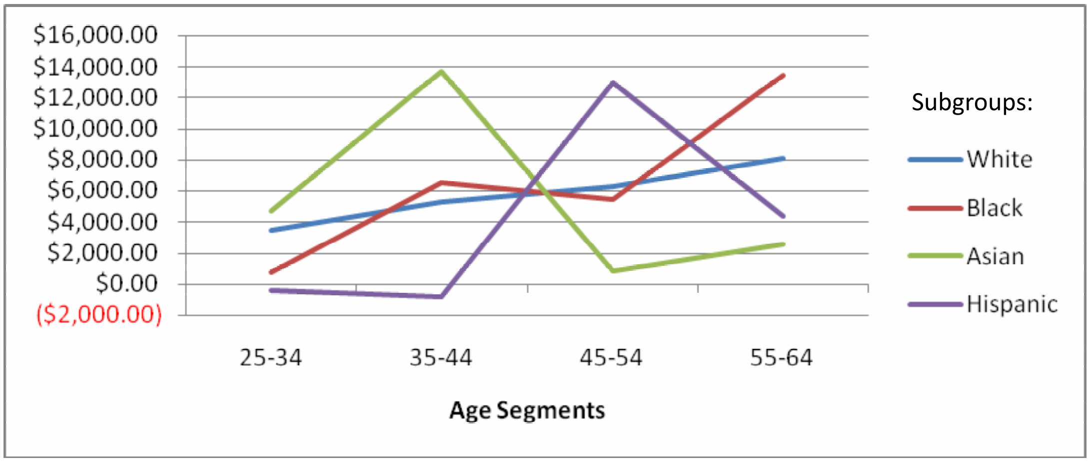
Figure 2: Annual Gain in Earnings From Receiving Bachelor's Degree (Returning Students)



Looking over the results of our analysis, we can begin to answer the questions that began our study. A few observations immediately stand out in the data. First, it appears that males and females do not share equal returns to delaying their college enrollment. Second, there are obvious differences in lifetime earnings among the races examined. Third, the opportunity cost of foregone wages appears to be more important than the direct cost of tuition and school supplies in determining the overall return to college. Finally, the difference between using $E_{HS}(.82,y)$ and $E_{HS}(.50,y)$ for the average returning student results in much smaller gains from returning to college for all of our subgroups.

Females

Figure 3: Annual Gain in Earnings From Receiving Bachelor's Degree (Females)



It is clear that female returning students achieve higher returns from obtaining a bachelor's degree then their male counterparts. From examining the differences in earnings for each of the ten-year age segments we see that the "All" subgroup of females has an initial gain of $3,387 per year. Asian females receive the greatest initial gain from obtaining a bachelor's degree with an earnings difference of $4,741 per year, followed by White females with an initial difference of $3,434 per year. Although Black females have a low relative initial gain of only $785 per year, we will soon see that this increases over time. The only negative initial difference is for Hispanic females, which lose $342 per year during the first ten-year age segment. From there, the gains increase throughout the second, third, and forth ten-year age segments for the "All", White, and Black subgroups of females. All three of these subgroups realize their greatest gains during the final ten-year age segment. The Black subgroup of females show a gain of $13,440 per year during these last ten years, followed by the "All" subgroup with $8,470, and White females with $8,100 per year.

For Asian and Hispanic females, the trend is quite different. Asian females have their greatest gain, $13,672 per year, during the second ten-year age segment, but then earnings differences decline to only $835 per year for the third ten-year age segment, and $2,556 per year for the fourth ten-year age segment. Hispanic females show a decline of $783 per year during the second ten-year segment, on top of the initial loss of $342 per year during the first ten-year age segment. However their earnings differences strongly rebound to $12,979 per year during the third ten-year segment, which more than compensates for the losses from the previous two ten-year age segments. Although not the largest increase of the female subgroups, they also show a gain of $4,446 per year during the final ten-year age segment. Looking closer at the results for females, a typical pattern emerges. Every subgroup of females, except for Hispanics, immediately earns more upon obtaining their bachelor’s degree and then their earnings continue to increase for each subsequent ten-year age segment as the women age; usually reaching its highest level during the fourth ten-year age segment.

We can think of at least two different ways to interpret the results that find females experiencing their largest gains during the last ten-year age segment. First, it is unfortunate that they have to wait so long to realize their gains from schooling. They must be able to work full-time at this late stage of their professional lives to capitalize on the gains from returning to college. This means that they must not only be physically able to work, but also free of personal and family problems that would prevent full-time employment. They must also want to work. This may sound obvious, but if an individual has been working for many years, they may lose interest over time and not be as willing to work. However, a different interpretation points to the late gains for females returning to college as a benefit. It can be viewed positively because women can delay returning to college longer then men without jeopardizing a positive monetary return. If the gains are back-end loaded then women can put off their college education for longer and still benefit from returning to college. Of all the female subgroups, the only exception to this pattern is Asian females, which are similar to males in the fact that their gains from returning to college are front-end loaded.

We now focus on the results of the difference in lifetime earnings for females generated by our eighteen scenarios. There is little surprise that working while attending college improves the overall gain from returning to school. Those individuals that are able to lower their cost of returning to college, whether by working part-time or attending a community college for the first two years and then transferring to a state university will have the highest monetary gains from returning to school. This dampens the effect of foregone wages while enrolled in college, and in most cases the earnings are enough to cover most of the direct costs that we assume in our model. For females, of the ninety individual lifetime earnings calculations, only twenty-two result in a negative return[19]. This encouraging result demonstrates the benefit of obtaining a bachelor's degree for females. For the "All" female subgroup the base scenario provides a total difference in lifetime earnings of $69,355 between $E_{BS}(.50,y)$ and $E_{HS}(.82,y)$. The positive values range from $109,354 in scenario 6 to $3,355 in scenario 17. The only two negative differences in lifetime earnings for "All" females come from scenarios 11 and 14. These happen to be the scenarios in which the individual attends either an out-of-state or private university with associated annual school costs of $30,000. For the White female subgroup the base scenario provides a total difference in lifetime earnings of $54,737. The positive values range from $94,737 in scenario 6 to $4,737 in scenario 2. Similar to the "All" female subgroup, White females have negative differences for scenarios 11 and 14, which involve out-of-state or private universities. However, White females also have a negative difference for scenario 17, which involves the out-of-state and private universities previously mentioned, but allows for part-time employment. For the Black female subgroup the base scenario provides a total difference in lifetime earnings of $100,647. The positive values range from $140,647 in scenario 6, which is the largest of all the 180 individual male and female lifetime earnings differences, to $14,647 in scenario 14. The only negative value, -$5,353, comes from scenario 11. For the Asian female subgroup the base scenario provides a total difference in lifetime earnings of $24,873. The positive values range from $64,873 in scenario 6 to $14,873 in scenarios 1 and 8. Asian females have a total of six negative values ranging from -$1,127 in scenario 10 to -$81,127 in scenario 11. For the Hispanic female subgroup the base scenario provides

[19] 5 subgroups x 18 scenarios

a total difference in lifetime earnings of $497. The positive values range from $40,497 in scenario 6 to $497 in the base scenario. Hispanic females have a total of ten negative values ranging from -$5,503 in scenarios 9 and 13 to -$105,503 in scenario 11. Hispanic females have the most negative values and also the single largest negative value. However, it is not likely that all of the females will be able to work full-time during the last ten-year age segment. This means the gains seen by women are likely skewed upward due to the probability that there will be women unable to capitalize on the earnings gains that come late in their working years.

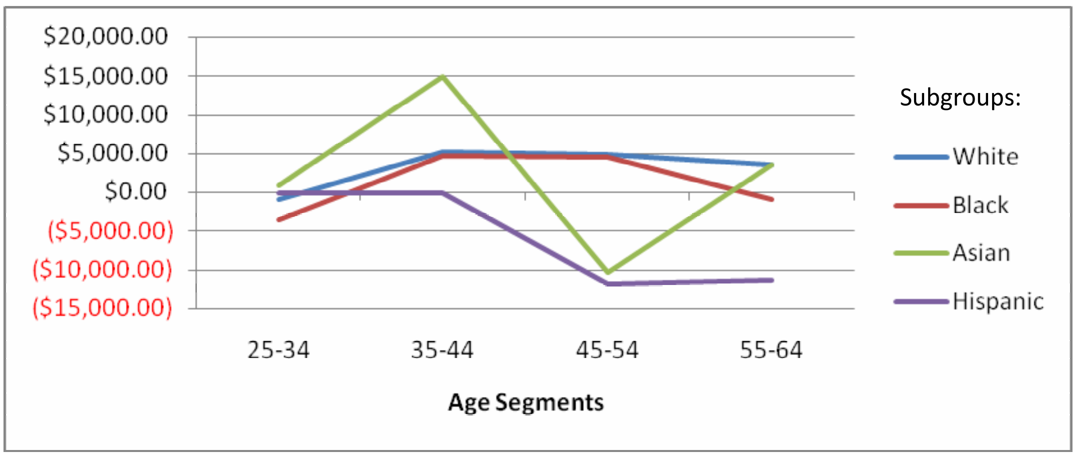
Once these differences in lifetime earnings are discounted, only three of the ninety scenarios for females remain positive. The first of these is the "All" female subgroup under scenario 6, which provides a total gain of $2,421. Next is the Black female subgroup under scenario 6, which provides a total gain of $8,611, followed by Black females under scenario 15, which provides a total gain of $2,871. As mentioned, the remaining discounted results for females are negative. The losses for "All" females range from $3,319 in scenario 15 to $133,418 in scenario 11. Losses for White females range from $5,356 in scenario 6 to $141,195 in scenario 11. Losses for Black females range from $407 in scenario 7 to $127,228 in scenario 11. Losses for Asian females range from $2,018 in scenario 6 to $137,857 in scenario 11. Lastly, losses for Hispanic females range from $44,638 in scenario 6 to $180,477 in scenario 11.

Turning our attention to the age cut-off for returning to college, the benefits from late gains that were first seen in the age segment differences become even more apparent. Because the gains come late, females can delay their return to college until later in life. Of the eight scenarios tested, only scenario 11, which had the highest total net cost of $120,000, failed to provide positive gains from returning to college after age twenty-five. Expectedly, as the total net cost decreased, the age cut-off increased. Under the base scenario the cutoff for "All" females is 36 years old. For White females it drops to 34 years of age. Black females have the highest age cut-off under the base scenario at 44 years of age, and thus can return to employment at age 48 and still have a positive return. Asian females have the lowest age cut-off for the base scenario at 30 years of age, followed by Hispanics at 33. Under all eight scenarios, Black females have the highest age cut-off and Asian females have the lowest. If they pursue the lowest cost option, scenario 7, Black females can delay college until they are fifty years old and still have a positive return. Under this low cost scenario, "All" females can wait until age 41, White females can wait until 39, Asian females can wait until 33, and Hispanic females can delay until they are 43. The "All" female subgroup can delay past twenty-five years of age for seven of the eight scenarios, with an average age cut-off of 33.7 years. White females can delay past twenty-five years of age for six of the eight scenarios, with an average cut-off of 33 years. Black females can delay past age twenty-five for seven of the eight scenarios, with an average cut-off of 41.1 years. Asian females can delay past age twenty-five for four of the eight scenarios, with an average age cut-off of 30.5 years. Finally, Hispanic females can delay past age twenty-five for only three of the eight scenarios, with an average age cut-off of 39.3 years. However, similar to the results from the female lifetime earnings scenarios, once discounted there are only three positive values remaining. They all occur under the lowest total net cost scenario, 7. This scenario allows "All" females to delay until age 32, Black females to delay until age 39, and Asian females to delay until age 26. It is evident that discounting has a dramatic impact on the age-cutoff for returning to college for females.

As we have seen from the difference in ten-year age segments, the difference in lifetime earnings, and the age cut-offs, females benefit tremendously from obtaining a bachelor's degree, even if the decision is initially delayed. The results highlight the importance of helping female returning students, especially Black and White females, obtain their bachelor's degree. They benefit the most from returning to college as seen by their positive overall lifetime earnings differences, as well as their relatively high age cut-offs. Black females appear to gain the most from returning to college. Our analysis tells us that they have the largest nominal lifetime earnings difference, the only positive discounted lifetime earnings difference, and also the highest age cut-off.

Males

Figure 4: Annual Gain in Earnings From Receiving Bachelor's Degree (Males)



From our analysis it appears that males do not benefit as much as females from returning to college. Unlike females, every subgroup of males, except Asian, suffer an initial hit in earnings during the first ten-year age segment. The "All" subgroup of males shows an initial loss of $547 per year for the first ten-year age segment. White males initially lose $1,017 per year, Black males lose $3,525 per year, and Hispanic males lose $208 per year. Asian males buck the trend and show an initial increase of $800 per year in earnings upon receiving a bachelor's degree. However, earnings tend to immediately recover from their initial hit for all subgroups of males. The "All" subgroup of males shows a gain of $4,851 per year during the second ten-year age segment. The gains are even greater for the average White male during the second ten-year age segment at $5,233 per year. Black males have their biggest gain during this ten-year age segment with $4,678 per year. Asian males not only receive an initial gain, but also have the highest overall single ten-year age segment gain of all ten subgroups during the second ten-year age segment. Their gain of $14,890 per year during these years is quite impressive. From their, a typical pattern emerges. The differences in earnings begin to decline over the following ten-year age segments; however they remain positive for most males. The exception to this is male Hispanics which have a negative earnings difference for all four ten-year age segments.

What can explain this pattern of pay cuts for males returning to the job market upon completing their bachelor's degree? It appears that the males are changing professions. They are leaving behind their previous salary to take an entry level position in a new career. This would also support the finding that males have their largest earnings differences during the second ten-year age segment. This is likely the result of upward mobility and subsequent earnings increases to their entry level salary.

We now focus on the results of the difference in lifetime earnings for males generated by our eighteen scenarios. All of the results show negative returns from returning to college, even under the scenarios in which the individual works year round and pays the minimal school costs[20]. For the "All" male subgroup the base scenario provides a total difference in lifetime earnings of -$121,686. There are no positive values, and the negative values range from -$81,686 under scenario 6 to -$227,686 under scenario 11. For White males the base scenario provides a total difference in lifetime earnings of -$88,097. There are no positive values, and the negative values range from -$48,097 under scenario 6 to -$194,097 under scenario 11. For Black males the base scenario provides a total difference in lifetime earnings of -$128,985. There are no positive values, and the negative values range from -$88,985 under scenario 6 to -$234,985 in scenario 11. For Asian males the base scenario provides a total difference in lifetime earnings of -$152,833. There are no positive values, and the negative values range from -$112,833 under scenario 6 to -$258,833 under scenario 11. Lastly, for Hispanic males the

[20] Scenario 6: Work part-time during school year and full-time in summer, Attend community college for 2 years then transfer to state university (CSU) for 2 years. $2000, $2000, $5000, $5000---Total Net Cost (-$26,000).

base scenario provides a total difference in lifetime earnings of -$429,305. This is the largest loss of all the subgroups under the base scenario. Similar to the rest of the male subgroups, there are no positive values and the negative values range from -$389,305 under scenario 6 to -$535,305 under scenario 11 which is the largest negative value for all subgroups under all possible scenarios. The discouraging results tell us that males aged twenty-five years and older will not benefit financially from returning to college to obtain the median earnings of a bachelor's degree recipient.

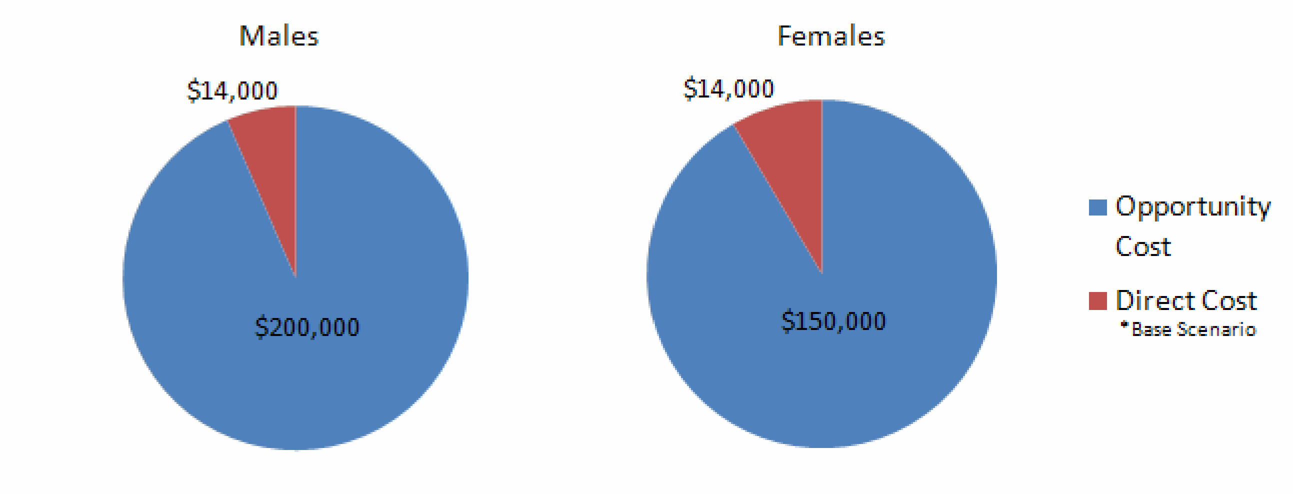
Once discounted, the results become even worse for all of the male subgroups, except for Hispanics. The losses for "All" males range from $115,068 in scenario 6 to $250,907 in scenario 11. Losses for White males range from $101,718 in scenario 6 to $237,557 in scenario 11. Losses for Black males range from $108,573 in scenario 6 to $244,412 in scenario 11. Losses for Asian males range from $122,042 in scenario 6 to $257,881 in scenario 11. Lastly, losses for Hispanic males range from $240,392 in scenario 6 to $376,231 in scenario 11. Since the losses were originally so high for this subgroup, they decreased with discounting.

Turning our attention to the age cut-off for males contemplating a return to college, the difference between sexes becomes even more apparent. Because the gains from returning to college come early for males, delaying their return past age twenty-five only exacerbates the losses. Of the eight scenarios tested, there are none that provide a positive return to any of the subgroups of males. As in the previous calculations, once discounted the losses increase under most scenarios.

Confirming the results from the differences in ten-year age segments and lifetime earnings differences, the age cut-off simulation shows that unlike females, males do not have the same opportunity to delay their return to college until later in life. As we have seen, males never earn enough later in their working years to overcome the combination of foregone wages and the initial hit in earnings that they take. Also, with the earnings differences decreasing over time, males do not show the large increases in earnings that are typical of females. It is clear that males are disadvantaged when it comes to benefiting financially from returning to college.

Direct Costs vs Opportunity Costs

Figure 5: Cost Comparisons (Total Net Cost)



Despite the results showing a financial gain disparity between males and females, there is one key finding that is similar for both sexes. Direct costs such as tuition and school supplies are nowhere near as important as the opportunity costs of foregone wages in determining the financial benefit of returning to college to pursue a bachelor's degree. The hundreds of thousands of dollars in earnings given up to return to college overshadow tuition and other school costs that we used for our calculations. With the average male giving up roughly $50,000 per year while attending college and the average female giving up about $37,500 per year[21], it is no wonder that there are so many negative overall lifetime earnings differences. These foregone wages decrease by working part-time, but the negative differences are never fully overcome for many of our subgroups.

$E_{HS}(.82,y) – E_{HS}(.50,y)$

[21] Calculated by taking the average of the 82nd percentiles for all of the first ten-year age segments (25-34) of males and females.

To address the critics of our assumption that a prospective returning student earns a much higher income than a high school graduate that will never attend college we have also calculated the difference between $E_{HS}(.82,y)$ and $E_{HS}(.50,y)$. We will not get into as much detail with these figures, but felt obliged to include several relevant results from our calculations for those individuals skeptical of the ability bias, and our assumptions. The difference between these two percentiles is quite large. This is evident from Tables 2.1 and 3.1. For "All" females the average difference between $E_{HS}(.82,y)$ and $E_{HS}(.50,y)$ is $13,998 per year. For White females the difference is $13,937 per year. Black females have the smallest difference at $12,757 per year. Asian females have the highest average difference with $16,800 per year. For Hispanic females the difference is $14,464 per year. These differences seem fairly consistent over time and do not vary much between the four ten-year age segments.

For our calculation of lifetime earnings differences between $E_{HS}(.82,y)$ and $E_{HS}(.50,y)$ we chose to focus on only two of the eighteen scenarios; the least expensive option, scenario 6, and the most expensive option, scenario 11. To show how big these differences are, consider that the largest of all lifetime earnings gains for all subgroups was $140,647 for Black females under our $E_{BS}(.50,y)$ minus $E_{HS}(.82,y)$ calculations. For our new calculation, even under the highest cost scenario, all of our female subgroups show large gains. Under this scenario the "All" subgroup of females have a lifetime difference of $523,280. When discounted this falls to $187,530. Under the lowest total net cost scenario the lifetime difference is $669,280. When discounted this falls to $323,369. White females have a difference of $506,208 under the high cost scenario. This falls to $176,725 once discounted. For the low cost scenario the difference is $652,208 for White females. This falls to $312,564 once discounted. Black females have a lifetime earnings difference of $504,914 under the high cost scenario. This falls to $175,837 once discounted. The low cost scenario provides a difference of

$650,914 for Black females. This falls to $311,676 once discounted. Under both the highest and lowest cost scenarios, Asian females have the largest difference in lifetime earnings of all females. Under the high cost scenario the difference is $590,876. This falls to $241,707 when discounted. Under the low cost scenario the difference is $736,876. Once discounted this falls to $377,546. In contrast to Asian females, Hispanic females have the smallest difference in lifetime earnings of all females under the two scenarios. Under the high cost scenario the difference is $473,059. When discounted this falls to $152,450. Under the low cost scenario the difference is $619,059. This falls to $288,289 once discounted.

As expected, the age cut-off for females also increases. We only consider the highest cost scenario for this calculation to highlight how great the return from obtaining a bachelor's degree is, even considering its high costs. The age cut-off for returning to college is very similar for all subgroups of females under this scenario. The "All", White, and Hispanic female subgroups all have an age cut-off of 50 years old. For Black and Asian females this age cut-off rises slightly to 51 years old.

The results for the males are even more surprising. Unlike the results of our $E_{BS}(.50,y)$ minus $E_{HS}(.82,y)$ calculations, the results from the new calculation show that males gain more than females from returning to college to obtain a bachelor's degree. However, there are still a few similarities between the sexes. Like females, the differences in earnings seem fairly consistent over time and do not vary much between the four ten-year age segments, except for Hispanic males which have a larger spread than the rest of the male subgroups. Also, similar to females, Asian males have the highest average difference of $25,912 per year and Black males have the lowest average difference with $15,794 per year. For "All" males the average difference is $21,871 per year. White males have an average difference of $21,627 per year. For Hispanics the average difference is $21,113 per year.

Although the differences in the first ten-year age segments are positive, they are the lowest of the ten-year age segments. This is exactly what we saw in our $E_{BS}(.50,y)$ minus $E_{HS}(.82,y)$ calculations.

We used the same two scenarios to calculate the difference in lifetime earnings between $E_{HS}(.82,y)$ and $E_{HS}(.50,y)$ as we did for our female subgroups. Under the highest cost scenario the "All" subgroup of males have a lifetime difference of $647,166. When discounted this falls to $246,064. Under the lowest total net cost scenario the lifetime difference is $793,166. When discounted this falls to $381,903.White males have a difference of $670,972 under the high cost scenario. This falls to $253,288 once discounted. For the low cost scenario the difference is $816,972 for White males. This falls to $389,127 once discounted. Black males have a lifetime earnings difference of $396,788 under the high cost scenario. This falls to $118,614 once discounted. The low cost scenario provides a difference of $542,788 for Black males. This falls to $254,453 once discounted. As mentioned, under both the highest and lowest cost scenarios, Asian males have the largest difference in lifetime earnings of all males. Under the high cost scenario the difference is $777,627. This falls to $312,951 when discounted. Under the low cost scenario the difference is $923,627. Once discounted this falls to $448,790. Also, similar to females, Hispanic males have the smallest difference in lifetime earnings of all males under the two scenarios. Under the high cost scenario the difference is $309,211. When discounted this falls to $94,832. Under the low cost scenario the difference is $455,211. This falls to $230,671 once discounted.

The age cut-off for males has a wider range than that of the female subgroups. Under the highest cost scenario the age cut-off for "All" males is 49 years old. This is nearly identical to the cutoff for "All" females, and is a big difference from our intuitive model calculations in which no male subgroup had a financial incentive to return to college even under the lowest cost scenario. This is probably the most striking result from the $E_{HS}(.82,y)$ minus $E_{HS}(.50,y)$ calculations. The age cut-off for

White males is also 49 years old. For Black males it is 45 years old. Asian males have the highest age cut-off among all subgroups, both male and female, at 54 years old. This is mostly due to the astonishing difference of $37,000 for their last ten-year age segment. Hispanic males have the lowest age cut-off for all subgroups at 40 years old. However, we should mention that this is a huge improvement over the results of our original model.

As we have seen using $E_{HS}(.50,y)$ instead of $E_{HS}(.82,y)$ leads to drastically different results for our differences in ten-year age segments, lifetime earnings differences, and age cut-off calculations. However, as we have attempted to show this is the basis of the ability bias. We do not believe it is sensible to compare $E_{HS}(.50,y)$ to $E_{BS}(.50,y)$ for our model's calculations. The differences are likely overstated and do not present an accurate assessment of the conditions facing a prospective returning student.

6 Possible Explanations

If there are so many individuals facing negative returns from returning to college why do they choose to do it? There are several possible explanations for the results of our model. The first, and most obvious, is that a returning student does not always earn $E_{HS}(.82,y)$, therefore they are not losing as much in foregone wages as our model predicts. Although we feel that our model intuitively calculated an appropriate percentile to use for our calculations, it is possible that the average returning student does not earn $E_{HS}(.82,y)$. After conducting the literature review we are fairly certain that they are above $E_{HS}(.50,y)$, however, we are not completely certain of how much above.

Another possibility is that an individual realizes returning to college will provide a negative financial return but remains content with this decision even if it means a pay cut, because it allows them to pursue personal interests. This can be justified by the fact that most of the overall losses are small relative to total lifetime earnings, making up only about one to three years of earnings. It is reasonable to assume that an individual will trade off a small relative lifetime earnings difference in order to have a satisfying and fulfilling career. The results for our male subgroups show that a decline in earnings likely comes from changing industries and starting with an entry level salary in a new career. The individual is making a choice that may not seem economically rational; however it may be providing a higher level of overall utility. They are choosing a fulfilling career over higher total lifetime earnings.

Yet another possibility that we consider is that an individual believes that they will have better success in the job market with a bachelor's degree as compared to only receiving a high school diploma. By increasing their chance of obtaining employment and remaining employed these individuals are hoping that a bachelor's degree will not only signal their ability to employers, but also provide long term stability in their careers. This is likely to be the case in a declining economy suffering elevated unemployment levels such as those we are currently experiencing[22]. The need to differentiate oneself from other job applicants may lead individuals to return to college to gain this edge.

There are numerous other reasons that can explain an individual's decision to return to college knowing that the monetary return may be low or possibly negative. It is important to note that monetary gains are not the only benefits from schooling. Whether it is personal rewards such as making lifelong friendships, having new experiences, finding oneself, or pursuing intellectual interests, there are numerous non-monetary rewards that provide value to individuals choosing to undertake the journey of returning to college to obtain a bachelor's degree. Because of these factors, even if college was to provide a negative monetary return for some individuals, they would still pursue it. As

[22] As of 04/04/09 unemployment reported by CPS to be 8.5% nationally, 10%+ in some states (CA), and 5 million jobs lost in the previous fifteen months.

Sweetland (1996) points out, there are also numerous ways that higher education helps society as a whole[23].

7 Further Research

We started our research in hope of better understanding how the ability bias affects returning students. We have seen that the underlying problem in addressing this unobserved phenomenon is the lack of detailed information regarding the earnings of returning students before they return to college. This can be solved in one of two ways. First, a survey targeted at first time college students who have delayed their college enrollment and are pursuing a bachelor's degree can be conducted at several colleges and universities to get an exact figure for their pre-college earnings. This would ensure that we are only measuring those individuals that are most likely to persist in obtaining a bachelor's degree and thus most similar to our target population.

A second, and I believe, more detailed approach would involve conducting a longitudinal study similar to the NELS:88 that follows high school students for several years to observe their education and employment choices along with corresponding earnings. This way we would have an exact figure for the average "high school only" earnings of those individuals that chose to eventually return to college to obtain a bachelor's degree, as well as an accurate figure for their earnings upon completing the degree. It would also address another problem in our calculations. Since the CPS data we considered in our model is not reported for individuals aged 18-25 we are not getting a complete representation of earnings. The proposed study would eliminate this problem and allow us to make more accurate calculations of lifetime earnings differences and age cut-offs. We would then be able to compare these results with our own to determine the accuracy of our model.

[23] Education makes a perceived contribution to improvements in health and nutrition. Education tends to affect a control on population growth and to increase overall quality of life. Education also provides the means to an enlightened citizenry able to participate in democratic and legal due process and to pursue values such as equality, fraternity, and liberty at both private and social levels.

8 Conclusion

In theory, the earnings of individuals that are capable of returning to college to obtain a bachelor's degree are already higher than those of the average high school graduate that will never attend college. Because of this difference in earnings, individuals with higher levels of ability have less to gain from returning to college. This also means that the longer they delay college enrollment, the less likely that the monetary return from their investment will be positive. The results of our model tell us that most females benefit tremendously from returning to college to obtain a bachelor's degree, even if the decision is initially delayed. In contrast, males do not fare as well, failing to overcome foregone wages and the initial hit in earnings that they take upon returning to the labor market. Females have a clear financial advantage over males and can delay their return to college longer without jeopardizing positive financial returns. It is clear that males are disadvantaged when it comes to benefiting financially from returning to college.

For both sexes, the opportunity cost of foregone wages overshadows the direct costs of tuition and school supplies in determining the financial benefit of returning to college. With the average male giving up roughly $50,000 per year while attending college and the average female giving up about $37,500 per year it is no wonder that our analysis results in so many negative overall lifetime earnings differences. Even as college costs continue to increase, students pondering a return to college should focus more on foregone wages and less on tuition costs when making their decision. As we have seen working part-time while enrolled helps ease some of the financial strains of returning to college, but does not eliminate them.

Lastly, we need to point out that using the median high school graduate earnings instead of the 82^{nd} percentile leads to drastically different results for our differences in ten-year age segments, lifetime earnings differences, and age cut-off calculations. However, as we have noted, we do not believe it is sensible to compare $E_{HS}(.50,y)$ to $E_{BS}(.50,y)$ for our model's calculations. The differences are likely overstated and do not present an accurate assessment of the conditions facing a prospective returning student.

Now that we have a better understanding of how the ability bias affects returning students it is evident that they need our help. Resources need to be directed at female returning students so that they can capitalize on the financial benefits that they receive from returning to college. However, if the goal is to increase college enrollment for both sexes, disadvantaged males will likely need higher levels of assistance in order to earn a positive monetary return. This aid would help alleviate the strain of foregone wages facing all returning students.

Appendix

Table 2.1: Female Differences

	$E_{HS}(.50,y)$	$E_{HS}(.82,y)$	$E_{BS}(.50,y)$		**(1)** $E_{BS}(.50,y) - E_{HS}(.50,y)$	**(2)** $E_{BS}(.50,y) - E_{HS}(.82,y)$		**(1) - (2)**
"All"								
25-34	$23,629.81	$36,777.23	$40,164.93		$16,535.12	$3,387.70		$13,147.42
35-44	$26,950.55	$41,210.67	$47,050.00		$20,099.45	$5,839.33		$14,260.12
45-54	$27,990.43	$42,740.38	$49,444.44		$21,454.01	$6,704.06		$14,749.95
55-64	$28,104.40	$41,939.50	$50,409.84		$22,305.44	$8,470.34		$13,835.10
White								
25-34	$24,535.40	$37,013.48	$40,447.53		$15,912.13	$3,434.05		$12,478.08
35-44	$27,306.25	$41,774.23	$47,009.80		$19,703.55	$5,235.57		$14,467.98
45-54	$28,952.51	$44,202.17	$50,484.97		$21,532.46	$6,282.80		$15,249.66
55-64	$28,862.18	$42,413.64	$50,513.89		$21,651.71	$8,100.25		$13,551.46
Black								
25-34	$22,101.00	$35,970.59	$36,755.95		$14,654.95	$785.36		$13,869.59
35-44	$25,994.90	$39,459.38	$45,972.22		$19,977.32	$6,512.84		$13,464.48
45-54	$25,060.48	$38,321.43	$43,750.00		$18,689.52	$5,428.57		$13,260.95
55-64	$26,190.48	$36,622.22	$50,062.50		$23,872.02	$13,440.28		$10,431.74
Asian								
25-34	$21,666.67	$40,050.00	$44,791.67		$23,125.00	$4,741.67		$18,383.33
35-44	$26,634.62	$37,327.78	$51,000.00		$24,365.38	$13,672.22		$10,693.16
45-54	$25,000.00	$42,290.48	$43,125.00		$18,125.00	$834.52		$17,290.48
55-64	$26,750.00	$47,583.33	$50,138.89		$23,388.89	$2,555.56		$20,833.33
Hispanic								
25-34	$23,159.72	$37,467.24	$37,125.00		$13,965.28	-$342.24		$14,307.52
35-44	$24,318.18	$39,420.00	$38,636.36		$14,318.18	-$783.64		$15,101.82
45-54	$25,033.78	$37,489.29	$50,468.75		$25,434.97	$12,979.46		$12,455.51
55-64	$25,312.50	$41,303.85	$45,750.00		$20,437.50	$4,446.15		$15,991.35

Table 2.2a: Female Scenarios

Scenarios	"All"	White	Black	Asian	Hispanic
Base	$69,354.58	$54,736.58	$100,646.70	$24,873.02	$497.30
Transfer					
1	$59,354.58	$44,736.58	$90,646.70	$14,873.02	-$9,502.70
2	$19,354.58	$4,736.58	$50,646.70	-$25,126.98	-$49,502.70
3	$89,354.58	$74,736.58	$120,646.70	$44,873.02	$20,497.30
4	$79,354.58	$64,736.58	$110,646.70	$34,873.02	$10,497.30
5	$39,354.58	$24,736.58	$70,646.70	-$5,126.98	-$29,502.70
6	$109,354.58	$94,736.58	$140,646.70	$64,873.02	$40,497.30
7	$99,354.58	$84,736.58	$130,646.70	$54,873.02	$30,497.30
8	$59,354.58	$44,736.58	$90,646.70	$14,873.02	-$9,502.70
Non-Transfer					
9	$63,354.58	$48,736.58	$94,646.70	$18,873.02	-$5,502.70
10	$43,354.58	$28,736.58	$74,646.70	-$1,126.98	-$25,502.70
11	-$36,645.42	-$51,263.42	-$5,353.30	-$81,126.98	-$105,502.70
12	$83,354.58	$68,736.58	$114,646.70	$38,873.02	$14,497.30
13	$63,354.58	$48,736.58	$94,646.70	$18,873.02	-$5,502.70
14	-$16,645.42	-$31,263.42	$14,646.70	-$61,126.98	-$85,502.70
15	$103,354.58	$88,736.58	$134,646.70	$58,873.02	$34,497.30
16	$83,354.58	$68,736.58	$114,646.70	$38,873.02	$14,497.30
17	$3,354.58	-$11,263.42	$34,646.70	-$41,126.98	-$65,502.70

Table 2.2b: Female Scenarios Discounted

Scenarios	"All"	White	Black	Asian	Hispanic
Base	-$34,749.87	-$42,527.39	-$28,559.98	-$39,188.93	-$81,808.92
Transfer					
1	-$43,768.01	-$51,545.54	-$37,578.12	-$48,207.07	-$90,827.06
2	-$79,840.59	-$87,618.11	-$73,650.69	-$84,279.65	-$126,899.64
3	-$16,164.38	-$23,941.90	-$9,974.48	-$20,603.44	-$63,223.43
4	-$25,182.52	-$32,960.04	-$18,992.63	-$29,621.58	-$72,241.57
5	-$61,255.10	-$69,032.62	-$55,065.20	-$65,694.15	-$108,314.14
6	$2,421.11	-$5,356.41	$8,611.01	-$2,017.94	-$44,637.93
7	-$6,597.03	-$14,374.55	-$407.14	-$11,036.09	-$53,656.08
8	-$42,669.60	-$50,447.13	-$36,479.71	-$47,108.66	-$89,728.65
Non-Transfer					
9	-$40,490.28	-$48,267.80	-$34,300.39	-$44,929.34	-$87,549.33
10	-$59,075.77	-$66,853.29	-$52,885.88	-$63,514.83	-$106,134.82
11	-$133,417.74	-$141,195.26	-$127,227.85	-$137,856.80	-$180,476.79
12	-$21,904.79	-$29,682.31	-$15,714.89	-$26,343.85	-$68,963.84
13	-$40,490.28	-$48,267.80	-$34,300.39	-$44,929.34	-$87,549.33
14	-$114,832.25	-$122,609.77	-$108,642.35	-$119,271.31	-$161,891.30
15	-$3,319.30	-$11,096.82	$2,870.60	-$7,758.35	-$50,378.34
16	-$21,904.79	-$29,682.31	-$15,714.89	-$26,343.85	-$68,963.84
17	-$96,246.76	-$104,024.28	-$90,056.86	-$100,685.81	-$143,305.80

Table 2.3a: Female Age-Cutoff

	"All"	White	Black	Asian	Hispanic
Scenario: Base *Total Net Cost: $14,000*	36/40	34/38	44/48	30/34	33/37
Scenario: 11 *Total Net Cost: $120,000*	X/X	X/X	X/X	X/X	X/X
Scenario: 17 *Total Net Cost: $80,000*	25/29	X/X	33/37	X/X	X/X
Scenario: 2 *Total Net Cost: $64,000*	30/34	26/30	35/39	X/X	X/X
Scenario: 5 *Total Net Cost: $44,000*	32/36	31/35	38/42	X/X	X/X
Scenario: 1 *Total Net Cost: $24,000*	34/38	33/37	42/46	28/32	X/X
Scenario: 4 *Total Net Cost: $4,000*	38/42	35/39	46/50	31/35	42/46
Scenario: 7 *Total Net Cost: ($16,000)*	41/45	39/43	50/54	33/37	43/47

*Return to school/return to labor market

Table 2.3b: Female Age-Cutoff Discounted

	"All"	White	Black	Asian	Hispanic
Scenario: Base *Total Net Cost: $14,000*	X/X	X/X	X/X	X/X	X/X
Scenario: 11 *Total Net Cost: $120,000*	X/X	X/X	X/X	X/X	X/X
Scenario: 17 *Total Net Cost: $80,000*	X/X	X/X	X/X	X/X	X/X
Scenario: 2 *Total Net Cost: $64,000*	X/X	X/X	X/X	X/X	X/X
Scenario: 5 *Total Net Cost: $44,000*	X/X	X/X	X/X	X/X	X/X
Scenario: 1 *Total Net Cost: $24,000*	X/X	X/X	X/X	X/X	X/X
Scenario: 4 *Total Net Cost: $4,000*	X/X	X/X	X/X	X/X	X/X
Scenario: 7 *Total Net Cost: ($16,000)*	32/36	X/X	39/43	26/30	X/X

*Return to school/return to labor market

Table 3.1: Male Differences

	$E_{HS}(.50,y)$	$E_{HS}(.82,y)$	$E_{BS}(.50,y)$		**(1)** $E_{BS}(.50,y) – E_{HS}(.50,y)$	**(2)** $E_{BS}(.50,y) – E_{HS}(.82,y)$		**(1) - (2)**
"All"								
25-34	$31,547.37	$50,592.44	$50,045.45		$18,498.08	-$546.99		$19,045.07
35-44	$38,221.15	$60,862.84	$65,714.29		$27,493.14	$4,851.45		$22,641.69
45-54	$40,705.21	$65,401.60	$67,986.11		$27,280.90	$2,584.51		$24,696.39
55-64	$40,704.02	$61,806.10	$64,166.67		$23,462.65	$2,360.57		$21,102.08
White								
25-34	$31,920.57	$51,055.22	$50,037.72		$18,117.15	-$1,017.50		$19,134.65
35-44	$40,431.55	$61,859.14	$67,092.70		$26,661.15	$5,233.56		$21,427.59
45-54	$41,727.07	$66,673.67	$71,578.95		$29,851.88	$4,905.28		$24,946.60
55-64	$41,121.32	$62,119.44	$65,603.45		$24,482.13	$3,484.01		$20,998.12
Black								
25-34	$30,052.82	$43,962.50	$40,437.50		$10,384.68	-$3,525.00		$13,909.68
35-44	$32,000.00	$50,381.25	$55,059.52		$23,059.52	$4,678.27		$18,381.25
45-54	$31,589.51	$47,440.63	$51,911.76		$20,322.25	$4,471.13		$15,851.12
55-64	$37,430.56	$52,465.79	$51,517.86		$14,087.30	-$947.93		$15,035.23
Asian								
25-34	$32,321.43	$55,950.00	$56,750.00		$24,428.57	$800.00		$23,628.57
35-44	$31,022.73	$51,091.67	$65,982.14		$34,959.41	$14,890.47		$20,068.94
45-54	$36,000.00	$61,825.00	$51,397.06		$15,397.06	-$10,427.94		$25,825.00
55-64	$32,426.47	$66,550.00	$70,104.17		$37,677.70	$3,554.17		$34,123.53
Hispanic								
25-34	$27,096.15	$44,640.00	$44,431.82		$17,335.67	-$208.18		$17,543.85
35-44	$31,494.57	$50,735.00	$50,500.00		$19,005.43	-$235.00		$19,240.43
45-54	$32,678.57	$58,962.50	$47,083.33		$14,404.76	-$11,879.17		$26,283.93
55-64	$32,083.33	$53,466.67	$42,031.25		$9,947.92	-$11,435.42		$21,383.34

Table 3.2a: Male Scenarios

Scenarios	"All"	White	Black	Asian	Hispanic
Base	-$121,686.40	-$88,097.38	-$128,985.30	-$152,833.00	-$429,304.98
Transfer					
1	-$131,686.40	-$98,097.38	-$138,985.30	-$162,833.00	-$439,304.98
2	-$171,686.40	-$138,097.38	-$178,985.30	-$202,833.00	-$479,304.98
3	-$101,686.40	-$68,097.38	-$108,985.30	-$132,833.00	-$409,304.98
4	-$111,686.40	-$78,097.38	-$118,985.30	-$142,833.00	-$419,304.98
5	-$151,686.40	-$118,097.38	-$158,985.30	-$182,833.00	-$459,304.98
6	-$81,686.40	-$48,097.38	-$88,985.30	-$112,833.00	-$389,304.98
7	-$91,686.40	-$58,097.38	-$98,985.30	-$122,833.00	-$399,304.98
8	-$131,686.40	-$98,097.38	-$138,985.30	-$162,833.00	-$439,304.98
Non-Transfer					
9	-$127,686.40	-$94,097.38	-$134,985.30	-$158,833.00	-$435,304.98
10	-$147,686.40	-$114,097.38	-$154,985.30	-$178,833.00	-$455,304.98
11	-$227,686.40	-$194,097.38	-$234,985.30	-$258,833.00	-$535,304.98
12	-$107,686.40	-$74,097.38	-$114,985.30	-$138,833.00	-$415,304.98
13	-$127,686.40	-$94,097.38	-$134,985.30	-$158,833.00	-$435,304.98
14	-$207,686.40	-$174,097.38	-$214,985.30	-$238,833.00	-$515,304.98
15	-$87,686.40	-$54,097.38	-$94,985.30	-$118,833.00	-$395,304.98
16	-$107,686.40	-$74,097.38	-$114,985.30	-$138,833.00	-$415,304.98
17	-$187,686.40	-$154,097.38	-$194,985.30	-$218,833.00	-$495,304.98

Table 3.2b: Male Scenarios Discounted

Scenarios	"All"	White	Black	Asian	Hispanic
Base	-$152,239.03	-$138,889.43	-$145,744.30	-$159,212.67	-$277,562.73
Transfer					
1	-$161,257.17	-$147,907.57	-$154,762.45	-$168,230.82	-$286,580.87
2	-$197,329.75	-$183,980.15	-$190,835.02	-$204,303.39	-$322,653.44
3	-$133,653.54	-$120,303.94	-$127,158.81	-$140,627.18	-$258,977.23
4	-$142,671.68	-$129,322.08	-$136,176.96	-$149,645.33	-$267,995.38
5	-$178,744.26	-$165,394.65	-$172,249.53	-$185,717.90	-$304,067.95
6	-$115,068.05	-$101,718.44	-$108,573.32	-$122,041.69	-$240,391.74
7	-$124,086.19	-$110,736.59	-$117,591.46	-$131,059.83	-$249,409.88
8	-$160,158.76	-$146,809.16	-$153,664.04	-$167,132.41	-$285,482.46
Non-Transfer					
9	-$157,979.44	-$144,629.84	-$151,484.71	-$164,953.08	-$283,303.13
10	-$176,564.93	-$163,215.33	-$170,070.21	-$183,538.58	-$301,888.63
11	-$250,906.90	-$237,557.30	-$244,412.17	-$257,880.54	-$376,230.59
12	-$139,393.95	-$126,044.35	-$132,899.22	-$146,367.59	-$264,717.64
13	-$157,979.44	-$144,629.84	-$151,484.71	-$164,953.08	-$283,303.13
14	-$232,321.41	-$218,971.81	-$225,826.68	-$239,295.05	-$357,645.10
15	-$120,808.46	-$107,458.85	-$114,313.73	-$127,782.10	-$246,132.15
16	-$139,393.95	-$126,044.35	-$132,899.22	-$146,367.59	-$264,717.64
17	-$213,735.92	-$200,386.31	-$207,241.19	-$220,709.56	-$339,059.61

Table 3.3a: Male Age-Cutoff

	"All"	White	Black	Asian	Hispanic
Scenario: Base *Total Net Cost: $14,000*	X/X	X/X	X/X	X/X	X/X
Scenario: 11 *Total Net Cost: $120,000*	X/X	X/X	X/X	X/X	X/X
Scenario: 17 *Total Net Cost: $80,000*	X/X	X/X	X/X	X/X	X/X
Scenario: 2 *Total Net Cost: $64,000*	X/X	X/X	X/X	X/X	X/X
Scenario: 5 *Total Net Cost: $44,000*	X/X	X/X	X/X	X/X	X/X
Scenario: 1 *Total Net Cost: $24,000*	X/X	X/X	X/X	X/X	X/X
Scenario: 4 *Total Net Cost: $4,000*	X/X	X/X	X/X	X/X	X/X
Scenario: 7 *Total Net Cost: ($16,000)*	X/X	X/X	X/X	X/X	X/X

*Return to school/return to labor market

Table 3.3b: Male Age-Cutoff Discounted

	"All"	White	Black	Asian	Hispanic
Scenario: Base *Total Net Cost: $14,000*	X/X	X/X	X/X	X/X	X/X
Scenario: 11 *Total Net Cost: $120,000*	X/X	X/X	X/X	X/X	X/X
Scenario: 17 *Total Net Cost: $80,000*	X/X	X/X	X/X	X/X	X/X
Scenario: 2 *Total Net Cost: $64,000*	X/X	X/X	X/X	X/X	X/X
Scenario: 5 *Total Net Cost: $44,000*	X/X	X/X	X/X	X/X	X/X
Scenario: 1 *Total Net Cost: $24,000*	X/X	X/X	X/X	X/X	X/X
Scenario: 4 *Total Net Cost: $4,000*	X/X	X/X	X/X	X/X	X/X
Scenario: 7 *Total Net Cost: ($16,000)*	X/X	X/X	X/X	X/X	X/X

*Return to school/return to labor market

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