Labor Market Opportunities and Education Choice of Male Black and White Youths

Chun-Chung Au*

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Abstract

This paper compares the decision on education attainment by male black and white youths, paying particular attention to labor market opportunities as determinants of their decision. If black youths perceive racial discrimination against them in the labor market, the incentives for them to invest in education are different from those of white youths. We construct race-specific age-earnings profiles and employment probabilities at different levels of education across metropolitan areas, and estimate an education choice model that incorporates these measures of labor market opportunities. Then we simulate the hypothetical situation in which black youths and white youths have access to the same labor market opportunities, to learn how the education gap between the two groups would change if they receive the same treatment in the labor market. We cannot find evidence to support that inferior labor market opportunities contributed to the lower education attainment of black youths.

1 Introduction

Blacks are significantly poorer than whites in the United States. In year 2000, the median black family income is $33,755 versus $54,411 of whites. 21.9% of black families are living below poverty line and the corresponding white number stands at 7.3%.[1] One reason why blacks are poorer is that they are less educated. Among the adult population, the rate of completing high school and four year college are respectively 78.9% and 16.6% for blacks, versus 88.4% and 28.1% for whites. If we focus on the younger batch at age 25–29, blacks finish high school and college at rates of 86.8% and 17.8% while the white rates are 94.0% and 34.0%. A young black adult is thus two times more likely to drop out from high school and half as likely to obtain a college degree as his white counterpart.[2] If education is the key to personal economic success in the US, why don't blacks make better use of this avenue?

To understand the differences in education attainment between blacks and whites, we need to know how decisions on education attainment are made. The dominant theory in economics with regard to education attainment choice is the human capital theory of Becker (1964), which views education as investment in human capital to enhance productivity.[3] To each individual, the optimal education attainment brings in the

*Department of Economics, Brown University, Providence, RI 02912, USA. Email: Chun-Chung_Au@Brown.edu

[1] U.S. Census Bureau, Statistical Abstract of the United States: 2003 (123th Edition), Washington DC, 2004, Table No. 39.

[2] www.census.gov/population/socdemo/education/tabA-2.pdf. Adult population is 25 years old and over and noninstitutionalized. Both blacks and whites are non-hispanic. The high school dropout rates for blacks should have been more severely understated than whites given institutionalized individuals are not counted in the statistics.

[3] Social scientists have proposed many other models of education attainment. See Haveman and Wolfe (1995) and Datcher-Loury (2005) for overviews of these models.

highest discounted benefits net of costs, both of which can include pecuniary (earnings, tuition, etc) and non-pecuniary (schooling as pleasurable consumption, psychic cost of effort in studying, etc) components. While the years of time spent on education and the direct and indirect costs of schooling represent huge investment in developing human capital, in return, the most important pecuniary benefits are obviously the enhanced future earnings obtained from employment in the labor market. It is hence natural to consider education choice in response to labor market opportunities. Yet, in their comprehensive survey of the empirical literature with emphasis on studies with economic orientation, among the fifteen studies selected by Haveman and Wolfe (1995) on the determinants of children's schooling attainment, some forms of labor market opportunities are considered in only two. There are practical difficulties to examining the effects of labor market opportunities on education choice, which we shall discuss in Section 1.2, but apparently there is a disconnection between our generally accepted theory and empirical works.

At the same time, labor market opportunities are often cited, formally or informally, as a key factor on education choice in qualitative works. For example, the ethnographic study of Macleod (1995) details how differing expectations on the future labor market affect aspiration and thus lead to divergent education choices among two groups of youths living in the same public housing project (Ch. 6).[4] Wilson (1987) explains the depressed education attainment among youths living in inner cities with their isolation from adults with normal employment, which leads to inadequate appreciation of the connection between education and the prospect of better post-schooling employment (p.56–58).[5] And directly addressing our question on why blacks lag behind whites in education in the United States, Ogbu (1978) puts forward that "lower school performance and lower educational attainment are functionally adaptive to minorities' ascribed inferior social and occupational positions in adult life." (p.4).

In this paper, we consider how returns in labor market from education may affect the education attainment choice of black and white youths. Paying attention to labor market opportunities is particularly important when we compare the schooling choice of the two groups, since it is reasonable to suspect that they are being treated differently, or they perceive to be treated differently, in the labor market. We want to know whether "discrimination" in the labor market may have adversely affected the incentives for blacks to invest in education as compared to whites.

1.1 Time Trends

To put things in perspective, let us begin by examining some time trends. Figure 1 shows the time series of education attainment of young blacks and whites from 1970 to 2005.[6] While generally upward trends can be seen at all three levels of education attainment (graduating from high school, attending college, and completing four year college) for both groups over time, there seems to be convergence only at high school graduation. Black college completion rate has been about half the white rate since the early 1980's, when the latter was 25% and has since grown to almost 35% in 2005. In levels, the black-white gap in college completion rate are in fact widening. For college attendance, blacks made dramatic improvement over the period, but fall behind the whites steadily by 12–15%. Even for high school graduation, the apparent convergence in absolute levels (blacks' high school dropout rate keep staying slightly less than double that of whites since mid-1980's) could be unreliable as the data are based on the non-institutionalized population

[4] In Macleod (1995), a group of black youths has higher aspiration than another group comprised of whites. Interviews show that these aspirations are driven by different perceptions of the payoffs to education.

[5] Streufert (2000) provides simulation examples to demonstrate the theoretical possibility of Wilson's rationale.

[6] Note that the college attendance and completion rates are unconditional on attaining the previous education level, and so, they are population rates for the two groups.

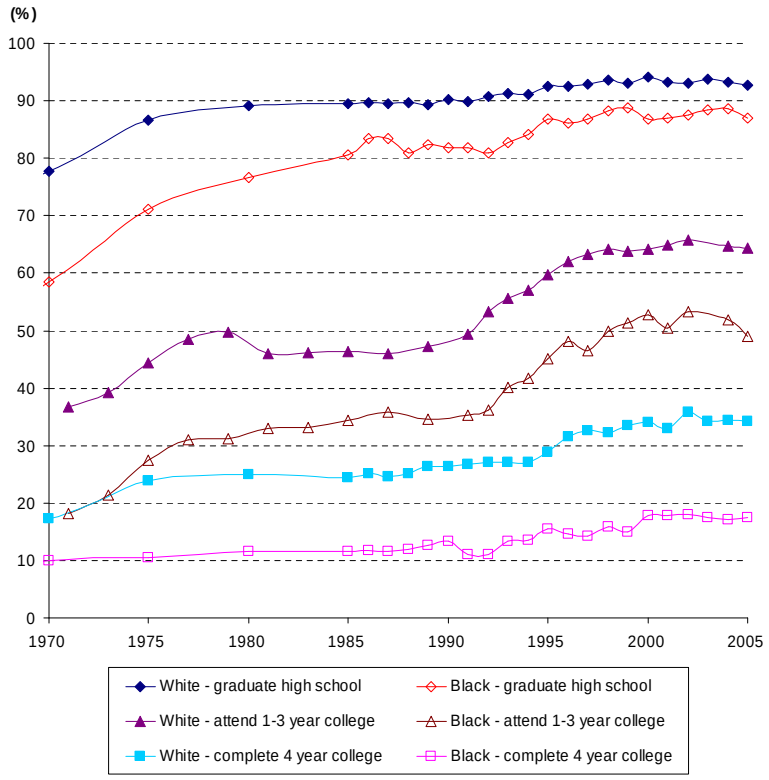


Figure 1: Education Attainment of 25–29 Years Old by Race 1970–2005

Note: Blacks and whites refer to non-hispanic blacks and non-hispanic whites respectively.
Data Sources:
College Attendance (1971–1993): The Condition of Education 1996, NCES 96-304.
College Attendance (1994–2005): Digest of Education Statistics (various years in 1994–2005)
High School Graduation and College Completion (all years): Digest of Education Statistics 2005, Table 8.
The above documents are published by the U.S. Department of Education, Washington, DC.
All data are based on U.S. Bureau of the Census, Current Population Survey (CPS), March 1971–2005.

which tends to under-count black high school dropouts.[7] On the whole, it is fair to say that since the mid-1980's, as compared to the few earlier decades, the general trend of convergence in education attainment between blacks and whites has slowed down.

Figure 2 shows average real earnings of male black and white workers at different levels of education in the period 1976 to 2002.[8] Two observations could be made about the graph. First, for both black and white males, while real earnings of high school dropouts remain more or less stagnant, those completed at least high school have seen their earnings growing, at faster pace for higher education levels. Second, white earnings are higher than black earnings at every education level, mostly by 20–30% for high school dropouts and those with 1–3 years of college education, and by 35–40% for high school graduates and four year college graduates. In fact, the gaps are so large that white high school dropouts have been earning no less than black high school graduates prior to 1987, and white high school graduates earn more than blacks with 1–3

[7]For example, in 1994, when the data show that 8.9% of whites and 15.9% for blacks did not complete high school, 6.1% of blacks in their 20's, mostly males, were in prisons or jails (author's calculation based on Table 1 of Mauer and Huling (1995)). It is reasonable to expect these young black inmates to have very low level of education. The corresponding number for whites is 1%.

[8]These series are calculated based on mean earnings of workers, i.e. conditional on employment, at different education levels in a given year, without considering that other characteristics could be systematically different across education groups.

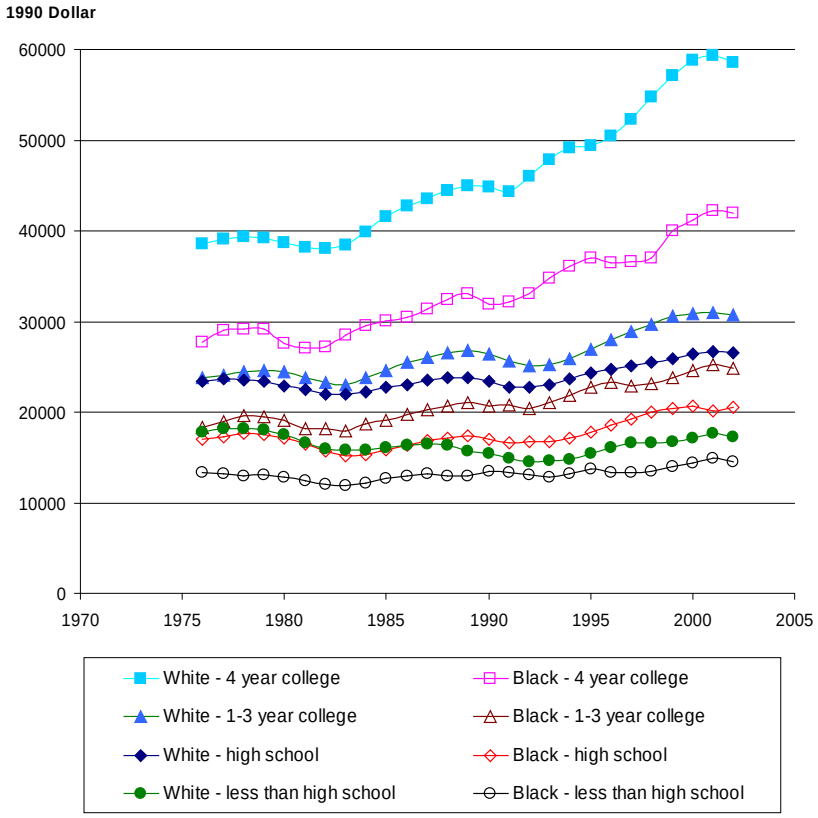


Figure 2: Mean Real Earnings of Male Workers by Race and Education Level 1976–2002

Note: Real earnings are three year moving averages, based on male workers 18 years old and over.
Data Source: www.census.gov/population/socdemo/education/tabA-3.pdf (internet release date: March 2005) (based on U.S. Census Bureau, Current Population Survey)

years of college education on the average throughout the years. From these data, a measure of the apparent returns to education can be calculated as the percentage increase in earnings from attaining an education level relative to the the preceding level, and these returns are shown in Figure 3. Returns at all levels of education are generally on a rising trend for both groups, although certain deviations from the trend could be large and persistent. For example, the returns to high school graduation for blacks hovered around 30% in the twenty years from 1976 to 1995, but included an eight year stint of decline from 1978 to 1985. On racial differences, completing 4 years of college produces more benefits for whites than for blacks, while the reverse is true in attending 1–3 years of college. These patterns are consistent with blacks having a low 4 year college completion rate but relatively high college attendance rate.[9] Besides, ever since 1980, whites enjoy better returns to graduating from high school. Figure 2 and 3 show that while blacks have lower earnings, the returns to education that they face, measured as such, are not necessarily lower than those of whites.

Earnings data in Figure 2 and 3 are based on employed workers, but there are significant differences in employment probabilities across races. From the mid-seventies to mid-nineties, the typical black employment rate is 12% below that of whites (61% vs. 73%). This difference comes from a 6–7% lower labor force participation rate, and a 6–9% higher unemployment rate of blacks than whites (Holzer 2001, Table 5-2).

[9]For analysis of time trends in wages/earnings and returns to education, see Welch (1973), Freeman (1976), Blackburn et al. (1991), Katz and Murphy (1992), Hauser(1993), Card and Lemieux (1996), Holzer (2001) and Juhn (2003).

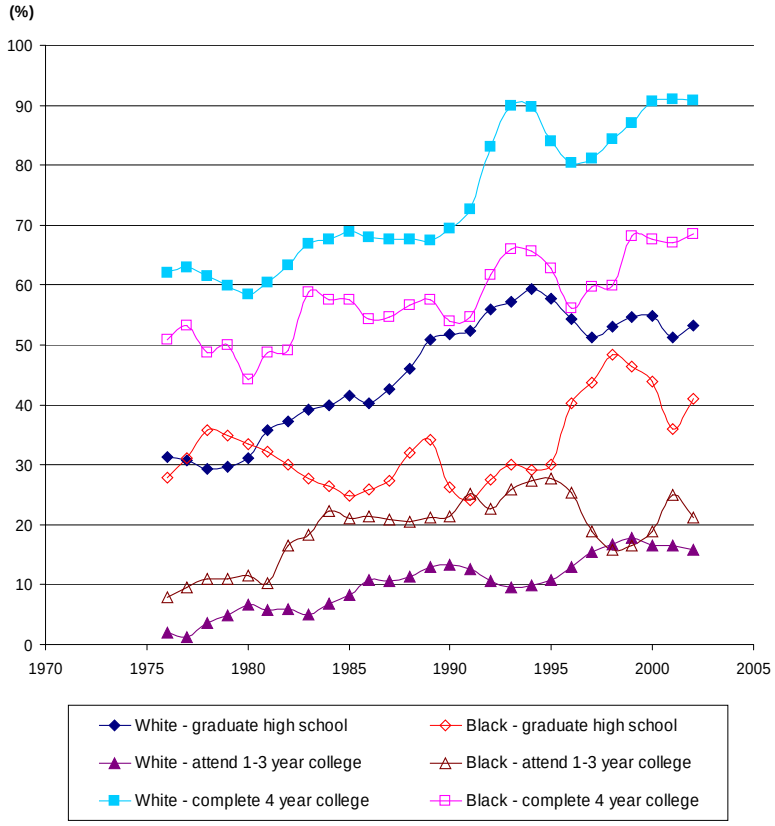


Figure 3: Increase in Earnings with Education—Male Black and White Workers 1976–2002

Note: Increase in earnings is the percentage increase in mean real earnings (three year moving average) from the previous education level, based on male workers 18 years and over.
Data Source: Derived from data in Figure 2.

Figure 4 shows the time series of black and white male unemployment rate at four education levels. Within each race, the better educated are less likely to be out of work. But unemployment is much more serious among blacks than whites at every education level. Over the economic cycles in the given period, at the four education levels from less than high school to completing college, black unemployment rates average to 15.0, 11.5, 8.5 and 5.1% as compared to 9.6, 5.8, 4.2 and 2.2% for whites. The better prospect of employment from more schooling could be an important incentive to get more education. Figure 5 shows the reduction in unemployment rates between consecutive levels of education. The most striking feature in the first panel on graduating high school is that in the late 70's and early 80's the employment prospect for black high school graduates are so poor that it was comparable to that of high school dropouts. Such prospect improves steadily afterwards to the white levels, and in the late 90's the gap between the two education groups started to rise rapidly, mainly due to faster deterioration in unemployment for black high school dropouts. Attending college and completing four year college have in most of the period helped blacks more on avoiding unemployment.

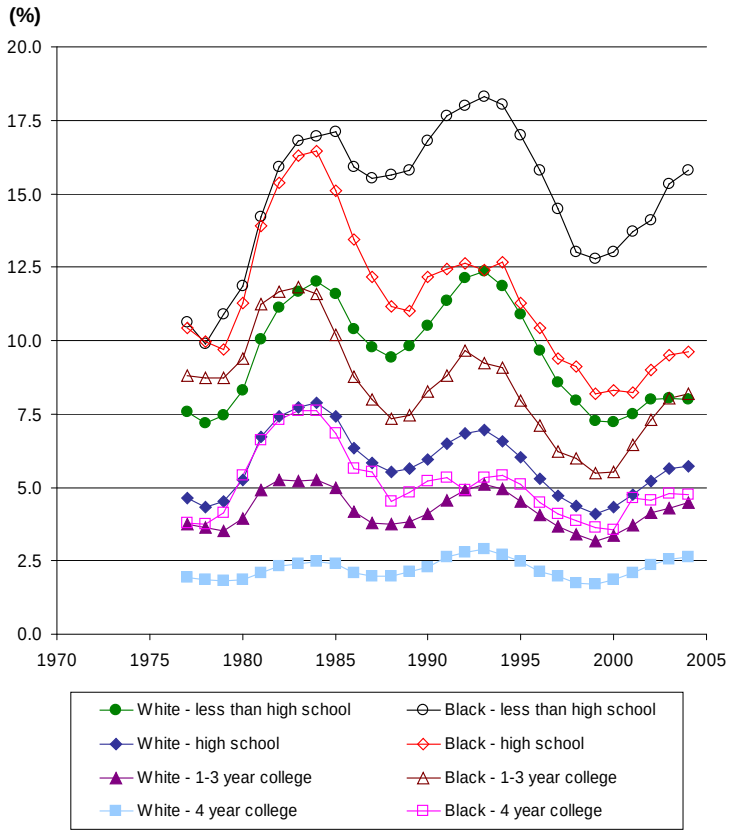


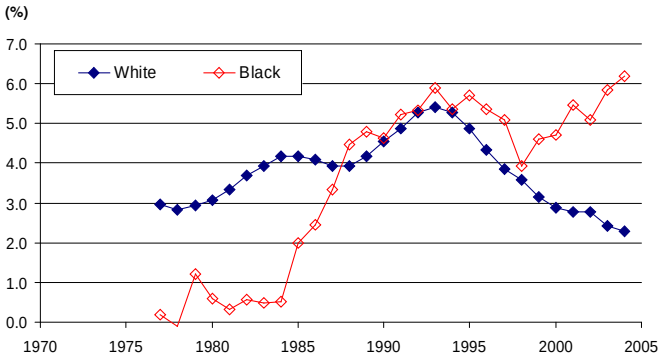
Figure 4: Unemployment Rate of Male Workers by Race and Education Level 1977–2004

Note: Unemployment rates are five year moving averages, based on male age 25–64.
Date Source: Bureau of Labor Statistics, Current Population Survey, March 1975–2006.

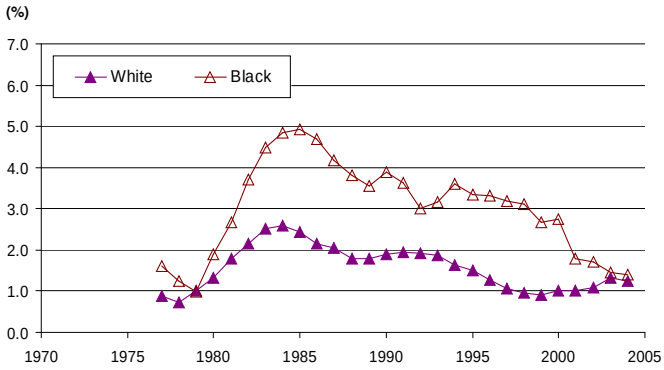
1.2 Expectations Assumptions on Labor Market Opportunities

The main reason why there are few empirical works that consider labor market opportunities as a determinant of education attainment is lack of data. Different schooling levels lead to diversely different sets of possible careers, and careers are more than earnings streams. But even if we consider narrowly only the financial rewards as returns to education, an earnings stream that comes with employment after the schooling years happens in the future and last for decades—it is variable and uncertain at the time of schooling decision. The decision on education attainment has to be based on some expectations of the conditions in the future labor market. These expectations exist in the minds of the decision makers; they are hard to be elicited or described reliably, if carefully asked in surveys at all.[10] Hence, they are often absent in major survey datasets. The expectations of each individual may or may not accord well with what would eventually happen, but right or wrong, they determine the person's schooling choice. Of course, the decision maker has incentives to collect information and make accurate forecasts on which his decisions are based. This, very importantly, provide some basis for certain assumptions on his information gathering and expectation formation process in the absence of reliable expectation data on labor market opportunities.

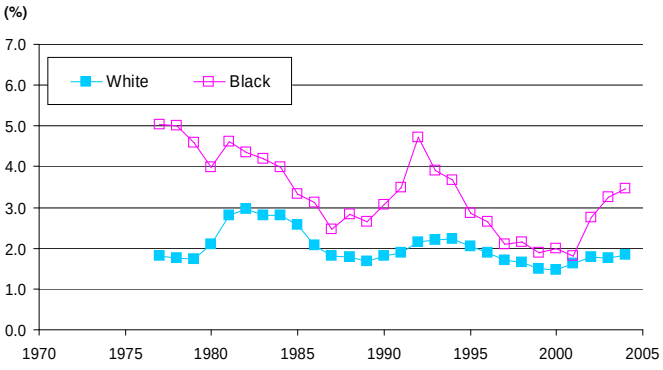
[10]Expectation data are often considered unreliable and sensitive to the precise framing and interpretation of the questionnaire. See discussions in Carneiro et al. (2003) and Mickelson (1990).



(a) graduate high school



(b) attend 1-3 years of college



(c) complete 4 year college

Figure 5: Reduction in Unemployment Rate with Education—Male Black and White Workers 1977–2004

Note: Reduction in unemployment rates is from the previous level of education. Unemployment rates are five year moving averages, based on male age 25–64.

Date Source: Derived from data in Figure 4.

Two alternative assumptions on expectation formation of future labor market opportunities are often used in the literature. The first is the assumption that the labor market is stationary, which is sometimes called the myopic assumption. It states that, in our context, a youth observes the labor market current to his education decision, and expect the future labor market that he will face during his working life to be the same. Based on this assumption, Rivkin (1994) compares the schooling, employment and non-participation choices of young blacks and whites, using the own-race wages and unemployment rates across education levels of prime-age workers in the local communities (county groups) as a basis of labor market expectations. He finds that a bigger wage premium to high school diploma encourages girls to complete high school, while higher education-specific local unemployment rates, as an indication of availability of working opportunities if giving up schooling, generally lead to further schooling across races and sexes. Kane (1994) finds that white high school graduates respond to returns to college education in their college attendance decision, though not their black counterparts. Kane's returns to college is a time-series of income differentials specific to race and sex, based on the national median income of 25 to 34 years old college graduates and high school graduates. Ribar (1993) uses earnings regressions to estimate lifetime earnings for female high school graduates and dropouts. Separate earnings regressions are obtained for each state, with differences across race and high school completion captured by shifts in the intercept. He cannot find statistical significant effects of the lifetime earnings on high school completion although signs of such effects tend to be as predicted by theory. In Averett et al. (2000), college earnings premiums are estimated separately for each race and metropolitan areas with the labor market experience of 18–40 years old. Black high school graduates do respond to such premium in their college enrollment decision, though the same cannot be found for whites.

An alternative to the above assumption is the rational expectation or perfect foresight assumption[11] that each youth can unbiasedly or perfectly forecast his/her future earnings at every level of education that s/he may choose. This assumption could be made partially operational when a researcher examines the education choice of a youth retrospectively after data on his eventual labor market outcomes become available. However, the counter-factual outcomes at education levels not actually chosen are not observed, and the researcher cannot avoid modeling the youth's expectation formation with further assumptions, explicit or implicit. Along this line, focusing on the effects of labor market returns on education choice, Willis and Rosen (1979) find college earnings premium to be an important determinant of college attendance for white high school graduates. According to their estimates, a 5% higher college premium in lifetime earnings produces an effect on encouraging college attendance equivalent to raising father's years of education by one standard deviation (from the mean of 10 years to 13.5 years). Averett and Burton (1996), with college wage premium derived from earnings in early career instead of lifetime earnings, also report it as an important determinant of college attendance for men though less so for women.

Manski (1993) cautions against the use of assumptions on expectation formation, since youths, like econometricians, could use vastly different models to infer the returns to their education. He thus advocates collection of subjective expectation data on earnings, and this leads to efforts to do so (e.g. Dominitz and Manski 1996; Dominitz 1998; Betts 1996, see also Blau and Ferber 1991). The collected data, however, are usually relatively small in size and not particularly suited for our purpose. But they do indicate that expectations on one's own earnings is well correlated to the same person's belief of the earnings in the current job market. With actual expectations data, Varga (2001) finds that returns to higher education as higher

[11] The terms rational expectation and perfect foresight are, unfortunately, often used imprecisely, and sometimes interchangeably in the literature. Rational expectation should allow for uncertainty in the eyes of the decision maker due to idiosyncratic events, while perfect foresight precludes that.

expected lifetime earnings have a significant positive effects on applying for college among Hungarian high school students. But she cannot find similar results for expected probability of employment.

1.2.1 Our Assumption

The expectation formation assumption made in this paper is stationarity of the labor market. We assume that youths form expectations of future labor market conditions based on observation of people of their own race living in their neighborhood at the time when the youths are about to finish high school. This is consistent with that information is most easily gathered in one's surroundings. Studies with access to actual expectation data tend to indicate that expectation of own future earnings is highly correlated to beliefs about prevailing earnings in current job market (Dominitz and Manski 1996; Varga 2001). At the same time, Ryoo and Rosen (2004) find that the fraction of college students choosing to major in engineering is synchronized to the lifetime earnings prospect of the field relative to other professions as projected from cross-sectional age-earnings profiles at the time of the choice. This reinforces that current job market information affects young people's expectations on the future labor market that they will face and hence the choices they make. The assumption of using the own-race older cohort as one's reference group is supported by the strong group identification of blacks with their own racial group (Lau 1989; Tatum 1999). It is central to us as well as Ogbu (1978), when describing how black children acquire perceptions on job prospect and schooling (p.194):

> Young black children learn about the job ceiling and later learn to relate it to their schooling, but not necessarily from deliberate instruction by parents and other adults. They learn by observing the job experiences of their parents, older siblings, other relatives, family friends, and neighbors. They learn, too, to evaluate education in terms of the job ceiling by assimilating the reactions to the job ceiling and schooling of older people around them. As the children grow older, they acquire increasing knowledge of these matters far beyond the experiences of those around them and begin to see the situation as a problem facing *all* black Americans.

While we have presented our rationale for adopting the stationary labor market assumption, we recognized that the expectation formation process as modeled may not be the whole story. It could be reasonable that a youth makes use of extra information like certain time trends that are not reflected in a snapshot of the labor market, or knowledge about himself that leads him to deduce that his future experiences would be different from those of the older cohorts. We should certainly weight our assumption against any alternative, say, the perfect foresight assumption with which a youth knows perfectly what his earnings will be at each education level he chooses, while a researcher has to rely on strong assumptions to capture the effects of these unobserved (except one) earnings on education decision. Ultimately, based on our assumption, our model leads to testable hypotheses, and data can help to decide if it is appropriate.

1.3 Other Factors Affecting Education Choice

Of course, labor market opportunities is only one of the many factors affecting education choice. Haveman and Wolfe (1995) categorize determinants of education attainment, apart from predetermined variables like race and gender, as related to choices made by the government or society (living environment, geographic or neighborhood variables), parents (family income, parental education, family structure like single parenthood and number of siblings, etc) and the children themselves (test scores, returns to education, etc). Studies in the empirical literature consider widely varying lists of variables mostly in the social and parental categories,

especially the latter, and include relatively few own choice determinants. Findings common to most studies are that parental education are robust and quantitatively important, followed by family structure variables, and family income has positive but relative modest effects. Effects of social variables tend to be less stable. After controlling for other variables, being black (as represented by a dummy variable on race) is often found not to be a handicap for education attainment.

2 Data

Our main data source is the National Longitudinal Survey of Youth 1979 (NLSY79)[12] which started to collect data on 12,686 American youths at age 14–22 in 1979. The survey documents in details the family background of these youths, their schooling experience and labor market experience thereafter. We use non-hispanic white youths in the cross-sectional sample, and non-hispanic blacks in the cross-sectional sample and the supplemental sample. These white and black youths are each nationally representative of the non-institutionalized young population of their race in the given age bracket. We further restrict the sample used in our estimation to male youths living in metropolitan areas. Only the male youths are used in order to avoid the more serious complications of female labor market participation decision which could feedback to education choice, and which we do not attempt to accommodate in our simple education choice model. The geographic restriction on residence in metropolitan areas relates to the scope of neighborhoods regarding expectation formation on labor market opportunities which we shall discuss more in the following. We match these youths by their residence location to information on local labor market from other data sources. The sample with the required variables used in our analysis is comprised of 1251 white youths and 591 black youths.

2.1 Measures of Labor Market Opportunities

We assume that a youth forms expectations of the future labor market based on the local labor market current to his education decision. More specifically, we assume he observes adults living in his neighborhood, learns about their age, education level, the compensation that they receive from work, how often they are employed and so on, and tries to infer the opportunities available to himself as if he is going to face a similar labor market like adults of his own race.

To put this assumption into operation, we define the neighborhood of a youth as a metropolitan area (Standard Metropolitan Statistical Area, SMSA), further narrowed to central city or outside central city if feasible.[13] For each NLSY79 youth in our estimation sample, we identify the set of working age (16–60) male individuals in the 5% Public Use Microdata Samples from the 1980 Census of Population who live in the same neighborhood and is of the same race as the youth to be his reference group. In 1980, the NLSY79 youths are on average 18–19 years old which is close to the time they make their education decision regarding

[12]For more information of the survey, see *NLSY79 User's Guide: A Guide to the 1979–2000 National Longitudinal Survey of Youth Data* or the website of the Bureau of Labor Statistics at http://www.bls.gov/nls/.

[13]There are two reason for using metropolitan area as the scope of information collection of our youths. First, a metropolitan area is usually considered a unified labor market and residents would live and work in different parts of the same metropolitan area. (See chapter III of Schmitz (1996) for a discussion on the appropriate definition of a local labor market.) The second reason is a data size issue. We need a sufficient number of observations of each education group to infer the race-education specific earnings profiles in a neighborhood. Even with the very large 5% census data, sample size for blacks is still a problem considering that there are hundreds of metropolitan areas in the US. Finer definition of a neighborhood would not be practical given the available data.

high school graduation and college education. The two main measures of labor market opportunities that we use here are lifetime earnings and employment probabilities.

To summarize earnings data in a neighborhood, age-earnings profiles specific to race and education level are each obtained from a median regression of log weekly earnings on a fourth order polynomial of age with data of full-time workers.[14] The higher order polynomial is used as a generalization of the typical Mincerian quadratic age-earnings profile to allow for more flexibility to capture the earnings profiles across age cohorts, especially when older cohorts of blacks could be on a different earnings trajectory as compared to younger cohorts due to rapid legal and social changes impacting discrimination during their working life. An age-earnings profile is then collapsed into a lifetime earnings as a sum of discounted earnings. The discounting here could be due to time discounting of earnings that flow in later in the future, or, probably more pertinent to us, discounting by the degree of relevance of the labor market experience of workers at different ages in the eyes of the youths. We assume that earnings streams start at age 17, 18, 20 and 22 for high school dropouts, high school graduates, college attendees completing one to three years of college education, and college graduates respectively, and they all end at age 60. Forgone earnings as a cost of pursuing education is therefore accounted for.

Local employment rates are calculated to reflect the availability of work opportunities for each race and education level combination. This is a rate of employment for the whole adult male population in the neighborhood, rather than for only those in the labor force. It takes into account unemployment as well as the extend that the working age population stay out of the labor force for reasons other than attending school.[15] Detachment from the labor force is much more serious among black males than white males (in the male population age 16–60 in 1980, for whites, 5.0% is unemployed and 6.6% is out of labor force but not attending school. For blacks, the corresponding numbers are 8.8% and 16.0%.[16]) and is here considered as an extension of unemployment.

Summary statistics of variables and the education attainment of black and white youths in the sample used in our analysis are presented in Table 1.

3 Modeling Education Attainment Decision

The starting point of our analysis is a simple ordered discrete choice model with a typical minimal set of determinants of education choice that does not include labor market opportunities. In their analysis of schooling choice using data of five generations of white males including one cohort from NLSY79, Cameron and Heckman (1998) show that an ordered discrete choice model is not only economically interpretable, but fits their data as good as or better than separate binary regressions for each schooling grade transition, even though the ordered discrete choice model is much more parsimonious in parameters. Elsewhere, we have shown that the key assumption behind an ordered discrete choice regression model is that utility is

[14] The race-education-neighborhood specific age-earnings profiles are estimated only when there are at least 20 data sample of full-time workers (15 produces a lot of variations, and 30 just slightly less variable than 20). Full-time workers are defined as those who worked at least 40 weeks a year and usually at least 35 hours during working weeks. Weekly earnings is annual wage and salary plus income from non-farm business or farm divided by number of weeks worked.

[15] As percentages out of the whole male population of age 16–60, employment rate = 1 − %(unemployed) − %(not in labor force and not in school). Due to the definition of employment and schooling status in the census data, being in school is not necessarily out of the labor force. To ensure the reliability of the employment rates calculated from the 1980 5% population census data, we set a minimum requirement on the sample size of adult male living in a neighborhood at 50 for calculating the employment rate, with the employment status of each male accounting for at most 2% of the employment rate.

[16] Author's tabulation from the 1980 Census of Population 5% data.

Table 1: Summary Statistics of Data

	White (N=1251)†		Black (N=591)‡	
Variable	Mean	Std. Dev.	Mean	Std. Dev.
No. of Siblings	2.97	1.97	4.23	2.76
Family Income ($10,000)	2.36	1.34	1.45	.997
Father's Education (Year)	12.7	3.34	10.6	3.30
Mother's Education (Year)	12.2	2.39	11.5	2.51
Broken Family	.179	.384	.430	.495
Rural Residence at age 14	.185	.389	.0711	.257
South Residence at Age 14	.194	.396	.435	.496
Log Lifetime Earnings				
HS dropout	9.09	.118	8.82	.162
HS graduate	9.18	.103	8.93	.144
Some college	9.20	.104	8.99	.142
4 Year college	9.37	.102	9.16	.147
Δ(Log Lifetime Earnings)				
HS graduate – HS dropout	.0865	.0401	.112	.0764
Some college – HS graduate	.0242	.0386	.0517	.0793
4 Yr college – Some college	.167	.0605	.173	.123
Local Employment Rate				
HS dropout	.848	.0382	.708	.0663
HS graduate	.889	.0321	.750	.0683
Some college	.932	.0185	.847	.0460
College degree	.961	.0147	.904	.0264
Δ(Local Employment Rate)				
HS graduate – HS dropout	.0411	.0213	.0427	.0317
Some college – HS graduate	.0428	.0205	.0967	.0377
4 Yr college – Some college	.0287	.0128	.0569	.0425
Tuition - 2yr college ($1,000)	.452	.220	.435	.230
Tuition - 4yr college ($1,000)	.767	.252	.763	.268
Population in SMSA (1,000,000)	1.74	2.09	2.83	2.62
Median Family Income in Neighborhood ($10,000)	2.22	.340	1.97	.323
Aptitude test score - AFQT89 (age-adjusted & standardized)	.211	.892	-.753	.856
Percentage attaining at least				
High school diploma	87.8		78.0	
Some college	47.3		36.2	
4yr college degree	28.0		12.7	

† Sample size for AFQT89 is 1182.
‡ Sample size for employment rates is 518 and for AFQT89 is 488.

single-peaked over the choices as arranged in their natural order[17] and we think this is reasonable in our present context.

3.1 An Ordered Choice Model of Education

The following simple model of ordered education attainment choice is adapted from Cameron and Heckman (1998). Suppose a youth's optimal choice of education attainment among discrete levels $\{1, \ldots, S\}$ is given by

$$\max_s \{R(s) - C(s \mid z, \eta)\}, \quad s = 1, \ldots, S. \tag{1}$$

where $R(s)$ represents the returns at education level s and $C(s \mid z, \eta)$ is the cost of achieving education level s given the characteristics of the youth (z, η). z is the observable characteristics of the youth and η, a scalar, embodies the effects of unobservable characteristics and is independent of z. Both $R(s)$ and $C(s \mid z, \eta)$ are strictly increasing in s and positive, and the net returns $R(s) - C(s \mid z, \eta)$ is assumed to be strictly concave. Ignoring ties, there is a unique optimal level of education for the youth. We assume that the cost takes the form

$$C(s \mid z, \eta) = C(s)\varphi(z)\eta \tag{2}$$

with $\varphi(z) > 0$ and $\eta > 0$. Variations in individual characteristics z or the shifter η thus affect cost at every level. For s to be the optimal level of education, its net returns must be higher than those of $s-1$ and $s+1$, i.e.

$$R(s) - C(s)\varphi(z)\eta > R(s-1) - C(s-1)\varphi(z)\eta,$$

$$R(s) - C(s)\varphi(z)\eta > R(s+1) - C(s+1)\varphi(z)\eta.$$

With strict concavity of the net returns in s, meeting these two conditions also guarantee that other levels are also dominated by s. Combining the two inequalities, we have

$$\frac{R(s) - R(s-1)}{C(s) - C(s-1)} > \varphi(z)\eta > \frac{R(s+1) - R(s)}{C(s+1) - C(s)}. \tag{3}$$

Assume that $\varphi(z) = \exp(-z\gamma)$, $\eta = \exp(-\varepsilon)$ and write $\frac{R(s)-R(s-1)}{C(s)-C(s-1)} = \exp(-\alpha_s)$, the above becomes

$$\alpha_s < z\gamma + \varepsilon < \alpha_{s+1}. \tag{4}$$

One can interpret $(z\gamma + \varepsilon)$ as a propensity to get education, which is compared against a set of monotonic increasing thresholds. If and only if such propensity is higher than the threshold α_s, the youth would attain at least education level s.

The above behavioral model could be completed as an econometric model with additional distributional assumption on ε. With the latent propensity for youth i to get education $y_i^* = z_i\gamma + \varepsilon_i$ where ε_i is assumed to be independent of z_i, and is i.i.d. with a continuous cdf $F(\cdot)$, the probability that y_i, the optimal level of education for i, is s when choosing from a set of education levels $1, \ldots, S$ is given by

$$\begin{aligned} \Pr[y_i = s \mid z_i] &= \Pr[\alpha_s < z_i\gamma + \varepsilon_i < \alpha_{s+1}] \\ &= \Pr[\alpha_s - z_i\gamma < \varepsilon_i < \alpha_{s+1} - z_i\gamma] \\ &= F(\alpha_{s+1} - z_i\gamma) - F(\alpha_s - z_i\gamma) \end{aligned} \tag{5}$$

[17] see Au (2006).

where $\alpha_1 \equiv -\infty$ and $\alpha_{S+1} \equiv +\infty$.

In this paper, we model education choice from four levels: drop out of high school (dropout), graduate from high school (hs), attend one to three years of college or some college (somec), finish four years of college and above (4yrc).[18] We consider these four particular levels because dropping out from high school and finishing college are generally regarded as under and well educated with certain social significance in the current US society, and the transition from high school graduation to college attendance is a decision most studied in the literature. So, in our case $S = 4$. The specific econometric model that we use is an ordered probit model where $F(\cdot)$ is assumed to be the standard normal cdf $\Phi(\cdot)$.[19] Parameters in this model can then be estimated by maximizing the log likelihood function

$$\ln L(\alpha, \gamma \mid y, z) \quad = \quad \sum_{i=1}^{n} \sum_{s=1}^{S} \ln \left[\Phi(\alpha_{s+1} - z_i\gamma) - \Phi(\alpha_s - z_i\gamma) \right] \cdot \mathbf{1} \left[y_i = s \right]. \tag{6}$$

The set of individual characteristics affecting education choice that we use is basically the same as in Cameron and Heckman (1998), and they are: number of siblings, family income, father's education, mother's education, growing up in a broken family, rural residence at age 14, and residence in the South at age 14.[20] We regard this set of characteristics to be minimal, and could be more safely considered as exogenous to the education choice of the youths. There are three thresholds for our four discrete education levels. For identification purpose, without loss of generality, we include no intercept term in γ.

3.2 Results of Ordered Probit Model

The ordered probit model is estimated separately for black and white youths, and the results are shown in Table 2. The estimated coefficients generally have signs as expected. Less siblings and higher family income raise education potential. Better educated parents encourage schooling, although for black youths, father's education is far less important as compared to mother's. Growing up in a broken family and in rural areas are detrimental to white education but their effects could not be precisely estimated for blacks among which living in a broken family is much more prevalent. No statistically significant effects of southern residence is found for either group. Lastly, even though the threshold estimates for black youths are lower than those of whites at all education transitions, since the thresholds could only be interpreted relative to the latent propensity, this by itself does not necessarily indicate that blacks would tend to choose more education than whites.

3.3 Do Black and White Youths Behave Similarly in Education Choice?

We want to know if the behavior of black and white youths are in some way similar that certain subset of the parameters have common values in the above model. So, the following set of ordered probit regressions in decreasing order of restrictiveness have also been estimated: 1) all parameters are the same across the two groups; 2) all parameters are the same, except a dummy term for blacks is included in y^* as the only

[18] Since the youths may reach a certain grade at different ages, the education choice of a youth in our data is determined as following: we first check if a youth has finished high school by age 21, if he has completed at least one year of college by age 25, and if he has finished four years of college education by age 30. When these unambiguously lead to one of our four education levels, that is determined to be the youth's choice, and only so is the youth included in our sample.

[19] Cameron and Heckman (1998) use a two-point logit mixture for the error term.

[20] To reduce measurement errors, family income is a three year average of inflation adjusted family income in the years 1979–1981. If family income is not reported in all three years, depending on availability, it would be a two year average or the income as reported in a single year. Broken family means not living with both biological parents at age 14.

Table 2: Ordered Probit Regression for Education Attainment

Dependent Variable: Education Level	**White**	**Black**
No. of Siblings	-.0583** (.0164)	-.0527** (.0175)
Family Income	.153** (.0267)	.156** (.0508)
Father's Education	.112** (.0119)	.0257 (.0170)
Mother's Education	.0835** (.0167)	.103** (.0220)
Broken Family	-.218** (.0849)	-.126 (.0963)
Rural Residence	-.140* (.0815)	.165 (.180)
South Residence	-.0730 (.0800)	-.0359 (.0924)
Thresholds:		
dropout/hs	1.15 (.197)	.554 (.276)
hs/somec	2.63 (.204)	1.77 (.281)
somec/4yrc	3.25 (.208)	2.66 (.290)
No. of observations	1251	591
Log likelihood	-1430.30	-717.93

Note: standard errors in parentheses.
** statistically significant at 5% level (for slope variables only)
* statistically significant at 10% level (for slope variables only)

difference allowed between the two groups; 3) same γ, and all thresholds are free to differ; 4) all parameters are allowed to differ, i.e. separate regressions. Likelihood ratio tests reject each of 1), 2) and 3) in favor of separate regressions.[21] It is noteworthy that rejecting 2) shows that representing racial differences by merely a dummy variable for race is inadequate.

4 Incorporating Labor Market Opportunities

We shall now extend the simple model to allow us to consider the effects of labor market opportunities. They are introduced into the model in the form of choice attributes. When these attributes take on values that vary across the individuals, thresholds that capture critical points of tradeoff between consecutive choices will also be different for each individual. A basic premise of the generalized model is that education attainment is largely determined by the individual characteristics included in z_i, and variations in labor market opportunities may tip a youth to choose up or down one level of education attainment but not further than that. More explanation of this property could be found in Au (2006).

[21] P-values of the χ^2statistics in the LR tests of 1), 2) or 3) against separate regressions are all smaller than 0.01.

4.1 A Generalized Ordered Choice Model with Variable Thresholds

To augment the simple ordered choice model in (1) to (5) to allow for observable choice-specific attributes, $\widetilde{x}_s$, that are variable across individuals (we omit the individual subscript for the moment), the returns and costs of education level s now depend on $\widetilde{x}_s$, in the form of $R(s \mid \widetilde{x}_s)$ and

$$C(s \mid \widetilde{x}_s; z, \eta) = C(s \mid \widetilde{x}_s)\varphi(z)\eta. \tag{7}$$

We maintain other assumptions in the basic model. Certain components of $\widetilde{x}_s$ may affect only the cost or only the returns. For individual i, the threshold dividing choices s and $s-1$ now comes from $\frac{R(s|\widetilde{x}_{s,i})-R(s-1|\widetilde{x}_{s-1,i})}{C(s|\widetilde{x}_{s,i})-C(s-1|\widetilde{x}_{s-1,i})} = \exp(-\alpha_{s,i})$. Obviously, $\alpha_{s,i}$ depends on $\widetilde{x}_{s,i}$ and $\widetilde{x}_{s-1,i}$.

These changes lead to a generalized ordered choice model with variable thresholds. Approximating the dependence of the thresholds on the relevant choice-specific attributes $x_{s,i} = [\ \widetilde{x}_{s,i} \quad \widetilde{x}_{s-1,i}\ ]$ with a linear function, the thresholds for youth i are

$$\alpha_{s,i} = \bar{\alpha}_s + x_{s,i}\beta_s, \qquad s = 2, \ldots, S. \tag{8}$$

Then, the probability that youth i chooses education level s is

$$\begin{aligned} \Pr\left[y_i = s \mid z_i; \widetilde{x}_{1,i}, \ldots, \widetilde{x}_{S,i}\right] &= \Pr\left[\alpha_{s,i} < z_i\gamma + \varepsilon_i < \alpha_{s+1,i}\right] \\ &= \Pr\left[\bar{\alpha}_s + x_{s,i}\beta_s - z_i\gamma < \varepsilon_i < \bar{\alpha}_{s+1} + x_{s+1,i}\beta_s - z_i\gamma\right] \end{aligned} \tag{9}$$

where $\bar{\alpha}_1 \equiv -\infty$ and $\bar{\alpha}_{S+1} \equiv +\infty$ for all i.

In a generalized ordered probit model, the resulting log likelihood function is

$$\ln L(\bar{\alpha}, \beta, \gamma \mid y, z) = \sum_{i=1}^{n}\sum_{s=1}^{S} \ln\left[\Phi(\bar{\alpha}_{s+1} + x_{s+1,i}\beta_{s+1} - z_i\gamma) - \Phi(\bar{\alpha}_s + x_{s,i}\beta_s - z_i\gamma)\right] \cdot \mathbf{1}\left[y_i = s\right]. \tag{10}$$

Ordered probit model with variable thresholds in the above form was first used in Terza (1985). Identification of more general cases including stochastic thresholds has been considered in Hansen et al. (2002). Example applications could be found in Pudney and Shields (2000) on grade promotion of nurses and Mullen (2001) on education attainment.

4.2 Lifetime Earnings and Discount Factor

The conversion of an age-earnings profile into a lifetime earnings reflects how youths draw implications from the labor market experience of older cohorts. It depends on how the youths discount future earnings, and how much they consider the experience of younger working adults as compared to those of the older workers to be relevant to them, both factors being embodied in a discount factor. It is, however, not obvious what value the discount factor should take. We therefore attempt not to pick a particular value ourselves but allow the data to reveal an appropriate one. In the process, we also check if the estimation results are sensitive to the discount factor being used.

Our baseline generalized ordered probit model includes lifetime earnings (log of sum of discounted earnings) as a measure of labor market opportunities. As an example of the variable thresholds which now depend on lifetime earnings, for the transition from dropping out of high school to graduating from high

school (the 2nd level of education),

$$\alpha_{2,i} = \bar{\alpha}_2 + earnings_{dropout,i} \cdot \beta_{2,dropout} + earnings_{hs,i} \cdot \beta_{2,hs}. \tag{11}$$

We expect $\beta_{2,dropout}$ to be positive, since higher earnings for high school dropouts, holding other factors constant, should make dropping out of high school a more attractive choice relative to finishing high school and hence more likely to be chosen. By similar logic, we expect $\beta_{2,hs}$ to be negative. If a term with the difference of the two earnings is entered into (11) replacing the two separate ones, that would be equivalent to imposing the restriction that $\beta_{2,hs} = -\beta_{2,dropout}$. We shall not impose this restriction a priori but we shall test it.

We estimate the baseline model for a range of discount factors from .80 to 1.00. Estimates of the coefficients in the latent propensity function stay very stable across the whole range of discount factor. Table 3 shows the log likelihood and the estimated slope parameters associated with lifetime earnings at the three thresholds. For white youths, the highest likelihood is achieved at the discount factor .97, although it does not yield significantly higher likelihood than other values of the discount factor in the range. For black youths, a discount factor at .98 is optimal likelihood-wise. An informal test[22] indicates that a discount factor at or smaller than .93 is unlikely for this group.[23]

Estimated coefficients are either statistically significant with expected signs, or statistically insignificant, except for one white threshold coefficient when the discount factor is set near .80, a very low value. The estimates are quite stable within several percentage point deviations in the discount factor from the one leading to the highest likelihood. For both black and white youths, likelihood ratio test of the restriction that the six coefficients of earnings in the thresholds are zero jointly (reverting to a simple ordered probit model) is in favor of including the earnings variables in the model.[24] The data thus support that education choice is responsive to labor market opportunities in the form of lifetime earnings as measured.

Given that the threshold estimates for white youths at discount factor .97 are practically indistinguishable from those at .98, for comparability, we shall use lifetime earnings calculated with a discount factor of .98 for both blacks and whites in our following analysis. At this value, a youth would weigh the earnings of a 30 years old person .82 times as relevant to him as that of a 20 year old person. Among the specifications of the thresholds that we will report on (differenced earnings, inclusion of employment rates), this discount factor value remains near optimal likelihood-wise.

4.3 Results of Generalized Ordered Probit Models

We estimate six regressions with different specifications of earnings and employment rates in the thresholds: (i) separate earnings; (ii) differenced earnings; (iii) separate earnings and separate employment rates; (iv) separate earnings and differenced employment rates; (v) differenced earnings and separate employment rates; and (vi) differenced earnings and differenced employment rates. Clearly, (ii) is nested in (i), (iv) and (v) are nested in (iii), and (vi) is nested in (iii)–(v). We test for the validity of the more parsimonious specifications

[22] This is a LR test variant treating the discount factor as one of the estimated parameters. Testing the discount factor at the highest-likelihood value against some other values is based on a $\chi^2(1)$ statistics which rejects at .05 level any value that leads to a log likelihood lower than the highest one by more than 1.92.

[23] Lang and Ruud (1986) estimate the implicit discount rate of own earnings at 7.3% in a schooling investment model. They cite studies in other areas like demand for durable goods and housing market that report discount rate estimates varying widely from 0–300%, but mostly in the 10–20% range. Willis and Rosen (1979), in a schooling model, put the average white discount rate at around 10–15%.

[24] The $\chi^2(6)$ test statistics has a p-value of .00 for whites and .01 for blacks.

Table 3: Coefficients of Earnings in Thresholds—Baseline Generalized Ordered Probit Model

White (N=1251)

Dis-count Factor	Log Likeli-hood	Threshold (dropout/hs)				Threshold (hs/somec)				Threshold (somec/4yrc)			
		dropout		hs		hs		somec		somec		4yrc	
		coeff.	z	coeff.	z	coeff.	z	coeff.	z	coeff.	z	coeff.	z
1.00	-1415.44	0.84	(0.66)	-1.07	(-0.73)	2.17	(2.43)	-0.67	(-0.78)	2.71	(4.15)	-1.06	(-1.76)
0.99	-1415.39	0.86	(0.66)	-1.09	(-0.73)	2.20	(2.44)	-0.68	(-0.77)	2.63	(4.04)	-0.95	(-1.57)
0.98	-1415.36	0.88	(0.66)	-1.11	(-0.74)	2.18	(2.41)	-0.66	(-0.73)	2.54	(3.92)	-0.83	(-1.36)
0.97	-1415.36	0.90	(0.68)	-1.14	(-0.76)	2.12	(2.35)	-0.59	(-0.65)	2.44	(3.79)	-0.69	(-1.14)
0.96	-1415.36	0.92	(0.70)	-1.16	(-0.79)	2.02	(2.26)	-0.49	(-0.54)	2.33	(3.67)	-0.56	(-0.92)
0.95	-1415.37	0.94	(0.74)	-1.18	(-0.83)	1.89	(2.15)	-0.37	(-0.40)	2.23	(3.55)	-0.42	(-0.70)
0.94	-1415.37	0.97	(0.78)	-1.20	(-0.88)	1.75	(2.02)	-0.22	(-0.24)	2.13	(3.43)	-0.29	(-0.49)
0.93	-1415.38	1.00	(0.83)	-1.22	(-0.94)	1.59	(1.88)	-0.07	(-0.07)	2.03	(3.33)	-0.17	(-0.29)
0.92	-1415.38	1.03	(0.89)	-1.24	(-0.99)	1.43	(1.73)	0.10	(0.11)	1.95	(3.24)	-0.06	(-0.10)
0.91	-1415.38	1.06	(0.94)	-1.26	(-1.05)	1.27	(1.58)	0.25	(0.29)	1.86	(3.15)	0.04	(0.07)
0.90	-1415.37	1.08	(1.00)	-1.27	(-1.11)	1.12	(1.44)	0.41	(0.47)	1.79	(3.08)	0.13	(0.22)
0.89	-1415.38	1.11	(1.06)	-1.28	(-1.17)	0.98	(1.29)	0.55	(0.64)	1.72	(3.01)	0.20	(0.36)
0.88	-1415.38	1.12	(1.11)	-1.28	(-1.22)	0.85	(1.16)	0.67	(0.81)	1.65	(2.94)	0.27	(0.48)
0.87	-1415.39	1.14	(1.16)	-1.28	(-1.27)	0.73	(1.03)	0.79	(0.98)	1.59	(2.89)	0.33	(0.59)
0.86	-1415.42	1.14	(1.20)	-1.27	(-1.31)	0.62	(0.90)	0.89	(1.13)	1.53	(2.83)	0.38	(0.68)
0.85	-1415.45	1.14	(1.24)	-1.25	(-1.35)	0.53	(0.79)	0.98	(1.28)	1.48	(2.78)	0.42	(0.77)
0.84	-1415.48	1.14	(1.28)	-1.24	(-1.38)	0.44	(0.68)	1.06	(1.41)	1.43	(2.74)	0.46	(0.84)
0.83	-1415.53	1.13	(1.30)	-1.22	(-1.40)	0.37	(0.58)	1.12	(1.54)	1.39	(2.69)	0.49	(0.90)
0.82	-1415.58	1.12	(1.33)	-1.19	(-1.43)	0.30	(0.49)	1.18	(1.66)	1.35	(2.65)	0.51	(0.96)
0.81	-1415.64	1.11	(1.35)	-1.17	(-1.44)	0.24	(0.40)	1.23	(1.78)	1.31	(2.61)	0.53	(1.01)
0.80	-1415.71	1.10	(1.37)	-1.15	(-1.46)	0.19	(0.32)	1.27	(1.88)	1.27	(2.58)	0.55	(1.06)

Black (N=591)

Dis-count Factor	Log Likeli-hood	Threshold (dropout/hs)				Threshold (hs/somec)				Threshold (somec/4yrc)			
		dropout		hs		hs		somec		somec		4yrc	
		coeff.	z	coeff.	z	coeff.	z	coeff.	z	coeff.	z	coeff.	z
1.00	-709.66	0.32	(0.42)	0.11	(0.13)	0.70	(1.38)	-0.88	(-1.70)	1.09	(2.20)	-1.52	(-3.52)
0.99	-709.59	0.23	(0.28)	0.20	(0.22)	0.74	(1.39)	-0.95	(-1.71)	1.24	(2.34)	-1.68	(-3.61)
0.98	-709.59	0.12	(0.14)	0.31	(0.32)	0.79	(1.41)	-1.02	(-1.74)	1.39	(2.45)	-1.85	(-3.67)
0.97	-709.69	0.00	(0.00)	0.42	(0.42)	0.85	(1.44)	-1.09	(-1.76)	1.53	(2.52)	-2.01	(-3.66)
0.96	-709.95	-0.10	(-0.12)	0.53	(0.53)	0.91	(1.47)	-1.16	(-1.79)	1.63	(2.52)	-2.15	(-3.55)
0.95	-710.38	-0.17	(-0.20)	0.60	(0.61)	0.96	(1.49)	-1.21	(-1.79)	1.67	(2.44)	-2.23	(-3.34)
0.94	-710.98	-0.20	(-0.25)	0.63	(0.67)	1.00	(1.49)	-1.23	(-1.77)	1.63	(2.31)	-2.22	(-3.08)
0.93	-711.67	-0.20	(-0.26)	0.64	(0.71)	1.01	(1.46)	-1.21	(-1.73)	1.51	(2.13)	-2.12	(-2.82)
0.92	-712.37	-0.18	(-0.25)	0.62	(0.73)	0.99	(1.42)	-1.18	(-1.67)	1.35	(1.93)	-1.96	(-2.58)
0.91	-713.01	-0.14	(-0.21)	0.58	(0.74)	0.97	(1.36)	-1.13	(-1.61)	1.18	(1.74)	-1.77	(-2.37)
0.90	-713.56	-0.10	(-0.16)	0.55	(0.74)	0.93	(1.30)	-1.07	(-1.55)	1.03	(1.56)	-1.59	(-2.17)
0.89	-714.03	-0.06	(-0.10)	0.51	(0.73)	0.88	(1.24)	-1.01	(-1.49)	0.89	(1.40)	-1.42	(-2.00)
0.88	-714.42	-0.02	(-0.03)	0.48	(0.72)	0.83	(1.18)	-0.95	(-1.43)	0.78	(1.25)	-1.28	(-1.85)
0.87	-714.74	0.02	(0.03)	0.45	(0.71)	0.77	(1.13)	-0.88	(-1.37)	0.68	(1.12)	-1.15	(-1.72)
0.86	-715.02	0.04	(0.10)	0.43	(0.70)	0.71	(1.06)	-0.82	(-1.32)	0.60	(1.01)	-1.04	(-1.60)
0.85	-715.25	0.07	(0.16)	0.41	(0.70)	0.66	(1.00)	-0.76	(-1.26)	0.52	(0.91)	-0.95	(-1.49)
0.84	-715.46	0.09	(0.22)	0.39	(0.69)	0.60	(0.94)	-0.70	(-1.21)	0.46	(0.81)	-0.86	(-1.39)
0.83	-715.63	0.11	(0.27)	0.38	(0.68)	0.55	(0.88)	-0.65	(-1.16)	0.40	(0.73)	-0.78	(-1.31)
0.82	-715.78	0.12	(0.33)	0.36	(0.67)	0.50	(0.82)	-0.60	(-1.11)	0.35	(0.65)	-0.71	(-1.22)
0.81	-715.91	0.13	(0.38)	0.35	(0.67)	0.45	(0.77)	-0.55	(-1.06)	0.31	(0.58)	-0.65	(-1.15)
0.80	-716.02	0.14	(0.43)	0.34	(0.66)	0.40	(0.71)	-0.51	(-1.02)	0.27	(0.52)	-0.59	(-1.07)

against the more general ones, and we find the following: for whites, differenced earnings is rejected when testing (ii) against (i), (v) against (iii) and (vi) against (iv), but we fail to reject employment rates to enter in differences when (iv) is tested against (iii); for blacks, we fail to reject any of the more parsimonious specifications. Therefore, the specifications that we are primarily interested in are (i) and (iv) for whites, in which earnings are separate, and (ii) and (vi) for blacks, with earnings in differences. Employments rates, when used in (iv) or (vi), are in differences for both groups. Estimation results of the generalized ordered probit model with separate earnings and difference earnings are shown in Table 4 and Table 5 respectively.

4.3.1 White Youths

Results for white youths are recorded in the first three columns of Table 4. While these columns have varying specifications on the thresholds, coefficients of the individual characteristics in the propensity function are very stable, and generally stay close to those estimated in the simple ordered probit model. The only exception is that after including the location specific labor market variables in the thresholds, southern residence has a stronger and statistically significant negative association with the latent propensity to get education.[25]

Column 1 is the baseline generalized model with earnings entered in the variable thresholds. All coefficients of earnings in the three thresholds are of the expected signs. One of the two earnings in threshold (hs/somec) and threshold (somec/4yrc) is statistically significant, supporting that education choice across these transitions respond to earnings prospects as predicted by theory. We however do not have sufficient evidence to say the same about the first transition on finishing high school. To illustrate how much these earnings shape education choice, we compare their effects to that of mother's education, which is stable and strong. Based on the point estimates, at the transition from high school to attending college, a one s.d. increase in high school earnings, which raises the threshold and reduces the chance of it being surpassed, produces the same effect as mother's education lowered by 1.2 s.d.. Similarly, a one s.d. increase in some-college earnings can negate a rise in mother's education by 1.4 s.d. in the decision on completing college in the transition (somec/4yrc). Taken alone, these earnings prospects indeed have quite substantial effects on education choices of white youths.

In column 2, differenced local employment rates are added as another labor market opportunity variable in the thresholds. We expect their coefficients to be negative but that is true only in the last transition, although none of the three coefficients is statistically significant. The introduction of the employment rate terms into the model has negligible impact on the estimated coefficients of earnings as compared to those in column 1. They also add very little to improving the fit of the model to the data.[26]

Along with future monetary returns in earnings, the immediate out-of-pocket cost of going to college is considered in column 3. Two year and four year college tuitions[27] are added to the thresholds relevant to college education. We find that tuition of two year college has a statistically significant effect in the expected direction on the transition from high school to attending college. There, a one s.d. increase in two year college tuition discourages college attendance by as much as reducing mother's education by .42 s.d.. Coefficients of both college tuition terms in the threshold (somec/4yrc) are statistically insignificant though

[25]The effects of living in the South (vs. non-South) is equivalent to a 1.1 s.d. drop in mother's education, based on point estimates in column 2 of Table 4.

[26]The $\chi^2(3)$ test statistics on zero coefficients for all three employment rate terms has a p-value of .76.

[27]Two year college tuition is the state average resident tuition and fees for community colleges. Four year college tuition is the state average resident undergraduate tuition and fees for colleges and state universities. The tuitions are inflation-adjusted, and are taken from the year when the youth is 18. Source: Washington Higher Education Coordination Board.

Table 4: Generalized Ordered Probit Models (Separate Earnings and Differenced Employment Rates)

Dependent Variable:		**White**			**Black**	
Education Level	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
No. of Siblings	-.0562**	-.0564**	-.0552**	-.0547**	-.0632**	-.0543**
	(.0164)	(.0164)	(.0164)	(.0176)	(.0186)	(.0176)
Family Income	.173**	.173**	.172**	.147**	.160**	.148**
	(.0273)	(.0273)	(.0274)	(.0513)	(.0552)	(.0513)
Father's Education	.111**	.111**	.111**	.0239	.0262	.0241
	(.0120)	(.0120)	(.0120)	(.0171)	(.0188)	(.0172)
Mother's Education	.0809**	.0807**	.0804**	.102**	.0975**	.102**
	(.0167)	(.0168)	(.0168)	(.0221)	(.0240)	(.0221)
Broken Family	-.229**	-.228**	-.229**	-.124	-.133	-.122
	(.0851)	(.0852)	(.0855)	(.0967)	(.103)	(.0969)
Rural Residence	-.146*	-.150*	-.140*	.146	.273	.153
	(.0819)	(.0820)	(.0824)	(.187)	(.223)	(.187)
South Residence	-.208**	-.214**	-.216**	-.0553	-.138	-.0600
	(.0888)	(.0892)	(.0908)	(.100)	(.112)	(.104)
Threshold (dropout/hs)						
Earnings - dropout	.880	.951	.797	.115	-2.55**	.151
	(1.33)	(1.33)	(1.31)	(.850)	(1.17)	(.841)
Earnings - hs	-1.11	-1.13	-1.03	.310	4.13**	.265
	(1.50)	(1.50)	(1.50)	(.981)	(1.45)	(.969)
Δ Employment Rate (hs-dropout)		1.29			-.730	
		(2.32)			(1.88)	
Constant	3.34	2.75	3.29	-3.29	-14.0	-3.20
	(4.64)	(4.74)	(4.66)	(4.14)	(5.20)	(4.17)
Threshold (hs/somec)						
Earnings - hs	2.18**	2.13**	1.81**	.790	2.06**	.721
	(.904)	(.916)	(.924)	(.559)	(.749)	(.586)
Earnings - somec	-.656	-.676	-.462	-1.02*	-1.81**	-1.01*
	(.903)	(.915)	(.916)	(.586)	(.840)	(.607)
Δ Employment Rate (somec-hs)		1.64			-2.95**	
		(1.73)			(1.47)	
Tuition – 2yr College			.368**			.172
			(.173)			(.232)
Constant	-11.3	-10.80	-9.94	3.80	-.177	4.25
	(3.75)	(3.79)	(3.79)	(3.72)	(5.06)	(3.77)
Threshold (somec/4yrc)						
Earnings - somec	2.54**	2.67**	2.99**	1.39**	2.13**	1.53**
	(.649)	(.725)	(.686)	(.567)	(1.08)	(.595)
Earnings - 4yrc	-.827	-.980	-1.13*	-1.85**	-1.52*	-1.87**
	(.607)	(.651)	(.624)	(.505)	(.898)	(.492)
Δ Employment Rate (4yrc-somec)		-.0414			-3.28*	
		(3.21)			(1.98)	
Tuition – 2yr College			-.304			-.473
			(.293)			(.516)
Tuition – 4yr College			.0220			.294
			(.243)			(.463)
Constant	-12.4	-12.2	-13.6	7.10	-2.49	5.93
	(4.06)	(4.19)	(4.15)	(4.59)	(6.60)	(4.66)
No. of observations	1251	1251	1251	591	518	591
Log likelihood	-1415.36	-1414.78	-1407.57	-709.59	-612.16	-708.38

Note: standard errors in parentheses.
** statistically significant at 5% level (for slope variables only)
* statistically significant at 10% level (for slope variables only)

with expected signs. Only minor changes in the estimated coefficients of earnings are observed as compared to those in column 1.

4.3.2 Black Youths

We next turn to Table 5 which reports the results of the generalized model estimated with differenced earnings for Blacks in column 4–6. As in the case of whites, all of these models with variable thresholds produce coefficients of the individual characteristics in the propensity function very similar to those estimated with the simple ordered probit model.

In column 4, coefficients of the earnings terms in all the three thresholds have the expected negative sign, although only in the threshold (somec/4yrc) do we find the differenced earnings to be statistical significant. A one s.d. increase in the earnings differential between some college and four year college for blacks produces an effect equivalent to raising mother's education by .81 s.d. on the decision to completing four year college. Specification test of the simple ordered probit model against this model indicates that incorporating the differenced earnings is appropriate.[28]

When employment rates differentials are included in the model as shown in column 5, unlike the case of white youths, the results show that the education choice of black youths are influenced by them. Earnings and employment rates differentials are both found to have statistically significant effects with the expected sign on the two latter schooling transitions about college education. Calculating from the point estimates, a one s.d. rise in the earnings differential and the same in the employment rate differential in the threshold (hs/somec) has effects equivalent to increasing mother's education by .58 and .54 s.d. respectively, whereas in the threshold (somec/4yrc), .86 and .50 s.d. respectively. In the transition on finishing high school, the two differentials, however, do not carry the expected sign although they are not statistically significant either. We do notice that in the less parsimonious corresponding specification in column 5 of Table 4, in the threshold (dropout/hs), the coefficients of the separate earnings are statistically significant with the wrong sign but the employment rates differential reverses to carry the expected sign. The anomaly could be due to the complex correlation structure between the two earnings and the employment rates, and/or that the earnings are calculated based on full-time workers which could be a more serious problem for the transition on finishing high school.

When tuitions of two year and four year college are included in the model on column 6, their coefficients are of the expected sign though they are not statistically significant. Their presence has minimum impact on other coefficients as compared to column 4 as well as on the model fit.

4.4 Robustness of Results

4.4.1 Alternative Measures of Lifetime Earnings

With the assumption that youths have a stationary view of the labor market, we followed the approach as described in Section 2.1 to calculate the earnings opportunities available to them. Lifetime earnings are calculated from a 4th order median age-earnings profile based on weekly earnings of full-time workers. The results reported in the last section (column 1–3 of Table 4 for whites, column 4–6 of Table 5 for blacks) are generally consistent with theory. There are, however, other reasonable ways to measure the monetary compensation from the labor market. We want to know if they may fit the data as well, and if so, whether the results produced are vastly different from what we have seen. We explore these alternatives in a few

[28] The simple ordered probit model is rejected in the LR test with a $\chi^2(3)$ test statistics having a p-value of .00.

Table 5: Generalized Ordered Probit Models (Earnings and Employment Rates in Differences)

Dependent Variable: Education Level	**White** (1)	(2)	(3)	**Black** (4)	(5)	(6)
No. of Siblings	-.0578** (.0164)	-.0581** (.0164)	-.0564** (.0164)	-.0541** (.0176)	-.0648** (.0185)	-.0539** (.0176)
Family Income	.153** (.0267)	.155** (.0268)	.153** (.0268)	.151** (.0510)	.149** (.0547)	.151** (.0510)
Father's Education	.112** (.0119)	.111** (.0119)	.111** (.0119)	.0242 (.0171)	.0272 (.0187)	.0243 (.0171)
Mother's Education	.0825** (.0167)	.0824** (.0167)	.0821** (.0167)	.102** (.0221)	.0964** (.0239)	.102** (.0221)
Broken Family	-.215** (.0849)	-.213** (.0849)	-.221** (.0853)	-.119 (.0966)	-.143 (.103)	-.119 (.0969)
Rural Residence	-.132 (.0816)	-.139* (.0817)	-.122 (.0820)	.135 (.183)	.303 (.220)	.143 (.183)
South Residence	-.107 (.0822)	-.122 (.0830)	-.132 (.0844)	-.0470 (.0936)	-.0352 (.103)	-.0498 (.0968)
Threshold (dropout/hs)						
Δ Earnings (hs-dropout)	-.178 (1.33)	-.412 (1.33)	-.121 (1.31)	-.109 (.876)	1.54 (1.16)	-.123 (.869)
Δ Employmentt Rate (hs–dropout)		2.19 (2.31)			1.17 (1.93)	
Constant	1.15 (.231)	1.06 (.245)	1.12 (.230)	.525 (.292)	.274 (.330)	.528 (.292)
Threshold (hs/somec)						
Δ Earnings (somec-hs)	-1.87** (.862)	-1.79** (.884)	-1.71** (.869)	-.762 (.525)	-1.77** (.723)	-.751 (.545)
Δ Employment Rate (somec-hs)		2.74 (1.69)			-3.46** (1.36)	
Tuition – 2yr College			.426** (.171)			.148 (.230)
Constant	2.65 (.205)	2.51 (.220)	2.43 (.224)	1.77 (.283)	2.14 (.333)	1.71 (.303)
Threshold (somec/4yrc)						
Δ Earnings (4yrc-somec)	-1.17** (.557)	-1.30** (.630)	-1.58** (.593)	-1.68** (.466)	-1.70* (.899)	-1.80** (.474)
Δ Employment Rate (4yrc-somec)		2.03 (3.04)			-2.85* (1.65)	
Tuition – 2yr College			-.350 (.289)			-.495 (.515)
Tuition – 4yr College			.174 (.238)			.281 (.460)
Constant	3.43 (.227)	3.38 (.257)	3.50 (.268)	2.92 (.304)	3.04 (.365)	2.94 (.361)
No. of observations	1251	1251	1251	591	518	591
Log likelihood	-1426.19	-1424.29	-1418.10	-710.82	-616.36	-709.55

Note: standard errors in parentheses.
** statistically significant at 5% level (for slope variables only)
* statistically significant at 10% level (for slope variables only)

dimensions. The first is on using 2nd order vs. 4th order median age-earnings profiles to summarize the earnings of adults living in a neighborhood. The second is on using weekly vs. annual earnings. Their main difference is due to variations in the number of weeks worked in a year.[29] Weekly earnings reflect more accurately the earnings during employment, while earnings on an annual basis take into account loss of remuneration during unemployment in parts of the year. We also calculate lifetime earnings from age-earnings profiles based on full-time workers, and separately, from profiles based on a larger sample extending to include people who work less.[30] Lastly, we consider weekly income which includes receipts from non-work sources. Income is defined as earnings plus income from social security, welfare, investments and other sources.

Tests on specifications as described at the beginning of Section 4.3 are performed with these other measures of monetary compensation. We consistently find the two respective sets of specifications that we have been using for black and white youths continue to be valid for all these measures,[31] and we shall focus on them. Model selection tests (Vuong 1989) are used to compare specifications with weekly earnings based on full-time workers that we use to arrive at our main results against specifications with these other measures of compensation as non-nested models. There are three possible outcomes in the model selection test: reject first model, reject second model, or reject neither.

For white youths, the order of the age-earnings profile makes little difference and so is using earnings on a weekly or annual basis. Including under-employed adults in the reference population for earnings and using weekly income instead of earnings tend to improve the fit to the data slightly. The likelihood function is very flat across discount factors in all cases. In the model selection tests, the models of our main results are never rejected, but neither are those with other measures of compensation that we consider. The results of all these models utilizing different measures of compensation are generally very consistent in that earnings/income for some college in the threshold (somec/4yrc), followed by earnings/income for high school in the threshold (hs/somec) show the most prominent effects on white youths' education choice.

In the case of black youths, lifetime earnings calculated from 4th order age-earnings/income profiles almost always fit their education choice better than those from 2nd order profiles.[32] Weekly earnings or annual earnings make minimal differences, but earnings based on only full-time workers tend to provide a closer fit to education choice of the youths, and the same is true for weekly earnings over weekly income. The models of our main results for blacks are never rejected in the model selections test. Their fit to the data is sufficiently better than many others to lead to rejection of a number of models with other measures of compensation. The unrejected ones often stay so only marginally (with p-value between .05 and .1), and their results are usually weaker in that often one less threshold variable in the two latter thresholds can reach a statistical significance level of .1. Annual earnings based on full-time workers (4th order) is the only alternative measure of compensation that can fit the data as well as weekly earnings on the same basis. The two give almost identical regression results.

[29] From the 1980 5% census data, among male adults not in school, in a year 81% of whites and 62% of blacks worked at least 40 weeks, while 9% of whites and 24% of blacks worked no more than 10 weeks.

[30] For weekly earnings based on full-time workers and other non-schooling males, we assume they are less than median if a person has worked no more than 10 weeks to reduce fluctuations in weekly earnings due to errors in the small reported number of weeks worked.

[31] We perform these tests at .05 significance level. There are a few cases when the more parsimonious specification are marginally accepted (p-value between .05 and .1).

[32] For the main results we report in the last section which are based on weekly earnings of full-time workers, visual inspection of the age-earnings profiles in major SMSA's shows that a 2nd order profile tend to overestimate the earnings of high school graduates in the first few years of their career and underestimate the earnings of college attendees around age 40–55 relative to the 4th order profile, and this is the case for both black and white youths.

We conclude that our main results given in Section 4.3 are quite robust with regard to using alternative measures of monetary compensation that can provide comparable fit to the data. Results of the specification tests, regressions models of education choice (only threshold coefficients are reported), and the model selection tests carried out in this section are reported in the appendix (available upon request).

4.4.2 Are the Effects of Earnings on Education Choice Spurious?

This paper makes use of variations of labor market opportunities across neighborhoods to identify their effects on education choice. It is reasonable to question if such effects are spurious, reflecting some other underlying differences across the neighborhood. We attempt to address the two possibilities about the population size of the metropolitan area (SMSA) and family income in the neighborhoods.

First, metropolitan areas with larger population typically has higher cost of living and wages. The question is whether our earnings, which tend to be higher in larger metropolitan areas, have effects simply reflecting the population size of the metropolitan area or attributes of the neighborhood that are associated with it. We shall respond in two ways. One, earnings (log lifetime earnings) at different levels of education are indeed highly correlated among themselves, and each is also positively correlated with the population size of the metropolitan area.[33] But it is less plausible that *differences* in log earnings between consecutive levels of education would reflect the effects of population size and cost of living.[34] Column 1–3 of Table 5 show that white youths do respond to the earnings differentials in the expected direction and with statistical significance in the two latter transitions. They are qualitatively similar to our main results for whites in column 1–3 of Table 4 where earnings are in levels. Although coming from specifications that we have shown to be overly restrictive for white youths (for black youths, our preferred specifications already have earnings in differences), they tend to support that our main results are not driven by population size. Further reinforcement comes from the results in column 1 and 4 of Table 6, for whites and blacks respectively, where population size is included as a threshold variable in each of the three thresholds in our main models. While the relationship between education choice and size of the city in which a youth resides is interesting in its own (it is more likely for white youths to dropout from high school and finish 4 year college in bigger cities; only the former for black youths), our main focus is that the presence of population size in the model has very minimal impact on the estimated coefficients in the original model.

A second concern about our main results is whether the effects of earnings are merely reflecting those of local income level. Earnings at all education level are quite highly correlated with local family income, and is more so for whites than for blacks.[35] School quality is affected by local income level as they are often funded by local taxes in the US. Presence of peers from more well-off families can also influence the education choices made by youths. Datcher (1982) finds that average income in a zip code level neighborhood has positive and strong effects on the years of education attainment of both black and white youths. Jensen and Selzer (2000) have findings in the same direction on the college attendance decision by youths in Australia. We add local median family income to the thresholds in our main model, and the estimation results are shown in column 2 and 5 of Table 6. Interestingly, no statistically significant effects of local family income is found for both

[33] Correlation coefficients between the earnings range from .61 to .94, with higher correlation observed between adjacent education levels. Those between earnings and population size of the metropolitan area are about .45 for whites and .15 for blacks.

[34] For whites, correlation coefficients among the earnings differentials are from .11 to .43, and between the earnings differentials and population of metropolitan area, from −.16 to .11. For blacks, they are, between earnings differentials, −.20 to .09, and between earnings differentials and population, −.03 to .09.

[35] Correlation coefficients between the earnings and median family income in the neighborhood is between .73 to .82 for whites, and .31 to .42 for blacks.

Table 6: Generalized Ordered Probit Models (Neighborhood Variables and Ability Measure)

Dependent Variable:		**White**			**Black**		
Education Level		**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
No. of Siblings		-.0577**	-.0556**	-.0332*	-.0714**	-.0647**	-.0355*
		(.0165)	(.0164)	(.0176)	(.0187)	(.0186)	(.0197)
Family Income		.176**	.174**	.127**	.152**	.154**	.100*
		(.0274)	(.0274)	(.0298)	(.0549)	(.0554)	(.0595)
Father's Education		.114**	.111**	.0673**	.0238	.0266	.00555
		(.0120)	(.0120)	(.0129)	(.0188)	(.0188)	(.0195)
Mother's Education		.0784**	.0815**	.0279	.0995**	.0963**	.0441*
		(.0168)	(.0168)	(.0180)	(.0240)	(.0239)	(.0252)
Broken Family		-.226**	-.232**	-.198**	-.128	-.137	-.263**
		(.0855)	(.0858)	(.0905)	(.103)	(.103)	(.109)
Rural Residence		-.144*	-.145*	-.188**	.285	.314	.0426
		(.0825)	(.0827)	(.0880)	(.223)	(.222)	(.236)
South Residence		-.204**	-.217**	-.127	-.180	-.0426	.126
		(.0891)	(.0891)	(.0971)	(.120)	(.104)	(.111)
Threshold (dropout/hs)							
Earnings	dropout	.683	.830	.958			
		(1.35)	(1.33)	(1.53)			
	hs	-1.40	-.444	-1.39			
		(1.54)	(1.66)	(1.72)			
Δ Earnings (hs-dropout)					1.16	1.51	1.57
					(1.24)	(1.15)	(1.30)
Δ Employment Rate (hs-dropout)					.548	1.06	-.00528
					(2.09)	(1.92)	(2.19)
Population in SMSA		.0645**			.0821**		
		(.0260)			(.0265)		
Median Family Income in Neighborhood			-.242			.107	
			(.261)			(.187)	
AFQT89				-.770**			-.674**
				(.0792)			(.102)
Constant		7.68	-1.82	3.84	-.0101	.0732	-1.10
		(4.97)	(7.07)	(5.12)	(.348)	(.499)	(.386)
Threshold (hs/somec)							
Earnings	hs	1.97**	2.40**	3.22**			
		(.904)	(.912)	(1.13)			
	somec	-.154	-.797	-2.23**			
		(.924)	(1.01)	(1.11)			
Δ Earnings (somec-hc)					-1.95**	-1.84**	-2.02**
					(.741)	(.742)	(.854)
Δ Employment Rate (somec-hc)					-3.23**	-3.44**	-3.35**
					(1.38)	(1.37)	(1.65)
Population in SMSA		.0298			.0247		
		(.0210)			(.0250)		
Median Family Income in Neighborhood			-.0226			-.000875	
			(.199)			(.183)	
AFQT89				-.991**			-.923**
				(.0649)			(.100)
Constant		-14.1	-12.0	-7.39	1.97	2.14	.729
		(4.17)	(5.82)	(4.20)	(.358)	(.504)	(.380)
Threshold (somec/4yrc)							
Earnings	somec	2.86**	2.07**	2.24**			
		(.668)	(.796)	(.773)			
	4yrc	-.606	-1.18*	-1.26*			
		(.623)	(.636)	(.749)			
Δ Earnings (4yrc-somec)					-1.58*	-1.82**	-1.64
					(.901)	(.928)	(1.02)
Δ Employment Rate (4yrc-somec)					-2.74	-2.69	-2.00
					(1.68)	(1.68)	(2.03)
Population in SMSA		-.0468**			.0333		
		(.0224)			(.0328)		
Median Family Income in Neighborhood			.278			.152	
			(.213)			(.248)	
AFQT89				-1.02**			-.929**
				(.0712)			(.124)
Constant		-17.3	-5.30	-6.44	2.84	2.76	1.76
		(4.62)	(6.55)	(4.61)	(.391)	(.579)	(.401)
No. of observations		1251	1251	1182	518	518	488
Log likelihood		-1408.73	-1413.48	-1143.01	-611.16	-615.93	-514.03

Note: standard errors in parentheses.
** statistically significant at 5% level (for slope variables only)
* statistically significant at 10% level (for slope variables only)

white and black youths in any of the three education transitions. Earnings with college degree, however, has become slightly stronger in its influence in the decision to finish college for whites. Other than that, the presence of local family income in the model produces little changes in the coefficients of other variables in the model for both blacks and whites. Replacing local family income with the own-race local family income (results not shown) would not change any of the above observations.

4.4.3 Aptitude Test Score

In the vast literature on racial differences and discrimination in economics, measures of ability or intelligence play a special and controversial role. Without accounting for them, there is often a large unexplained difference between blacks and whites in wages or attainments which blacks lack behind. However, once they are included as explanatory variables in a model and are controlled for, the black-white differences are usually substantially narrowed, eliminated or even reversed to blacks' advantage (see e.g. Rivkin 1994, Neal and Johnson 1996, Carneiro et al. 2003). These measures of ability or intelligence are often scores from tests of various nature obtained at age of youth or adult. And blacks score much worse than whites in these tests (Jencks and Phillips 1998). The test scores indicate certain ability at a point of time which has been developed and accumulated from infancy up till the test is taken. One general aptitude test score that is available in NLSY79 is the Armed Forces Qualifying Test score (AFQT89).[36] Cameron and Heckman (2001) regard it as reflecting long term family income and background, and are cautious about putting it in their education attainment model. With the test score in its present form, it is unlikely that it is exogenous to education attainment decision.[37] We nevertheless include the results with AFQT89 in the thresholds in column 3 and 6 of Table 6 for comparison. Our interest here is whether including the test score in the model would substantial change our main results regarding earnings and employment probabilities. As expected, the test score is a very strong determinant of education choice. Its presence also has a quite large impact on the coefficients of family background variables—most of them are weakened substantially. For whites, coefficients of earnings in the two latter transitions tend to become more prominent, numerically as well as in statistical significance, in the direction as predicted by theory. For blacks, minor changes in the coefficients of variables in the thresholds are observed, although differenced earnings and differenced employment rates are no longer statistically significant in the threshold (somec/4yrc) in the presence of AFQT89.

4.5 Predictions on Education Attainments

Based on our main results in column 5 of Table 5, we attempt to predict how the education attainment of black youths would be if 1) they possess individual characteristics which are on the average equal to those of their white counterparts, but face the same set of labor market opportunities as before; and 2) each of the black youths retains his own background characteristics, but have access to the labor market opportunities available to whites living in his neighborhood.[38] We perform a similar exercise with white youths based on estimates in column 1 of Table 4, by adjusting their individual characteristics toward means of black youths, and switching their earnings to black ones. The results are shown in Table 7.

[36] Our AFQT89 score is age-adjusted and standardized. Since the NLSY79 youths take the test at different ages, their raw score are not directly comparable. We rank each youth according to his test score among the group of youths at the same age in the cross-section sample. The percentile rank of a youth within his age group is then converted to a standard normal score at the same percentile in the standard normal distribution.

[37] See Hansen et al. (2003).

[38] See note c. and d. of Table 7 for details.

Table 7: Predictions on Education Attainment

	White (N=775)			Black (N=518)		
	High School	Some College	4 Yr College	High School	Some College	4 Yr College
A. Actual and Predicted Education Attainment (% attaining at least)						
Actual						
Full Sample[a]	87.8	47.3	28.0	78.0	36.2	12.7
Sample Used for Predictions[b]	85.8	47.1	26.1	76.1	35.1	12.2
Predicted						
Model fit	87.3 (.9)	46.9 (1.3)	27.2 (1.1)	76.1 (1.7)	35.3 (1.9)	12.2 (1.4)
1) Adjusting All Individual Characteristics	74.6 (1.8)	28.5 (1.7)	13.7 (1.1)	86.2 (1.8)	50.1 (3.2)	21.4 (2.7)
2) Switching Labor Market Opportunities	86.7 (1.9)	57.6 (2.6)	38.1 (2.6)	76.3 (1.8)	28.8 (2.7)	11.6 (1.8)
B. Effects on Predicted Education Attainment (%)						
Adjusting Characteristics of Individuals[c]						
No. of siblings	-1.2 (.4)	-2.4 (.7)	-1.9 (.5)	2.3 (.6)	2.8 (.8)	1.5 (.5)
Family Income	-2.9 (.5)	-5.2 (.8)	-4.2 (.6)	3.7 (1.3)	4.6 (1.7)	2.6 (1.0)
Father's Education	-4.0 (.5)	-7.1 (.7)	-5.6 (.6)	1.5 (1.0)	1.8 (1.2)	1.0 (.7)
Mother's Education	-1.0 (.2)	-1.8 (.4)	-1.5 (.3)	1.8 (.4)	2.2 (.5)	1.2 (.3)
Broken Family	-1.1 (.4)	-2.0 (.8)	-1.7 (.6)	1.1 (.7)	1.3 (.9)	.7 (.5)
Rural Residence	.3 (.2)	.6 (.4)	.5 (.3)	1.1 (.8)	1.3 (1.0)	.7 (.5)
South Residence	-.8 (.3)	-1.5 (.6)	-1.2 (.5)	.2 (.6)	.2 (.7)	.1 (.4)
All Characteristics	-12.7 (1.2)	-18.4 (1.1)	-13.5 (.8)	10.2 (1.4)	14.8 (2.3)	9.2 (1.8)
Switching Labor Market Opportunities[d]						
Earnings	-.6 (1.8)	10.7 (2.5)	10.9 (2.4)	.4 (.3)	-1.7 (.7)	.9 (.6)
Employment Probabilities				-.1 (.2)	-4.9 (1.9)	-1.5 (.9)
Earnings & Employment Prob.				.3 (.3)	-6.5 (2.0)	-.6 (1.1)

Note: standard errors in parentheses (calculated based on 1000 random draws from the distribution of the estimated parameters)

a. The full sample has 1251 white youths and 591 black youths.
b. 775 white youths could be matched to available black earnings at every education level in the same neighborhood. Own-race employment rates are available for 518 black youths only.
c. Characteristics of individuals in a group are adjusted to have the same mean as the reference group. For example, for white youths to have the same number of siblings as blacks on the average, we add to the number of siblings of each white youth a constant, which is the difference in the mean number of siblings between the two groups.
d. Earnings and/or employment probabilities are switched by replacing own earnings and/or own employment probabilities with those of the reference group in the same neighborhood.

When the whole set of individual characteristics of black youths are adjusted to the white levels, their education attainment at all levels improve significantly by 9–15%. The proportions of them finishing high school and attending college become comparable to and slightly ahead of the actual white percentages, although they would still fall short on completing four year college by about 5%. Mirroring these, attainments of white youths fall across the board by 13–18% when their characteristics are adjusted to average to black means. Percentage of them finishing high school and four year college are then similar to the actual black figures, but their college attendance rate would go down sharply to 7% below the actual black rate. Breaking down the predict effects by individual characteristic, as reported in part B of the table, shows that closing the racial gaps in family income and parental education are the more important causes of the above changes.

More central to this paper are the predicted effects of switching labor market opportunities between the two groups. When black youths face the earnings and employment rates of whites in their neighborhood, there are very minimal changes in their predicted percentage finishing high school or four year college. Interestingly, college attendance is predicted to go *down* by 6.5%, mostly due to changes in employment probabilities. It is true that blacks who attended some college face earnings and employment probabilities significantly lowered than their white counterparts, but even more so are black high school graduates as compared to white high school graduates. What determine education attainments here are the differentials of earnings and employment probabilities between consecutive levels of education. In our sample used for these predictions, the median earnings differentials and employment probabilities differentials between some college and high school are .061 and .094 for blacks and .035 and .051 for whites living in the same neighborhoods. The narrower differentials reduce the incentives for black high school graduates to attend college.

As a comparison, when white youths are to face black earnings, while the proportion of them finishing high school would be essentially unchanged, both college attendance rate and college completion rate would go *up* by almost 11%. The model we use for white predictions is based on separate earnings in levels. Lower black earnings associated with some college education makes attending college less attractive, but at the same time, lower earnings for high school graduates would encourage further schooling. In this case, with the given combination of responsiveness of education choice to earnings (coefficient estimates) and earnings gaps between blacks and whites, the latter more than offset the former. Similar logic explains the change in college completion rate.

The two scenarios above indicate that lower earnings and more limited employment opportunities available to blacks are not direct causes of their lower education attainment than whites. Predictions based on results of some other models estimated in this paper may vary, but they generally support the same conclusion.[39] At the same time, group differences in background characteristics, when eliminated as shown earlier, are sufficient to explain most if not all of the differences in education attainment between black and white youths.

5 Summary and Conclusion

Human capital theory suggests that education attainment is the result of a conscious decision weighing the costs and benefits of getting education. The most obvious benefits to more education come from higher

[39]For white youths, based on estimates in column 2 of Table 4, when given black earnings and employment rates, the predicted change in the percentage attaining (hs, somec, 4yrc) are (−.6, 7.7, 9.9). For black youths, the corresponding predicted changes as a result of switching to white earnings and employment rates are (−2.6, .7, 2.9) with column 4 of Table 4, (−9.5, −7.4, −2.7) with column 5 of Table 4, and (−.0, −.7, 1.1) with column 4 of Table 5.

compensations to work and more employment opportunities. We observe that black people in the US receive lower wages and are less likely to be employed at every education level, and at the same time they are less educated than white people. It is natural to ask whether their lower education attainment is partly a response to the less favorable labor market opportunities available to them.

We estimate a model of education choice that incorporates labor market opportunities with data of male white youths and male black youths from the NLSY79. Since the decision on education attainment by the youths precede their working life, it depends on their expectations of future labor market conditions. We assume that these expectations are formed based on observation of own-race adults living in his neighborhood at the time of a youth's decision. Labor market opportunities in the forms of lifetime earnings and employment probabilities in the local labor markets are measured accordingly. Estimation results of the education choice model are generally consistent with theory. They show that white youths are responsive to earnings opportunities, and black youths to earnings as well as employment probabilities, in their decisions on attending college and obtaining a four year college degree.

Based on the estimated model, we attempt to predict the education attainments of black youths if they have access to white opportunities. The reverse case with white youths facing black opportunities is also performed for cross-checking. The results in both cases indicate that equal access to labor market opportunities, by itself, would not bring the racial gap in education attainment closer. On the other hand, differences in family background between the two groups are sufficient to explain most if not all of the gap in education.

We cannot find evidence to support that inferior labor market opportunities contributed to the lower education attainment of black youths.

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