

# **The Determinants of Education: An In-depth Examination by Race/Ethnicity**

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## **Abstract**

College enrollment is increasing even though the real cost of attending college is rising. There is variation in college enrollment across race and ethnicity. White enrollment rates have increased faster than both black and Hispanic enrollment rates. Additionally, Hispanic enrollment rates are more volatile than whites or blacks. This paper estimates three college enrollment equations; one for each race/ethnicity discussed to find differences in the college decision. Factors such as student characteristics, family background characteristics, and high school quality have positive effects on the enrollment decision and counteract the negative effect of tuition. The effect of each of these characteristics varies among white, black and Hispanic students.

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## ***I. Introduction***

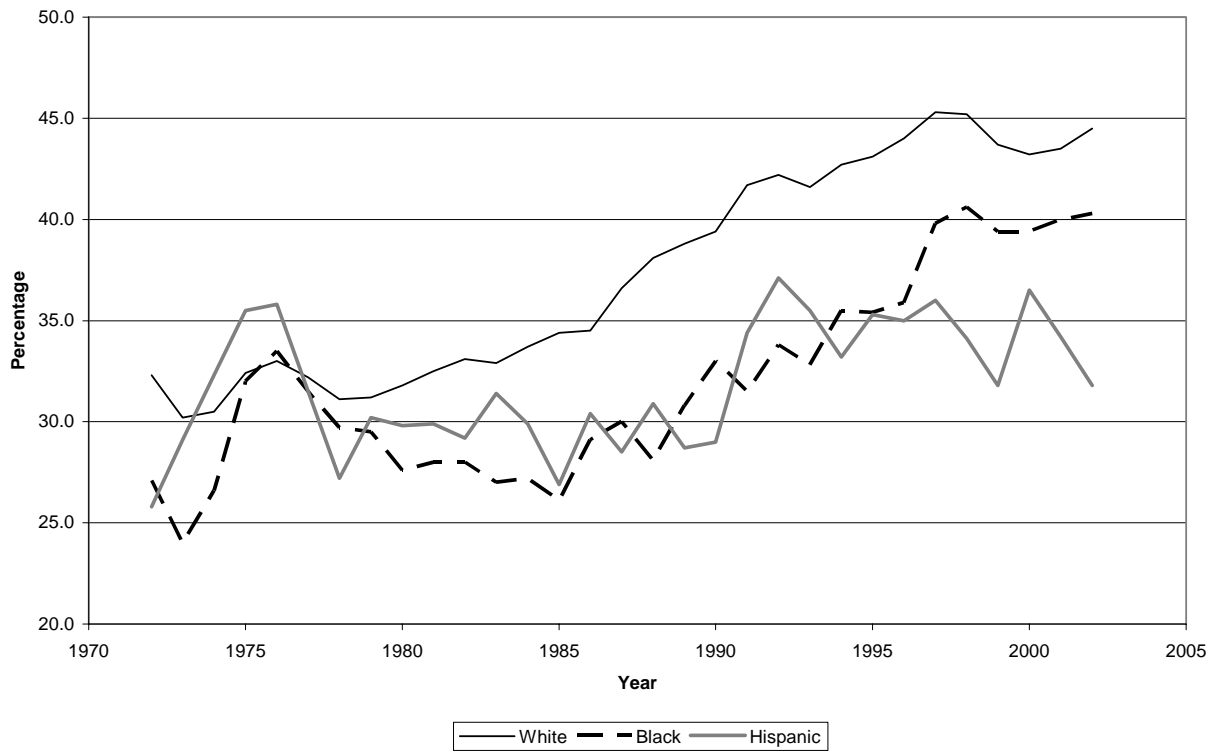
The decision to attend college is affected by both monetary and qualitative factors. These include, but are not limited to, tuition, family income, student ability, and parents' educational attainment. Tuition represents one aspect of the "price" of schooling, which also includes the opportunity cost of foregone earnings. The law of demand states that the quantity of college education demanded decreases as its price increases, *ceteris paribus*. The extant literature focuses on the student demand response to rising tuition and confirms the negative relationship between tuition and college enrollment. While they include background variables in their research, their focus is mainly on tuition. Leslie and Brinkman (1987) and Heller (1997) survey price response studies and find a negative relationship. This paper supplements student price response research by Leslie and Brinkman (1987) and Heller (1997), while providing an update to research done on background characteristics by Tierney (1980) and Kane (1994).

Tuition is increasing at a rate greater than inflation, but overall college enrollment rates are not decreasing. Kane (1994) attributes this increasing enrollment to two main family background characteristics: rising income levels and an increase in the average parental educational attainment level. Leslie and Brinkman (1987) cite six reasons why college enrollment rates are increasing: 1) tuition did not rise significantly in real terms; 2) some students matriculated to cheaper institutions, leaving enrollment rates unaffected; 3) need-based financial aid grew substantially since 1972; 4) increased enrollment of women; 5) new student programs and aggressive marketing strategies; and 6) decreased admission standards widened the applicant pool.

College enrollment rates differ across different races/ethnicities. Figure 1 shows that black and Hispanic enrollment rates are consistently lower than white enrollment rates after

1980.<sup>1</sup> The Hispanic enrollment rates are more volatile than whites or blacks. Since 1985 white and black enrollment rates have increased, even though tuition is rising, while Hispanic enrollment rates stopped increasing in 1992.

**Figure 1: The Percentage of High School Graduates Enrolled in College (18-24 years old)**



This research paper quantifies the effects of individual, family, and school characteristics on the enrollment decision and determines whether these factors differ across three race/ethnicities: white, black and Hispanic. I use cross-sectional data provided by the National Center of Education Statistics.

Since both tuition and enrollment are increasing, there must be other factors that counteract the negative effect of rising tuition. Similar to Kane (1994), I find parents' education variables and income variables have a positive influence on college enrollment. High school

<sup>1</sup> The data for this graph are available on the official website of the National Center for Educational Statistics.

quality and student ability are positively related to enrollment in a postsecondary institution. Although some of the variance across the race/ethnicity groups remains unexplained, the results identify differences in the college enrollment decision between whites, blacks and Hispanics. Father's education has a larger positive effect on whites than both blacks and Hispanics. I find high school quality and income have stronger positive effects on black enrollment rates than white or Hispanic enrollment rates. Student ability has a stronger effect on Hispanic enrollment rates than whites or blacks.

This paper continues with the following structure. Section two summarizes the relevant research. Section three describes the data. The empirical model is discussed in section four, while section five explains the main results. Lastly, section six provides the conclusion.

## ***II. Literature Review***

Kane (1994) examines the effects of family background, direct college costs, local economic conditions and the returns to education on the public college enrollment decision. Focusing on the pattern of black enrollment rates in the 1980's, Kane (1994) finds two competing factors. Rising tuition rates coupled with decreasing Pell grant amounts decrease black enrollment rates, while increasing parental education levels increase black enrollment rates.

Kane (1994) concentrates on youth aged 18-19 years old from 1973 through 1988 using data from the annual October Current Population Survey, the National Center for Education Statistics, and the Higher Education Board. Kane (1994) finds black children of college graduates are more than twice as likely to attend college than children of high school dropouts. Other family background effects, such as income levels, have a positive effect on the enrollment

rates of both blacks and whites. Both parents' education levels and family background characteristics cause enrollment to increase even though tuition is increasing.

Changes in the net cost of college over time affect college enrollment rates as well. Kane (1994) defines the net cost of college as tuition less a simulated figure for Pell grant eligibility.<sup>2</sup> Kane (1994) finds the likelihood of enrollment decreases by 5% for every \$1000 increase in the net cost of college. These net cost of college effects vary across race. A \$1000 increase in net tuition decreases the enrollment rates of blacks and whites in the lowest income quartile by 8.5% and 4.6% respectively. In his examination of financial aid, Kane (1994) finds no significant effect of Pell grant eligibility on the enrollment decision of black youth, which is likely tied to the student's uncertainty about their Pell grant eligibility before college enrollment.

Tierney (1980) provides a more in-depth approach to financial aid sensitivity. Using data on students who applied and were accepted by at least one private and one public institution, Tierney (1980) examines the impact of financial aid on the matriculation decision. Tierney (1980) assumes students attend the college with the highest net present value. Net present value, which is a measure of utility, is determined by both monetary factors, such as tuition, financial aid and current household income, and non-monetary factors, such as the distance between college and home, and the academic benefits of attending a particular institution. Tierney (1980) utilizes 1975 data from the American College Testing program, the Educational Testing Service, and the American Council of Education survey. Tierney (1980) stratifies the data into six income-race combination regressions (white and nonwhite and low, middle and high income) and runs a probit with matriculation to a public college as the dichotomous dependent variable. The regressors are six institutional variables: tuition, distance from a student's home town (using

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<sup>2</sup> Kane (1994) uses CPS data on family income, home ownership, number of siblings and parent/guardian employment to estimate a Pell grant figure for each student.

zip codes), college selectivity, scholarships and grants, loans, and work study, and seven individual variables: parental income, father's and mother's education (measured by a dummy variable for at least a bachelor's degree), a student's choice of college type, degree aspirations, gender, and a dummy variable indicating whether the student enrolls in their first choice.

Tierney (1980) finds positive effects of financial aid on enrollment, with the exception of work study for upper-income, non-white students. This confirms the basic hypothesis that an increase in financial aid increases enrollment at private postsecondary institutions. Changes in tuition have a smaller effect on enrollment rates than changes in financial aid. This suggests that the matriculation decision is influenced by increases in financial aid more than decreases in tuition, which goes against Kane (1994) and Heller (1997).

In contrast to Tierney (1980), Leslie and Brinkman (1987) examine the effects of tuition and financial aid on the overall decision to enroll in college, rather than the matriculation decision to a public institution. Leslie and Brinkman (1987) summarize 25 studies on the relationship between tuition, financial aid and enrollment rates. Since each study uses different methods, Leslie and Brinkman (1987) standardize the results by converting them to a generalized measure of student response to price changes. The authors find an inverse relationship between enrollment rates and tuition; there is a mean price response of -0.7 percentage points for every \$100 (in 1982-83 dollars) increase in tuition. Since the enrollment rate in higher education in 1982 was 0.33 percent, Leslie and Brinkman (1987) conclude that a \$100 increase in tuition decreases U.S. enrollment by 2.1 percentage points. Freshmen absorb most of this enrollment decline since upperclassmen are less sensitive to tuition changes. They also find a positive relationship between enrollment rates and student aid, and a substitution effect between public and private institutions, e.g., public institution enrollment rates increase as private institution

tuition increases and vice versa. Contrary to these findings, enrollment rates grew while tuition rose during the early 1980's. Leslie and Brinkman (1987) attribute this to the six reasons listed in the introduction.

Heller (1997) updates Leslie and Brinkman (1987) by reviewing twenty studies after 1987. All of these studies find an inverse relationship between tuition and enrollment rates similar in magnitude to the studies in Leslie and Brinkman (1987). A selection of the studies reviewed by Heller focused on the differences across race. Heller (1997) finds three main explanations for varying tuition sensitivities across races: 1) minority races are more price sensitive because they tend to have a lower family income; 2) using mean SAT scores as a measure of student ability, black students and Hispanic students have lower ability and are less willing to make financial sacrifices because they do not picture themselves as "college material"; and 3) there are different social values of attending college across races. Heller (1997) also concludes Hispanic students have sensitivities that are more volatile than blacks or whites.

A selection of studies summarized in Heller (1997) discusses the relationship between financial aid and college enrollment. Heller (1997) separates financial aid into grants, loans, and work-study and finds the effect of financial aid on enrollment varies. In general, students are most sensitive to grant awards and least sensitive to loans, with work-study in the middle. Similar to Kane (1994), these studies find the lack of public information on financial aid availability causes students to base their enrollment decisions on tuition prices. Other studies Heller (1997) reviews do find a positive correlation between financial aid and enrollment data.

### ***III. Data***

Data are from the National Education Longitudinal Study of 1988 (NELS:88). The National Center for Education Statistics (NCES) ran the first wave of NELS:88, which consists

of a nationally representative sample of 8<sup>th</sup> graders in 1988. These respondents were again surveyed in follow-ups in 1990, 1992, 1994, and 2000. During each follow-up the students completed a questionnaire and aptitude tests in math, English, science and social science. In addition, parents/guardians, teachers, and school administrators were surveyed during these successive waves to augment the student data. NELS:88 also contains cross-sectional weights, which allow projections to expanded populations. I focus on the college decision made by high school graduates and omit those who received their GED or dropped out of high school from my sample.

The independent variables come from the second follow-up in the early spring of 1992. During this follow-up, the respondents were in their second semester of their senior year and actively making the decision to attend college. Thus, the second follow-up provides data closest to the college decision of all the survey years. The second follow-up also includes official high school transcripts and high school course offerings, which allow further examination into the college decision.<sup>3</sup> College enrollment data are from the third follow-up, which was administered in spring of 1994. These data produce the dependent variable, which is a dummy variable for enrollment in a four year public or private postsecondary school. This enrollment variable does not include those who first attend college at least two years after graduating high school. The model is not estimating college enrollment after a period of employment. Table 1 displays the sample means for the independent variables, as well as the dependent variable.

This paper examines the enrollment decision by race/ethnicity. Kane (1994) and Heller (1997) both show that black students and white students have different responses to various individual and institutional characteristics. I stratify the data into three non-overlapping

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<sup>3</sup> Full transcripts and course offerings are only available in the confidential data. Average grades in each type of course are available on the public release data disk.

race/ethnicity subgroups to observe the effects various characteristics have on the enrollment decision of black, white and Hispanic students. NELS:88 defines Hispanic students as those with Latin American heritage. After accounting for respondents who did not belong to these three race/ethnicity subgroups and for missing data, the sample was reduced from 14,915 high school seniors to 8,034 high school seniors.<sup>4</sup>

I separated the NELS:88 variables of interest into three categories: student characteristics, family background characteristics and high school quality. The student characteristic variables are gender, race, geographical location, and student quality variables. Gender is a dichotomous variable where one represents a female. NELS:88 separates race into three non-overlapping groups: white, black and Hispanic. The NELS:88 public release data consolidates the geographical location of the respondent into the four main census regions: Northeast, Midwest, South and West. I create a dummy variable for each. The student quality variables are scores on standardized quartile tests in math and reading and average grades in Math and English courses.<sup>5</sup> The average grade variables are listed as continuous variables where a 1.00 represents an A+ and 12.01-13.00 represents an F.<sup>6</sup> There is a disparity among races in grade distribution. White students receive higher grades than both blacks and Hispanics. For example, white students have a sample mean of 6.46 in their English grades, whereas black and Hispanic students have a sample mean of 8.06 and 7.4 respectively in English courses. Since a lower number represents a higher grade, the lower sample mean shows white students have higher grades than black and

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<sup>4</sup> I deleted respondents listed as Asian/Pacific Islander and American Indian because there were too few observations.

<sup>5</sup> Quartile tests are standardized subject tests that separate the students into quartiles, where testing into the 4<sup>th</sup> quartile means a student is better than at least 75% of their fellow students in the tested subject. Average grades are used instead of the high school GPA variable, because some schools measured GPA on a 4.0 scale, while others used a 100.0 scale.

<sup>6</sup> Appendix A lists out the grades these continuous numbers represent.

Hispanic students on average. Additionally, in order to estimate the standardized test scores, I created dummy variables for each quartile.

In addition to the student characteristic variable listed above, generational variables and Hispanic subgroup variables are included in the Hispanic estimation. Age at immigration affects English skills, student ability and success in school for Hispanics. In order to account for these effects, I use a dummy variable for the number of years passed since immigration to the United States, where a one represents eight years or less. I also use dummy variables for four Hispanic subgroups (Mexican, Cuban, Puerto Rican and other Hispanic) to capture differences in enrollment among the subgroups.

Family characteristic variables include family income and parent's educational levels. Income proxies for whether college is affordable. Haveman and Wolfe (1995) find that family income variables are the best estimate of the financial dedication parents have to their children's educational future. NELS:88 tabulated family income observations into ranges. I combined these ranges into three dummy variable categories: low income, which consists of annual income of \$9,999 and below, middle income, which ranges from \$10,000 to \$49,999, and high income, which is \$50,000 and above.<sup>7</sup> Kane (1994) and Haveman and Wolfe (1995) show parental education is an important factor to a student's choice to attend college. Parents' education variables were also separated into dummy variables for both the mother and the father, where a one represents at least some college.

NELS:88 provides few high school quality proxies. The variable of interest is the percent of 1991 graduates who went on to a four year postsecondary school. In order to capture the effect of this variable, I separate it into four dummy variable ranges according to the ranges given by NELS:88: less than 25%, between 25% and 50%, between 50% and 75%, and greater

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<sup>7</sup> All monetary figures are in 1992 dollars.

than 75% of 1991 graduates continued their education by attending a 4 year school. Not surprisingly white students attend high schools with higher percentages of college attendance. On average 35.7% of white students attend a high school where at least 75% of the previous graduates went on to a 4 year school, compared to 7.6% of blacks and 6.5% of Hispanics.

#### ***IV. Empirical Model***

The dependent variable is a binary outcome because a student either enrolls in postsecondary school or does not. Since the dependent variable is binary, ordinary least squares produces fitted values of enrollment that are not constrained to [0,1]. In addition these fitted values are heteroskedastic. For this reason, I use a probit to estimate the effect of qualitative characteristics on the decision to attend college. The probit uses maximum likelihood estimation with normally distributed error terms. This model requires the college matriculation decision to be independent among individuals. If there are  $n$  observations in a random sample, where these observations either attend college or not, independence of the observations requires:

$$\Pr(A_1 \cap A_2 \cap \dots \cap A_n) = \Pr(A_1) \Pr(A_2) \dots \Pr(A_n) \quad (1)$$

where event  $A_i$ =person  $i$  attends college. The probit restricts the predicted dependent variable to [0, 1] by using the normal cumulative probability function to determine predicted enrollment.

The log likelihood function is:

$$l(y | x_i; \beta_1, \beta_2, \dots, \beta_k) = \sum_{y=1} \{ \ln[\Phi(\beta_1 + \beta_2 x_i + \dots + \beta_k x_{ik})] \} \sum_{y=0} \{ \ln[1 - \Phi(\beta_1 + \beta_2 x_i + \dots + \beta_k x_{ik})] \} \quad (2)$$

The log likelihood function is favored because the likelihood function is particularly difficult to solve. When  $l(y | x_i; \beta_1, \beta_2, \dots, \beta_k)$  from equation (2) is maximized, unbiased and efficient estimates for  $\beta_1$  through  $\beta_k$  are produced.

I estimate a probit for each race/ethnicity category, where 4 year college enrollment is the binary dependent variable and the proxies listed above are the independent variables. The black and white estimations use the same model because they do not involve generational variables:

$$enroll4yr_i = \beta_0 + \beta_1 f2sex_i + \sum_{r=2}^5 \beta_r hssa_{ir} + \sum_{r=6}^8 \beta_r geo_{ir} + \sum_{r=9}^{11} \beta_r hsqu_{ir} + \sum_{r=12}^{15} \beta_r fach_{ir} + e_i$$

where  $hssa_{ir}$  are the four variables for student ability,  $geo_{ir}$  are the three geographical dummy variables (Northeast is omitted to prevent multicollinearity),  $hsqu_{ir}$  are the three dummy proxies for high school quality (the lowest high school quality variable is the omitted category), and  $fach_{ir}$  are the four family characteristic dummy variables (low income is the omitted category).

The Hispanic model accounts for both Hispanic subgroups and generational variables in addition to the variables listed above:

$$enroll4yr_i = \beta_0 + \beta_1 f2sex_i + \sum_{r=2}^5 \beta_r hssa_{ir} + \sum_{r=6}^8 \beta_r geo_{ir} + \sum_{r=9}^{11} \beta_r hsqu_{ir} + \sum_{r=12}^{15} \beta_r fach_{ir} + \sum_{r=16}^{19} \beta_r hisp_{ir} + e_i$$

where  $hisp_{ir}$  includes the three Hispanic subgroup dummy variables: Cuban, Puerto Rican, and other Hispanic. Mexican is the omitted category. Also included in  $hisp_{ir}$  is a dummy variable for the number of years passed since the respondent's immigration, where a one represents a student who immigrated to the US eight years ago or less.

Unlike Tierney (1980), Leslie and Brinkman (1987), Kane (1994), and Heller (1997), tuition variables are not included in my estimation. In order to protect anonymity, the public release version of NELS:88 only includes the four census regions for geographical variables.<sup>8</sup> These regions are too broad to create a tuition proxy. For example the average tuition for a 4 year public school in Vermont in 2001 was \$12,849/yr, while the average tuition for a 4 year

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<sup>8</sup> Appendix B lists the states in each of the four census regions: Northeast, Midwest, South, and West.

public school in Massachusetts in 2001 was \$9,207/yr.<sup>9</sup> Although these two states belong to the same census region, their tuitions are dissimilar. My model will instead focus on the effect student, family and high school characteristic variables have on the enrollment decision.

My estimation will not cover all factors that affect the college enrollment decision. For this reason certain groups within each race/ethnicity category could have a larger unexplained portion to enrollment. This will result in heteroskedasticity, i.e. there is more than one error variance, producing incorrect standard errors, incorrect confidence intervals, and hypothesis tests that are no longer valid. STATA, the statistical software, automatically calculates White's robust standard errors when a probability weight is used in the probit model.<sup>10</sup> I employ the use of cross-sectional weights in my model, which minimize the impact of outliers and paint a more accurate picture of the population. Although White's Robust Standard Errors do not eliminate heteroskedasticity, they provide consistent estimators for the coefficient variances. This means that statistical inference will be approximately correct in large samples.

## ***V. Results***

Table 2 and Table 3 present the regression results for the black and white samples, respectively. Since the black and white regressions use the same dependent and independent variables, I can compare their goodness of fit. The white regression fits about 33% of the data whereas the black regression fits about 28%.<sup>11</sup>

I use a Likelihood Ratio test to determine whether the black and white regressions are statistically different.<sup>12</sup> This is a test used with maximum likelihood estimation. The LR test statistic is  $-2\ln\lambda$ , where  $\lambda$  is equal to the ratio between the likelihood of the restricted probit

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<sup>9</sup> Monetary values are in 2001 dollars.

<sup>10</sup> Probability weights are equal to the inverse probability that an observation is included due to sampling techniques.

<sup>11</sup> These are pseudo  $R^2$  values.

<sup>12</sup> The Hispanic regression is not included in this test because it estimates variables not included in either the black or the white regression.

model and the likelihood of the unrestricted probit model. If  $-2\ln\lambda > X^2_k$ , where  $k$  is equal to the number of restrictions, then the null hypothesis that the 16 coefficients of the black regression are equal to those of the white regression is rejected. The alternative hypothesis is that at least one pair of coefficients are not equal. My unrestricted model estimates separate models for whites and blacks. The sum of their log-likelihoods is the unrestricted log-likelihood of -3372.78006. The restricted model pools blacks and whites into the same model. The restricted log-likelihood is -3444.0045. These numbers yield a test statistic of 142.45, which is greater than 34.27 (the chi-squared random variable with 16 degrees of freedom at a significance level of .005). Therefore, I reject my null hypothesis that the black and white regression coefficients are all equal. This suggests the college enrollment decision for whites and blacks should be estimated separately. Table 4 presents the regression results for the Hispanic sample. Although the Hispanic regression has the best fit with a pseudo  $R^2$  equal to .3477, it has less statistically significant coefficients than the black regression or the white regression.

Generally, across all three groups, the variables that show a positive significant effect on college enrollment are the student characteristic variables. These include gender, geographical locations and student quality. The results for the gender variable contrast with those found by previous authors such as Leslie and Brinkman (1987). Both white and Hispanic women are less likely to attend college than men in my sample, after accounting for the rest of the model. White women are about 7% less likely to attend a four year postsecondary school, while Hispanic women are about 9% less likely. Leslie and Brinkman (1987) believe increasing female college enrollment has offset decreasing male enrollment, which means women are more likely to attend college. Additionally, all three races have a significant negative response for the geographical dummy variable *West* (where a one represents living in the West census region), with the black

sample having the strongest effect. A black student living in the West is 35% less likely to attend college than a black student living in the Northeast. As expected, ability is positively related to college enrollment, regardless of race. Average English grades are statistically significant for all three races. Their negative coefficients show that as letter grades increase, represented by a decrease in their numerical value, college enrollment increases. Average Math grades are only shown to be significant for the black and Hispanic students, and to a lesser degree in both magnitude and significance than English grades. With the exception of Hispanic students, the quartile tests show opposite effects than the average grades. Scoring in the top quartile in the standardized math test increases the probability of enrollment for blacks and white by a larger amount than testing into the fourth quartile of the standardized reading test. The standardized reading test might be more important for Hispanic students because it is a way to test English skills. Scoring in the lower quartiles could represent lacking English skills.

The Hispanic regression includes additional student characteristics: Hispanic subgroup variables and a generational variable. Both Puerto Ricans and Cubans are less likely to enroll in a postsecondary institution than Mexicans, with the stronger negative effect being on the Puerto Ricans. Puerto Ricans are about 19% less likely to attend college than Mexicans, while Cubans are only about 14% less likely. Although the generational variable is not significant, it has the expected negative sign.

The family characteristic variables, which include family income and parents' education, generally have the expected effect on enrollment. Two variables where the black students and white students share similar coefficients are the two income variables, middle income and high income. As expected, income positively affects college enrollment. Both black and white students are about 20% more likely to enroll in a four year school if their family income falls into

the high income range rather than the low income range. Previous authors such as Kane (1994) and Haveman and Wolfe (1995) show that parents' education, specifically the mother's education, positively affects college enrollment. Similar to Haveman and Wolfe (1995), the mother's education of a black student positively influences their college enrollment. A black student whose mother received some college education is 17% more likely to attend a postsecondary institution than one whose mother has no college education. The white students have an opposite effect, where their fathers' education has a stronger positive effect than their mothers' education. Neither parental education variables show a significant effect for Hispanic students.

School quality proxies also have a positive relationship to the enrollment rates of different races, but to varying degrees. All three races show a significant positive coefficient for the third school quality dummy variable (where one represents between 50% and 75% of 1991 graduates went on to a four year school). The black students have a statistically different coefficient than the white students for the second school quality dummy variable (where a one represents between 25% and 50% of 1991 graduates continue their education at a 4 year school).<sup>13</sup> Similar to the inequality in average grades received, this disparity may occur due to the unequal school quality present in high schools.

## ***VI. Conclusion***

College enrollment rates differ across races and ethnicities. These enrollment rates are affected by both monetary and non-monetary factors, such as tuition, student characteristics, family background and high school quality. Tuition has been drastically increasing, but enrollment in postsecondary institutions is not decreasing. The extant literature shows other

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<sup>13</sup> This is evidenced by their non-overlapping confidence intervals. The black student confidence interval is [.2648, .8490] and the white student confidence interval is [-.0448, .1681]

factors are counteracting this negative tuition response. This paper also finds a positive relationship between certain background characteristics and the college enrollment decision.

Enrollment increases with both student ability and high school ability. Family background characteristics, such as family income and parental educational attainment, are also positively related to college enrollment. The effects of these factors vary among white, black, and Hispanic students. Parent's education variables and income variables have a positive influence on college enrollment. Father's education has a larger positive effect on whites than both blacks and Hispanics. Income variables have the strongest positive effect on blacks. High school quality and student ability are also positively related to enrollment in a postsecondary institution. I find high school quality and student ability have the strongest effect on black students and Hispanic students respectively. In addition, the results of the Likelihood Ratio Test show that the black sample and white sample should not be pooled together. The factors that affect college enrollment might be equal among both races, but the negative effects of these factors are not.

There are many opportunities for future research on the college decision. With the exception of income, this paper focuses on the non-monetary factors that affect college enrollment in 1992. It would be interesting to see if these factors affect white, black, and Hispanic enrollment rates differently after 2000. This research is important for colleges, specifically liberal arts colleges, who are looking for ways to increase their minority enrollment. In addition, the extant literature provides tuition response research that is dated. With tuition rates and financial aid policies changing drastically over the last ten years, updated student price response research is needed. This updated research could provide more insight into the college enrollment decision and have large impacts on the pricing policies of postsecondary institutions.

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### Appendix A: Grade Values

<b>Number Values</b>	<b>Grade</b>
1.00	A+
1.01-2.00	A
2.01-3.00	A-
3.01-4.00	B+
4.01-5.00	B
5.01-6.00	B-
6.01-7.00	C+
7.01-8.00	C
8.01-9.00	C-
9.01-10.00	D+
10.01-11.00	D
11.01-12.00	D-
12.01-13.00	F

## Appendix B: Census Regions

### **Region 1: Northeast**

Connecticut  
Maine  
Massachusetts  
New Hampshire  
New Jersey  
New York  
Pennsylvania  
Rhode Island  
Vermont

### **Region 2: Midwest**

Illinois  
Indiana  
Iowa  
Kansas  
Michigan  
Minnesota  
Missouri  
Nebraska

### **Region 3: South**

Alabama  
Arkansas  
Delaware  
District of Columbia  
Florida  
Georgia  
Kentucky  
Louisiana  
Maryland  
Mississippi  
North Carolina  
Oklahoma  
South Carolina  
Tennessee  
Texas  
Virginia  
West Virginia

### **Region 4: West**

Alaska  
Arizona  
California  
Colorado  
Hawaii  
Idaho  
Montana  
Nevada  
New Mexico  
Oregon  
Utah  
Washington  
Wyoming

**Table 1: Summary Statistics**

<i>Variable Name</i>	<i>Mean (black)</i>	<i>Mean (white)</i>	<i>Mean (Hispanic)</i>
F2sex (Gender)	0.504	0.497	0.519
F2rheng2 (Avg. grade in English courses)	8.0634 (2.415)	6.463 (2.650)	7.404 (2.492)
F2rhmag2 (Avg. grade in math courses)	8.618 (2.343)	7.075 (2.695)	8.074 (2.413)
Readq_high (Reading Quartile—high)	0.104	0.452	0.168
Mathq_high (Math Quartile—high)	0.083	0.462	0.139
Mexican (Hispanic subgroup-Mexican)	-	-	0.668
Cuban (Hispanic subgroup-Cuban)	-	-	0.050
Puerto_rican (Hispanic subgroup-Puerto Rican)	-	-	0.074
Otherhisp (Hispanic subgroup-other)	-	-	0.209
Northeast (Reside in Northeast quadrant)	0.134	0.400	0.066
Midwest (Reside in Midwest quadrant)	0.122	0.476	0.131
South (Reside in South quadrant)	0.677	0.465	0.375
West (Reside in West quadrant)	0.067	0.346	0.428
Pct4yr1 ( $\leq 25\%$ attend 4 yr school)	0.227	0.378	0.215
Pct4yr2 ( $25\% < X \leq 50\%$ attend 4 yr school)	0.277	0.470	0.299
Pct4yr3 ( $50\% < X \leq 75\%$ attend 4 yr school)	0.194	0.399	0.140
Pct4yr4 ( $\geq 75\%$ attend 4 yr school)	0.077	0.357	0.065
Fa_edu (Father's educational attainment)	0.313	0.495	0.261
Mo_edu (Mother's educational attainment)	0.321	0.486	0.220
Low_inc (Low income)	0.204	0.205	0.144
Mid_inc (Middle income)	0.612	0.498	0.629
High_inc (high income)	0.178	0.491	0.218
Byp18r (Num. Of years since R's immigration)	-	-	0.050
Enroll4yr (enrolled in a 4 yr school)	0.444	0.4999	0.343

**Table 2: Probit results: Black Sample (Pseudo R<sup>2</sup>=0.2830)<sup>14</sup>**

<i>Variable (Dependent Variable: Enroll4yr) N=811</i>	<i>Marginal Effect</i>	<i>Coefficients</i>	<i>z</i>
Sex	0.060	0.158	1.15
Avg. grade in English courses	-0.057	-0.150	-3.52
Avg. grade in Math courses	-0.041	-0.109	-3.12
Reading Quartile—high	0.154	0.392	1.48
Math Quartile—high	0.222	0.565	2.14
Midwest Region	-0.083	-0.226	-0.87
South Region	-0.128	-0.333	-1.42
West Region	-0.350	-1.344	-4.11
25%<X≤50% of 1991 HS Grads attend 4yr school	0.215	0.557	3.74
50%<X≤75% of 1991 HS Grads attend 4yr school	0.300	0.773	5.04
≥75% of 1991 HS Grads attend 4yr school	0.259	0.661	1.35
Father's Education	0.050	0.132	0.75
Mother's Education	0.170	0.441	2.42
Income between \$10,000 and \$49,000	0.151	0.408	2.63
Income at least \$50,000	0.225	0.576	2.56
Constant		1.155	

**Table 3: Probit results: White Sample (Pseudo R<sup>2</sup>=0.3305)**

<i>Variable (Dependent Variable: Enroll4yr) N=6439</i>	<i>Marginal Effect</i>	<i>Coefficients</i>	<i>z</i>
Sex	-0.074	-0.187	-3.76
Avg. grade in English courses	-0.096	-0.242	-16.38
Avg. grade in Math courses	-0.006	-0.014	-1.09
Reading Quartile—high	0.027	0.069	1.04
Math Quartile—high	0.178	0.449	6.94
Midwest Region	-0.161	-0.414	-6.57
South Region	-0.175	-0.451	-6.93
West Region	-0.286	-0.790	-10.33
25%<X≤50% of 1991 HS Grads attend 4yr school	0.024	0.062	1.14
50%<X≤75% of 1991 HS Grads attend 4yr school	0.195	0.495	8.04
≥75% of 1991 HS Grads attend 4yr school	0.232	0.594	6.05
Father's Education	0.162	0.410	7.61
Mother's Education	0.051	0.130	2.32
Income between \$10,000 and \$49,000	0.131	0.333	3.14
Income at least \$50,000	0.216	0.551	4.95
Constant		1.075	

<sup>14</sup> The Marginal effects are calculated with a dprobit in the STATA program. The dprobit reports the change in probability for a marginal change in each continuous variable. In addition, it also reports the discrete change in probability for the dummy variables.

**Table 4: Probit results: Hispanic Sample (Pseudo R<sup>2</sup>=0.3477)**

<i>Variable (Dependent Variable: Enroll4yr) N=784</i>	<i>Marginal Effect</i>	<i>Coefficients</i>	<i>z</i>
Sex	-0.093	-0.296	-2.41
Avg. grade in English courses	-0.069	-0.219	-5.43
Avg. grade in Math courses	-0.032	-0.102	-2.77
Reading Quartile—high	0.259	0.729	3.40
Math Quartile—high	0.028	0.086	0.40
Cuban	-0.137	-0.529	-2.01
Puerto Rican	-0.185	-0.778	-2.65
Other Hispanic	-0.056	-0.183	-1.13
Midwest Region	-0.029	-0.094	-0.33
South Region	0.047	0.146	0.57
West Region	-0.231	-0.771	-2.95
25%<X≤50% of 1991 HS Grads attend 4yr school	0.037	0.117	0.86
50%<X≤75% of 1991 HS Grads attend 4yr school	0.117	0.345	2.10
≥75% of 1991 HS Grads attend 4yr school	0.122	0.354	1.18
Father's Education	0.098	0.296	1.82
Mother's Education	0.107	0.321	1.86
Income between \$10,000 and \$49,000	-0.004	-0.011	-0.07
Income at least \$50,000	0.031	0.096	0.44
Num. of yrs. passed since respondent's immigration	-0.077	-0.269	-0.86
Constant		2.0124	