

THE CAPABILITY APPROACH TO UNDERSTANDING STUDENT OUTCOMES:
EXPANDING THE CONCEPT OF HUMAN CAPITAL

By

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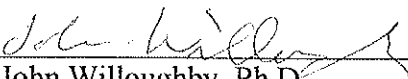
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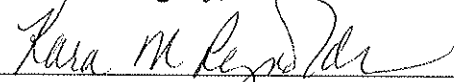
In

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To my father - your patience, discipline and perseverance speech did not fall on deaf ears

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CHAPTER 1

INTRODUCTION

Standard human capital theory views education as an investment that increases the productive potential of people. Theorists such as Gary Becker parallel investment in human capital to other forms of investment, suggesting that the amount invested in human capital is based on a comparison of the benefits to cost, which is often summarized by measuring the rate of return (Becker 1993, 85). Over the second half of the twentieth century, the rate of return to a year of high school decreased, while the rate of return to a year of college increased in the United States (Goldin and Katz 2008). Today, the rate of return to a year of schooling ranges between 10 and 14 percent regardless of race or gender (Ashenfelter and Rouse 1998b).

To Amartya Sen and others interested in economic and social development, education serves as more than a means of increasing the productive potential of people. Beyond being an important aspect of productivity and a way to improve personal socio-economic status, Sen describes education as the means by which an individual has the freedom to choose a life she has reason to value and the means by which she can become an agent of social change (Sen 1999, 296-297). That is, education contributes to an individual's overall well-being construed broadly, and therefore to the well-being of society overall. Therefore, while all economists agree that education policy is important, Sen views it as *essential*.

The Research Question

A large number of policies have the goal of increasing educational attainment. Here I study a relatively new policy, the Texas Top 10 Percent Law, which guarantees admission to the Texas state college of choice for all students who graduate in the top 10 percent of their high school class. I ask whether the Texas Top 10 Percent Law contributes to the overall well-being or quality of life of the citizens of Texas. Specifically, I use Sen's capability approach, and I ask whether the law provides students with measurably greater freedom to realize the educational outcomes they desire and whether the law increases the likelihood of college enrollment. I am particularly interested in the impact of the law on minorities and individuals with low socioeconomic status as these groups have found educational attainment most difficult. In Sen's terminology, I evaluate the law from the perspective of its impact on substantive freedoms, that is, the individual's real opportunities to pursue her objectives. If the individual is able to achieve her objective as a result of the guaranteed admission via the law, then the well-being of that individual is increased. Furthermore, if the law increases college enrollment, particularly for minorities and individuals from a low socioeconomic status then there are both social and economic benefits to society as a whole.

Motivation

Both as individuals and as society we benefit from education in many ways. The study of the benefits of education began with studies of individual benefit. In the 1960's, economists such as Gary Becker and Jacob Mincer tried to explain the observed inequality of personal income in the United States. They did so by exploring the quality

of labor. They measured the rate of return or profitability of a year of education. Becker (1993) estimated the internal rate of return to education which accounts for the cost of investment. Using data from the 1930s through the 1960s, Becker finds the internal rate of return to a year of college to range between 8 percent and 14.8 percent, controlling for region and race (Becker 1993, 186 – 220). In 1974, Jacob Mincer formalized the human capital earnings function, which remains the most commonly used model in measuring the rate of return to schooling. Mincer's model included post-schooling investment. Using data from 1959, Mincer estimated the rate of return to schooling to be between 12.8 and 17.4 percent dependent on level of schooling (Mincer 1974, 93).

Since Becker and Mincer's studies, there have been many studies (David Card 1999, Goldin and Katz 2008, Ashenfelter and Rouse 1998b, Psacharopoulos and Patrinos 2002) confirming the profitability of education. According to Psacharopoulos and Patrinos (2002) the rate of return to education is highest for primary school followed by post-secondary school regardless of country per capita income (15). Overall, the studies corroborate that the average rate of return to a year of schooling ranges between 10 and 14 percent.

The return to higher education has increased over the second half of the last century. There was a dramatic increase in the rate of return after 1980 (Goldin and Katz 2008, 83). This increase in the rate of return to schooling holds for women (Becker, Hubbard and Murphy 2010) and across race and ethnic groups (Barrow and Rouse 2005). The formalization of human capital theory, particularly the measurement of the private rate of return to education, is discussed in Chapter 2.

It is intuitive that the benefits of education extend beyond the individual. There are a wide range of social benefits, and there has been a recent surge of interest in the social rates of return to higher education that builds on foundational work completed following World War II. In the 1950s, economists found that labor and capital inputs do not account for all of output growth in the United States. Technology and human capital helped explain output growth. Theodore Schultz (1962) found that the estimated return to human capital between 1930 and 1957 accounted for approximately one-fifth of economic growth (4). Recent studies (Uhalde, Strohl and Simkins 2006, Pencavel 1991, Goldin and Katz 2008) demonstrate the continued importance of education for national output growth. There is evidence of the positive impact of education on income growth at the city or regional level. Moretti (2002) found that a one percent increase in the proportion of college educated workers raises the wage of high school dropouts by 1.9 percent, high school graduates by 1.6 percent, workers with some college by 1.2 percent and college graduates by 0.4 percent. Furthermore, there is evidence of income growth in American cities from 1960 to 1990 based on initial stock of human capital. Rizzo (2004) suggests that the percentage of workers with a college degree strongly predicts future income growth rates in urban areas.

Psacharopoulos and Patrinos (2002) offer a different perspective. They measure the social rate of return by estimating the private internal rate of return to also include the public cost of education. They find the social rate of return to primary school to be 13.4 percent, secondary school to be 10.3 percent and 9.5 percent for higher education in a high income country (Psacharopoulos and Patrinos 2002, 14). A limitation of measuring the social rate of return in this way is that any positive externalities of education are

unaccounted for. For instance there is a positive association between education and health (Rizzo 2004, Becker, Hubbard and Murphy 2010). Further, education decreases crime rates which in turn decrease the cost of law enforcement (Lochner and Moretti 2004). There are many benefits such as the dispersion of knowledge or an educated electorate that are unquantifiable. Chapter 2 includes a complete discussion of the social benefits of education.

Considering the well documented private and social rates of return to higher education one would expect to see high levels of investment in higher education among all groups of people. Yet college enrollment is low among minorities. According to the U.S. Census Bureau Current Population Survey in October 2002, 45.6 percent of 20 and 21 year old Whites and 70.2 percent of 20 and 21 year old Asians were enrolled in college. Only 38.9 percent of 20 and 21 year old Blacks and 22.3 percent of 20 and 21 year old Hispanics were enrolled in college.

College and university enrollment increased since 1980. The increase in enrollment is not surprising as during the same time period the rate of return to education increased relatively quickly. Figure 1 shows the percentage of 18 to 24 year olds enrolled in higher education institutions by race/ethnicity from 1980 to 2004. Although enrollment rates are increasing for all groups, especially after 1990, Hispanics clearly have the lowest enrollment rates followed by blacks. Asians have the highest enrollment rates followed by whites.

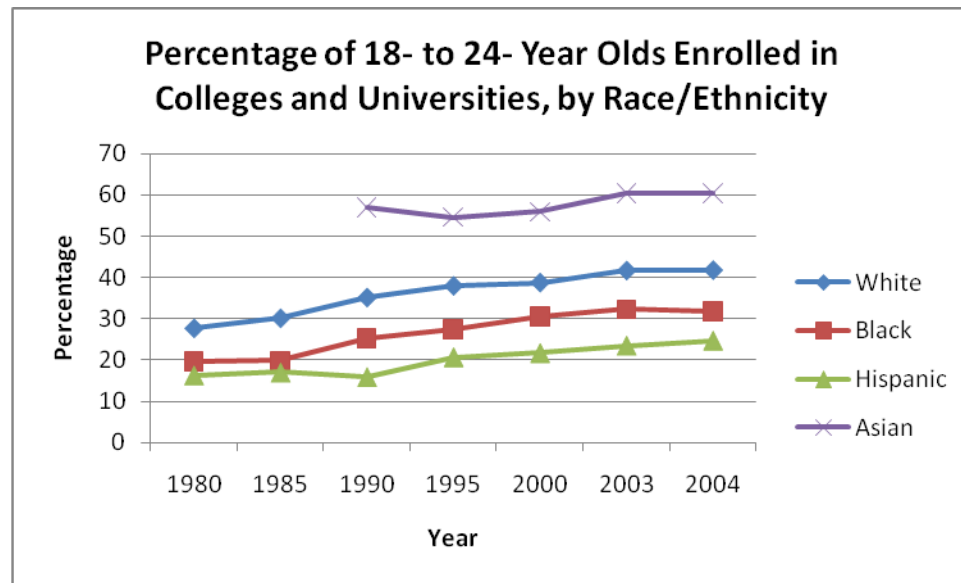


Figure 1 – Percentage of 18 to 24 Year Olds Enrolled in Post-Secondary Institutions by Race/Ethnicity from 1980 to 2004. Source: National Center for Education Statistics, http://nces.ed.gov/pubs2007/minoritytrends/tables/table_23_3.asp.

These statistics suggest that certain groups face tighter constraints in the pursuit of a higher education. Some (e.g. Becker 1993) argue that these enrollment statistics reflect differences in expected earnings due to discrimination in the labor market and differences in ability. Others (e.g. Card 1999, 1852-1854) argue that the potential sources of heterogeneity in returns to higher education include elementary and secondary school quality and location, among other variables.

Ashenfelter and Rouse (1998) argue that genetic factors do not predetermine education and income (281). If we accept this view and if we accept the view that government has a role in the provision of equal opportunities for higher education because of its positive externalities, then we need to consider policies that reduce inequality in the pursuit of higher education.

Higher education institutions founded through the Morrill Act of 1862, were founded under the ideals of making higher education for everyone. States were given land to sell in order to create endowments with which they could start “people’s colleges” that focused on educating students in mechanical arts and agriculture (Richter 1962, 234). Competition and a laissez faire system, among other virtues are credited to shaping excellence in American universities. There was and remains enormous choice among higher education institutions for students even within one state. By the beginning of the twenty-first century there were 1,400 institutions that awarded bachelor’s degrees and an additional 1,500 two-year institutions that awarded associate’s degrees (Goldin and Katz 2008, 254).

Openness in the American educational system was an important attribute, particularly at the tertiary level. Colleges and universities were gender neutral allowing women access to education (Goldin and Katz 2008, 260). It was a different story for African Americans. African Americans would not gain equal access to colleges and universities for almost one hundred years after the Civil War with the Supreme Court decision in *Brown v. Board of Education of Topeka* that recognized that segregated schools were inherently illegal (Klose and Lader 1994, 261). Title VI of the Civil Rights Act of 1964, ten years after the *Brown* verdict, banned discrimination in educational institutions receiving federal funding. Although the Act was effective in increasing the number of African Americans attending college their representation was not proportionate to the size of the black population. In the late 1960s and early 1970s colleges began using affirmative action policies. One of those policies was a dual admissions process in which there was a qualifying standard based on race so to create a

diverse student body representing the population at large. The dual admissions policy at some colleges created a quota system that reserved a specific number of places for minorities in each entering class.

Affirmative action in university admissions did not occur without resistance. The University of California at Davis was sued for using such a quota system in their Medical School admissions. The plaintiff argued that affirmative action in this form violated the Equal Protection Clause of the Fourteenth Amendment. The case eventually went to the Supreme Court. The 1978 Supreme Court decision in *Regents of the University of California v. Bakke* found the dual admissions process used by the university unconstitutional. At the same time, the Supreme Court recognized the right of the university to use affirmative action to create a diverse student body. The verdict sent a mixed message and began a long legal debate as to the appropriate use of affirmative action in higher education. In 1996, a case was brought against the University of Texas Law School claiming that minority applicants were admitted over white applicants with similar qualifications. The federal district court reinforced the *Bakke* verdict, specifying that a dual admission process is unconstitutional, but that considering race for the sake of diversity was acceptable. The case was appealed to the Fifth Circuit Court where the consideration of race in the admissions process was ruled unconstitutional. The ruling in *Hopwood v. the University of Texas* reignited the debate. There were several other lawsuits brought against various universities. Two cases were brought against the University of Michigan. These cases were combined (*Gratz and Grutter v. Bollinger, et al.*) and eventually taken to the Supreme Court. In 2003, the Supreme Court ruled that race consideration for the sake of diversity in colleges and universities was constitutional,

clarifying and upholding the *Bakke* decision (Springer 2005, 6). Creating equal access to higher education for all races and socioeconomic groups was and remains a central theme of public policy. The history of educational policies and the legal decisions affecting higher education in the United States is described in detail in Chapter 3.

Federal and state governments have tried to increase access to higher education via Pell Grants, the federal loan program and state grants or aid. The federal government offers loans, grants and work study to students who demonstrate financial need. State programs, on the other hand, are usually merit based. Both federal and state governments attempt to influence college enrollment primarily through policies that decrease the cost of college. Yet the effects of these policies are mixed. Kitmitto (2004) finds that the federal Pell Grant does not have a significant positive effect on college attendance. Dynarski (2002) finds that merit aid at the state level has a positive effect on college attendance. Kane (2004) finds that the D.C. Tuition Assistance Grant increased college entry rates of D.C. residents, nearly doubling the number of D.C. students at public institutions nation-wide. Heckman and Lochner (2000) find that credit constraints are not significant deterrents to college attendance, particularly for low-income families, suggesting that many of the policies that increase access to higher education via lowering the cost of education may be ineffective. These studies are a subset of a much larger literature review of the impact of policies on college enrollment found in Chapter 3.

The Texas Top 10 Percent Law (House Bill 588) along with similar laws in California (Eligibility in a Local Context), and Florida (the Talented 20 Program), represent recent new approaches that state governments are trying to influence college attendance. The Top 10 Percent law was a response to the affirmative action debate and

specifically the Fifth Circuit Court's ruling in *Hopwood v. the University of Texas*. Two years after *Hopwood*, the Texas Top 10 Percent law was enacted as a race neutral alternative to affirmative action. The Top 10 Percent law grants admission to the college of choice within the Texas state-funded system to students graduating in the top ten percent of their high school class. The law was expected to bring back affirmative action levels of minorities to public colleges and universities (Leicht and Sullivan 2002).

Chapter 3 includes the details of the Texas Top 10 Percent law, a comparison to race neutral laws in California and Florida, and a review of the studies that evaluate such programs.

The major difference between the Texas Top 10 Percent law and other federal and state programs geared toward decreasing cost of education is that the Top 10 Percent law guarantees a place in college. The federal programs and many of the state merit programs require the student to first fill out the Free Application for Federal Student Aid (FAFSA). Hence, a student has already decided that college admission and attendance is possible when they apply to these programs. With the Top 10 Percent law, particularly since there are no curriculum requirements and class rank is defined by each school, a student who may have thought that college admission and attendance was not a possibility now may consider it possible. I evaluate the Texas Top 10 Percent law from this perspective. Does the law increase individual perception of real opportunities?

Methodology: A Different Perspective

I contribute to the literature on the benefits of higher education by considering, as Sen does, a broader class of benefits. Sen (1997) explicitly distinguishes the

accumulation of human capital from the closely related concept of the expansion of human capability. He defines human capital as the monetary value of human qualities employed in production. Human capability is the enhancement of an individual's choices so she has the ability to lead the life she values most (Sen 1997, 1959-1960). Education is thus critical for both its contribution to production and for its impact on individual well-being and enhancement of substantive choices. It is through understanding individuals' substantive choices, and their perceptions of their choices, that we can create policies that promote access to higher education and expand the opportunities of all students.

Amartya Sen investigates the individual's capability. Capabilities provide the opportunities for the attainment of well being. The capability set is a set of real possibilities open to the individual, representing the opportunities for choice. Sen defines individual functionings as the things a person values doing or being. The choices made, a person's observed achievement reflects a person's functionings and is called the chosen functioning vector. The capability set, and therefore the functioning vector are constrained by formal and informal institutions (Sen 1999, 74-76). The capability approach to the value of education differs from the human capital approach in that the capability approach considers what an individual's perceived choice set is and views understanding limits to the perceived choice set as a critical part of understanding human freedom. Hence, the capability framework forces the researcher to first ask whether attaining a higher education is even perceived as a choice for an individual. If it is not, why not? And can policy affect perceived choices? From this perspective one is able to examine real constraints individuals face in the attainment of a higher education. I expand the study of the economic impact of higher education by taking a capabilities approach to

the problem of inequality in education. Chapter 4 reviews studies that use the capability approach and presents the theoretical framework for the empirical analysis.

Main Findings of the Study

The empirical analysis is presented in three interrelated sections. In the first section I examine what influences a student's expectation to go to college. That is, I examine what impacts a student perceiving going to college as a real opportunity in her capability set. I then look at the determinants of college enrollment. More specifically, I examine what influences the student choosing the functioning of going to college. Last, I decipher the impact of the Texas Top 10 Percent law on a student's ability to attain or realize her expectation to go to college. A detailed description of the empirical analysis and discussion of the results is found in Chapter 5. Below are some of the main findings of the study and their implications.

Using propensity score matching to create a control group I find that the Texas Top 10 Percent law increases the freedom of Mexican students by increasing the probability of realization of college aspirations by 14.97 and 19.85 percent dependent on the choice of matching algorithm. For whites the law increases the probability of realization of educational expectations by approximately 9 percent. The results suggest that the law does increase the freedom of students to achieve their expected educational outcome. Hence, one can infer that the law increases the well-being of students.

In examining the capability set of students, I find that for Mexicans top ten percent rank increases the probability of expecting to go to college by 24 percent. Further, a college prep curriculum is positive and significant for whites, blacks, Mexicans

and Hispanics, increasing the probability of expecting to go to college from between 10.3 to 19.8 percent. Parent encouragement had a particularly large influence on white students and a smaller impact on black and Mexican students. The estimates for college being part of the perceived choice set suggest that while for whites family encouragement may be most influential, for minorities, academic achievement variables have the greatest impact.

The analysis of the chosen functioning variable examines college attendance. For students in the top ten percent, perceiving college in the choice set and receiving a scholarship are the only significant determinants of college attendance. Further, receiving a scholarship was significant for all races increasing the probability of college attendance by between 36.7 percent and 10.6 percent.

The results of the study have various policy implications. First, the Texas Top 10 Percent law, although controversial, has a positive impact when evaluated from the perspective of freedom. Further the findings suggest that minorities may respond to different factors than whites. The law encourages academic achievement, which positively influences minority student expectation to go to college. Further, in comparing the Top 10 Percent law to affirmative action (that it replaced), the Top 10 Percent law provides the incentive to do well academically as it guarantees admission into college whereas affirmative action does not.

The overall results of the study show that the Texas Top 10 Percent law has had a positive impact on students and the citizens of Texas. The law increased the probability of a student's perception of college attendance in the capability set. That is, student's perception of real choices increases because of the law. Hence, the student has greater

freedom. Further, the law increases the probability of a student realizing her educational expectations, thereby increasing her well-being. As more students are able to attend college because of the Texas Top 10 Percent law, then the overall well-being of the citizens of Texas is increased as higher education provides numerous positive externalities.

CHAPTER 2

A REVIEW OF THE BENEFITS OF HIGHER EDUCATION

The benefits of education are well documented. The founders of economic thought recognized the importance of human capital. Adam Smith, in his introduction to the Wealth of Nations, points to human effort as the basis of production and hence wealth (Heilbroner 1986, 159-161). Alfred Marshall in his Principles of Economics asserted: “The most valuable of all capital is that invested in human beings” (1890, 592). Although most people would agree that education has a positive impact on the individual and society, it is important to be able to quantify that impact. It also then becomes important to be able to demonstrate the causal relationship of education to the positive outcome.

In this chapter, I discuss how human capital theory was formalized, that is, how economists measure the return to education. Evidence from the past half a century demonstrates that the return to a year of college has increased, while the return to a year of high school has decreased in the United States. The estimated rate of return to a year of schooling today, ranges between 10 to 14 percent, regardless of gender or race. Further, I discuss the question of causality between education and income. Do individuals with higher ability receive more education and more income, or does education provide skills that increase individual productivity which is reflected in higher income? The studies reviewed show consistently that the return to schooling is not because of an ability bias or measurement error. I then review current trends in educational attainment and earnings focusing on the years relevant to the dataset used in Chapter 5. The statistics presented

further support the individual benefit to education for all races/ethnicities and both men and women. The last section of this chapter analyzes the social benefits of education. This covers a broad spectrum of benefits from economic growth to a better educated electorate. Some of these social benefits are more easily quantified than others. Nonetheless, the overall consistent theme is that there are tremendous benefits from education to both the individual as well as society. If the Texas Top 10 Percent law provides students with greater freedom to realize the educational outcomes they desire, and thus increasing college enrollment, then the citizens and state of Texas will reap these benefits.

The evidence in this chapter primarily focuses on the United States. I limit the focus on the benefits of education to the United States for two reasons. First, the Texas Top 10 Percent law concerns increasing access to post-secondary institutions. Second, it is a law specific to the United States, which is a high income country. The return to education and specifically higher education is different in a high income country versus a middle or low income country (Psacharopoulos and Patrinos 2002).

Measuring the Rate of Return to Education

Human capital theory was formalized by Theodore Schultz (1960), Gary Becker (1964) and Jacob Mincer (1974), amongst others. These economists observed inequality of personal income and that the growth of physical capital and labor explained a relatively small part of the growth of income in the United States. The search for understanding led economists to less tangible entities, such as technological change and

human capital (Becker 1993, 11-12). The “quality” of labor appeared to be the answer, which Becker (1993) describes as follows:

Probably the most impressive piece of evidence is that more highly educated and skilled persons almost always tend to earn more than others. This is true of developed countries as different as the United States and the Soviet Union, of underdeveloped countries as different as India and Cuba, and of the United States one hundred years ago as well as today (12).

The question of how much of the inequality in the distribution of incomes was attributed to individual differences in human capital investments remained an important question to answer. Becker (1964) wrote the book Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education, in which he elaborated on the investment in human capital, the rate of return to that investment and the age-earnings profile. According to Becker, investment in human capital was assumed to be a rational response to the calculation of expected costs and benefits. Foregone earnings, the difference between what could have been earned and what is earned, and the value placed on foregone leisure are the indirect costs of schooling. Tuition, fees, books, supplies, transportation and lodging expenses are the direct costs of schooling. Net earnings (W) can be expressed as the difference between actual earnings and direct school costs: $W = MP - k$, where MP is actual marginal product (assumed equal to earnings) and k is direct costs. If MP_0 is the marginal product that could have been received, we can rewrite the equation as: $W = MP_0 - (MP_0 - MP + k) = MP_0 - C$, where C is the sum of direct and indirect costs and where net earnings are the difference between potential earnings and total costs. The property right of the student in his skills is the source of his incentive to invest in an education by foregoing a lesser wage during the schooling period (Becker 1993, 51-53). Becker measured the rate of return to the human capital investment as the discount rate of

equating the present values of net earnings (1993, 61). The rate of return described by Becker is known as the *internal* rate of return to education because it accounts for the costs incurred to the individual by choosing to invest in education. Becker suggested that the single most important determinant of the amount invested in human capital may be its rate of return (Becker 1993, 59).

Constrained by the data available at the time, Becker estimated the internal rates of return on college education to urban white males who graduated after 1939, college dropouts, college-educated women, nonwhites and rural persons. The private rate of return to the cohort of urban white males graduating from college in 1939 was slightly over 14.5 percent (Becker 1993, 169). The rates of return to the cohorts of urban white males graduating from college in 1949, 1956 and 1958 were 13 percent, 12.4 percent and 14.8 percent respectively (Becker 1993, 220). The rates of return for 1939 and 1949 urban, white, male college dropout cohorts were 9.5 percent and 8 percent, respectively (Becker 1993, 185). The 1939 cohort of urban, nonwhite, male college graduates had rates of return between 12.3 percent and 8.3 percent depending on their location in the North or South (Becker 1993, 186). Becker found that white women had a lower rate of return than white men, but tended to marry college educated men, thus making their family income higher (Becker 1993, 193). There was a lower rate of return to college for the rural cohort and a smaller fraction of rural high school graduates that went on to college (Becker 1993, 195).

Jacob Mincer (1974) set out to understand how investment into differing forms of human capital impacted productivity and hence earnings. Mincer took the simplest human capital model, the “schooling model” and expanded it to include post-schooling

training or labor market experience which he called the human capital earnings function (Mincer 1974, 2). According to Mincer's 1974 book, Schooling, Experience, and Earnings, the human capital earnings function is expressed as:

$$\ln y_t = \ln y_0 + rS + \beta_1 X + \beta_2 X^2 + e,$$

where y is individual earnings in a given time period, S is years of schooling, X represents post-schooling experience, and e represents the statistical residual. The work experience term, X , is assumed to be continuous, starting immediately after the completion of schooling, equaling current age minus years of schooling minus age at the beginning of school. The rate of return to schooling is given by the r (Mincer 1974, 84). Using data from 1959 annual earnings of white, urban men, Mincer found a rate of return of 17.4 percent at 8 years of schooling, 15.1 percent at 12 years, and 12.8 percent at 16 years (Mincer 1974, 93). He further found that schooling and post-schooling investments accounted for approximately two-thirds of the inequality of earnings of white urban men in the United States in 1959 (Mincer 1974, 96). The human capital earnings function remains the primary econometric model economists use to measure the return to schooling.

As David Card (1999) tells us, "...the human capital earnings function is alive and well" (1809). Although this is the case, over the past several decades there has been some debate over the human capital earnings function (Card 1999, 1804). Murphy and Welch (1990) extend Mincer's model by using higher order terms in experience, specifically cubic and quartic specifications, which they believe offers a better fit of the true empirical relationship between earnings and experience (216). Card (1999) demonstrates using Current Population Survey data that even using a cubic version of

Mincer's model, the age-earnings profiles for different education groups is not a precise fit, suggesting a need for more flexible interactions between education and experience (1805). The Mincerian human capital earnings function calls for log earnings to be a linear function of years of completed schooling. Hence, it is assumed that the correct measure of schooling is the number of years of completed education and that each additional year of education has the same impact on earnings (Card 1999, 1806). Some economists, such as Hungerford and Solon (1987) and Belman and Heywood (1991), argue that receiving a diploma or degree rather than the number of years of schooling should be used to determine returns to education. This concept, known as the "sheepskin effect," explains that in an educational system like that of the United States, there is a wage premium for completing a degree. The U.S. Census Bureau likewise accepted this view and in the 1990's began asking what degree an individual had rather than the number of years of schooling. Card (1999) uses Current Population Survey data from 1994-1996 of men age 40-55 to compare mean log wages of education groups (Associates degree, Bachelor's degree, etc.) versus mean number of years of education for the groups. He finds that they are remarkably close, supporting the linear functional form of the human capital earnings function (Card 1999, 1807-1808). As David Card (1999) states, the Mincerian human capital earnings function is a "...natural starting point for building more complex models of earnings determination, and...useful benchmark for theorizing about the effects of education in the labor market" (1809).

Private Rate of Return

The recent book, The Race between Education and Technology by Claudia Goldin and Lawrence F. Katz, provides the returns to schooling over the twentieth century. Prior to 1940, the U.S. Census Bureau did not collect information on years of completed formal schooling or income. Goldin and Katz use the Iowa State Census of 1915 which was taken to seat representatives in the state legislature to find the rate of return to schooling in the early twentieth century. The Iowa Census contained questions about completed education, income and occupation. As all residents of Iowa were surveyed, there is enough data to serve as a proxy for the U.S. population (Goldin and Katz 2008, 71-73). Goldin and Katz find the returns to formal schooling for young men (18 to 34 years old), all men (18 to 65 years old) and unmarried women (18 to 34 years old). The authors estimate the return to formal years of education using the Mincerian human capital earnings function. Based on the data from the 1915 Iowa Census, the return to a year of college for all men was about 10 percent, while the return for young men was about 15 percent. Likewise, the rate of return to a year of college in 1914 for unmarried women was 15 percent (Goldin and Katz 2008, 76). Although the rates of return to a year of college are quite large in 1914, to have the complete picture, those rates need to be looked at relative to the returns to high school. The rate of return to a year of high school for all men in 1914 was about 10 percent and about 12 percent for young men. The rate of return to a year of high school for unmarried women was around 10 percent (Goldin and Katz 2008, 76). Goldin and Katz explain that the large rates of return to high school at the time were due to various factors. Secondary school provided the cognitive skills to enter into craft occupations such as electricians and machinists

(who often own their own businesses) and office jobs (that had a relatively higher wage). Further, educated farmers did better because they had additional knowledge of animal inoculation, farm machinery, etc. (Goldin and Katz 2008, 77). The limitation of the rate of return estimates from the Iowa State Census of 1915 is that as family background information was not available, there may be an “ability bias” inflating the results. An ability bias means that those individuals with greater innate ability may complete more school and receive a higher wage because of greater skill (Goldin and Katz 2008, 80).

From 1940 onward, the U.S. Census Bureau collected data necessary to estimate returns to education. Goldin and Katz estimate these returns for male workers in the U.S. for the years 1939, 1949, 1959, 1969, 1979, 1989, 1995 and 2005. Table 1 provides the rates of return to a year of high school and college education of the aforementioned years for men in the U.S. The rate of return to a year of high school and college in the early twentieth century was relatively high as demonstrated by the Iowa data. The rate of return declines between 1914 and 1939 and declines rather dramatically by 1949, although less dramatically for the rate of return to a year of college for all men. Goldin and Katz attribute the decline in rate of return to both high school and college to increased educational access (2008, 83). By 1959, the return to a year of education began increasing, although the return to a year of high school never rises to its previous level. The return to a year of college meanwhile increased up to 14 and 15 percent by 2005, similar to the rates in the early part of the twentieth century.

Table 1 - Returns to a Year of Schooling from 1939 to 2005

Returns to a Year of:				
	High School		College	
Year	Young Men	All Men	Young Men	All Men

1939	0.102	0.085	0.115	0.100
1949	0.054	0.051	0.078	0.077
1959	0.070	0.054	0.090	0.091
1969	0.074	0.059	0.096	0.099
1979	0.081	0.066	0.084	0.089
1989	0.093	0.078	0.124	0.124
1995	0.096	0.081	0.133	0.129
2005	0.087	0.077	0.148	0.144

Figure 2 depicts the rates of return to a year of high school and college for all men over time. The rate of return to both college and high school initially are decreasing. After 1949, both the rate of return to college and high school begin to increase again. Then the rates of return diverge with the return to college increasing at a faster rate, especially during the 1980s. What is evident in this data is that the private investment in a higher education relative to high school is quite profitable, particularly by the end of the century.

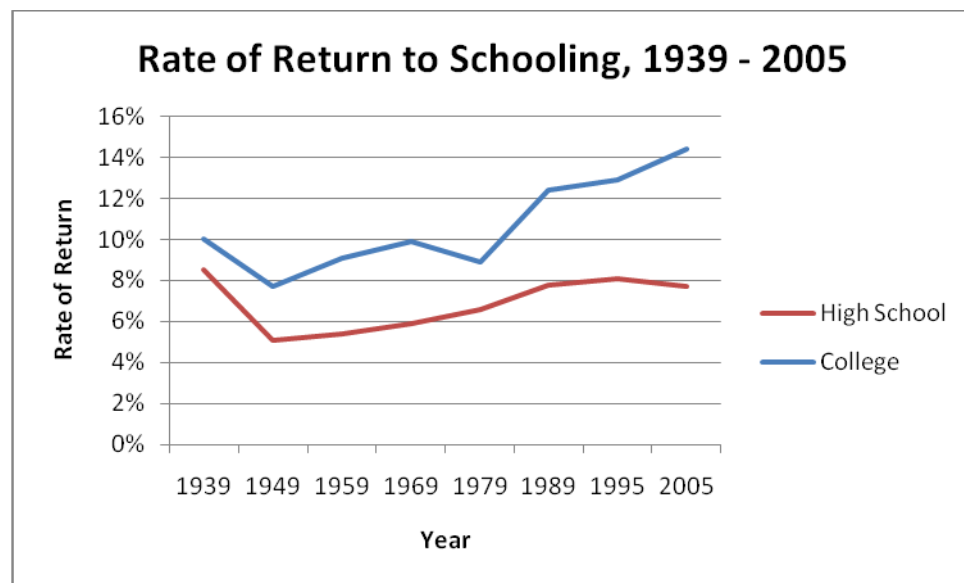


Figure 2 – Rate of Return to a Year of High School and College, 1939 to 2005

Ashenfelter and Rouse (1998b) use the 1990 United States Census to compare the rate of return to a year of education across racial and ethnic groups. They categorize race/ethnicity by White, African-American, Hispanic, Native American and Asian. Ashenfelter and Rouse (1998b) find that there is little variability in the estimates of returns to education by sex and race. For women, they find that White, non-Hispanics earn 13 percent per additional year of schooling, while African-American women have a rate of return of 13.3 percent, Hispanic women have a rate of return of 12.5 percent and Asian women of 13.5 percent. Men, whether White non-Hispanic, Black and Hispanic earn between 10.1 percent to 10.8 percent more for each additional year of schooling. The outlier is Asian men who have a return of 13 percent (Ashenfelter and Rouse 1998b, 16). Ashenfelter and Rouse's results are consistent with the estimates by Goldin and Katz, where in 1989, the return to a year of college for men was 12.4 percent.

Barrow and Rouse (2005) estimate the rates of return to schooling by race/ethnicity from 1979 to 1999 using the 1980, 1990 and 2000 Decennial Censuses. In 1979, the rate of return for all races (white, black, Hispanic, Asian/Pacific Islander, Native American and other) ranges from 7.3 percent to 8.5 percent. Between 1979 and 1989 there was a large increase in the return to schooling for all races, ranging between 10.7 and 12.3 percent. The estimated returns to education slightly increased over the period from 1989 to 1999, with a rate of return between 10.2 and 13.6 percent for all race groups (Barrow and Rouse 2005, 85). The authors further use the National Longitudinal Survey of Youth, 1979 to estimate returns to education. To address issues of selection bias they use test scores and sibling relationships. Using ordinary least squares and

instrumental variable estimates, the authors conclude there is little difference in the returns to schooling across race and ethnic groups (Barrow and Rouse 2005, 86).

A recent study by Becker, Hubbard and Murphy (2010) explains the increase of women in higher education since the 1970's. They attribute this boom to the greater benefits relative to costs of having a higher education. Using data from the United States, the authors examine various benefits from higher education. They go beyond the usual earnings premium and measure other benefits such as better health, better marriage prospects, better investments in children and more effective responses to uncertainty (Becker, Hubbard and Murphy 2010, 1). In reviewing various studies, the authors demonstrate that the effect of education on life expectancy has increased over the last three decades. Specifically, men receive a greater benefit than women, although the gender gap for this health variable has decreased over time (Becker, Hubbard and Murphy 2010, 8). Next, the authors present data on men and women aged 40 – 44 currently married by education level at ten-year intervals between 1967 and 2007. For men, they find that at every interval college educated men are more likely to be married than high school educated men. They further find that the education-marriage advantage is stronger after the 1980s for men. The data for women showed a different picture. High school educated women were more likely to be married than college educated women until the 1980s. After 1980, college educated women were more likely to be married than high school educated women (Becker, Hubbard and Murphy 2010, 9). Children of college educated individuals are more likely to go to college. Further, although there is evidence that women tend to emphasize education more than fathers, both parents' level of education appears to have a positive impact on children's education (Becker, Hubbard

and Murphy 2010, 10). Finally, the benefit of more effectively dealing with uncertainty is viewed as both having the earnings premium as well as greater employment opportunity. Overall, they find that these benefits of education have increased over time, especially for women. Yet, the total benefits from college are still higher for men than women. Hence, the authors turn to the costs of college to explain further the increase of women in higher education. Direct monetary costs are the same for both men and women. As suggested by some literature, the differences in cognitive and non-cognitive ability by gender may lower costs of attendance and increase likelihood of completion of college. The authors demonstrate that in fact the higher non-cognitive ability of women relative to men lowers the full cost of college for women, explaining the increase of women in higher education over the past 30 years (Becker, Hubbard and Murphy 2010, 17-18). Becker, Hubbard and Murphy (2010) further suggest that the increase in benefits to education and lower costs for women account for the worldwide increase of women in higher education (1).

Economist George Psacharopoulos analyzes the profitability of investment in education not only for the United States, but throughout the world. Psacharopoulos (1995) discusses the various techniques in measuring the rate of return to schooling. He differentiates between the internal rate of return that includes the cost of investment and the Mincerian rate of return that is the coefficient on the schooling variable in the earnings function, recognizing the usefulness of both. Psacharopoulos and Patrinos (2002) estimate the rates of return to education for 98 countries over various time periods. They find that the overall average rate of return to a year of schooling is 10 percent (Psacharopoulos and Patrinos 2002, 1). Psacharopoulos and Patrinos estimate the

internal rate of return based on per capita income groups for the latest year of data available. They find that the highest returns are for low and middle-income countries, evident in Table 2. This is explained by the relative scarcity of human-to-physical capital in low and middle-income countries.

Table 2 – Private Returns to Investment in Education by Level and Per Capita Income Group (Percentage)

Per Capita Income Group (US\$)	Primary	Secondary	Higher
High Income (\$9,266 or more)	25.6	12.2	12.4
Low Income (\$755 or less)	25.8	19.9	26.0
Middle Income (\$756 to \$9,265)	27.4	18.0	19.3
World	26.6	17.0	19.0

Further, Psacharopoulos and Patrinos using a Mincerian earnings function, estimate the rate of return to an additional year of schooling by regions. Demonstrated in Table 3, Latin America and the Caribbean and Sub-Saharan Africa have the highest average return to schooling, while the non-OECD European, Middle East and North African group of countries have the lowest rate of return.

Table 3 – Private Rate of Return to Schooling by Region

Region	Mean Per Capita Income (US\$)	Rate of Return
Asia	5,182	9.9
Europe/Middle East/North Africa	6,299	7.1
Latin America/Caribbean	3,125	12.0
OECD	24,582	7.5
Sub-Saharan Africa	974	11.7
World	9,160	9.7

Using data from all countries, Psacharopoulos and Patrinos estimate the rates of return to education by gender. They find that women receive higher rates of return to schooling investments overall at a rate of return of 9.8 percent compared to men's rate of return of 8.7. Men receive a significantly higher rate of return from primary schooling at 20.1 percent compared to women's 12.8 percent. It is in the return to secondary school that women receive 18.4 percent relative to the men's 13.9. The estimates for higher education are similar for both men and women at approximately 11 percent (Psacharopoulos and Patrinos 2002, 15). Psacharopoulos (1985) argues there is an underinvestment in education at all levels of education, especially in the developing world. He believes the most important investment is that made into primary schooling. Further, he stipulates that based on the estimates of returns for women, it is socially efficient to expand education for women in the developing world (Psacharopoulos 1985, 591-2).

Several long run trends emerge from the studies discussed. Goldin and Katz (2008) provide estimates for the longest period of time. They find that the returns to education fall in the first half and rise the second half of the twentieth century. Goldin and Katz describe this trend as the race between education and technology. First, in the early twentieth century a high school graduate was considered well educated in much the same way we consider college graduates well educated today, reflected in the rate of return to education. Hence in the early part of the twentieth century education "ran" faster than technology. As more capital-intensive technologies were adopted, more skilled labor was needed. Further the skills of the worker changed over time. By the end of the twentieth century technology "ran" faster than education. This in turn raised the rate of

return to college educated while decreasing the return to high school educated (Goldin and Katz 2008, 292). Although the following studies are constrained to shorter and more recent periods of time relative to Goldin and Katz (2008), they confirm the increase in the rate of return to education while expanding the discussion to women and race/ethnicity. Becker, Hubbard and Murphy (2010) likewise find that the benefits of education and specifically higher education have increased for both men and women over the past three decades. Further, they find that the benefits are stronger for men than women, but that the education benefits gap between men and women has decreased over time. Barrow and Rouse (2005) find that the rate of return to schooling increased over the period of 1979 to 2000, with the most dramatic increase occurring over the 1980s. They find that these increases in the rate of return to schooling are relatively consistent for all race groups.

Together, all the aforementioned studies provide solid evidence that the private rate of return, regardless of measurement technique used, is significant. Particularly in the United States, the rate of return to higher education is increasing, whereas it is decreasing for secondary school. Further, regardless of race or gender, the investment in human capital is beneficial for all. Having measured the return to the investment in human capital, the following question is whether the relationship described is causal.

The Question of Causality

There is a definite positive relationship between education and earnings, that is, that more educated people have higher earnings. There is a debate as to the causality of this link between education and earnings. One side of the debate suggests that education promotes ability which increases productivity and hence income. This train of thought

believes education to be an important determinant of social mobility. The other side argues that those with greater ability receive more education and higher incomes. In an ideal world economists could easily prove that the rate of return on education is really thanks to the education variable. As a perfect natural experiment does not exist, economists have used different methods and controls to decipher the causal effect of education.

Causal inference refers to empirical research that attempts to determine the effects of some intervention or policy, or estimates the characteristics of the behavioral relationship implied by economic theory. As Angrist and Krueger (1999) describe, the question of causality involves comparing “counterfactual states of the world” (1282). The difficulty with counterfactual outcomes is that the outcome of a specific scenario is all that is observed. It is believed that the best evidence about counterfactuals comes from randomization. For instance, in medical research, randomized trials guarantee that the outcome of the control group is the counterfactual for a treatment group (Angrist and Krueger 1999, 1283). Economists cannot easily randomize variables such as educational attainment and so use observational studies, controlling for observable differences between comparison groups. Such studies are done using “...regression or matching techniques, using pre-post comparisons on the same units of observation to reduce bias from unobserved differences, and by using instrumental variables as a source of quasi-experimental variation” (Angrist and Krueger 1999, 1284).

The question as to whether the positive relationship between education and earnings is causal stems from observations such as people with more schooling have wealthier parents, which is associated to higher earnings. Further, ability is considered a

principal determinant of educational attainment which is an unobserved variable (Angrist and Krueger 1999, 1284). The most common way of analyzing the relationship between education and earnings is by using regression. A Mincerian human capital earnings function is estimated with a vector of control variables such as ability and family background. The interpretation of regression coefficients provides the answers to the question of causality. The coefficients can be viewed as the best linear predictor of the dependent variable, earnings in this case (Angrist and Krueger 1999, 1285). Another technique used to analyze causal inference is fixed effects and differences-in-differences modeling. Fixed effects models attempt to identify the effect of something by using repeated observations of an individual, controlling for unobserved characteristics that are related to both the outcome and causal variables (Angrist and Krueger 1999, 1293). Differences-in-differences models are most often used to estimate the effect of a change in policy. The method compares group means for groups exposed to the variable of interest or policy to those that are not (Angrist and Krueger 1999, 1296). Another method of analyzing causal relationships is by using instrumental variables. The idea is to create randomization by identifying an instrumental variable that is correlated to the control or experiment group but is independent of the potential outcomes. A similar strategy to conventional instrumental variables models is the regression-discontinuity design, where the instruments are derived from discontinuities between the variable of interest and the control variable (Angrist and Krueger 1999, 1306). Although the various models have limitations, they are the tools used to understand and explain causal relationships. In the following section I review studies of the causal inference between education and earnings.

The following studies attempt to pinpoint what factors impact earnings, focusing on education and controlling for any other observed and unobserved variables that could influence earnings. Particularly, by running a simple regression initially, and then controlling for ability or measurement errors (errors in self reported responses), or other observables, such as school quality, the researcher is able to isolate the “real” return of education on earnings. Several studies make intra-family comparisons to control for family background and environmental characteristics. Altonji and Dunn (1996) examine the impact of family background on the labor market payoff to a year of schooling using the National Longitudinal Survey (NLS) and the Panel Study of Income Dynamics (PSID). The baseline rate of return estimate for young men (NLS) which excludes ability measures and parents’ education interaction terms is 3.73. With family fixed effects, estimates suggest that a one year increase in mother’s education raises return to education by 1 percent for young men. The effect for father’s education is weak for young men (Altonji and Dunn 1996, 699-700). The baseline rate of return for women (NLS) is 6.33. With family fixed effects, the rate of return is 6.65, which is slightly raised by the mother’s education (Altonji and Dunn 1996, 700). Using the PSID sample, Altonji and Dunn found that a two year increase in mother’s education is associated with a 0.892 point increase in rate of return to schooling for men. They found no effect for women in the PSID sample. The pooled results with both the NLS and PSID provide no effect of parents’ education on wage (Altonji and Dunn 1996, 701). Their results imply that parental education has a modest effect on the rate of return to schooling. Ashenfelter and Zimmerman (1997) matched data on brothers and fathers and sons using the National Longitudinal Survey of Youth and Older Men for a time period in the 1980’s. They

estimated schooling differences to income differences between 143 brother pairs and 332 father-son pairs (Ashenfelter and Zimmerman 1997, 4). Ashenfelter and Zimmerman's least-squares estimates for brothers' return to schooling is 5.9 percent and 7.1 percent. They also report the instrumental-variables estimate of return to schooling by using the education of one brother as the instrument for the education of the sibling. The return to schooling rises to 8 percent and 8.3 percent for brothers. These results suggest that the estimate for brothers is slightly biased upward due to omitted family background characteristics (Ashenfelter and Zimmerman 1997, 5-6). Using a correlated random effects framework, they find that the downward bias in estimated returns to schooling due to measurement error is greater than the slight upward bias from omitted family characteristics for the brothers sample (Ashenfelter and Zimmerman 1997, 7). The fixed effects estimate for the father-son sample illustrate that a one year difference in education levels of father and son is associated to approximately a 4.5 percent difference in wage rate. The instrumental-variables estimates suggest an upward bias on the return to schooling, but should be interpreted with caution as fathers and sons are not raised in the same family environment and hence do not share family characteristics as brothers do. For this reason, the authors put greater emphasis on the results of the brother-pairs. The results of the study imply that the estimated return to schooling is due to education rather than omitted family variables or measurement errors as they basically cancel each other out.

Some of the most compelling family comparisons are that of identical twins. As the studies discussed attempt to demonstrate that the correlation between wage and schooling is not due to the correlation between schooling and ability or other omitted

variables, using identical twins allows the comparison of genetically identical individuals that are raised in the same family environment. Ashenfelter and Krueger (1994), with a sample size of 298 identical twins, estimate the return to schooling by comparing wage rates of identical twins with different schooling levels (Ashenfelter and Krueger 1994, 1159). The authors compared the results of various regression methods, such as least squares, generalized least squares, instrumental-variables and fixed effects. According to their results, there is a downward bias in returns to schooling from the measurement errors in self-reported schooling. Their estimates of the rate of return to schooling range between 12 and 16 percent per year completed (Ashenfelter and Krueger 1994, 1171). Ashenfelter and Rouse (1998) estimate the return to schooling for 700 genetically identical individuals (Ashenfelter and Rouse 1998, 253). The authors use regression techniques similar to that in Ashenfelter and Krueger (1994) and add a three-stage least squares. They find that individuals with higher levels of ability receive higher levels of schooling. Hence the return to schooling is slightly upward biased by omitted ability variables. Higher ability individuals may receive a slightly lower marginal benefit to schooling, but tend to invest more in schooling because they face lower marginal costs (Ashenfelter and Rouse 1998, 279). They estimate the average return to schooling to be about nine percent (Ashenfelter and Rouse 1998, 281). Ashenfelter and Rouse conclude by stating that their results "...stand in sharp contrast to recent claims that genetic factors predetermine education and income, and that such differences are not amenable to alteration by public or private choices" (1998, 281).

There are other family factors that some believe may help to explain the education-earnings relationship. Using the Panel Study of Income Dynamics (PSID) from

1985, the National Longitudinal Survey of Women (NLSW) from 1967, and the Current Population Survey (CPS) from 1989, Butcher and Case (1994) examine the effect of sibling sex composition on women's educational attainment and earnings. They find that a woman with a brother sibling receives more education than one with a sister sibling in all the data sets (Butcher and Case 1994, 544). They use sibling sex composition as an instrument to estimate returns to schooling as sibling sex composition is correlated to educational attainment, but not to measurement error. Using an ordinary least squares regression, the return to a year of education is nine percent. When they use the "sister" instrument for years of completed schooling, the estimate doubles to 18 percent. Further, as they add a variable for the number of siblings, the estimate for return to a year of schooling remains at 18 percent, but is a more precise estimate (Butcher and Case 1994, 556). This study suggests that without correction for measurement error, there may be a significant underestimation of the returns to education.

There are institutional factors that are used to control for biases in the rate of return to education estimates. Angrist and Krueger (1991) examine whether compulsory school attendance affects educational attainment and earnings using data from the 1980 Census. Compulsory schooling laws create a situation where those born earlier in the year can choose to dropout when they hit legal age, whereas those born later in the year are forced to be schooled, which serves as a natural experiment. Angrist and Krueger analyze whether those that attend school longer because of the compulsory laws have higher wages due to the additional schooling. They use season of birth as an instrument for education in an earnings function. Angrist and Krueger use both ordinary least squares (OLS) and two-stage least squares (TSLS) regressions to estimate the return to education

to be between six and ten percent (Angrist and Krueger 1991, 1003). The similar OLS and TSLS results suggest that there is little evidence of an omitted variable bias or measurement error bias in the return to education. Further, the evidence suggests that if there is a bias in the OLS estimates, it is a slightly downward bias (Angrist and Krueger 1991, 1009). Card and Krueger (1992) investigate the affect of school quality on earnings using fixed effects modeling. They use cohorts of men born between 1920 and 1949 from the 1980 Census. Using a two-step regression, they first estimate the average rate of return to education for individuals born in a specific cohort in a specific state, controlling for state of birth, state of residence and regional differences. Next, they relate the estimates of rate of return to schooling to the quality variables (Card and Krueger 1992, 5). They find that the rate of return for the oldest cohort is 5.1 percent per year, while the rate of return for the youngest cohort is 7.4 percent. The returns to schooling are significantly related to the school quality variables. Specifically, they find that the rate of return to a year of schooling is higher for individuals who attended schools with lower pupil/teacher ratios and higher relative teacher salaries (Card and Krueger 1992, 14). Card uses the National Longitudinal Survey Young Men sample to examine the schooling and earnings differentials associated with proximity to a college or university. Card finds that growing up near a college or university has a greater effect on the children of less educated parents. When Card accounted for both proximity and family background, he still ended up with a rate of return to schooling of approximately 10 percent (Card 1999, 1838). For further examples of the causal inference of education on earnings, please refer to David Card's chapter "Causal Effect of Education on Earnings" in the Handbook of Labor Economics.

Current Trends in Educational Attainment and Earnings

The Current Population Reports released by the U.S. Census Bureau backs the assertion that education pays off. According to the U.S. Census Bureau, in 2000, 84 percent of American adults ages 25 and over had at least completed high school; 26 percent had a bachelor's degree or higher. These figures stand in impressive contrast to the 1975 statistics of 63 percent of adults with high school degrees and 14 percent with a bachelor's degree (Cheeseman Day and Newburger 2002, 1-2). The average annual earnings of workers 25 to 64 years of age in the years 1997 through 1999 ranged from \$18,900 for high school dropouts to \$99,300 for those with a professional degree. Figure 3 below shows the positive relationship between educational attainment and earnings.

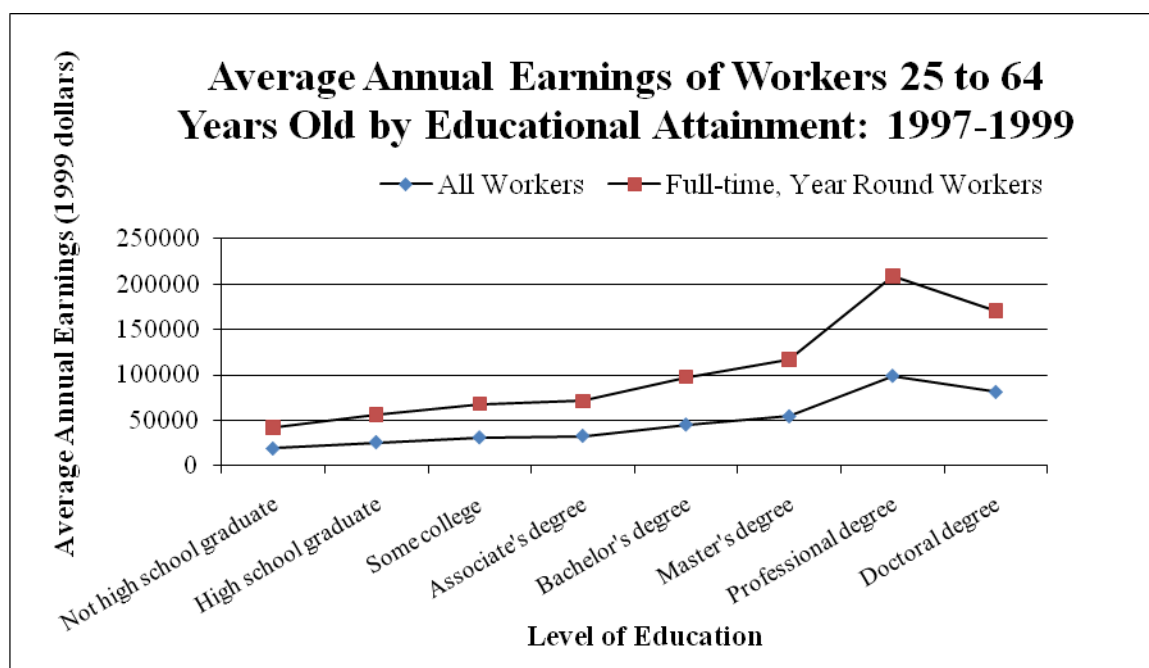


Figure 3 – Earnings by Educational Attainment. Source: U.S. Census Bureau, Current Population Reports, P23-210, July 2002

Over the past 25 years, there has been a visible wage premium on skill. For instance, in 1975, full-time workers with a bachelor's degree earned 1.5 times the annual earnings of a worker with only a high school diploma. By 1999, the ratio had increased to 1.8 times. Even more dramatic is the wage differential between those with an advanced degree versus a high school diploma. In 1975, full-time workers with an advanced degree earned 1.8 times the annual earnings of high school graduates. By 1999, the earnings of those with advanced degrees were 2.6 times that of high school graduates. The relative earnings of the least educated, of high school dropouts, decreased over the same period (Cheeseman Day and Newburger 2002, 2-3). The change in relative earnings by educational attainment can be explained primarily by an increase in the demand for skilled labor. With technological change, employers were seeking out skilled or educated labor, while at the same time there was a decline in labor unions, which contributed to the relative change in earnings (Cheeseman Day and Newburger 2002, 3).

These statistics certainly suggest that education has been and remains a vehicle to improve one's own economic status. Likewise it is obvious that over time our population has become more educated. The questions remain: which groups are educated, and why, if there is so much evidence of the positive returns to education, do not more people pursue a higher education?

To see the whole story, the above statistics need to be broken down by race and gender. According to the 2002 Current Population Report the earnings difference between men and women increases with age, particularly for those with a bachelor's degree. More specifically, the female-to-male earnings ratio for those with a bachelor's degree increases from 0.81 for ages 25 to 29 years to 0.60 for ages 60 to 64 (Cheeseman

Day and Newburger 2002, 5). Hence, a woman's return to educational level is lower than that of a man, generally speaking. Certainly a portion of the earnings difference is due to labor market separation when women have children. Yet we do see the initial gap of .81 to 1 at entrance into the labor market, at the 25 to 29 age group. Educational attainment differs dramatically by race. In 2000, of adults 25 years old and above, 88 percent of White non-Hispanics, 86 percent of Asians and Pacific Islanders, and 79 percent of Blacks attained a high school diploma. Likewise, 28 percent of White non-Hispanics, 44 percent of Asians and Pacific Islanders, and 17 percent of Blacks had received a Bachelor's degree. For Hispanics, only 57 percent had a high school degree and 11 percent a bachelor's degree (Cheeseman Day and Newburger 2002, 6).

Education past the compulsory years is both a consumption choice and investment choice. Hence, the main focus of the benefits of education has been on the individual or private rates of return to education. The evidence reviewed here demonstrates that more education leads to higher income. In addition, there is little difference between the rates of return by race and sex, suggesting that most people have the same or similar incentive to further their education.

Social Benefits of Education

Recently there has been a growing interest in the social returns to education. Some of these benefits are quantifiable while others are not, which makes the social returns to education literature less developed. Here I shall first put forth the quantifiable benefits followed by a discussion of the unquantifiable, that may be of equal, lesser or greater importance.

In the 1950's, research into the determinants of economic growth, found that output growth in the United States in the twentieth century was greater than the increase in the inputs capital and labor. Economists looked to new technology and improved labor force quality for an answer to this discrepancy. Again, economists would need to isolate and measure the impact of schooling on economic growth (Pencavel 1991, 333). Schultz (1962) paralleled the investment in man or human capital to the investment in physical capital to explain economic growth. In paralleling the education or job training investment to physical capital investment, it became important to likewise find the rate of return to that investment. Schultz found that the estimated return to additional "educational capital" in the labor force between 1930 and 1957 accounted for approximately one-fifth of economic growth during that period (Schultz 1962, 4). These results were supported by Edward F. Denison's findings that education contributed more to economic growth during the period from 1929 to 1957 than did physical capital (Schultz 1962, 5). Gary Becker also recognized the social rate of return to education. Becker referred to Denison's findings that of the 1.60 percent average annual growth rate of per capita national income from 1929 to 1957, 0.58 percentage points were attributed to growth in knowledge and 0.67 percentage points were explained as growth in education. Becker pointed out that if the growth in knowledge were an indirect effect of the growth in education, then the social rate of return would be estimated close to 25 percent (1993, 210-211).

Education impacts the growth of a nation which benefits society overall. By increasing productivity and improving the quality of human capital, education enhances economic growth. An important effect of education is its influence on individual

innovation, creativity and adaptability. New growth theory states that technological change drives economic growth, but it is education that supports the process (Uhalde, Strohl and Simkins 2006, 11). Uhalde, Strohl and Simkins quantify the contribution of education on the United States economy. They find that a one percent increase in the average years of schooling, *ceteris paribus*, raises Gross Domestic Product (GDP) per worker by 0.05 percent. In addition, they find that a one percent increase in the post-secondary completion rate results in a 0.1 percent increase in long-run aggregate output. Likewise, for the average years of schooling below completed post secondary level, they find a 0.06 percent increase in long-run aggregate output for a one percent increase for this group. For both groups there is a positive and significant impact on real GDP per worker (Uhalde, Strohl and Simkins 2006, 11-12). Evidence demonstrates that education and particularly college are important for growth.

Education enhances the quality of the labor force which in turn increases economic growth. Pencavel (1991) argues that there are three ways in which schooling, particularly higher education, serves as a productive input in work performance. First, a labor force that has more schooling is viewed as equivalent to having a larger work force. Hence, more output can be produced from its resources. Further, the enhancement of the effective labor input may increase the productivity of other inputs. Second, Pencavel argues that schooling may contribute to allocative efficiency. That is, a more educated labor force is more prepared to make informed decisions, follow directions, be better prepared to deal with unforeseen circumstances and more easily adapt to new technologies (Pencavel 1991, 338). Last, Pencavel, points to research and development that is done at the university level and at research institutes that are linked to private

industry. This research and development is important to technological progress which is a key component of economic growth (Pencavel 1991, 339).

Claudia Goldin and Lawrence F. Katz (2008) in their book The Race Between Education and Technology designate the twentieth century both the Human Capital Century and the American Century (12). In their own words:

It was the century when education became the dominant factor determining the wealth of nations and it was the century when America was the first to discover that notion. It was the century when America began to lead the world economically and it was the century during which America remained at the top (2008, 34).

They argue that the United States experienced skill-biased technological change in the twentieth century. The success in economic growth was due to a more educated labor force combined with technological change. Further, the ability of the labor force to adjust to changes in the demand for different skills was critical (Goldin and Katz 2008, 352).

George Psacharopoulos (1995) explains the social rate of return estimated in his studies as the private internal rate of return with added costs based on the state's or society's spending on education. He explains that ideally the social benefit should include non-monetary positive externalities, but as the empirical data is minimal, the social benefit is based on direct observable monetary benefits to education, or earnings (Psacharopoulos 1995, 4). Using data from 98 countries from various periods of time, Psacharopoulos and Patrinos (2002) estimate the social rates of return to education. Table 4 contains the results of the social rate of return to education level by per capita income group. Similar to the pattern seen for the private rate of return, the low income group has the highest return followed by the middle income group. Also, there are higher returns to

primary school than any other level (Psacharopoulos and Patrinos 2002, 14). Comparing the social and private rates of return as estimated by Psacharopoulos and Patrinos, the private rate of return is significantly higher than the social rate of return. This is not surprising considering the calculation of the social return.

Table 4 – Social Returns to Investment in Education by Level and Per Capita Income Group (Percentage)

Per Capita Income Group (US\$)	Primary	Secondary	Higher
High Income (\$9,266 or more)	13.4	10.3	9.5
Low Income (\$755 or less)	21.3	15.7	11.2
Middle Income (\$756 to \$9,265)	18.8	12.9	11.3
World	18.9	13.1	10.8

Figure 4 provides the social rate of return by education level over time, available in Psacharopoulos (1985, 1993), for the United States. The social rate of return to secondary schooling follows a similar pattern to the private rate of return in that it has decreased over time. The social rate of return to higher education has remained relatively flat over time with a slight positive slant. This relative stability of social returns to higher education over time, Psacharopoulos credits to the increasing demand for educated manpower coupled with the increasing supply of education (Psacharopoulos 1985, 590). This notion is supported by Goldin and Katz discussion of the race between technology and education.

Psacharopoulos recognizes the limitations of calculating the social rate of return without accounting for the positive externalities that are difficult to quantify or that have unavailable data. In quantifying these externalities and non-market effects, Psacharopoulos argues his estimates would be strengthened (Psacharopoulos 1985, 592).

The following economists attempt to quantify such externalities or social benefits to education.

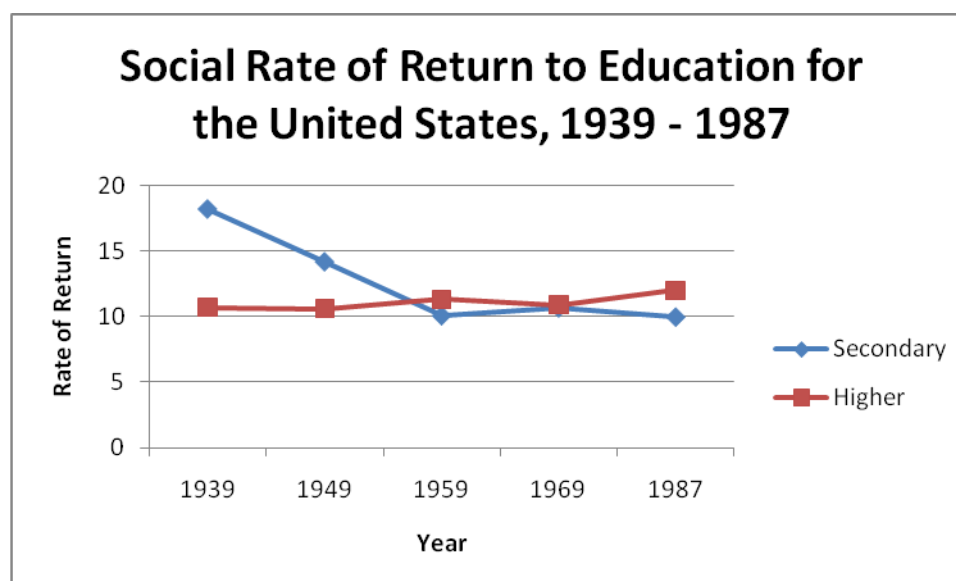


Figure 4 – Social Returns to Investment in Education by Level over Time for the United States

Rizzo (2004) defines social benefit by: anything that shifts out the utility function of society; anything which reduces costs or makes resources available for more productive uses; and anything which increases welfare possibilities directly (Rizzo 2004, 3). One important pecuniary return to society is the tax revenues from the educated. Furthermore, a larger tax base would alleviate tax pressure on low income families (Rizzo 2004, 4).

There are various studies that show there is a relationship between the concentration of educated workers and the growth of cities and wages for the less educated. Glaeser, Scheinkman, and Shleifer (1995) find that cities and regions that had a

greater stock of human capital in 1960 experienced greater income growth in the period from 1960 to 1990. Glaeser and Saiz (2003) compare the labor markets and growth rates of Detroit and Boston. They find that the percentage of workers with college degrees strongly predicts future income growth rates in urban areas. Also, they find that more educated workers tend to more easily adapt to changing technologies (Rizzo 2004, 10). Moretti (2004) examines the effects of educated workers on the wages of less educated workers. The results show that there are positive spillovers to the less educated. More specifically, a one percent increase in proportion of college educated workers raises the wage of high school dropouts, high school graduates, those with some college and college graduates by 1.9 percent, 1.6 percent, 1.2 percent and 0.4 percent, respectively (Moretti 2004, 37). Holzer and Neumark (2000) find that minorities that attain degrees in medicine are more likely to serve minority patients, providing a valuable externality (89).

Educating society also serves to reduce certain costs to society. A higher education increases employment opportunities, which could reduce unemployment and welfare payouts (Rizzo 2004, 3). Educating the citizenry serves to decrease crime rates which in turn would decrease the cost of law enforcement. Lochner and Moretti (2004) use three different data sets all of which provide similar results: schooling significantly reduces criminal activity. Further, they estimated that a one percent increase in the high school completion rate of all men age 20 to 60 would save the United States approximately \$1.4 billion per year (Lochner and Moretti 2004, 183-184). Educating women decreases the fertility rate and increases the quality of children. Although there is debate to the causality, there is a positive relationship between education and health. Hence, it is possible that health care costs to society would decrease, both because a more

educated citizenry would uphold regular doctors' visits and there may be less uninsured because of greater labor market opportunities (Rizzo 2004, 5).

Intergenerational benefits cannot be ignored. Going back to Weisbrod (1962) and supported by current literature, there is the benefit of the informal education that children receive at home from educated parents. The health benefits discussed earlier that educated individuals maintain their own health also applies to the children of educated mothers. Evidence shows that better educated women provide better health care for their children (Rizzo 2004, 5). Also, evidence indicates that children of college educated parents are much more likely to receive a college degree (Rizzo 2004, 6).

Hanushek, Kain and Rivkin (1998), among others find that student learning is greater when the students have better educated teachers. Also as the more educated earn more, so too do they give more to charities (Rizzo 2004, 24).

There are a great number of benefits that are much harder to measure. For instance, society may value the dispersion of knowledge. Education may lead to other social goals such as income equality or tolerance. In addition, there is evidence that more educated people participate in a democracy and what society wouldn't want well educated voters (Filer, Kenny and Morton 1991, 374-375)? Developing minds so that there exists a flow of new ideas and innovations are some of the benefits of education that may be priceless. Creating role models for the young and having people who have greater community responsibility are all positive effects of higher education.

As the social rate of return to education can be defined in a variety of measurable and immeasurable ways, it is more difficult to discuss long run trends. From the studies discussed, such as Psacharopoulos (1985), it is evident that the social rate of return to

secondary education in the United States increased over the period from 1939 to 1987. The social rate of return to higher education during the same time period only slightly increased. The small increase in return to higher education may be attributed to the lack of accounting for positive externalities. Education also impacts economic growth. Greater accumulation of human capital increases economic growth over time as evident in the study by Glaeser, Scheinkman, and Shleifer (1995). Many of the other social benefits or externalities discussed are harder to either directly attribute to education or are difficult to measure.

The studies on the benefits of education reviewed here are a subset of a much larger pool of literature. Together, they provide solid proof of the benefits of education overall, and more specifically, the benefits of higher education. As Goldin and Katz (2008) argue in their book, technological change is racing forward, while education in the United States is falling behind. This information is important as policy makers decide what social programs to target. Further, as economic growth is associated to education, it seems even more pertinent to create access to higher education.

CHAPTER 3

THE POLICY DEBATE ON INCREASING ACCESS TO HIGHER EDUCATION AND THE TOP TEN PERCENT LAW IN THE ENVIRONMENT OF TEXAS

The history of education policy in the United States is an important context to the current policy debate. The characteristics on which the educational system was founded were ones of democratic and egalitarian principles. These characteristics more specifically were: public provision by fiscally independent districts, public funding, secular control, gender neutrality, open access and a forgiving system (Goldin and Katz 2008, 130). This suggested equality of opportunity and education for all; although it was not the reality for all. The Civil Rights Movement would further help to level the playing field, yet based on the statistics of educational attainment in Chapter 2, there is still work to be done to create equitable access to education.

A Legal History

The Morrill Act, also known as the Land-Grant Act of 1862, was signed into law by Abraham Lincoln. The Act offered to give each state which accepted its provisions 30,000 acres of land for each member of Congress from said state to be sold to provide a permanent endowment for at least one college. The main provisions of the Act were a five year limit to opening the first educational institution, emphasizing “agriculture and the mechanical arts” (although not restricting other subjects) and a State could not be in rebellion of the government (Richter 1962, 234). Today there is at least one land-grant

institution in each of the 50 states and Puerto Rico. What is striking about the Land-Grant Act, particularly as the first higher education policy, is the purpose of the policy. The purpose was to create the “people’s colleges,” to provide a liberal and practical education focused on, but not limited to “agriculture and the mechanic arts” (Richter 1962, 234). The Land-Grant Act changed the traditional European principle of education for the aristocracy, to education for the sons of farmers and industrial workers. The Land-Grant Act incorporated the notion of equality of opportunity in education.

Women were attending universities by 1865 well before they were granted the right to vote in 1919 (Klose and Lader 1994, 153). Even though the historical time frame of women attending college is similar to that of men, there are distinct differences. Women mainly attended two-year teacher training colleges, whereas men were attending four-year universities. Further, women’s college rates increased at a slower pace than men’s, creating a significant college gender gap. For males born in the mid-1920s, college graduation rates were more than double that of women of the same age. Although men’s graduation rates decreased during times of war, such as the World Wars and Korea, women’s graduation rates did not increase fast enough and the GI Bill as veterans returned maintained the gender gap. It was not until the cohort of women born in the 1960s that women’s college rates began to quickly increase. By 1980, women became the majority of college students and those graduating (Goldin and Katz 2008, 251).

After the Civil War, the rights of African Americans needed to be defined and more specifically, what kind and what level of education were up for debate. Two Black leaders emerged with distinct ideas on African American education. Booker T. Washington (1856-1915), a former slave, educated at the Hampton Institute and later

president of the Tuskegee Institute argued for agricultural and industrial/vocational education for Blacks (Dunn 1993, 26-27). Washington stressed that the goal of this type of education was economic self-sufficiency for Blacks so that as a race they may attain civil and political rights equivalent to Whites. His educational philosophy attempted to make African Americans more marketable in a segregated labor market (Dunn 1993, 27). Washington ultimately believed that an industrial education was what society would allow for Blacks and by working hard within the rules of society Blacks would be better off. In turn, he found great support by White philanthropists and politicians in both the North and South. Washington gained great popularity and soon efforts were made to limit African American education to vocational, industrial and agricultural training and service (Dunn 1993, 27).

Washington's philosophy was criticized as reinforcing Blacks as second class citizens. Black intellectuals, particularly W.E.B. DuBois attacked Washington's views, suggesting a more revolutionary opposition to oppression. DuBois believed that Blacks should develop their own culture in society and should at the same time fight for equal social, economic, political and legal rights as Whites. DuBois promoted a liberal arts education suggesting that a percentage of the Black population should receive a higher education and should then return to the Black communities and educate the masses (Dunn 1993, 28). By achieving intellectual competence, DuBois argued, one could never again be enslaved. The debate between Washington and DuBois had consequences on the development of Black schools. Washington, backed by the National Education Board and further financially supported by White industrialists, was in a position to develop and maintain industrial or vocational educational institutions for Blacks (Childs 1981, 30).

Furthermore, as the National Education Board feared Black radicalism and the philosophies put forth by DuBois at Black universities, there was a proactive attempt to subdue or limit Black schools. As Black educational institutions lacked financial resources, the Booker T. Washington model was financed by White industrialists (Childs 1981, 30).

Court Decisions

The legal process to gain educational rights for African Americans was extensive. The Supreme Court interpreted the Fourteenth Amendment as permitting separate but equal schools for African Americans in the 1896 *Plessy v. Ferguson* case (Klose and Lader 1994, 113). It was not until 1954 that the Supreme Court decided that “separate educational facilities are inherently unequal” in the case of *Brown v. Board of Education of Topeka* (Klose and Lader 1994, 261). The Supreme Court later pushed for educational institutions to correct the differential treatment of blacks and whites. Affirmative action was born out of these circumstances and gained momentum in university admissions with the passage of the Civil Rights Act of 1964. Higher education just as any other institution evolves within a society that defines its existence. As the United States matured, racism and segregation left a mark on our society and its institutions.

Affirmative Action in University Admissions

In the 1970’s the Supreme Court sent a mixed message as to whether affirmative action was appropriate in college admissions. In 1977, the case of the *Regents of the University of California v. Bakke* was brought before the Supreme Court. The Medical School of the University of California at Davis (hereinafter UC Davis) was sued for

having two admissions programs for the entering class of 100 students; a regular admissions program and a special admissions program. Under the regular admissions program, candidates whose undergraduate grade point averages fell below 2.5 on a 4.0 scale were rejected. Of those candidates that had a 2.5 or above grade point average, one out of six were given interviews. Each candidate was then rated on a scale from one to 100 by each committee member (five in 1973 and six in 1974), based on interview, grade point average, science course grade point average, Medical College Admissions Test score, letters of recommendation, extracurricular activities and other biographical data (Legal Information Institute, 438 U.S. 265 (1978), Syllabus). The special admissions program was for applicants who on their application wished to be considered as “economically and/or educationally disadvantaged” and members of a “minority group” (blacks, Chicanos, Asians, American Indians). The applicants that were found to be “disadvantaged” were then rated similarly to those under the regular admissions program, although the applicants did not have to attain a 2.5 grade point average and were rated relative to other applicants within the special admissions program. Sixteen slots out of 100 were held for “disadvantaged” students. No “disadvantaged” white applicants were admitted through the special admissions program, although many applied (Legal Information Institute, 438 U.S. 265 (1978), Syllabus).

The respondent, a white male, was rejected from the regular admission program two years in a row. For both years the respondent did not have a high enough rating relative to others in the regular admissions program, but did surpass the score of many of the students admitted under the special program. Further, the first time he was rejected there were still open slots for the special program. After the second rejection, the

respondent sued UC Davis in state court alleging the special admissions program excluded him on the basis of his race which violated the Equal Protection Clause of the Fourteenth Amendment (Legal Information Institute, 438 U.S. 265 (1978), Syllabus). That clause guarantees that no person shall be excluded from participating in any program receiving federal financial assistance on the grounds of race or color.

At the state level, the special admissions program was found unconstitutional as it served as a racial quota and ruled that race not be taken into account in admissions decisions. The respondent was ordered to be admitted to UC Davis. The Supreme Court in 1978 ruled that the respondent be granted admission, but reversed the prevention of taking race into account in future admissions decisions (Legal Information Institute, 438 U.S. 265 (1978), Syllabus). More specifically, the Supreme Court Justices agreed that the special admissions program was unlawful and hence the respondent should be admitted to UC Davis. They further concluded that the portion of the California Supreme Court's ruling that race no longer be considered in the admissions decisions be reversed. The Court found UC Davis' two separate admissions programs as unconstitutional, but did recognize the need or right of the University to create a diverse student body for purposes of their educational mission. Stated by the Court:

In enjoining petitioner from ever considering the race of any applicant, however, the courts below failed to recognize that the State has a substantial interest that legitimately may be served by a properly devised admissions program involving the competitive consideration of race and ethnic origin. For this reason, so much of the California court's judgment as enjoins petitioner from any consideration of the race of any applicant must be reversed (Legal Information Institute, 438 U.S. 265 (1978), Opinion Powell, Section VC).

Since the *Regents of the University of California v. Bakke* ruling, affirmative action programs at universities have been based on diversity. In recent years the

diversity rationale for affirmative action has been challenged. It is this debate and various court rulings that led to race neutral percent policies in Texas, California, Florida and Washington.

The Recent Legal Debate

The diversity rationale for affirmative action in university admissions as stated by the Supreme Court in the *Bakke* verdict was challenged, debated and eventually reaffirmed by the Supreme Court twenty-five years after *Bakke*. The first of the recent reverse discrimination cases was *Hopwood v. University of Texas*. The suit was brought to the federal district court in 1992 by four white applicants to the University of Texas Law School. The applicants alleged that the Law School's admissions policies were unconstitutional. The applicants or Plaintiffs claimed that the Law School put black and Mexican-American applicants in a separate applicant pool and further accepted minority applicants over comparable non-minority applicants with similar qualifications thus violating the equal protection clause under the Fourteenth Amendment. The federal district court ruled that separate evaluations for minority and non-minority applicants were unconstitutional, although the court held that giving minority applicants a "plus" was lawful (Springer 2005, 4). The case was then appealed to the Fifth Circuit in 1996, which reversed and remanded the district court ruling, stating that consideration of race or ethnicity for purposes of attaining diversity was not of compelling interest under the Fourteenth Amendment. The circuit court's ruling further brought into question the *Bakke* precedent and the diversity rationale for affirmative action. The court required the Law School to demonstrate that the plaintiffs would not have been admitted under a

constitutional admissions policy. The Law School proved that plaintiffs would not have been admitted to the Law School under a race neutral policy, resulting in minimal damages on the remand verdict. The Supreme Court denied *writ of certiorari*, a judicial review of the lower court's ruling, as the admissions program at the Law School was no longer in effect (Springer 2005, 5). The Hopwood decision re-opened the debate of affirmative action in admissions and financial aid policies. The ramifications of Hopwood would be seen as new suits were brought across the United States, and more specifically in Texas, where race and ethnic consideration in both university admissions and financial aid would be entirely banned.

The first application of the Hopwood decision took place in 1998 with the case of *LeSage v. University of Texas*. The case was originally brought in 1997 to a federal district court, where the plaintiff, Francois LeSage, accused the University of Texas at Austin with discrimination against white applicants to a doctoral program in counseling psychology. The federal district court dismissed the case, ruling that the plaintiff's denial of admission had nothing to do with the affirmative action admissions policy. On appeal, the Fifth Circuit court ruled that LeSage's application may have been affected by racial preferences and sent the case back to the district court for reconsideration. The circuit court's ruling was appealed to the Supreme Court which concluded that LeSage would have been denied admission even under a race neutral admissions policy. Further, as the challenged affirmative action policy was no longer in place, the plaintiff had no injury (Springer 2005, 6).

In 1997, the University of Michigan had two lawsuits brought against them for their affirmative action admissions policy, one at the undergraduate level (*Gratz v.*

Bollinger, et al) and one at the graduate level (*Grutter v. Bollinger, et al*). The lawsuits were filed by the Center for Individual Rights on behalf of the white students denied admission to University of Michigan. The Plaintiffs alleged that different standards for grade-point average and standardized tests were used for minority students and white students. The University of Michigan argued that race was only one of many factors considered for admission. In 1998, the University of Michigan changed their admissions policy to a point system, granting points for academic and non-academic factors. The lawsuits held the administrators who were involved in the admissions decisions personally liable for violating the plaintiffs' civil rights "under color of law" (Springer 2005, 6). This case was of specific importance because as the University of Michigan, a selective public university, did not have a history of segregation, so the school had to rely on the diversity rationale for their affirmative action policy, rather than a resolving discrimination defense (Springer 2005, 6). The cases moved from the district court to the circuit court, and before the circuit court issued a decision, the plaintiffs applied to the Supreme Court for a Rule 11 Writ of Certiorari, or judicial review considering the *Gratz* and *Grutter* cases together. The Supreme Court granted certiorari for both cases on December 2, 2002 (Springer 2005, 7). Twenty-five years after *Bakke* the Supreme Court would again face the question of constitutionality of affirmative action in higher education.

On June 23, 2003 the United States Supreme Court issued its decision on the *Gratz* and *Grutter* cases. In a five to four decision, written by Justice Sandra Day O'Connor, the Supreme Court stated that in the *Grutter* case the University's admissions policy was constitutional. Further, they endorsed Justice Powell's opinion in the *Regents*

of the *University of California v. Bakke*, that the diversity rationale for affirmative action is of compelling interest to the state, hence upholding the law school admissions program. Justice O'Connor specifically points to the fact that the admissions program did not have a quota or reserved number of slots for minorities, but rather considered race and ethnicity as a plus on an individual level. The Supreme Court also recognized that as universities encourage a respectful exchange of freedom of speech and thought, educators ultimately need to determine how to create such an environment (Springer 2005, 9).

The *Gratz* six to three decision, on the other hand, found the University of Michigan's undergraduate admissions program as unconstitutional. The Supreme Court did state that affirmative action with the goal of creating diversity in higher education is of compelling interest to the state. The undergraduate admissions program granted minorities twenty points, which was one-fifth of the points needed to guarantee admission. The Court found that such a program was not narrowly tailored to achieve diversity. Again, referencing Justice Powell's opinion in the *Regents of the University of California v. Bakke*, the Supreme Court Justices reiterated the importance of reviewing an applicant individually to evaluate their potential contribution to creating a diverse student body (Legal Information Institute, 539 U.S. 244 (2003), Syllabus).

Before the 2003 Supreme Court ruling on the Michigan cases, various other challenges to affirmative action in university admissions were brought to the court. A white female sued the University of Washington in 1997, accusing the university's law school of not admitting her because of preferential treatment of minorities. In 1998, a state initiative to ban race-conscious affirmative action in the public sector was voted into law and remains the law. Hence, the courts thought much of the *Smith v. University of*

Washington case moot. The plaintiff appealed and as the case moved from the district to the circuit court, the circuit court eventually chose to wait with their verdict until the Supreme Court made their ruling on the same topic. Following the 2003 Supreme Court verdict, the circuit court ruled that the law school's admission policy was indeed constitutional. Further, the plaintiff was denied claimed damages as the admissions program was viewed as sufficiently narrowly tailored to meet the interest of educational diversity (Springer 2005, 10-11).

The University of Georgia had numerous discrimination lawsuits. *Wooden, Tracy, Bratcher, Harris, Jarvis, Davis and Green v. University of Georgia* in 1999 was the first of such cases. The suit had two dimensions. First, plaintiffs accused the University of Georgia of having different admissions criteria for black and white applicants. Second, the plaintiffs argued that policies at the state's three historically black public universities prevented desegregation of the state's university system. The plaintiffs' goal was to eliminate the consideration of race not only in admissions, but in hiring, financial aid and other decisions. While the plaintiff Green's case was dismissed for not proving he would have been admitted under a race neutral policy, University of Georgia's admission program was ruled unconstitutional by the district court. The portion of the lawsuit against the three historically black public universities was dismissed as the court ruled the plaintiffs had suffered no injury, and so the plaintiff's appealed the district court ruling (Springer 2005, 11-12). These cases were passed back and forth between the district and circuit courts ultimately upholding the district court's decision. In the mean time, another suit by a white female (*Johnson*) was brought against the University of Georgia. In 2000, the district court ruled in the *Johnson* case that the University of Georgia's admission

policy was in fact unconstitutional and that affirmative action for the sake of a diverse student body was not of compelling interest to the state. Although this case was also appealed, the district court's ruling was upheld. Two other cases, *Noble v. Board of Regents of the University of Georgia* and *Welsh v. Board of Regents of the University of Georgia* were brought in 2000. In both cases a settlement was reached (Springer 2005, 13-14).

In California, Proposition 209 was voted into law in 1996. The law forbids the use of race as a factor in college admissions. In 1999, the American Civil Liberties Union (ACLU) filed two cases on behalf of minority students. The first case, *Castaneda v. the Regents of the University of California* alleged that the admissions process at the University of California at Berkley gave minorities a disadvantage because they did not take into account a full range of "merits." More specifically, the university gave special consideration to advance placement courses, which are not available at many minority high schools. The case was settled in 2003, as the University of California at Berkley agreed to have a more comprehensive individual applicant review (Springer 2005, 14). The other case filed by the ACLU, *Daniels v. State of California*, alleged that the lack of advanced placement courses at minority high schools harmed the students' secondary education and limited student access to higher education. The case was stayed while educational experts discussed a resolution (Springer 2005, 14).

The University of Maryland, Oklahoma State Regents and the Commonwealth of Virginia Public Universities, among others, all faced similar suits challenging affirmative action in higher education policy. The 2003 Supreme Court decision in the Michigan cases was of critical importance amidst all these affirmative action cases. The Supreme

Court upholding the 1978 *Bakke* verdict, has brought some resolution to a highly debated issue. Yet as many states implemented race neutral policies and as institutions will figure out how to apply the Supreme Court's decision, the debate will likely continue. For the time being, the Supreme Court's ruling provides greater access to higher education for disadvantaged minority students.

Actions by State Legislatures

Various states banned the use of affirmative action. Proposition 209 in California was voted into law in 1996 and prohibited public institutions from considering sex, race or ethnicity. H.B. 588 in Texas was passed in response to the legal banning of affirmative action in higher education. After the *Hopwood v. the University of Texas* verdict, H.B. 588 was voted into law in 1997. In 1998, Initiative 200 in the state of Washington banned affirmative action in the public sector. In Michigan (2006), Nebraska (2008) and Colorado (2008) initiatives to ban affirmative action were voted on by the citizens of the states. Only in Colorado was it defeated. For a summary of the legal history of education and changes to federal education policies, refer to the Appendix.

Federal Policies to Increase Access to Higher Education

Some education policies have tried to level the playing field by increasing access to higher education by decreasing costs. There is an effort to not only bring minorities into colleges but also students from a low socioeconomic status. Often times these are one in the same. Both federal and state governments have policies in place to promote higher education.

Actions by Congress

The Higher Education Act of 1965 and It's Changes over Time

The Higher Education Act of 1965 was signed into law by President Lyndon Johnson. This legislation is the basis of current law regarding federal student aid programs. The student aid programs are contained in Title IV of the Higher Education Act and are administered by the U.S. Department of Education. Further, the Higher Education Act established federal scholarships for the needy, the Educational Opportunity Grant Program and the Guaranteed Student Loan Program¹. In 1972, the reauthorization of the Higher Education Act was amended to include the Pell Grant Program, which was originally called the Basic Opportunity Education Grant Program. The purpose of the Pell Grant was to provide a basis for the student's financial aid package. It not only served to increase access to higher education, but provided choice in what institution to attend. Other amendments of the reauthorization were renaming the National Defense Student Loan Program to the National Direct Student Loan Program, renaming the Economic Opportunity Grant Program to the Supplemental Educational Opportunity Grant Program further attaching the program to the Pell Grant Program, and allowing profit-making higher education institutions eligibility to use Title IV funds. Again in 1976, the Higher Education Act was amended. Amendments included in the reauthorization were requiring students to demonstrate academic progress to receive Title IV funds and requiring institutions to provide information to students on academic progress, job placement after graduation and financial aid policies. The Higher Education

¹ All information found on the history of federal programs from 1958 to 1999 was found at <http://www.chessconsulting.org/financialaid/history.htm>.

Act was again amended in 1980, officially changing the name of the Basic Education Opportunity Grant Program to the Pell Grant Program. Further, the Parent Loan for Undergraduate Students Program was established, allowing middle-income families to borrow \$3,000 a year for each dependent child in school regardless of income. The reauthorization of the Higher Education Act in 1986 restricted eligibility for both the Guaranteed Student Loans and the Parent Loan for Undergraduate Students, requiring demonstration of financial need. The Supplemental Loan to Students was established offering graduate and professional students and independent undergraduate students' loan opportunities. The Pell Grant was restricted to eligibility for a specified number of years of full-time enrollment. The National Direct Student Loan Program name was officially changed to the Perkins Loan Program. In 1992, the Higher Education Act was amended by adding in the Free Application for Federal Student Aid (FAFSA), putting into use a single need analysis methodology, changing the name of the Part B programs, of which the Guaranteed Student Loan Program is a part of, to the Federal Family Education Loan (FFEL) Program and standardizing the procedures for the FFEL program. Further, the specific Guaranteed Student Loan was renamed the Federal Stafford loan Program. The limits on the majority of the loans were increased and the Federal Work-Study Program was enhanced by adding a community service requirement. In 1998 there were further amendments to the Higher Education Act. The amendments included raising the maximum funding levels for the Federal Pell Grant, expanding eligibility to programs, extending Pell Grants to post-baccalaureate students preparing to teach and restricted eligibility of the Pell Grant for students who default on Federal loans. In 2003, the Higher Education Act was renewed making various changes. The main change in 2003 was

increased funding to institutions and while there was a request to increase the amount offered in Pell Grants, it was not approved by Senate. In August of 2008, the Higher Education Opportunity Act² was enacted which reauthorized the amended version of the Higher Education Act. Of greatest interest are the changes to the federal financial aid programs which increased the maximum Pell Grant award and reduced interest rates on subsidized student loans. The law further capped loan repayment to 15 percent of an individual's discretionary income and enacted loan forgiveness to those who chose public service. The Higher Education Opportunity Act authorized numerous new programs such as promoting post-baccalaureate opportunities for Hispanic-Americans, promoting Master's programs at historically Black institutions and predominantly Black institutions, among other initiatives.

Although the Higher Education Act and the amendments to it were the main policy changes in higher education at the federal level, various other legislative items impacted higher education during the same time. In 1978, the Middle Income Student Assistance Act extended eligibility of the Guaranteed Student Loan Program and the Pell Grant to middle and upper-middle income students. In 1981 under the Omnibus Reconciliation Act, Congress reversed the expansion of loan eligibility and limited loan interest subsidies to applicants whose family income was below \$30,000. Between 1981 and 1992, the Congress made various one-year cost reductions to the Pell Grant Program in order to cut costs. In 1993, the Student Loan Reform Act made adjustments to the Federal Family Education Loan Program to comply with the Direct Loan Program.

² Information regarding the Higher Education Opportunity Act was found at: <http://www2.ed.gov/policy/highered/leg/hea08/index.html>.

Congress further increased limits on unsubsidized loans. In the following section I review the current programs offered to students to increase access to higher education institutions.

Current Status of Federal Programs

Today, the main federal policies on higher education stem from the significant history of the Higher Education Act. For a summary of current federal programs available and their specific criteria, refer to the Appendix. The Federal government provides reduced cost loans to either the parent or guardian or directly to the student. The Department of Education offers three types of loans as part of the Federal Family Education Loan Program. The Plus Parent Loan is taken out by the parent or guardian of a dependent postsecondary student who is working toward a postsecondary degree. The parent or guardian must not have an adverse credit history. The maximum amount of the loan is the cost of attendance minus any other financial aid. The maximum length of the loan is 30 years and the interest rate on the loan is variable.³ Unlike loans taken out by the student the Plus Parent Loan is paid while the student is in school.

The Perkins Loan is taken out by the student pursuing a postsecondary degree. The loan is offered to the student based on financial need after accounting for other available financial aid. The amount of the loan is \$5,500 per year for undergraduates with

³ All information on the Federal policies discussed were found through the Federal Family Education Loan (FFEL) Program, The U.S. Department of Education, http://studentaid.ed.gov/students/publications/student_guide/index.html and http://www.govloans.gov/govloans_en.portal?_nfpb=true&_pageLabel=gbcc_page_locateEducation&action=locateLoans¤tSubType=5&_nfls=false.

a maximum amount of \$27,500 for all undergraduate years of education. The Perkins Loan amount for graduate study is \$8,000 per year with a maximum of \$60,000 which includes any Perkins undergraduate loans. The Perkins Loan has a length of 10 years, begins payments after the student is no longer enrolled and has a fixed interest rate that is currently at five percent.

Another available federal loan is the Stafford Loan. The Stafford Loan can be either subsidized or unsubsidized. The amount of the subsidized loan is based on financial need and the interest accrued on the loan during the student's enrollment in school is paid by the government. The unsubsidized loan amount is based on grade level, status of the student as a dependent/independent and undergraduate/graduate and the total cost of attendance. The loan amount varies from \$5,500 to \$12,500 annually, has a length of 10 to 25 years and has a variable interest rate.

The Pell Grant and Federal Work Study Program are two other forms of financial aid that do not need to be repaid. The current maximum Pell Grant amount is \$5,500 a year. The Federal Work Study Program provides an on- or off- campus job for the student. The amount the student receives is based on financial need. As these are subsidies rather than loans, they specifically target the lowest income students.

Although one could go to the Department of Education website to calculate the award amount, most students must apply for the Free Application for Federal Student Aid (FAFSA) as part of their college application. In essence, the students applying to and receiving this aid are students that intend on going to college and more than likely go to college. The FAFSA must be filled out in order to determine eligibility for federal financial aid. Part of the FAFSA asks what schools the student intends on applying to and

the student's federal award is then sent to each institution where he/she is applying. Those institutions then send the student (after he/she has been accepted for admission) their financial award package which includes federal, state and merit aid that the student may have been eligible to receive. Students are hence informed of their true cost of higher education after they have applied and been accepted to a higher education institution. These Federal programs ultimately may serve the purpose of allowing students a greater choice of where they go to college, not the incentive or ability to go to college.

Evaluation of Federal Programs

Most of the federal programs attempt to increase access by decreasing the cost of attendance or providing lower cost loans to individuals. Over the years many studies have attempted to estimate the impact of the price of higher education on student enrollment decisions. By understanding how price influences different groups college going behavior one can better evaluate whether federal programs do in fact increase access to education. The majority of these studies coincide on two points. First, a decrease in the cost of higher education or an increase in financial aid positively impacts a student's enrollment decision. Second, the decision of where to enroll in college responds to changes in the relative price of alternative schools (McPherson and Schapiro 1991, 310).

Leslie and Brinkman (1987) evaluate 25 student demand studies. Such studies investigate the economic factors that influence student enrollment. The purpose of their literature synthesis is to find meaningful consistencies in the estimates of the various studies. The results of all the studies show there is an inverse relationship between

enrollment and price (Leslie and Brinkman 1987, 188). Leslie and Brinkman offer as a best estimate, that a \$100 (in 1982-3 dollars) increase in tuition is associated with a decline in enrollment (for 18 to 24 year olds) of 1.8 percent (189). Some of the studies demonstrate that students respond to changes in price of tuition more than they do to changes in room and board costs and financial aid. The results are compared to one of the more influential studies of that time by Manski and Wise (1983). Manski and Wise found equal student sensitivity to changes in tuition, financial aid, room and board and foregone earnings. There are differing explanations as to why a tuition change would have a greater impact on student enrollment decisions. One explanation is that tuition is the most visible college price and it is inescapable. Further, although it would appear that financial aid is a reduction in tuition, often the enrollment decision is already made before the student is aware of what the lower tuition is because of the financial aid (Leslie and Brinkman 1987, 196). The authors suggest that this discrepancy may simply be a function of time. As financial aid has increased over time and more information is disseminated about need based aid, students have become more responsive to aid (Leslie and Brinkman 1987, 197). Another consistency found in the studies was that low-income students are the most sensitive to price changes, followed by middle-income. The Manski and Wise study further confirmed that result.

A later study by Donald E. Heller (1997) adds a more recent update to Leslie and Brinkman's work. As there were increases in real tuition prices in the 1980s and 1990s, it is important to capture this effect. Heller reviews twenty quantitative student demand studies and compares those results to that of Leslie and Brinkman's (1987) study. His literature synthesis includes studies by Kane (1991, 1994, 1995), Rouse (1994), among

others. Heller, like Leslie and Brinkman, found that all studies found the inverse relationship between enrollment and tuition. Evidence from the studies indicate that an increase in tuition of \$100 is consistent with a decline in enrollment in the range of 0.5 to 1.0 percentage points, which is consistent with Leslie and Brinkman's (1987) estimates (Heller 1997, 631). Heller then reviews studies that examine the relationship between college enrollment and financial aid. In general, researchers who performed cross-sectional analyses (Jackson 1988) using major longitudinal data sets found students were sensitive to financial aid in making college enrollment decisions. Some of the studies found that students responded similarly to financial aid as they would to a change in tuition, whereas others found students to be less sensitive to aid than changes in tuition (Heller 1997, 637). Evidence from time-series studies is mixed. Particularly, an article by Hansen (1983) was quite controversial as he found that the Basic Education Opportunity Grants (later known as the Pell Grant) which was presumed would increase access to education for low-income students, had little if any effect on access to higher education (Heller 1997, 633). Kane (1994) also analyzed the impact of the Basic Education Opportunity Grants, looking at slightly different dates. Both authors used data from the Current Population Surveys with dates before and after the implementation of the Basic Education Opportunity Grants program. Kane also found that enrollment rates for low-income students relative to high-income students did not increase after the implementation of the program (Heller 1997, 634). Other studies, such as the McPherson and Shapiro (1991) study described in greater detail below, found that financial aid and more specifically the Basic Education Opportunity Grants program increased enrollment (Heller 1997, 637). Evidence from the studies suggests that lower-income students are

more sensitive to changes in tuition and financial aid. Hence, if tuition increases are not offset by increases in financial aid, the result is a reduction in access to higher education for the poorest (Heller 1997, 642). Heller also reviews various studies on the effect of tuition and financial aid changes on students by race. The studies consistently found that black students are more sensitive to college costs than white students, even when controlling for income, socioeconomic status and ability. The effect for Hispanics was mixed (Heller 1997, 648). Finally, students in community colleges (two-year institutions) were found to be more sensitive to tuition and financial aid changes than students attending four-year educational institutions (Heller 1997, 650). For greater detail of the various studies, Heller (1997) offers a rich review of studies prior to 1997.

McPherson and Schapiro (1991) estimate the effect of financial aid on college enrollment using enrollment, tuition, and financial aid data for population subgroups over the years 1974 through 1984. The estimates include all forms of financial aid, although the years of data were chosen specifically to account for the Pell Grant program (McPherson and Schapiro 1991, 311). Prior to the introduction of the Basic Educational Opportunity Grant Program (later renamed the Pell Grant), federal spending on need-based grants to undergraduate students accounted for less than three percent of tuition revenue in U.S. colleges and universities, compared to 29 percent of tuition revenue in 1980. Although there was this increase in federal spending for higher education, enrollment rates in 1980 were slightly below that of the previous decade (McPherson and Schapiro 1991, 309). It is this empirical puzzle that McPherson and Schapiro attempt to decipher. They use data from the Current Population Survey and the American Freshman Survey. Due to sample size limitations in the time-series data, the analysis is only of

whites. The sample is analyzed by three income groups (low-income: income less than \$10,000, medium-income: income between \$10,000 and \$30,000 and high-income: income higher than \$30,000 in 1978 dollars) and two gender groups (McPherson and Schapiro 1991, 312). Their main finding is that increases in the net cost of college attendance have a statistically significant negative effect on enrollment rates for white low-income students. Specifically, a \$100 net cost increase results in a 2.2 percent decline in enrollment. McPherson and Schapiro convert their estimates in 1978 dollars to 1982-3 dollars for comparison purposes, finding their estimate to be 1.6 percent decline which is comparable to Leslie and Brinkman's (1987) estimate that a \$100 increase in net costs reduces enrollment by 1.8 percent for low-income students. Their result is also consistent with Manski and Wise's (1983) result of a 4.9 percent decline in enrollment for low-income students when there is a net cost increase of \$100 (McPherson and Schapiro 1991, 314). Increases in net cost do not inhibit enrollment of the middle- or upper- income groups in the McPherson and Schapiro study. The gender coefficient showed that the enrollment rate for women was about five percentage points higher than for men during the 1974 to 1984 time period. Although the time trend variable suggested a tendency for low-income women's enrollment to fall over time, the coefficient was negligible. The final analysis separates out public versus private institutions. For private enrollment, McPherson and Schapiro found that a \$100 increase in net costs decreases enrollment by six percent for low-income students and also negatively impacts the enrollment rates for middle-income students. The result for public institutions also demonstrates a negative impact for low-income students, but is not statistically

significant. Hence, financial aid in so far as it decreases the net cost of attendance can impact low-income students.

Kitmitto (2004) uses the Survey of Income and Program Participation to estimate the effects of Pell Grants. The 1992 Higher Education Act changed the eligibility requirements of the Pell Grant and hence serves as an exogenous variation in the policy. Kitmitto finds that Pell Grants do not increase enrollment rates (25). Ultimately, the Pell Grant does not create an incentive for individuals to go to college even though it decreases the cost. Kitmitto suggests that this may be because individuals lack the information necessary to apply for the Pell Grant (2004, 26). The idea is that those awarded the Pell Grant intended on going to college regardless of the reception of aid.

Susan Dynarski (2003) uses a difference-in-differences approach in analyzing the effect of the Social Security Student Benefit Program that was in place from 1965 to 1982. The program ultimately allowed for single, full-time students to remain dependents of the disabled, retired or deceased Medicare/Medicaid beneficiary until the age of 22, providing a generous subsidy to those in college (Dynarski 2003, 279). Dynarski finds that financial aid eligibility has a positive effect on college enrollment. More specifically, she finds that a \$1,000.00 increase in grant aid increases overall educational attainment by approximately 0.16 years and increases the probability of attending college by about four percentage points (Dynarski 2003, 285). Furthermore, she finds that students with initial financial assistance upon entering college are more likely to continue education even after the subsidy stops. Dynarski suggests that the incentive structure of Federal programs is inefficient. For instance, programs like the Pell Grant that give a fixed amount each year or the Stafford Loan that allows the student to borrow more the longer

one is in school could be more effective if the government would give higher subsidies in the initial year of postsecondary education (Dynarski 2003, 286).

Overall, federal policies that decrease the cost of higher education do in fact have the intended impact of increasing access to higher education. Moreover, lower-income students, the intended targets of the federal programs, are more sensitive to increases in financial aid. Yet different aid, whether access to loans, grants or work study have different impacts. As the evidence further suggests that students may respond more to tuition decreases than financial aid, the question remains whether subsidizing higher education should go to students or directly to colleges and universities to lower the “sticker price” of tuition.

State Policies

State support for education and higher education in particular was of great importance in creating access to education. Prior to the Morrill Act of 1862, two-thirds of the existing 33 states had at least one state higher education institution (Goldin and Katz 2008, 267). In states that specialized in an economic activity, the public sector heavily invested in training and research of that industry at the university level. State expenditures on higher education increased from 5.1 percent in 1902 to 11 percent in 1940. Public funding for higher education varied from state to state with more support in the Pacific, Mountain and West North Central states and less support in the New England and Middle Atlantic states (Goldin and Katz 2008, 269). Further, college tuition, especially at public institutions, was affordable. College costs relative to family income decreased in the 1940s and 1950s as incomes quickly rose and tuition rates rose slowly.

From 1950 to 1980 tuition and family incomes increased at approximately the same rate. After 1980, tuition rates consistently increased to more than 10 percent of median family income by 2005 (Goldin and Katz 2008, 278). Historically, states maintained relatively low tuition rates. In recent decades, states have moved from keeping tuition rates low to offering merit aid programs.

Since the early 1990s, over a dozen states have established merit based aid programs⁴. Academic requirements to receive merit aid differ from state to state. Many of the programs, such as Georgia's, require a 3.0 high school grade-point average or above, while others such as Arkansas require only a 2.5 high school grade-point average to receive aid upon entering college (Dynarski 2002, 3). The programs typically award tuition and fees to a state college or university for residents that maintain the required grade-point average in college. As the state merit aid programs are broader and able to reach more students there has been much interest as to whether these programs have had a positive impact on students' decision to attend college. Further, as suggested by the evaluation of the federal programs, lower tuition rates may have a greater impact on access to higher education than does increasing aid. As merit aid is distinct from the federal policies, there are several studies that examine the effect of such policies on college enrollment.

Kane (1995) investigated how well public subsidies promote access to higher education. Kane used the National Longitudinal Survey of Youth, High School and Beyond and the October Current Population Survey data sets. Kane evaluated the traditional program of maintaining low tuition rates and found that states with high public

⁴ Refer to the Appendix for a list of programs by state.

tuitions levels have lower college entry rates and the enrollment gap between high- and low- income youth is wider. Furthermore, he found that within-state tuition increases lead to lower enrollment rates and a widening of the enrollment gap between high- and low-income youth (Kane 1995, 25). Kane also estimated the effect of the increase in the minimum wage in California in 1988 on enrollment rates as foregone earnings represent a large cost of college attendance. The results showed that an increase in the minimum wage had a negative impact on enrollment rates, especially at two-year colleges (Kane 1995, 21). Increasing college costs appear to be related to the growing gap in enrollment between low-income and high-income and minority and white students. Kane argues that with these rising costs, states cannot afford to subsidize three-quarters of the cost of attending public higher education institutions (Kane 1995, 29).

Dynarski (2002) examines merit aid programs and their effects on students in seven states. Only Southern merit states are investigated as the Southern non-merit states serve as a control group. Dynarski begins by investigating the Georgia HOPE Scholarship, as it was one of the initial programs. She finds that in Georgia, the HOPE Scholarship increased college attendance by 8.6 percentage points relative to other Southern non-merit states. Furthermore, she finds that HOPE increases the probability of attending a four-year public institution, slightly increases the probability of attending a four-year and two-year private institution and lowers the probability of attending a two-year public institution (Dynarski 2002, 16-19). Dynarski also finds that HOPE encourages in-state college attendance. An interesting finding in the Georgia data is that HOPE increases the racial and ethnic gaps in college attendance. That is, the HOPE Scholarship has a much greater positive effect on non-Hispanic whites, than it does on

blacks and Hispanics (Dynarski 2002, 22). Dynarski then estimates the effect of merit aid in Arkansas, Florida, Kentucky, Louisiana, Mississippi and South Carolina. She finds the overall effect (including Georgia) to be an increase in college attendance of 4.7 percentage points. The effect is greater for states that have lower performance standards, such as Arkansas and Kentucky. Moreover, merit aid has a strong effect on the choice of college, shifting students into four-year public colleges rather than two-year public colleges (Dynarski 2002, 25-26). Dynarski also estimates the distributional impact of merit aid. She estimates the effect in four states (Georgia, Florida, Arkansas and Mississippi) where the merit programs are four or more years old. As mentioned previously, Georgia's results were an increase in the racial and ethnic gap in college attendance, yet in the other three states the estimated effect on blacks and Hispanics is consistently more positive than the effect on non-Hispanic whites. The merit aid programs in Florida, Arkansas and Mississippi narrowed the racial gap in college attendance (Dynarski 2002, 26-27). Dynarski suggests that the Georgia result may be due to higher performance standards, lower scholarship renewal rates for blacks in Georgia and that lower income students that receive other financial aid (such as the Pell Grant) get less HOPE money. There is some evidence that merit aid induces students to take easier course loads or to drop classes in order to maintain the necessary grade-point average to retain the scholarship (Dynarski 2002, 29-30).

The District of Columbia Tuition Assistance Grant (D.C. TAG) was put into effect in the fall of 2000. The program pays the difference between in-state and out-of-state tuition at public institutions in other states with a maximum of \$10,000 for D.C. residents. Kane (1995) estimates the impact of the D.C. TAG on students' enrollment

decisions (2). Kane finds that the number of D.C. residents attending public institutions in Maryland and Virginia between 1998 and 2000 nearly doubled. Likewise the number of D.C. residents attending public institutions in other states increased, with the largest increases at non-selective four-year public institutions (Kane 2004, 31). Kane does point out that the reshuffling of D.C. students from private to public institutions (particularly non-selective schools) may potentially have a negative effect as quality of education may be lacking (2004, 32).

The Bright Futures Scholarship offers up to full tuition and fees to a public Florida institution or the equivalent dollar amount at a private institution based on grade-point average and ACT/SAT scores (Marin and Lee 2003, 13). Both California and Florida have percent plans in addition to the merit programs. Florida guarantees admission to a Florida institution if a student graduates in the top 20 percent of their public high school. Likewise, California guarantees admission to a state public institution to students that graduate in the top four percent of their public high school. The percent policies in these states as well as in Texas were devised to be a race neutral policy to be used in place of affirmative action in college admissions.

Affirmative Action versus Race Neutral Plans

Affirmative action in higher education is used to maintain diversity at colleges and universities. Legally, the university can consider race in admissions as long as minority applicants are not admitted as a quota system. Race neutral policies were born out of the legal debate over affirmative action in college admissions and financial aid

decisions. Race neutral policies have the same goal as affirmative action, that is, to increase access to higher education for minorities.

Evidence of the Impact of Affirmative Action

There is a relatively large and growing literature on the benefits of campus diversity that supports the use of affirmative action in university admissions. Bowen and Bok's (1998) book, The Shape of the River, focuses on the effect of affirmative action admissions policies in higher education. The study uses the College and Beyond database that consists of records for more than 80,000 undergraduate students who matriculated at twenty-eight academically selective colleges in the fall of 1951, 1976, and 1989 (Bowen and Bok 1998, xxviii). Bowen and Bok use multivariate regression analysis to investigate what affects student performance in college, receipt of advanced degrees and life outcomes (1998, xxxi). Chapter Eight of the book specifically focuses on the issue of diversity. According to the 1976 cohort, 74 percent of blacks and 42 percent of whites believed it was very important to be able to work effectively and get along across racial lines. The 1989 cohort had a smaller gap in the black and white response to the importance of working effectively and getting along across racial lines, with a percentage of 76 for blacks and 55 for whites (Bowen and Bok 1998, 223). Bowen and Bok's study added several empirically supported points to the debate over affirmative action. First, they found that blacks performed well at selective universities. Further, blacks represented in the College and Beyond data set were more than five times more likely to earn a professional degree relative to black college graduates nationwide. Black men who graduated from selective universities and colleges, twenty years later earned twice the

average earnings for all black men with bachelor's degrees (Bowen and Bok 1998, 256-7). Another point of contention in the affirmative action debate was whether race sensitive policies harmed the intended beneficiaries. The idea here was that if black students were admitted based on race, they may not be academically prepared to compete with others. Bowen and Bok found the opposite result. They found that the average black dropout rate for their data set was approximately 25 percent, in comparison to the average of 60 percent for the National Collegiate Athletic Association (NCAA) Division I colleges (many of which are not selective) (Bowen and Bok 1998, 259). Lastly, in terms of campus diversity, students were asked how well they know students of other races. Of the 1989 cohort, 56 percent of white graduates reported knowing at least two black students "very well" and 26 percent reported knowing at least two Hispanic students "very well." Black students were even more likely to know other races; 88 percent knew at least two white students "very well" and 54 percent knew at least two Hispanic students "very well." These percentages are significant considering these minorities made up less than 10 percent of the total undergraduate student body (Bowen and Bok 1998, 267).

Holzer and Neumark in a 2000 study ask whether affirmative action improves or impedes efficiency or performance. They find that blacks that are admitted to college have average lower grade-point averages and graduation rates. Interestingly, there is no race difference in graduation rates at selective universities (Holzer and Neumark 2000, 558-559). Research on medical education demonstrates that minority students perform less well in school, but at the same time are more likely to serve minority patients, providing a positive externality. There is some evidence that female faculty in

coeducational institutions serve as role models in encouraging women to study traditionally male fields (Holzer and Neumark 2000, 558-559). Also, they argue that a case can be made that diversity positively impacts interracial and intercultural relations. Holzer and Neumark believe that affirmative action, in how it has had a positive effect on diversity, contributes to overall better education (2000, 558-559).

Patricia Gurin was asked to provide expert testimony in the *Gratz and Grutter v. Bollinger, et al.* case. As part of her expert testimony, Gurin (1999) uses the Michigan Student Survey (MSS), the Cooperative Institutional Research Program (CIRP) national survey and the Intergroup Relations, Community, and Conflict (IGRCC) program to examine the impact of diversity on educational outcomes⁵. Gurin argued that a diverse university environment stimulates greater engagement in the learning process which results in developing more complex thinking, hence supporting affirmative action in college admissions. More specifically, Gurin focused on four categories of learning outcomes: 1. Growth in active thinking processes that reflect a more complex mode of thought, 2. Engagement and motivation, 3. Learning a broad range of intellectual and academic skills and 4. Value placed on skills in the post-college years. All three analyses demonstrated that interaction with peers of diverse backgrounds was positively associated to learning outcomes. Students who experienced the most diversity in the classroom (and informal interactions) showed the greatest engagement in active thinking processes, intellectual engagement and motivation and intellectual and academic skills.

⁵ Information from Gurin's expert testimony in the *Gratz and Grutter et al. v. Bollinger et al.* was taken from <http://www.umich.edu/~urel/admissions/legal/expert/gurintoc.html>.

There are other studies that examine the impact of diversity on educational outcomes (Chang (1999) and Terenzini et al. (2001)) with mixed results. Looking at the time frame of these studies, they correspond to the legal debate over the use of affirmative action in college admissions. The question debated legally was whether the diversity rationale was of compelling interest to continue the use of affirmative action. Hence, in the late 1990s and early 2000s, studies arose on both sides of the aisle with the legal outcome in support of affirmative action with the diversity rationale as its basis (the Supreme Court ruling in 2003 in the case of *Gratz and Grutter v. Bollinger, et al.*).

Evidence of the Impact of Race Neutral Policies

There are pros and cons that arise from changing from an affirmative action admission criteria to a race neutral admissions policy. Advocates of race neutral policies argue that they are good substitutes for affirmative action, while critics claim that they are ineffective and potentially promote segregation in high schools (Horn and Flores 2003, 7). In this section I review some of the studies that analyze the effect of race neutral policies on minorities, taking particular notice of whether such policies can be a viable alternative to affirmative action.

Thomas Kane (2000) examines the trade-offs that come with basing college admissions on class rank. He points out that there is a considerable overlap for white, non-Hispanic students who rank in the top 10 percent of their high school class and those who's SAT scores are in the top 10 percent. Approximately half of the white non-Hispanic students that rank in the top 10 percent of their class also rank in the top 10 percent of the national SAT distribution. The same does not hold for blacks and

Hispanics. Some 18 percent of blacks and Hispanics that rank in the top 10 percent of their high school class also rank in the top 10 percent of the national SAT distribution. Furthermore, 53 percent of minority youth that ranked in the top 10 percent of their high school class had SAT scores below the 70th percentile in the national SAT distribution (Kane 2000, 3). According to Kane, if a top 10 percent plan were used rather than the typical admissions criteria, then the new pool of admitted students would be minorities that have a high class rank and low test scores. Kane estimates whether class rank or SAT scores better determine college grade point average. He finds that the two admissions criteria serve as compliments in as far as SAT scores provide more information about one's likely college performance, the higher their class rank (Kane 2000, 12). Ultimately, the test score shows a person's performance where as class rank is associated to quality of high school. Kane particularly focuses on the effects of admissions based on class rank to selective four-year institutions. He reports that among white non-Hispanic youths attending selective four-year colleges, 56 percent were in the top 20 percent both in class rank and SAT scores versus only 28 percent of black and Hispanics. Yet of the blacks and Hispanics attending selective four-year institutions, only 9.9 percent were ranked in the top 10 percent of the class and had SAT scores below the 70th percentile (Kane 2000, 21-22). Kane demonstrates that students with a high class rank and low SAT score are still likely to go to college, just not necessarily to a selective institution (Kane 2000, 27).

Horn and Flores (2003) analyze the race neutral percent plans in Texas (H.B. 588), Florida (Talented 20) and California (Eligibility in a Local Context or ELC). Specifically they report on how the programs work and if they achieve the goal of a racially diverse student body. H.B. 588 was voted into law in 1997 and set made Texas

the first state to adopt a race neutral percent plan. In 2000, Florida adopted the Talented 20 program and California adopted ELC or what is better known as the “Four Percent Plan.” The three states have distinct criteria for their respective percent plans⁶. In Texas the top 10 percent of graduating students from both public and private high schools gain automatic admission to the Texas public school of choice. The only other criteria is that students must submit SAT or ACT scores and an application in the appropriate time period. Class rank is determined by the high school attended at the end of 11th grade, middle of 12th grade or at high school graduation (whichever is most recent for the application deadline) (Horn and Flores 2003, 23). California on the other hand grants admission to a University of California system campus (although not necessarily one of choice) for the top four percent of graduating students from public and private high schools accredited by the Western Association of Schools and Colleges in California. California requires further academic criteria such as completion of specified coursework by the end of junior year. Further qualified students must submit an application in the appropriate time frame and submit either the SAT or ACT and three SAT II tests. Class rank is determined by University of California administrators based on coursework completed in 10th and 11th grade. Students are then notified of their class rank at the beginning of their senior year (Horn and Flores 2003, 23). Florida grants admission to the top 20 percent of high school graduates from Florida public schools to a Florida higher education institution (but not necessarily one of choice). Like California, Florida requires students to complete specific college preparatory courses, requires submission of an

⁶ For further information on percent plans, refer to:
<http://www2.ed.gov/about/offices/list/ocr/edlite-raceneutralreport2.html#toc4p4p2>

application in the appropriate time frame and requires submission of either SAT or ACT scores. In Florida, each secondary school district determines how class rank is calculated (Horn and Flores 2003, 23). A study by Marin and Lee (2003) found that among the Florida students considered in the top 20 percent of their class in 2000 and 2001, the overwhelming majority could have gained admissions without the percent plan in place.

Horn and Flores make various conclusions from the data available. First, they found that percent plans have the smallest impact on the most selective universities. Only the Texas Top 10 Percent law provides automatic admission to selective institutions (Horn and Flores 2003, 58). Second, the percent plans by themselves do not appear to recover the diversity that existed during affirmative action. Rather, the percent plans when combined with further race-conscious outreach can have the intended impact (Horn and Flores 2003, 59). Lastly, the authors assess that the critics of affirmative action will likely next target the race-conscious outreach programs, making the percent plans a policy with the same potential political and legal complications as those of affirmative action (Horn and Flores 2003, 59).

The race neutral plans discussed ultimately are all very different. Horn and Flores (2003) point out that University of Texas (at Austin) is loosely comparable to the University of California school system and Florida's institutions are not really comparable to those in terms of academic ranking (11-13). The thresholds for academic performance seem to reflect these differences. According to Horn and Flores (2003) it is questionable whether the Texas Top 10 Percent law could maintain diversity levels of an affirmative action policy at higher institutions without outreach programs targeting minorities. The case of Texas is particularly interesting as it differs from the percent

plans in California and Florida by having less rigorous academic criteria and by granting admission to the college of choice. Those two specific points in the law stood out to me as potentially having a more profound effect on the perceived choice set of minority students.

A more recent study by Card and Krueger (2005) examines how the elimination of affirmative action in California and Texas has affected the application behavior of highly qualified minorities. Card and Krueger are specifically interested in whether the change in affirmative action policy would negatively impact minority application rates to selective universities by either decreasing the probability of admission or decreasing the utility of attending. Assuming minority students value a large minority presence on campus, the elimination of affirmative action may lower the utility of attending a selective university (Card and Krueger 2005, 424). Using data from the College Board's Test Takers Data Base, Card and Krueger are able to include all SAT takers in California and Texas in the 1994 through 2001 admission cohorts (Card and Krueger 2005, 424). Card and Krueger offer three main conclusions from their analysis. First, they find no distinct trend in the number of applications sent by minorities relative to non-minorities after the policy change. Second, they found no statistically significant changes to quality of schools minorities applied to relative to non-minorities. More specifically, highly qualified minorities did not lower the quality of schools that they applied to. And lastly, their data demonstrate a slight shift of highly qualified minorities away from high-minority universities (Card and Krueger 2005, 432). Overall, Card and Krueger conclude that based on their data the elimination of affirmative action had basically no impact on the application behavior of highly qualified minorities in California and Texas.

The Demographic Challenge in Texas

In this section, I report the demographic challenges in Texas. I follow that by a discussion of the Texas Top 10 Percent law in the context of those demographic challenges and keeping in mind that the Texas higher education school system has a history of segregation. Finally I review some studies that elaborate on the effect of the law in the face of these demographic challenges.

In 2005, Texas became a minority-majority state. According to the U.S. Census Bureau the median age of Texans in 2005 was 33.2, of which Utah was the only other state that had a lower median age. In 2005, Texas ranked sixth in the nation for individuals under the poverty level at 17.6 percent. Compared to the national average of 10.2 percent of families below the poverty line, Texas has a higher percentage of 14.2 (U.S. Census Bureau 2005). That is approximately 3.7 million people living in poverty.

The Texas Higher Education Coordinating Board (THECB) reports that enrollments in the state's public and independent colleges and universities, as well as graduation rates from colleges and universities, are not keeping pace with the population boom in Texas. According to a THECB study, as of 2005, 27.1 percent of whites, 18.3 percent of blacks, 53 percent of Asians and only 10.4 percent of Hispanics age 25 and older had completed a bachelor's degree or higher (Perryman Group 2007, 37). As evident in Table 5, the Hispanic population has grown faster than other races in Texas, particularly throughout the 1990's. Furthermore, according to the Texas State Data Center the projected population of Hispanics in Texas will increase to 13.9 million in 2020 and 25.3 million in 2040 assuming a net migration based on the average from 2000

through 2004. The population of whites will decrease at a slow rate and the population of blacks will increase slightly from 3.1 million in 2020 to 3.5 million in 2040 (Texas Higher Education Coordinating Board 2007).

Table 5 – Population Growth by Race/Ethnicity in Texas (in millions)

	1990	2000	2005
Hispanic	4.3	6.7	7.9
White	12.8	14.8	16.0
Blacks	2.0	2.4	2.4

Source: <http://www.thecb.state.tx.us/reports/PDF/1345.PDF>, Pg. 37

Figure 5 shows the participation rate of students by race in the year after they should graduate from high school at four year institutions. There is a small increase in the participation rate of Hispanics.

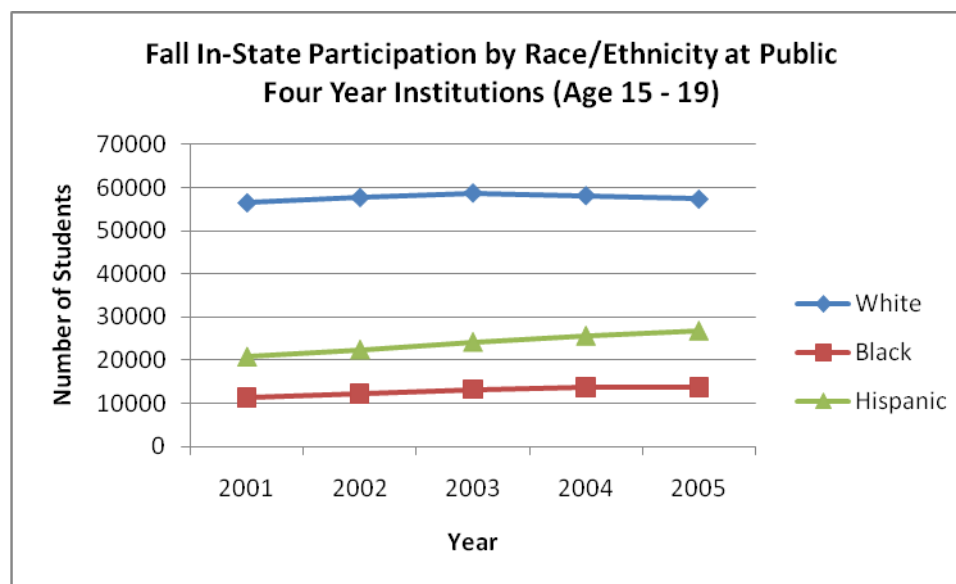


Figure 5 – Fall In-State Participation by Race/Ethnicity at Public Universities.

Source: www.thecb.state.tx.us/Reports/PDF/1301.PDF, Pg. 25

Figure 6 shows the participation rate of students by race in the year they should graduate from high school at two year institutions. In this figure there is a greater increase in the number of Hispanics enrolling in two year colleges.

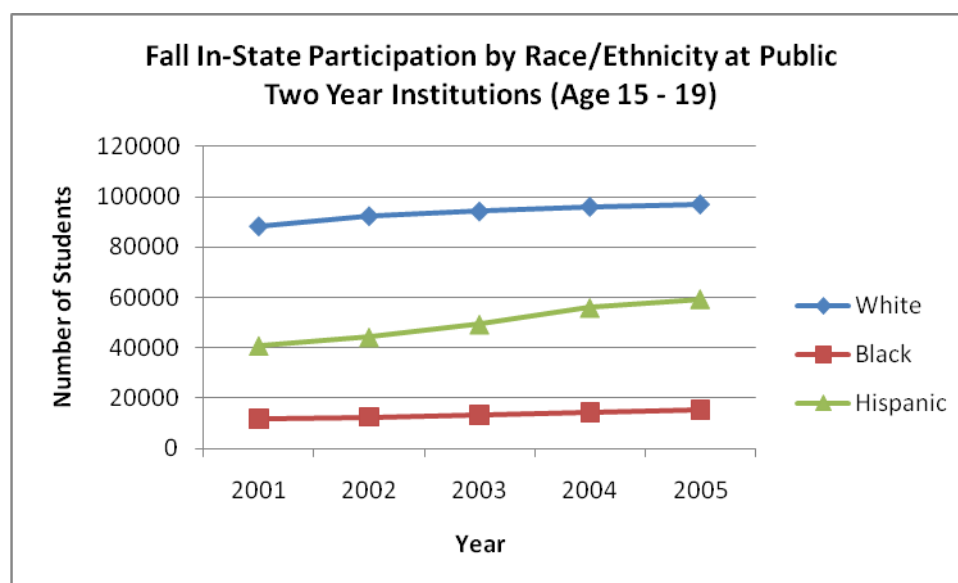


Figure 6 – Fall In-State Participation by Race/Ethnicity at Two Year Colleges
Source: www.thecb.state.tx.us/Reports/PDF/1301.PDF, Pg. 26

The problem is the large gap between the number of white students versus the number of Hispanic students in both figures, considering there are more Hispanics in Texas than white people. Looking at the last year of data, 2005, the gap between Hispanics and whites at both four year as well as two year institutions is approximately 30,000 people, respectively. According to the THECB report where these figures were published, the Hispanic-white gap in fall in-state participation at four year universities in 2005, regardless of age, is a difference of over 130,000 people (THECB 2007, 25). The Hispanic-white gap at two year institutions in 2005, regardless of age, is a little under 100,000 people (THECB 2007, 26). Hence, even when accounting for students that may

not enter into college immediately after high school graduation, there is a tremendous gap between Hispanics and whites regardless of the state's demographic composition.

Poverty must come into discussion here as the poverty rate in Texas is 16.3 percent, relative to the national average of 12.7 percent (CPPP 2007, 2). In order to have a better understanding of the word "poverty," Table 6 provides the 2007 Federal Poverty Guidelines. Annual income by family size is broken down to monthly income and hourly wage. For each additional person over a family of six, another \$3,480 is added to the annual income.

Table 6 – 2007 Federal Poverty Guidelines

Family Size	Annual Income	Monthly	Hourly*
1	\$10,210	\$850	\$4.90
2	\$13,690	\$1,140	\$6.58
3	\$17,170	\$1,430	\$8.25
4	\$20,650	\$1,720	\$9.92
5	\$24,130	\$2,010	\$11.60
6	\$27,610	\$2,300	\$13.27

Source: CPPP, http://www.cppp.org/files/8/BRP%20poverty101_Jan%2007.pdf, Pg. 1

*Hourly wage is calculated based on 52 weeks at 40 hours per week

According to the Center for Public Policy Priorities (CPPP) in Austin, the poor are concentrated in the state's largest cities and along the Texas-Mexico border (CPPP 2007, 2). Of those below the poverty line in 2005, 26 percent were Hispanic, 23 percent were black, 12 percent were Asian and 7.5 percent were white (CPPP 2007, 3). What may be more disturbing is that the child poverty rate (children under 18) in Texas in 2005 was 24.9 percent relative to the national average of 18.5 percent (CPPP 2007, 3). Moreover, the poverty rate for children under the age of five in Texas in 2005 was 25 percent where as the national average was 20.4 percent (CPPP 2007, 3). That is the total

number of children under the age of five in poverty in the state of Texas was 455,600 and the total number of children (under the age of 18) in poverty was 1.6 million (CPPP 2007, 3). Most poor families with children in Texas are considered working-poor families. According to 2002 Census data, approximately 70 percent of families in poverty were headed by a worker that on average worked 43 weeks per year (CPPP 2007, 2). The picture drawn by these statistics is a state with a growing minority population that is the least likely of minorities to invest in post-secondary education, a relatively young population and an above average percent of the population below the poverty line.

The Texas Top 10 Percent Law

The Texas Top 10 Percent law is a policy designed to maintain diversity in higher education. The Top 10 Percent law was passed in response to a court ban on affirmative action in university admissions in the state of Texas as was discussed in the “Recent Legal Debate” section of this chapter. The Fifth Circuit Court in *Hopwood v. Texas* ruled that taking race into account for college admission was unconstitutional. In August of 1996, Texas Attorney General, Dan Morales, informed all Texas public colleges and universities that they could not consider race in their college admissions decisions and financial aid decisions (Kain, O’Brien and Jargowsky 2005, 2).

As the higher education community tried to understand what the *Hopwood* ruling would mean for minority admissions, enrollment and graduation numbers, key legislators began recruiting academics and policymakers to find alternatives. Concern from the academic community was not unfounded. The Texas public school system (both K – 12 and the university system) has a history of racial segregation. The federal Office for Civil

Rights (OCR) reviewed the states attempt to remedy racial segregation beginning in the 1970's and followed by subsequent reviews in 1980, 1987 and 1997. The Texas Higher Education Coordinating Board formalized several plans to decrease discrimination in higher education. In last review in 1997, the OCR found that disparities traceable to segregation still existed (Horn and Flores 2003, 13-4). State Senator Gonzalo Barrientos (a democrat from Austin) created a task force consisting of several faculty members associated with the Center for Mexican American Studies at the University of Texas, faculty members from the University of Houston and others from the Mexican American Legal Defense and Education Fund (MALDEF). The task force was asked to find alternatives to affirmative action that could be written into legislation (Horn and Flores 2003, 15). The result of the committee's work was House Bill 588 (H.B. 588). More specifically, the bill included automatic admission of each student in the top 10 percent of each accredited public or private high school as a first-time freshman to a public academic institution of his/her choice; the option for universities to extend the automatic admission to the top 25 percent; and 18 other factors schools could potentially consider in the admissions process. Some of the factors for consideration include: academic record, socioeconomic background, first-generation college student status, bilingualism, financial status of the applicant's district employment history, extracurricular activity and personal interview (Horn and Flores 2003, 16). Of interest is that the automatic admission plan was not drastically different than the University of Texas's (at Austin – the most selective Texas University) regular admissions practice. State Senator Barrientos and State Representative Irma Rangel (a democrat from Kingsville) introduced H.B. 588 in the 75th Texas Legislature in 1997. The Legislature passed the bill and H.B. 588 was signed into

law by Governor George W. Bush in 1997 (Horn and Flores 2003, 16). This law granted automatic admission to all students in the top 10 percent of their graduating class, regardless of test scores or other academic criteria, to any public Texas university. Students in the top ten percent had two years to enter college under the law. To read the full document, H.B. 588, refer to the Appendix.

The following year, enrollment of first-time minority freshman dramatically decreased at the Texas flagships. At University of Texas, Hispanic enrollment dropped from 14.7 percent in 1995 to 12.6 percent in 1997 and black enrollment fell from 4.9 percent to 2.7 percent over the two years (Tienda and Niu 2004, 2). Likewise, at Texas Agricultural and Mechanical University (Texas A&M), Hispanic enrollment fell from 14.7 percent to 9.7 percent and black enrollment fell from 4.7 percent to under 3 percent after the *Hopwood* decision (Tienda and Niu 2004, 2). The decline in enrollment was in part because some students who would have been admitted under affirmative action, were not admitted and in part because minorities who would have been accepted under the new policy were discouraged from applying because of the ban on affirmative action (Card and Krueger 2005, 425). Enrollment numbers increased the following year. Whether this increase was due to outreach from universities or the implementation of scholarships to students from the lowest income schools, pre-*Hopwood* enrollment was achieved. Based on the 1998 figures, H.B. 588, more commonly referred to as the Top 10 Percent law, appeared to have succeeded in restoring diversity at the flagships (Tienda and Niu 2004, 3).

Tienda and Niu (2004) argue that the Top 10 Percent law capitalizes on segregation, on that which the *Brown v. Board of Education* decision sought to dismantle

in order to provide equality in educational opportunity (3). They find that black and Hispanic students who qualify for admission under the Top 10 Percent law attend schools where minority students comprise the majority of the student body. Also, the students that attend predominantly white high schools are significantly more likely to enroll at selective post-secondary institutions, whereas students that attend predominantly minority schools are significantly less likely to enroll at selective universities (Tienda and Niu 2004, 3). They find that the lower likelihood of college enrollment among those who attended segregated schools is due to their concentrated disadvantage (Tienda and Niu 2004, 5). That is, segregation serves to perpetuate economic disadvantage. Tienda and Niu believe that whatever advantage is received thanks to H.B. 588 is trumped by the fact that school segregation will accentuate class differences (2004, 31).

There have been several studies to determine the effects of the Top 10 Percent law (Tienda et al. (2003a, 2003b), Tienda and Niu (2004), Kain, O'Brien and Jargowsky (2005) and Niu et al. (2006)). The results of the studies are relatively consistent. Most agree that the percent plan alone cannot replace affirmative action, but with outreach programs diversity can be attained. Further, most of the studies found that white students increased attendance to selective universities, whereas minorities were more likely to attend institutions where minorities comprised the majority of the student body.

Tienda et al. (2003a) found that higher ranked students are more likely to enroll in four year institutions rather than two year institutions, which the authors expected. Of interest was that knowledge of the law influenced likelihood of enrollment to both four and two year post-secondary institutions (Tienda et al 2003a, 24). The authors also find that of those in the top 10 percent that are not decided upon a two versus four year

institution, cost of college figures into the decision making process (Tienda et al 2003a, 24).

Kain, O'Brien and Jargowsky (2005) also examine how the Top 10 Percent law affected college enrollment decisions. They found that although the number of minorities at Texas selective public institutions did rebound back up to the pre-*Hopwood* period, they believe that it rebounded thanks to aggressive recruiting on the part of the universities rather than the law per se (Kain, O'Brien and Jargowsky 2005, 33). The authors suggest that the increase in minority enrollment is misleading and that if one looks at the increase in enrollment relative to demographic changes, then the Top 10 Percent law fails in being as effective as affirmative action admissions policies (Kain, O'Brien and Jargowsky 2005, 34-35). They agree with Tienda and Niu's argument that the law works in maintaining diversity because of segregation. Furthermore, the authors argue that the recruitment policies in place to complement the Top 10 Percent law promote segregation as there is no incentive for parents to send their children to better schools (Kain, O'Brien and Jargowsky 2005, 35).

The Impact of the Texas Top 10 Percent Law on the Public University System

Although the focus of research has been on the impact of the Top 10 Percent law on students and their enrollment decisions, the public university system in Texas has also been affected by the law. The Texas Top 10 Percent law is just as debated today as it was in its inception. What seemed like a simple fix to the ban on affirmative action would prove to bring many challenges to the University of Texas System. The law guaranteed admission to any public college or university of choice in Texas to students graduating in

the top 10 percent of their class. Qualifying students would still have to complete the university's application, including entrance exams (SAT or ACT). Class rank is reported by the student's high school and eligible rank can be attained either at the end of junior year, fall of senior year or end of senior year. Moreover, the guaranteed admission is good for two years after graduating high school assuming the student does not register at another college (Tienda and Niu 2004, 3). In addition, although the affirmative action ban affected both public and private post-secondary institutions, only public institutions had to abide by the Top 10 Percent law (Tienda and Niu 2004, 2). Hence, this simple formula of a race neutral unitary system left room for a wide variety of problems.

Problems ranged from academic standards to underlying racial inequality. One problem was that the law did not specify that students take college prep courses. Similarly, there was no way to account for school quality, so selective universities such as University of Texas at Austin would need to find a way to help students succeed in their academic environment. Furthermore, there was concern that parents would move their children to lower quality schools so that students could rank in the top 10 percent, or just continually move their children around from school to school. Likewise, high schools reported class rank with different criteria in each school. Some questioned what would happen to the students in the next decile who traditionally would have been accepted to selective in-state universities. There was also concern that as Texas universities would fill up with the top 10 percent of graduating high school seniors, other quality students would move out of state for college (Tienda and Niu 2006, 714 - 716). Another problem was that although admissions were guaranteed, financial aid was not. Hence students from

low socioeconomic status who are more likely to be minorities might not be able to afford to go to college.

The Texas University System has gone to some lengths to prevent negative outcomes and to protect their academic integrity. University of Texas at Austin (UT) designed the Longhorn Opportunity Scholarship (LOS) program to recruit students from inner city and rural high schools that did not traditionally send many students to UT. As of 2002, 70 high schools were chosen to participate in the LOS. The LOS is a scholarship of \$5,000 annually for up to four years at UT given to students chosen from the participating high school who are in the top 10 percent of their class. The high schools were chosen based on having significantly lower than average percentage of entrance exams sent to UT from the particular school and average parental income lower than \$35,000.⁷ Texas A&M began a similar program to LOS called the Century Scholars Program (CS). CS is a scholarship of \$5,000 a year for four years to Texas A&M for qualifying students based on academic performance, extracurricular activities and individual interview (Tienda and Lloyd 2003, 1).

In order to counter criticisms that the Top 10 Percent law was not allowing for qualified non-top 10 percent ranking students to attend UT, UT instated Summer Enrollment and Provisional Admissions. The Summer Enrollment program offered 1,000 non-top 10 percent students admission to UT conditional upon the students enrolling full-time in the summer immediately after graduation. The Provisional Admissions program offers strong applicants who miss ranking in the top 10 percent to spend a year at a

⁷ Information on the Longhorn Opportunity Scholarship found on the Texas Scholarship website, <http://www.texasscholarships.org/types/osfs/los.html>

satellite campus, such as University of Texas at San Antonio (UTSA) or University of Texas at El Paso (UTEP), and then transfer to Austin if they achieve a 3.0 grade-point average (Kain, O'Brien and Jargowsky 2005, 18).

There has been debate and several proposed legislative measures to amend the Top 10 Percent law with little avail (Stutz 2009, 1-3). The President of UT, William Powers Jr., argued for a 50 percent cap on admitting top ten percent students from Texas. In May of 2009, the Texas Senate and House approved limiting the number of top ten percent students to University of Texas (at Austin) to 75 percent of entering in-state freshmen. This cap was only passed for UT and no other Texas higher education institutions. The university will admit the top one percent, and then the top two percent, etc. until the cap is reached. This limit on the Top 10 Percent law will go into effect with the 2011 entering freshman class.⁸

Evaluating the various educational policies discussed in this chapter, it is evident that policies that increase access to higher education for minorities and low income students do in fact have the intended results. State and federal policies that lower the cost of attendance do tend to increase enrollment especially for minorities and low income students. Affirmative action did increase college enrollment for minorities. As affirmative action was challenged, other policies attempted to achieve the same result of creating access to higher education. The percent plans discussed seem to be a viable alternative to affirmative action, particularly when coupled with scholarships. The intended outcomes of the policies discussed are increased enrollment, persistence and graduation from

⁸ Information found at <http://www.citytowninfo.com/career-and-education-news/articles/texas-house-approves-limiting-top-ten-percent-rule-09052801>

college. My analysis of the Texas Top 10 Percent law not only examines the enrollment outcome, but asks whether the law changes the student's perception of their real opportunities and hence increases the student's freedom.

CHAPTER 4

PLACING EDUCATION INTO THE FRAMEWORK OF AMARTYA SEN'S

CAPABILITY APPROACH

The significant transformation that has occurred in recent years in giving greater recognition to the role of “human capital” is helpful for understanding the relevance of the capability perspective. If a person can become more productive in making commodities through better education, better health and so on, it is not unnatural to expect that she can, through these means, also directly achieve more – and have the freedom to achieve more – in leading her life (Sen 1999, 294).

Chapter 2 reviewed the benefits of higher education, recognizing both the social and private rate of return. In Chapter 3, both a legal history of higher education policies as well as current education policies are discussed. Further, both federal and state policies are evaluated. Specifically, the Texas Top 10 Percent law is analyzed to determine whether it was a true alternative to affirmative action. This chapter explains the capability approach, which is used to evaluate the Texas Top 10 Percent law from a different perspective.

Amartya Sen (1999) challenges traditional welfare economics by suggesting a broader informational base from which to evaluate development and well-being. Rather than accepting revealed preferences as the end all of individual welfare, Sen proposes to ask why one thing is chosen over another and what social circumstances may be relevant to the decision (Sugden 1993, 1949). Sen calls for alternate forms of evaluation. The capability approach recognizes the societal value of more than one human end (such as employment, knowledge, health, etc.) and that the weight of these ends varies among

individuals and cultures (Alkire 2002, 85). A further distinction of the capability approach is that there is value in the number of choices an individual has and not just that which the individual chooses.

The capability approach evaluates well-being from the perspective of freedom. I ask whether the Texas Top 10 Percent law increases the well-being of students by providing greater freedom to realize educational outcomes. The capability approach provides the framework to analyze the choice set or capabilities of students. I specifically examine whether a student's perception of their choice set increases because of the law.

Amartya Sen's Capability Approach

Sen argues that the appropriate space in which to evaluate well-being is that of freedom or *capabilities*. Sen defines "functionings" as the various things a person may value doing or being (Sen 1999, 75). An individual's "capability" refers to the combination of functionings that are feasible to achieve. Hence the capability set or choice set consists of the alternative functioning vectors a person can choose from. As explained by Sen, "While the combination of a person's functionings reflects her actual achievements, the capability set represents the freedom to achieve: the alternative functioning combinations from which this person can choose" (1999, 75). It is the evaluation of well-being from the perspective of freedom that is the capability approach. Sen formalized this relationship in his 1999 book Commodities and Capabilities is summarized in the Appendix.

The capability approach can either focus on realized functionings or on the capability set. In other words, the researcher can use the approach to evaluate what an

individual is actually able to do or the individual's real opportunities (Sen 1999, 75). The freedom represented by the capability set has use beyond the value of the best or chosen element of it. There can be value or importance placed on having opportunities that are not chosen. "Choice" thus can be a valuable functioning (Sen 1999, 76).

Amartya Sen provides an excellent example demonstrating the value of using the capability approach in understanding freedom. Imagine looking at two individuals, both of whom consume 1,200 calories a day. Individual A consumes 1,200 calories a day because he is fasting. Individual B consumes 1,200 calories a day because that is the maximum amount of calories or food available to him. If the analyst did not know the circumstances of the two individuals she could only assume there is no difference between them. In fact once it is known why each individual consumes the calories he does, the analyst can say something about their freedom. It becomes evident that individual A is freer than individual B because his choice set is greater than that of individual B. (Sen 1999, 75).

Elaine Unterhalter, professor of Education and International Development, suggests a similar example that is more relevant to this study. Assume two fifteen year old girls who achieve poor results on a state mathematics exam. Although one attended a reputable school with highly qualified teachers, she decided to spend more time socializing than studying. The other girl who was a good student attended a low quality school, with low quality teachers. Furthermore, her home environment was not supportive of academics for women, with greater focus and demands placed on housekeeping and childcare. Although both girls had the same outcome, their capabilities or opportunities for achievement were very different (Unterhalter 2003, 666). In other

words, the girl that socialized rather than studied has the ability or capability to overcome the poor grade on the mathematics exam. Sen suggests that it not be the achievement of the individual that counts for welfare analysis, but rather the individual's potential achievement (Kuklys 2005, 6).

A Comparison of Evaluative Approaches

Sen comments on various evaluative approaches, specifically utilitarianism, libertarianism and Rawlsian theory of justice. Each approach, Sen argues can be characterized by its informational basis or the information needed (or excluded) for judgments using that approach. Classical utilitarianism, as developed by Jeremy Bentham, evaluated well-being in the space of utility, defined as pleasure or satisfaction. The idea was to focus on individual well-being and to see well-being as essentially a mental characteristic (Sen 1999, 58). Hence, freedoms, rights and other aspects of quality of life are not directly reflected in the utilitarian structure. They can have an indirect role to the extent that they impact utility or satisfaction. Sen further points out that human desires and pleasure adapt to circumstances, especially in adverse situations, making the mental metric, utility, too malleable to be a firm basis for well-being (Sen 1999, 62).

Modern utilitarianism views utility as preference fulfillment, a representation of an individual's choice behavior, which Sen argues is just as limited as Classical utilitarianism (Sen 1999, 56 - 57). The basic idea is that if a person chooses an alternative x over alternative y , then and only then that person has more utility from alternative x than alternative y (Sen 1999, 60). Hence, utility is each individual's scaled representation of his preferences. Sen takes issue with revealed preference theory's assumption that an

individual chooses what is good for her (Sugden 1993, 1951). The classical prisoner's dilemma is a prime example of how although there is a strictly dominant strategy the prisoners do not choose it (Alkire 2002, 97). In a prisoner's dilemma, there is enough evidence against the two prisoners for each to go to jail for a year. However, if one of the prisoners confesses and provides incriminating evidence against the other, he will go free and his partner will go to jail for ten years. If both confess, they each get eight years (ten for the crime minus two for confessing). Although by staying quiet they could each get one year in a single-shot game, both will end up serving eight years. Sen further argues that utility comparisons based on choice behavior are basically comparisons of "real incomes" or a commodity basis of utility (Sen 1999, 69).

The income approach to well-being Sen regards as inadequate because of human diversity. Differences in age, gender, disability, etc. can make two different individuals who share the exact commodity bundle, have completely different opportunities of quality of life (Sen 1999, 69). Sen points out five distinct sources of variation between real income and the well-being gained from it. The first, *personal heterogeneities*, refers to differing physical characteristics that make needs diverse (such as gender, illness, etc.). A person with an illness for instance may not enjoy the same quality of life at a given income that another person would. The second, *environmental diversities*, refers to environmental conditions, climatic circumstances, the presence of infectious diseases that can influence what a person gets out of a given level of income. The third, *variations in social climate*, refers to social conditions including, but not limited to educational arrangements and the prevalence or absence of crime that can influence the benefit from a certain level of income. The fourth, *differences in relational perspectives*, refers to

commodity requirements that may vary in differing communities based on conventions and customs. Lastly, *distribution within the family*, refers to how distributional roles within a family can influence the attainments of individual members of that family. It is these variations in the relationship between real income and well-being that makes the income approach a limited guide to welfare and the quality of life (Sen 1999, 70-71).

Libertarianism, on the other hand, has no interest in pleasure or preference fulfillment, and solely focuses on liberties and rights as its informational basis. Sen points out that libertarian rights can be fully satisfied in a society where deprivation (undernourishment, famine, lack of medical care, etc.) exists. He further takes issue with the exclusion of evaluating consequences. Accepting procedural rules regardless of the consequences of human freedom or lack thereof is not an adequate evaluative system of well-being or justice (Sen 1999, 66).

In considering the Rawlsian theory of justice which has a broader informational base than libertarian theory, Sen finds it a too narrow view for evaluating welfare. Although personal liberties, such as basic political and civil rights are included, precedent is given to them over economic needs, which Sen argues, can be the difference between life and death. He further argues that an individual's liberty should be given equal importance as other advantages, such as income, utility, etc. (Sen 1999, 64). While Sen considers these evaluative spaces relevant, he claims they are not sufficient as a basis of social evaluation (Alkire 2002, 6).

It is thus important...to favor the creation of conditions in which people have real opportunities of judging the kind of lives they would like to lead. Social and economic factors such as basic education, elementary health care, and secure employment are important not only on their own, but also for the role they can play in giving people the opportunity to approach the world with courage and

freedom. These considerations require a broader informational base, focusing particularly on people's capability to choose the lives they have reason to value (Sen 1999, 63).

Sen suggests that for many evaluative purposes, the appropriate space is that of substantive freedoms, rather than utilities, primary goods, or liberties. More specifically, he challenges the researcher to concentrate on an individual's real opportunity to pursue his own objectives. Hence, consideration has to be taken of the freedoms generated by commodities (income, etc.), not commodities on their own (Sen 1999, 74). The concept of capabilities upholds the foundation of freedom that Sen stresses in the capability approach.

Capability Approach Studies

It is important to recognize that although Sen's theory is not without problems, there are various studies that demonstrate how the capability approach can either complement or provide different results from traditional welfare theory. For instance, in Development as Freedom, Sen provides some examples of this. Sen examines income and mortality finding that although African Americans have a lower per capita income than white Americans, it is considerably higher than countries such as China or Kerala. Yet Sen finds that men from China and Kerala outlive African American males (Sen 1999, 21-22). To understand why a relatively high per capita income group in the United States has a relatively lower survival rate than some third world countries, one needs to investigate social and community relations that include health care, education, laws, prevalence of violence, etc. (Sen 1999, 23). Similarly, Sen demonstrates that certain countries such as Kerala, China and Sri Lanka have a low GNP per capita, while their life

expectancy at birth is much higher than nations that have double and even triple their GNP per capita (Sen 1999, 47). Hence, it becomes evident that there is valuable information to gain from investigating other functionings aside from income.

Table 7 reviews some microeconomic studies using the capability approach and their findings. Klasen (2000) compares the results of an expenditure-based poverty approach to capability approach measure of deprivation on survey data from South Africa. The author uses data on 9,000 households in 1993 and included information on family composition, income, expenditures, employment, health status, education, transportation, housing, agriculture and perceptions of the population (Klasen 2000, 36). The expenditure-based poverty measure used in the study is the adult monthly expenditures. This measure is preferred to income, as it gives a better impression of resources and is more reliably reported on than income (Klasen 2000, 36). Households were ranked according to adult expenditure and divided into five quintiles, from the poorest 20 percent to the richest 20 percent. The poverty line is set at the 40th percentile of households (Klasen 2000, 37). The author then compiles a measure of deprivation using the following functionings: education, income, wealth, housing, water, sanitation, energy, employment, transportation, healthcare, safety and perceived well-being. A score from one to five is assigned (one signifying most deprived) (Klasen 2000, 40). The author finds that while both measures identify 16.8 million expenditure poor and functionings deprived, 3.3 million people are either expenditure poor, but not deprived, or vice versa. The deprivation index identifies another 17 percent as poor, over the expenditure-based measure (Klasen 2000, 54). Klasen concludes that although there is a strong correlation overall between the expenditure-based measure of poverty and the deprivation index, the

correlation is weaker for the worst-off in society. For the worst-off in South Africa (rural areas, female head of household families, and least educated families), the expenditure-based measure fails to capture the rates, depth and distribution of poverty (Klasen 2000, 56).

Burchardt and Le Grand (2002) analyze whether the behavior of an individual is the result of the constraints he faces or the result of him exercising his preferences. The authors use the British Household Panel Study to look at participation versus non-participation in employment, with non-participation defined to include full-time education, early retirement and unemployment (Burchardt and Le Grand 2002, 9 - 10). They find that one in 10 of the non-employed men and a similar proportion for non-employed women, are voluntarily not participating in employment, while another one tenth can be classified as involuntarily not participating in employment (Burchardt and Le Grand 2002, 22 -23).

Anand et al. (2005) contribute to the literature on the capability approach by testing a range of capabilities in relation to well-being. The authors use the British Household Panel Survey comprising of 5,000 households and approximately 10,000 individual interviews (Anand et al. 2005, 15). Specifically, the authors attempted to find questions in the data that related to freedoms as described by Martha Nussbaum. The main dependent variable used is a self-reported well-being statistic (Anand et al. 2005, 16). The survey also asked individuals whether they are overall satisfied with their life, health, home, income, partner, job, social life, amount of leisure, and use of leisure. Anand et al. then attempt to measure the effects of the different capabilities and demographic variables on the overall satisfaction with life (2005, 17). The main

conclusion of the study is that capabilities matter, that is, that capabilities do influence well-being. The authors do point out that a main limitation of their study is that the measures of capabilities used are actually based on functionings chosen, but the data constrained determining a choice set. Nonetheless, they view the capability approach as a viable and significant evaluative space for well-being (Anand et al. 2005, 43).

Anand and van Hees (2006) demonstrate that capabilities are measurable and how they relate to well-being. Specifically, they focus on happiness, sense of achievement, health, intellectual stimulation, social relations, environment and personal projects (Anand and van Hees 2006, 274). The authors sent out their own survey to a random sample of British homes. They argue that by asking appropriate questions such as ‘scope to do things’ and the ‘limitations of opportunities,’ capability indicators can be developed and separated out from functioning or achievement (Anand and van Hees 2006, 279).

Anand and van Hees identify various empirical phenomena. First, they are able to statistically distinguish between different capabilities. Second, income, membership in an ethnic minority, and voting in one of the major parties are covariates of an individual’s satisfaction overall. Further, people use their own capabilities to make judgments about the distribution of opportunities in society, except when it comes to health and environment. Lastly, the authors find a strong link between capabilities and satisfaction from achievement (Anand and van Hees 2006, 279). The authors believe that the capability approach can supplement standard economic measures of well-being.

Table 7 – Review of Microeconomic Studies Using the Capability Approach

Author	Functionings	Main Findings
Klasen (2000)	Education, income, wealth, housing, water, sanitation, energy, employment, transport, financial services, nutrition, health care, safety, perceived well-being	Some groups have much deeper functionings deprivation than suggested by expenditure measure; 17% of people who are functionings deprived are not identified as poor by expenditure index
Burchardt and LeGrand (2002)	Being able to hold a job	Capability to hold a job identified by whether individual decided to be unemployed; 10% of unemployed were due to constraints
Anand, Hunter and Smith (2005)	Health, housing, social relations, leisure, having a partner, being employed	Capabilities chosen based on Nussbaum's theory; capabilities are strongly correlated with subjective well-being
Anand and van Hees (2006)	Happiness, general achievement, health, intellectual stimulation, social relations, environmental quality, personal integrity	Income is negatively correlated with self reported overall capability levels; High positive correlations between self reported capabilities and achievement

The Capability Approach and Education

There has been a great deal of attention put on attempting to define a list of “basic” capabilities that every individual should have the right to attain (Nussbaum (2002), Alkire (2002)). Such a list would allow for the comparability of individual

welfare. It would seem obvious that education be placed on the list of capabilities, yet there is some debate as to how education fits into the capability approach (Flores-Crespo (2002), Lanzi (2004), Unterhalter (2003)). Sen sees development as a process of expanding the real freedoms of individuals. With the capability approach, expansion of freedom is both the primary end (the constitutive role of freedom) and the principal means (the instrumental role of freedom) of development (Sen 1999, 36).

Sen specifies five types of freedom, referred to as instrumental freedoms, that he argues would advance the general capability of an individual. Those instrumental freedoms are (1) political freedoms, (2) economic facilities, (3) social opportunities, (4) transparency guarantees and (5) protective security (Sen 1999, 10). Political freedoms refer to the freedom to determine who should govern and on what principles, and to have political dialogue and dissent. Political freedom could be paralleled to civil rights in the United States (Sen 1999, 38). Economic facilities refer to an individual's opportunity to consume, produce and exchange economic resources. Also, the availability of personal finance and the wealth of a country in as far as it is reflected in the economic entitlements of the population, would be considered economic facilities (Sen 1999, 39). Social opportunities refer to the institutions built by society, such as education, health care, etc. that enhance substantive freedoms. These social arrangements can foster greater participation in economic and political activities (Sen 1999, 39). Transparency guarantees refers to social interactions or exchanges occurring under some guarantee of disclosure or trust and that if that trust is violated there are adverse consequences (Sen 1999, 40). The final instrumental freedom, protective security, basically refers to a social safety net whether due to devastation from famine or deprivation due to unemployment (Sen 1999,

40). Sen argues that public policy should encourage enhancing these instrumental freedoms, as these freedoms serve to directly increase human capability. Sen points out the interconnectedness of the instrumental freedoms. Certainly the social opportunity of health care not only allows for an individual to live a healthy life, but also allows the individual to participate in the labor market, increasing his economic facilities. Sen places education in the social opportunities category. Education, one could argue can potentially enhance all other instrumental freedoms (Sen 1999, 41). Education, and particularly higher education, can serve to increase political and economic activities, foster the development of greater social opportunities, encourage transparency guarantees and decrease the use of a social safety net.

Martha Nussbaum, an American philosopher, expands on Sen's instrumental freedoms, suggesting a broader range of capabilities. Nussbaum's list consists of, but is not limited to, life, bodily health, bodily integrity, senses, imagination and thought, emotions, practical reason, affiliation, concern for other species, play and the ability to exercise control over one's political and material environment (Unterhalter 2003, 669). The list attempts to create a social minimum of human dignity for policy makers or a society to achieve. Nussbaum's list was derived to provide a basis for constitutional principles (Alkire 2002, 28). To Nussbaum, an adequate education allows for freedom of imagination and thought, practical reason and control over one's political and material environment (Unterhalter 2001, 4). Neither Sen, nor Nussbaum specifies or even suggests what level of education need be achieved to nurture these freedoms or capabilities.

Others have also discussed the interconnectedness of education, human capital and capabilities. Diego Lanzi (2004) analyzes the relationship between human capital and

human capability. Lanzi compares the education production function, where inputs such as school and teacher quality, parenting, natural ability, etc. determine an outcome such as test scores or after school earnings, to the capability approach's perspective of education. He argues that the aim of education, as understood from the capabilities perspective, is not only to improve labor market skills, but life skills (Lanzi 2004, 2). The outcome of interest is human freedom. Hence, the capability approach recognizes the social and cultural externalities of education (Lanzi 2004, 2). If this view of education is accepted, as Lanzi suggests it should be, he argues that public sector institutions, firms and civic society organizations need to create a network of cooperation in defining what capabilities need to be strengthened and what level of education is necessary for that development (Lanzi 2004, 14).

Pedro Flores-Crespo (2002) analyzes the relationship between education and development using a capabilities approach. He conducts a survey on graduates from three technological universities in Mexico that allows for the capability approach to be implemented. Flores-Crespo finds that the technological universities provide a means for achieving professional and personal functionings (Flores-Crespo 2002, 355). He further examines the possibility of higher education's role in the development process. He particularly looks at what instrumental freedoms are enhanced as a result of the education at the technological universities. Flores-Crespo divides economic facilities into job conditions that consist of wages, labor hours, incentives, etc. and financial support which includes access to finance and credit. He also explores the enhancement of social opportunities by looking at further educational chances (Flores-Crespo 2002, 356). Flores-Crespo finds that the graduates faced challenges in the labor market associated

lack of economic facilities and social opportunities. Dependent on the region in Mexico, graduates have had to deal with discrimination, trade-off between labor hours and wages, lack of credit available and in some situations a lack of protective security as Mexican labor laws had been violated (Flores-Crespo 2002, 357-359). Hence, Flores-Crespo argues that in order for education and in this case higher education to serve the purpose of enhancing freedom, it needs to be implemented in conjuncture with other instrumental freedoms, such as economic facilities, protective security and social opportunities (Flores-Crespo 2002, 360).

Elaine Unterhalter (2001) criticizes the implied causal link of education to freedom. In her paper, “The Capability Approach and Gendered Education: An Examination of South African Contradictions,” Unterhalter demonstrates how young women in South Africa are increasingly infected with HIV through sexual violence in schools (Unterhalter 2001, 6). She argues that Sen’s instrumental freedoms are too vague and that rather than complementing one another, the instrumental freedoms need to be constitutive or an essential part of each other. Unterhalter suggests that social policy needs to promote all capabilities or freedoms, not just some, in order to truly enhance freedom (Unterhalter 2001, 8).

Criticisms and Limitations of the Capability Approach

Sen’s theory has received a great deal of praise (Alkire (2002), Nussbaum (2002)), and a good amount of criticism (Kuklys (2005), Sugden (1993)). Many questions have been and continue to be raised, such as how can we observe capabilities, if we observe them, how do we value them? Other questions remain as to weighing and

prioritizing capabilities. Furthermore, if the capability approach were narrowed down to “basic” capabilities, wouldn’t the approach be useless to developed and developing countries?

Robert Sugden (1993) writes: “Given the rich array of functionings that Sen takes to be relevant, given the extent of disagreement among reasonable people about the nature of the good life, and given the unresolved problem of how to value sets, it is natural to ask how far Sen’s framework is operational” (Sugden 1993, 1953). The capability approach and its call for subjectivity on the part of the researcher have understandably raised eyebrows in the economics profession. Furthermore, Sugden finds theoretical discrepancy between the interchangeability between capabilities and freedom and the relationship between functionings and freedom. To Sugden, freedom is a dimension of well-being, that is, freedom could be part of the functioning vector, which Sen would not agree with as freedom is associated to capabilities and the ends of development (Sugden 1993, 1951). Although Sugden takes issue with some of the ambiguities of the capability approach, he concludes stating “...proposals for the reconstruction of a long established body of theory should not be rejected just because they are incomplete” (Sugden 1993, 1954).

Sabina Alkire (2002) suggests that a framework for valuing freedoms is necessary in order for the capability approach to be put into practice (Alkire 2002, 13). Alkire’s focus is on development economics and hence she argues that poverty reduction can be attained using the capability approach once one can value or weigh freedoms. Further there is disagreement over what “basic capabilities and functionings” are relevant and to what degree they are relevant. That is, what weights should be placed on the various

capabilities and functionings (Alkire 2002, 36). Alkire argues that the single most important function of the capability approach is that it makes explicit the value of choice and participation (2002, 170).

Kuklys and Robeyns (2005) discuss methodological problems in the empirical literature of the capability approach. They state four main methodological issues: 1) the selection of relevant functionings, 2) the measurement of functionings at an individual level, 3) the aggregation of functionings into a scalar of individual welfare and 4) the aggregation of individual welfare to social welfare (Kuklys 2005, 21). Most studies select relevant functionings based on the researcher's values or some prescribed set of functionings or capabilities (Nussbaum's list of "basic needs"). Robeyns proposes the selection of functionings or capabilities using methodological criteria. Specifically, she argues that the selection be explicit, the method and selection be justified, the selection be sensitive to the context, distinguish between levels of generality and attempting to achieve a complete selection of functionings or capabilities (Kuklys 2005, 21). The measuring of functionings at the individual level has two problems: assigning a numerical value to achieved functionings and aggregating functionings into a composite measure of well-being. In traditional welfare theory, prices are placed on goods that provide utility. The prices can then be used to calculate a measure of well-being (ie. budget constraint), which can be compared across individuals. Studies use both statistical and non-statistical methods to measure and aggregate functionings (Kuklys 2005, 22). Studies, such as Klasen (2000), use statistical methods to analyze functionings and capabilities. Non-statistical methods comprise scaling, as is used in the Human Development Index (Kuklys 2005, 22). Lastly, there is difficulty in assessing social welfare. There would be a

need to create a composite measure, which requires agreement on selecting functionings and capabilities (Kuklys 2005, 23). Kuklys and Robeyns maintain that although methodological issues exist, the capability approach does serve as an alternative to traditional welfare economics (Kuklys 2005, 29).

I use the capability approach focusing specifically on whether the Top 10 Percent law increases the capability set for students in Texas and if by doing so more students attend college. If by increasing the capability set, more students attend college, I argue that well-being is also increased. Similar to Burchardt and LeGrand (2002), I look at whether the individual is able to achieve that which he desires to. The capability approach is often restricted to the analysis of developing or underdeveloped nations. Many of the studies discussed focus on creating an index of well-being. Like Sen, I argue that education is an instrumental freedom. I argue that having the opportunity to go to college is a relevant capability for the developed world.

Theoretical Framework

Figure 7 is a Venn diagram to demonstrate the interdependent nature of the structural model. The interior of the rectangle enclosing the diagram represents the universe of discourse U , the set of all elements considered in a given problem, and the circles represent two choice sets P_1 and P_2 . An assumption of traditional human capital theory is that each individual graduating high school faces an identical choice set. That is, there exists a set P containing elements $R=r_1, \dots, r_n$, where r_1 is going to vocational or technical school, r_2 is joining the labor market, r_3 is attending college, r_4 is joining the military, r_5 is being a stay at home mother, r_6 is being unemployed and r_7 is any other

possible choice. Each individual then decides whether or not to go to college based on the monetary benefits relative to the costs. The capability approach on the other hand takes into account the social and cultural structure of a certain time and place. Hence social circumstances affect individuals, their perceptions and preferences (Jackson 2005, 102). Evidence shows that school quality, location and the percent of minorities attending high schools affect educational attainment (Card 1999, 1852). Low-income and high percentage minority schools tend to send fewer students on to college. I argue that in addition to financial and potential academic constraints, that in fact the social circumstances faced by minority and low socio-economic status students constrains their perceived options or choice set. The capability approach examines the choice set by asking whether an individual perceives to have available to him all the elements in set P . I argue that all individuals do not face the same choice set and that in fact some individuals face choice set P_1 in figure 1. Set P_1 contains all the elements of R except r_3 which represents the student expecting to go to college (C). Set P_2 contains all the elements of P_1 including r_3 . I examine whether the individual's perception of being in the top 10 percent increases the choice set from P_1 to P_2 . If in fact the Texas Top 10 Percent Law increases the choice set then it increases the likelihood of observing $R=C$.

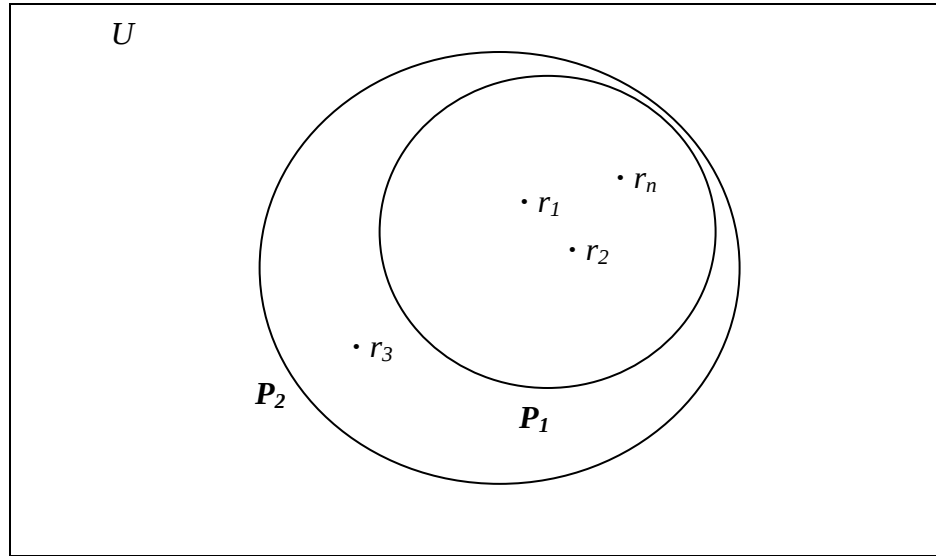


Figure 7 – Choice Sets P_1 and P_2

I explore three sets of interdependent relationships, which are summarized in equations (1)-(3). I explore if being in the top 10 percent matters to students' aspirations (equation 1) and if it serves to help students realize their aspirations (equation 2). If membership in the top 10 percent contributes to the realization of aspirations, particularly of the realization of college attendance, then I can infer that the Texas Top 10 Percent law might have a positive effect on the well-being of students. Finally, I examine the determinants of college attendance (equation 3).

$$P = g(T, I, A, F, G, HS) \quad (1)$$

$$R = h(T, I, A, P, F) \quad (2)$$

$$C = j(T, I, A, P, F, HS, aid) \quad (3)$$

Students' functionings/desires/intentions (P) are assumed to be a function of being in the top 10 percent (T), a vector of individual characteristics (I), past academic

achievement (A), family characteristics (F), guidance/expectations of parents/teachers/counselors (G) and other characteristics of the high school attended (HS). Equation 2 represents students' intentions realized (R) which is a function of being in the top 10 percent (T), individual characteristics (I), past academic variables (A), students' functionings/desires/intentions (P) and family characteristics (F). College attendance (C) is a function of being in the top 10 percent (T), individual characteristics (I), past academic variables (A), students' functionings/desires/intentions (P), family characteristics (F), high school characteristics (HS) and availability of financial aid/loans (aid).

I expect $\frac{dP}{dT}$, the rate of change in students' intentions (P) as a function of being in the top 10 percent (T), to be positive. In the figure, this is shown as the expansion of the size of the functioning from P_1 to P_2 , to include r_3 , which is the option of attending college. Also I expect $\frac{dR}{dT} = \frac{dR}{dP} \cdot \frac{dP}{dT}$, the rate of change of students' intentions realized (R) relative to being in the top 10 percent (T), to be positive. In the figure, as functionings expand to P_2 , the realization of college attendance should become more probable. As the Texas Top 10 Percent Law guarantees admission to the college of choice, I would also expect to find that students in the top 10 percent would attend their first choice college. If the law does in fact affect the population by allowing the students, regardless of race or socioeconomic status, to realize their goals by making college a tangible choice, I can infer the Texas Top 10 Percent Law has increased the well-being of students in Texas.

This analysis of the Top 10 Percent law is distinct from other studies because it examines different outcomes. A good majority of the studies regarding the Top 10

Percent law focused on whether the law was a good replacement for affirmative action. I am interested in whether the law provides students with greater freedom to achieve their educational goals. I do this by examining student perception of capability set and the chosen functioning. I provide a different way of analyzing educational policies from the perspective of freedom.

CHAPTER 5

THE EMPIRICAL MODEL AND RESULTS

In this chapter, I examine student perception of whether college attendance is in her own choice set, whether she aspires to go to college, and whether college attendance is realized when it is aspired to. The first wave of the Texas Higher Education Opportunity Project (THEOP) data set asked questions about educational aspirations and expectations, and the second wave assessed whether students realized their goals, allowing me to examine the constraints on students' capacity to obtain their goals. Thus the THEOP data offers a unique opportunity to implement Sen's capability approach to understanding the value of education.

The main limitations of the data are the fact that data were collected from only two years, family income data were not collected and the lack of a counterfactual to the Top 10 Percent law. The two years of data are during the transition from high school seniors to college freshman. Under the Top 10 Percent law, a student ranking in the top ten percent of her class is guaranteed acceptance to college of choice for up to two years, as long as she is a first-time freshman. The income variable can be corrected for as there is information on parent occupational prestige scores. To correct for the lack of counterfactual, that is, to be able to see the true impact of the Top 10 Percent law, I create a control group by matching based on the propensity score. Propensity score matching allows the researcher to compare the outcome of a treated and control group using a

single index of pre-treatment characteristics. Hence, the researcher is able to decipher the impact of the treatment, or in this case the Texas Top 10 Percent law.

The Texas Higher Education Opportunity Project

The data were collected by the Office of Population Research at Princeton University as part of the Texas Higher Education Opportunity Project. THEOP was devised, explicitly, to examine the influence and effect of the Texas Top 10 Percent law. The THEOP data set is divided into survey and administrative data. The survey data were a two-cohort longitudinal survey of sophomores and seniors enrolled in Texas public schools in spring 2002. The first wave was conducted in 2002 and interviewed 13,803 high school seniors and 19,969 sophomores statewide in 105 schools. The second wave in 2003 consisted of a random sample of the baseline senior-cohort, with a final sample size of 5,836. The sophomore-cohort was re-interviewed in 2004 to record their progress in high school, with a sample size of 3,092. The administrative data consists of applicant and enrollee records from nine Texas universities with years varying from 1990 to 2007 depending on the school.⁹

I use the senior longitudinal survey data from the years 2002 and 2003. In the first wave, data were collected on students' demographics, course taking/grades, knowledge/perceptions of the Top 10 Percent Law, school attitudes/behavior, peer information, college plans, extracurricular activities, self-esteem, language, interaction with counselors, plans for the future and knowledge of class rank. The second wave

⁹ For further information on THEOP, refer to http://www.texastop10.princeton.edu/survey_overview.html and http://www.texastop10.princeton.edu/admin_overview.html.

focused on individuals' demographics, current enrollment or employment status, work and college experiences, college preparedness, reasons for college choice, college finances, psychological well-being, civic activity, admission by college rank, family status/living arrangements and future plans and expectation. The merged data have additional restricted variables on high school and college characteristics. Although the data cover only two years, it is a critical time for students graduating high school. They decide whether to continue their education, join the labor market, join the military, etc.

There are various constraints to having only two years of data. The Texas Top 10 percent law guarantees admission for students graduating in the top ten percent of their class for two years as long as the student is entering as a first time freshman. Thus there is a chance that some of the students in our sample that are graduating in the top ten percent of the high school class could choose to go to college or use the guaranteed admission a year later which I could not account for in my data.

THEOP Literature Review

Because the Texas Top 10 Percent law was enacted to replace affirmative action, initial research focused on the law's impact on diversity at Texas universities. Leicht and Sullivan (2000) was one of the first studies examining the impact of the transition from an affirmative action policy to the Texas Top 10 Percent law¹⁰. The authors point out several early effects of the race neutral policy on applications, admissions and enrollments at the Texas flagship universities, University of Texas at Austin (UT) and

¹⁰ Teresa Sullivan is the co-principal investigator for THEOP and at the time of this study she was Vice President and Graduate Dean at the University of Texas at Austin, where she had been a faculty member since 1981. The study discussed was part of the grant proposal to the Ford Foundation which later funded THEOP data collection and research.

Texas Agricultural and Mechanical University (TAMU). They find that in 1997, post-*Hopwood*, there was a general decline in minority applications, which then rebounded in 1998, the first year of the Texas Top 10 Percent law. In 1998, approximately half of the minority students that were offered admission accepted compared to overall acceptance of about 57 percent. Further, 50 percent of black students who did not accept admissions to UT went to college out of state, as did approximately one-third of black students admitted to TAMU (Leicht and Sullivan 2000, 9). Surprisingly, in 1998 a smaller fraction of top ten percent minorities applied to the flagships; 58 percent of Asians, 30 percent of Hispanics, 23 percent of whites and 14 percent of blacks in the top ten percent applied to UT. Similarly at TAMU, 16 percent of Asians, 23 percent of Hispanics, 29 percent of whites and 15 percent of blacks in the top ten percent applied. There is some overlap in these figures as some of the top ten percent students likely applied to both universities. Regardless, all of these percentages were lower than 1996 and 1997 applications (Leicht and Sullivan 2000, 10). By 1999, the second year of the Texas Top 10 Percent law, enrollments of minorities at the flagships were approximately equivalent to 1996 enrollments under the affirmative action policy. In 2000, UT experienced the greatest number of applications, including the highest number of minority applicants in its history (Leicht and Sullivan 2000, 10). As number of enrollments ultimately served as the most important signal as to whether the law would succeed, the Texas Top 10 Percent law was deemed a success. Leicht and Sullivan conclude with a tone of caution in their article, reminding researchers and policy makers of some of the challenges that may arise from the percent plan. Particularly, the authors discuss problems with the incentive structure of

the percent plan as well as how the law may potentially make students less competitive at out of state universities (Leicht and Sullivan 2000, 24).

Niu, Tienda and Cortes (2006) examine how institutional selectivity impacts college preferences and enrollment decisions under the Top 10 Percent law. Using the THEOP data, they categorize institutional selectivity according to the Barron's scheme as most competitive (e.g. Rice University), highly competitive (e.g. UT-Austin), very competitive (e.g. TAMU), competitive (e.g. Texas Tech) and non or less competitive (e.g. UT-San Antonio). They also include community college as a category (Niu, Tienda and Cortes 2006, 263). They use conditional logit estimation for models of preference and enrollment decisions by high school type and race. They find that Texas seniors are highly responsive to institutional selectivity (Niu, Tienda and Cortes 2006, 265). Students from resource affluent or feeder high schools are four to six times as likely to prefer very competitive colleges over non or less competitive colleges compared to their statistical counterparts at average high schools. Further, students from resource affluent high schools are about twice as likely as students from an average high school to prefer most to very competitive institutions. Students from resource poor high schools, which include high schools that are offered Longhorn Opportunity Scholarships and Century Scholarships, are less likely than their statistical counterpart at an average school to prefer selective institutions. These findings based on high school type hold for enrollment decisions (Niu, Tienda and Cortes 2006, 266). Blacks and Hispanics are significantly less likely than whites to prefer or enroll in selective institutions (Niu, Tienda and Cortes 2006, 267). As for top decile graduates, the authors find that they are two to three times more likely to prefer a most or highly selective institution. Top decile seniors from feeder

high schools are the most responsive to college selectivity, followed by resource affluent high school seniors. Top decile seniors from resource poor high schools have similar preferences to their rank counterparts at average high schools. Although these disparities are evident in preferences, they disappear upon enrollment for top decile students (Niu, Tienda and Cortes 2006, 268-269). Overall, the study demonstrates that qualified students from resource poor high schools and minorities (particularly blacks and Hispanics) have lower college aspirations and hence do not seek admission at more selective institutions.

Domina (2007) argues that the Texas Top 10 Percent law, coupled with associated scholarships, has served to reform secondary education by providing postsecondary incentives to students. The study uses THEOP data and additional data from the Texas Education Agency and the National Center for Education Statistics to examine the outcomes: college going behavior and academic engagement (Domina 2007, 264). Analyzing the period from 1993 to 2002, he finds that although there is a slight decline in enrollments during the policy shift to the Top 10 Percent law, the Longhorn Opportunity and Century Scholarships increased enrollments at UT and TAMU from selected resource poor high schools. That is, the high schools that historically sent few applications to the flagships benefited by the policy change, where as feeder high schools suffered. Enrollments at UT slightly increased and there was no effect on TAMU enrollments from average high schools in the state associated with the policy change. Together these findings suggest that the law and associated scholarships helped to equalize information inequalities at Texas high schools leading to increased college going behavior at disadvantaged high schools (Domina 2007, 268-270). The Top 10 Percent law is positively associated to increased enrollments at nonselective universities such as

University of Texas at Arlington, University of Texas at San Antonio and Texas Agricultural and Mechanical University at Kingsville (Domina 2007, 271). Further, Domina finds that the law and scholarships had a positive effect on academic engagement at all high schools, as more students partook in advanced classes and attendance rates increased after the policy change. Specifically, the number of students who took advanced courses at an average high school increased by 2.6 percentage points annually after the law was put in effect (Domina 2007, 272). Domina suggests that although some of the increase is more than likely due to a secular trend toward college prep curriculum, the Top 10 Percent law did have a positive impact on student engagement. Also, the Longhorn Opportunity and Century Scholarships had a positive impact over time which Domina believes can be credited to better information and relationships between disadvantaged high schools and the flagships (Domina 2007, 275). The author also looks at dropout rates and concludes that the policies, both the Top 10 Percent law and the scholarships did not improve dropout rates (Domina 2007, 277).

Domina (2007) considers the Longhorn Opportunity and Century Scholarships which results in a more positive view of the effect of the Texas Top 10 Percent law relative to the Leicht and Sullivan (2000) study. The Longhorn Opportunity Scholarship was initiated in 1998, with the first cohort of enrollees in 1999, and the Century Scholarship began in 1999 with the first cohort of enrollees in 2000. Leicht and Sullivan focus on the immediate changes in admissions and enrollment from 1997 versus 1998, when the scholarships were not yet available. Although there is some discussion of consecutive years, the scholarships were in the initial stages and underwent changes over

the years.¹¹ Niu, Tienda and Cortes (2006) specifically consider whether seniors from schools that receive Longhorn Opportunity and Century Scholarships choose selective or less selective higher education institutions. They find that seniors from resource poor or Longhorn and Century high schools are less likely to choose selective colleges. The Appendix contains a summary of studies analyzing the impact of the Texas Top 10 Percent law using the THEOP data. The THEOP website provides a list of studies using the THEOP data.¹²

The Empirical Model: Perceiving Choice Set

This analysis uses the senior participant follow-up survey data. Table 8 provides the demographic composition of the population. A little over half the sample is female (53.88 percent). Whites represent 40.98 percent and blacks represent 17 percent of the sample population. There is a relatively high percentage of Mexicans (26.49 percent) in the population which is important since the lowest enrollment rate in the United States is by Hispanics. While the Hispanic population in the sample is predominantly Mexican, it would be a mistake to group all Hispanics together. There are cultural differences between the groups that may affect their college going behavior via differences in assimilation in our society. For instance, Mexican immigrants tend to live in Mexican American communities, whereas Chileans would be less likely to find a high density Chilean American community, forcing greater assimilation. In addition, 14.46 percent of

¹¹ Descriptions of the Longhorn Opportunity Scholarship and the Century Scholarship can be found at <http://www.texasscholarships.org/types/osfs/los.html> and <http://honors.tamu.edu/scholarships/FutureStudents/CenturyScholars>, respectively.

¹² The THEOP home page is <http://www.texastop10.princeton.edu>.

the population are foreign born and 41.17 percent speak a second language at home. Speaking a second language shouldn't be a constraint to college attendance assuming students are proficient in writing and reading English as well. Yet it is important to recognize that immigrant families, particularly those living in ethnic communities may not have the need to learn English, much less teach their children English. Hence, immigrant parents may have a harder time helping their children with homework, may need to work more hours to get by or may lack the language skills or literacy to find information on colleges. I therefore consider Mexicans and other Hispanics separately in this study. I define "Hispanic" to be "of Central and South American decent." Asians make up 7.24 percent of the sample and 3.34 percent are categorized under "other."

Table 8 - Demographic Composition of THEOP Senior Participants in Follow-up Survey

% Female	53.88
% White	40.98
% Black	17.0
% Mexican	26.49
% Asian	7.24
% Other	3.34
% U.S. Born	85.54
% Speak Second Language at Home	41.17
Number of observations =	4,224

THEOP provides information on student individual characteristics (race/ethnicity, sex, academic ability and achievement and extracurricular activities), institutional influences (tuition, school reputation, location and selectivity, size, type, social atmosphere, etc.) and contextual influences (parents, teacher and counselor encouragement, peers' plans, high school climate and economic status, etc.), making it possible to control for a great number of influential variables to see if minorities and

students from lower income families feel constrained, even with the Top 10 Percent law in effect.

I begin by examining students' capability set or choice set. I interpret this capability variable as what the student both expects to do and what he views as available to him. Each student was asked what his primary activity would be after graduating high school. The choice set consisted of ten options from which the students could choose. Table 9 presents the choice set and the student responses. Based on the student responses, approximately 76.7 percent of the Texas senior student population in 2002 not only viewed college as a viable option, but intended on attending a two or four-year college. Further, 6.9 percent of the students intended on going into full-time work and 5.6 percent anticipated joining the Armed Forces. Approximately three percent planned on going to vocational or technical schools and another three percent did not know what they would do. Less than two percent of the students said they would take a break from work and school and a smaller percentage put the option "other" as the response. Less than one percent anticipated either an apprenticeship or being a homemaker and 0.5 percent did not respond.

Table 9 – Description of Student Capability Set:
Expected Primary Activity after High School
THEOP Senior Participants in Follow-up Survey

Choice Set	Student Response	Percentage of Sample
Two or four-year college	3,238	76.7
Vocational/Technical school	130	3.1
Apprenticeship/Training program	27	0.6
Full-time job	293	6.9
Armed Forces	237	5.6
Homemaker	9	0.2
Taking a break from work and school	70	1.7

Other	56	1.3
Don't know	145	3.4
No response	19	0.5

I then ask what contributes most to a student's own perception of this opportunity or lack thereof. I assume that a student's perception of his opportunities is given by individual characteristics, individual academic characteristics, family characteristics, guidance, and high school characteristics. These assumptions are based on the literature pertaining to modeling college expectations suggested by the Wisconsin model of status attainment and the rational choice model. The models differ in that the Wisconsin model focuses on the cognitive processes of others, while the rational choice model focuses on the cognitive processes of the individual/student. Together, the models support the view that family, peers, individual characteristics and high school context influence a student's expectation or aspiration to go to college (Lloyd, Leicht and Sullivan 2008, 1109). I use a probit model to estimate the probability of the student expecting to attend a two or four-year college.

$$\Pr(\text{expects}_i = 1) = \theta[\beta_0 + \beta_1 \text{rank}_i + \beta_2 \text{econdisad}_i + \beta_3 \text{gradplan}_i + \beta_4 \text{counselor}_i + \beta_5 \text{teacher}_i + \beta_6 \text{parent}_i + \beta_7 \text{dadcollege}_i + \beta_8 \text{momcollege}_i + \beta_9 \text{male}_i]$$

where θ is the standard cumulative normal probability distribution. The dependent variable, *expects*, is equal to one if the student expects to go to a two of four year college. The dependent variable does not reflect the entire capability set, but is based on the student's most likely post high school activity. I assume that if the student expects to go to college, then they view college as a viable option in her choice set. The explanatory variables are student rank (*rank*), the percent of economically disadvantaged students at

the school (*econdisad*), whether the student completed a college prep graduation plan (*gradplan*), guidance to go to college by counselors (*counselor*), teachers (*teacher*) and parents (*parent*), parents attended some college (*dadcollege* and *momcollege*) and gender (*male*).

Table 10 provides summary statistics for the variables used in this model.

Provided in the table are the questions used in the survey instrument. All the variables are dichotomous except for class rank as a percentile and the percentage of economically disadvantaged students in high school. The Mexican and Hispanic means for students wanting to go to college, the dependent variable is lower than all other races. The class rank variable ranges from one percent (the top one of the class) to one-hundred percent (the bottom of the class). Hence the lower the class rank, the higher the academic achievement of the student. Hispanics have the lowest academic achievement as given by class rank, followed by Mexicans, blacks and other races. Asians have the highest academic achievement with an average class rank at 34.71 percent. Looking at the percent of economically disadvantaged students variable, it is evident that Mexican students attend much poorer schools than the other races, as the average percent of economically disadvantaged students in high schools attended by Mexicans is over 50 percent. Hispanics and blacks follow attending high schools where on average 40.7 percent and 35.38 percent of the students are economically disadvantaged, respectively. Whites, Asians and other races all attend schools where the average of economically disadvantaged students falls below the average of the entire sample. Participation in a college prep curriculum is similar across race groups. Likewise, counselor, teacher and parent encouragement averages are similar for all race groups. Logically, parent

encouragement averages are higher than teacher encouragement averages which are higher than counselor encouragement. This is not surprising as students spend the most time with parents, then teachers and spend the least time with counselors. Also, counselor interaction is generally the choice of the student, whereas parent and teacher interaction is not. As for parents having some college education, white and Asian parents have higher averages than all other races. For blacks, mothers have a higher average than fathers. Mexican parents have the lowest average at 0.31 followed by Hispanics.

Table 11 reports the change in the expected probability of expecting to attend college for an infinitesimal change in independent continuous variables and the discrete change in the probability for dummy variables.

According to the results in Table 11, when a student ranks in the top ten percent of her class the probability of expecting to go to college increases by 13.3 percent relative to the fiftieth percentile. Ranking in the twentieth and thirtieth percentiles also increases the probability of expecting to go to college by 9.39 and 7.0 percent respectively. Although there is a clear positive and significant effect for top ten percent status, it is difficult to decipher if this is the impact of the law. Class rank also serves as an academic achievement variable. Evident in the results of the probit, the probability of expecting to go to college increases the higher the academic achievement.

The percent of economically disadvantaged students in a high school has a significant negative impact on the probability of expecting to go college. An increase of one to the percent of economically disadvantaged students in high school decreases the probability of expecting to go to college by 0.171 percentage points.

Table 10 – Summary Statistics - Mean of Variables by Race/Ethnicity, THEOP Senior Participants in Follow-up Survey

Variables	All	White	Black	Mexican	Hispanic	Asian	Other
What do you expect will be your primary activity in the fall after you leave high school? Variable equal to one if student expects to go to college.	0.77	0.82	0.79	0.66	0.69	0.91	0.74
Please indicate the percentage that best represents your current class rank?	51.52	45.51	57.09	59.60	61.87	34.71	54.13
Percent of students expecting to complete college preparation, by race.	0.67	0.67	0.68	0.65	0.60	0.78	0.67
During your senior year, have your guidance counselors (or transition coordinators) encouraged you or discouraged you about going to college? Variable is equal to one if counselor encouraged going to college.	0.72	0.70	0.77	0.72	0.77	0.66	0.64
During your senior year, have any of your high school teachers encouraged you or discouraged you about going to college? Variable is equal to one if teacher encouraged going to college.	0.88	0.87	0.89	0.89	0.84	0.84	0.82
During your senior year, have your parents or guardians encouraged or discouraged you about going to college? Variable is equal to one if parent encouraged going to college.	0.95	0.95	0.95	0.94	0.94	0.96	0.95
Father or male guardian has completed at least some college.	0.58	0.73	0.59	0.31	0.48	0.73	0.58
Mother or female guardian completed at least some college.	0.57	0.72	0.65	0.31	0.39	0.63	0.57
Percent of economically disadvantaged students in high school	32.81	20.50	35.38	52.77	40.70	19.20	30.29

Questions/variables taken directly from survey instrument, which can be accessed at
<http://theop.princeton.edu/surveys/baseline/SeniorW1Instrument.pdf>

Table 11 - Probit Regression for THEOP Senior Participants in Follow-up Survey
Marginal Effect of Variables Influencing Student Expectation to Go to College

Dependent Variable: Expects to go to college	Df/dx
Student Class Rank (Relative to the fiftieth percentile)	
Top tenth percentile	0.133** (0.0191)
Twentieth percentile	0.0939** (0.0209)
Thirtieth percentile	0.0700* (0.0234)
Fortieth percentile	0.0126 (0.0297)
Sixtieth percentile	0.00293 (0.0350)
Seventieth percentile	-0.138* (0.0497)
Eightieth percentile	-0.104 (0.0535)
Ninetieth percentile	-0.101 (0.0723)
One hundredth percentile	-0.0847** (0.0257)
Percent of economically disadvantaged students in high school	-0.00171** (0.000331)
College prep graduation plan	0.129** (0.0152)
Counselor encouraged going to college	0.0105 (0.0145)
Teacher encouraged going to college	0.0668* (0.0215)
Parents encouraged going to college	0.172** (0.0360)
Father completed some college	0.115** (0.0156)
Mother completed some college	0.0645** (0.0152)
Gender (Male)	-0.0623** (0.0129)
Race/Ethnicity (Relative to White)	
Black	0.0296 (0.0178)
Mexican	0.00258 (0.0188)
Hispanic	0.00749 (0.0284)

Asian	0.0703*
	(0.0241)
Other race	-0.0191
	(0.0373)
Observations	4,224
Pseudo R ²	0.2062

Zero failures and successes completely determined.

Standard errors in parentheses. * significant at 5%; ** significant at 1%

Participation in a college prep curriculum increases the probability of expecting to go to college by 12.9 percent. The impact of the college prep curriculum may be biased as those who choose to take college prep courses may do so because they expect to go to college. That being said, college prep curriculums in schools are more common place than they used to be. Further, a college prep curriculum is not one of the requirements of the Texas Top 10 Percent law. Hence, there could be an incentive for students to move away from college prep courses towards easier classes so to attain a higher class rank. In terms of perceiving college as a viable option, having a college prep curriculum not only prepares the student academically, but also puts students in an environment where college is discussed and peers are more likely to aspire to postsecondary education. Another important consideration for this variable is whether resource poor schools offer college prep curriculums and the quality of those classes.

For the guidance variables, although the counselor variable is positive, it is not significant. Parent encouragement to go to college increases the probability of expecting to go to college by 17.2 percent, while teacher encouragement is associated to a probability increase of 6.68 percent. The parent encouragement variable has the greatest impact on the expectation to go to college. As students spend the most time with parents during both their formative years and throughout elementary and secondary education, it

is not surprising that parent encouragement would have a strong impact on the expectation to go to college.

Parents having some college education, as one would expect, increases the probability of expecting to go to college and is significant for both father and mother at the one percent level. More specifically, a father having some college raises the probability by 11.5 percent and a mother having some college raises the probability by 6.45 percent. The encouragement to go to college by parents has a stronger impact than the parent having attained some college.

Further, being a male decreases the probability of expecting to go to college by 6.23 percent. For the race variables, the white category is omitted as the reference group. Only the Asian race variable is significant. That is, relative to whites, being Asian increases the probability of expecting to go to college by 7.03 percent.

The results for the full sample assume the law affects each race in the same way. However, as discussed above, there are cultural differences between race groups. Moreover, since the law was intended as a replacement for affirmative action laws, I want to explore whether there are systematic differences in the determinations of expecting to go to college. I run probit regressions of each race separately. The results are provided in Table 12.

Table 12 - Probit Regression for THEOP Senior Participants in Follow-up Survey by Race/Ethnicity
Marginal Effect of Variables Influencing Student Expectation to Go to College

Dependent Variable: Expects to go to college	All	White	Black	Mexican	Hispanic	Asian	Other
Student Class Rank (Relative to the fiftieth percentile)							
Top tenth percentile	0.135** (0.0188)	0.0781* (0.0272)	0.115* (0.0473)	0.240** (0.0454)	0.0809 (0.156)	0.0892 (0.0553)	0.124 (0.142)
Twentieth percentile	0.0935** (0.0209)	0.0909** (0.0252)	0.0904 (0.0479)	0.133* (0.0548)	0.0773 (0.138)	0.0154 (0.0490)	0.0345 (0.176)
Thirtieth percentile	0.0703* (0.0234)	0.0640* (0.0280)	-0.0607 (0.0739)	0.137* (0.0597)	0.0916 (0.131)	0.0217 (0.0435)	
Fortieth percentile	0.0141 (0.0295)	0.0361 (0.0343)	-0.0628 (0.0767)	0.0348 (0.0740)	0.0208 (0.172)	0.0258 (0.0404)	-0.251 (0.269)
Sixtieth percentile	0.00381 (0.0349)	-0.00518 (0.0475)	-0.00648 (0.0693)	0.0709 (0.0834)	-0.210 (0.249)		-0.296 (0.358)
Seventieth percentile	-0.137* (0.0496)	-0.236* (0.0845)	-0.0651 (0.0901)	-0.112 (0.108)	-0.00220 (0.204)		
Eightieth percentile	-0.102 (0.0532)	-0.218 (0.132)	-0.0284 (0.0883)	-0.216* (0.110)	-0.0465 (0.197)		-0.203 (0.313)
Ninetieth percentile	-0.0953 (0.0715)	0.0721 (0.0540)	0.0280 (0.104)	-0.301 (0.181)		-0.111 (0.244)	
One hundredth percentile	-0.0865** (0.0258)	-0.108* (0.0409)	-0.0838 (0.0537)	-0.0154 (0.0564)	-0.123 (0.130)	-0.0434 (0.0889)	-0.311 (0.182)
Percent of economically disadvantaged students in high school	-0.00177** (0.000282)	-0.00262** (0.000562)	-0.00132 (0.000784)	-0.000690 (0.000671)	-0.00271 (0.00147)	-0.00112 (0.000888)	-0.00346 (0.00213)
College prep graduation plan	0.131** (0.0152)	0.103** (0.0214)	0.136** (0.0367)	0.182** (0.0337)	0.198* (0.0696)	0.0359 (0.0382)	0.184 (0.0986)
Counselor encouraged going to college	0.0117 (0.0145)	0.00203 (0.0190)	-0.0160 (0.0362)	0.0352 (0.0341)	0.0959 (0.0885)	-0.000645 (0.0262)	0.126 (0.0906)
Teacher encouraged going to college	0.0663* (0.0214)	0.0717* (0.0303)	0.118* (0.0574)	0.0535 (0.0508)	0.00511 (0.0897)	0.0154 (0.0421)	-0.0364 (0.110)
Parents encouraged going to college	0.172** (0.0360)	0.224** (0.0608)	0.188* (0.0884)	0.144* (0.0697)	0.0620 (0.141)	0.0652 (0.104)	0.0396 (0.211)
Father completed some college	0.117** (0.0155)	0.134** (0.0249)	0.0658 (0.0350)	0.0965* (0.0355)	0.146 (0.0787)	0.0545 (0.0410)	0.156 (0.100)
Mother completed some college	0.0644** (0.0150)	0.0248 (0.0206)	0.0776* (0.0368)	0.144** (0.0341)	-0.0518 (0.0808)	0.0362 (0.0327)	0.139 (0.0910)
Gender (Male)	-0.0625** (0.0128)	-0.0299 (0.0174)	-0.0730* (0.0315)	-0.103** (0.0302)	-0.0545 (0.0690)	-0.0566* (0.0262)	-0.107 (0.0894)

Observations	4,224	1,731	718	1,119	206	292	125
Pseudo R ²	0.2040	0.2497	0.1450	0.1608	0.1472	0.2795	0.3249

For Hispanics, the ninetieth percentile is dropped because it predicts failure perfectly. For Asians, the sixtieth, seventieth and eightieth percentile are dropped because they predict success perfectly. For other race, the ninetieth is dropped because it predicts failure perfectly.
Standard errors in parentheses. * significant at 5%; ** significant at 1%

The results for the entire sample are shown in the first column for ease of comparison. Immediately, the first thing that jumps out when looking at the table is that ranking in the top tenth percentile of the class is statistically significant at the one percent level for the Mexican subsample. More specifically, top ten percent status (relative to the fiftieth percentile) increases the probability of expecting to go to college by 24 percent for Mexicans. Top ten percent status also increases the probability of expecting to go to college for blacks by 11.5 percent and for whites by 7.81 percent. The strongest impact is on Mexicans, not only at the tenth percentile but the twentieth and thirtieth percentiles. Specifically for Mexicans, ranking in the twentieth and thirtieth percentiles of the class increases the probability of expecting to go to college by 13.3 and 13.7 percent, respectively. Although this is an academic achievement variable, the large positive effect particularly for Mexicans likely reflects the Top 10 Percent law. There may be a more positive effect on Mexicans for various reasons. First, the largest minority in Texas is Mexican Americans. As Texas universities attempted to have a student body representative of the state population, the universities may have targeted the Mexican population by disseminating information about the law. What may be of greater importance in this result is the fact that University of Texas at Austin and Texas A&M both offered scholarship programs to top ten percent students in low income schools. Discussed below under the percent of economically disadvantaged students in the high school, 59 percent of Mexicans in the sample attended a high school with 50 percent or more economically disadvantaged students. This percent is almost double the percent of blacks and Hispanics that attended high schools with 50 percent or more economically disadvantaged students. Information about the Century and Longhorn Opportunity

Scholarships was certainly disseminated. Likewise, the high schools that fell under the category to receive these scholarships likely made sure students were aware of the programs as it provided the schools an opportunity to send students to the Texas flagship universities.

Another interesting result is that only the white subsample is significantly negatively impacted by the percent of economically disadvantaged students in the high school. To better understand this result, it is informative to look at what percentage of each racial subsample attends high schools that have 50 percent or more of economically disadvantaged students. Only four percent of whites and Asians attended a school that had 50 percent or more economically disadvantaged students, while 59 percent of Mexicans in the sample attended a school that had 50 percent or more economically disadvantaged students. Approximately 34 percent of blacks and 35 percent of Hispanics attended high schools that had 50 percent or more economically disadvantaged students. Clearly, minorities and especially Mexicans are segregated into low resource schools. Hence, when looking at the summary statistics, Mexicans have the lowest average for expecting to go to college.

A college prep curriculum is significant at the one percent level for whites, blacks and Mexicans. The greatest impact is on Mexicans, increasing the probability of expecting to go to college by 18.2 percent, followed by 13.6 percent for blacks and 10.3 percent for whites. A college prep curriculum was also significant at the five percent level for Hispanics, increasing the probability of expecting to go to college by 19.8 percent. As stated before, a college prep curriculum not only prepares a student for college, offers an environment where college is discussed and a greater number of peers

are likely to go on to college. This is the only variable for black students that is significant at the one percent level. This variable has the second largest positive impact on Mexicans in the sample. Both academic achievement variables, class rank and college prep curriculum, have a greater impact on Mexican students' expectation to go to college than any of the other variables. This result suggests that encouraging academic achievement (as the Top 10 Percent law does) may be the best way to increase minority students' perception of college as a viable choice in his or her capability set. Again it is important to consider whether a student even has the option to take a college prep curriculum if she attends a resource poor school. If attending a resource poor school with a college prep curriculum, one would have to question the quality of classes offered.

The guidance variables show that encouragement by parents is most important, specifically for whites. Parent encouragement increases probability of expecting to go to college for whites by 22.4 percent at a significance of one percent. Parent encouragement is also important for blacks and Mexicans, raising the probability by 18.8 and 14.4 percent, respectively, at the five percent level. Teacher encouragement only increased the probability of expecting to go to college for whites and blacks, at 7.17 and 11.8 percent respectively. The guidance variables become more interesting once broken down by race. When reviewing the results for the entire sample, it made sense that parent encouragement to go to college would have the greatest impact on student expectation to go to college. This seems logical as parents are the greatest influence in most children's lives and we are discussing a sample of individuals that has likely lived with one or more of her parents for her entire life (thus far). Yet, parent encouragement is the strongest influencing factor only for whites at the one percent level of significance. As mentioned

in the results of the entire sample, parent encouragement would likely lead to a student choosing college prep classes. Yet for Mexicans and blacks, who are also positively impacted by the parent encouragement variable, are impacted to a lesser degree by parent encouragement than by the academic variables. For blacks it does appear that teacher encouragement has a larger positive impact on the probability of expecting to go to college, than for other races. It is interesting that guidance counselors do not have a significant impact on a student expecting to go to college. Due to the time limitations spent with students, the result is not surprising. Yet, it is the job of a guidance counselor to provide information throughout the high school career of their options for the future based on decisions made from freshman year and each consecutive year. For this reason, I included the guidance counselor variable.

A father having attended some college has a significant positive impact for whites at 13.4 percent and for Mexicans at 9.65 percent. A mother having attended some college has a significant positive impact for Mexicans, increasing the probability of expecting to go to college by 14.4 percent at the one percent level of significance. There is also a positive impact for blacks, increasing the probability of expecting to go to college by 7.76 percent at the five percent level of significance. It is reasonable that students who have parents that went to college are more likely to expect to go to college. What is interesting is that for whites, a father having attended some college is of greater influence (a mother having attended some college is not significant), whereas for Mexicans and blacks (to a lesser degree), a mother having attended some college is of greater influence. This is likely the result of a greater percentage of minorities, especially blacks, raised in one parent households generally headed by the mother. For whites this result is less easily

explained. This may be a function of social norms where men are still viewed as the breadwinner.

The gender variable which equals one if the student is a male is negative and significant at the one percent level for Mexicans. That is, being a male decreases the probability of expecting to go to college by 10.3 percent for Mexicans. I suspect this result is because Mexican males may often be expected to go to work and contribute to the household as soon as they are able, especially if the family is lower income. The gender variable is significant at the five percent level for blacks and Asians by decreasing the probability of expecting to go to college by 7.3 and 5.66 percent, respectively. For black males, there might be a similar expectation to work rather than continue education in order to contribute to the household income. I do not think that is the same situation for Asian males.

Determinants of College Attendance

Many economists and sociologists have attempted to answer the question of who goes to college and why? In reviewing the benefits of higher education, one finds that all races and ethnic groups have relatively equivalent rates of return to education. Furthermore, the rate of return to education for all groups has risen over the past few decades. Yet educational attainment of different groups has not converged. According to the U.S. Census Bureau, 53 percent of Asians aged 25 and older, 33 percent of non-Hispanic whites, 19 percent of blacks and only 13 percent of Hispanics attained a Bachelor's degree or more in 2009¹³.

¹³ Taken from <http://www.census.gov/newsroom/releases/archives/education/cb10-55.html>.

The conventional explanation for the difference in educational attainment and the differential response to returns to education is the variation in family resources to finance a higher education. Hence the disparity in educational attainment by race can be explained by the fact that minority families are concentrated near the bottom of overall family income distribution and hence face short-term liquidity constraints (Cameron and Heckman 1999, 1). Historically, most studies focused on the supply side of the market for a college degree, that is, the price of higher education. Corazzini, Dugan and Grabowski (1972) used a Boston data set to examine the determinants of college enrollment. They expected that the price and the opportunity cost of college would have a negative impact on enrollment and that father's level of education and academic achievement would have a positive effect on enrollment. They found that indeed family income is important in determining who enrolls in college. Also they found that high school students from the lowest socioeconomic quartile face a severe admission standard constraint (Corazzini, Dugan and Grabowski 1972, 56-57). Fuller, Manski and Wise (1982) investigate the determinants of postsecondary schooling choices. They are specifically interested in the effects of tuition costs and financial aid. They find the availability of financial aid to be a significant determinant of college attendance (Fuller, Manski and Wise 1982, 485). Similar to Corazzini, Dugan and Grabowski's results, they find that individual ability relative to admission standards determines which college a student chooses (Fuller, Manski and Wise 1982, 488). As is evident in these studies, the cost of college and family income are determinants of college attendance, but some argue it isn't the whole picture.

Heckman and Lochner (2000) assert that although the average “sticker price” tuition levels of public four year institutions rose by 100 percent between 1980 and 1997, the current subsidies to students at such institutions are approximately 80 percent (1, 5). Cameron and Heckman particularly focus on the disparity of educational attainment for blacks, Hispanics and whites. They point out, which is supported by current statistics, that Hispanics have low high school graduation rates (Cameron and Heckman 1999, 2). That is, there is a portion of the Hispanic population that never even gets to the point of facing the possibility of financing an education. Cameron and Heckman use the National Longitudinal Survey of Youth data to estimate how family background, family income, college tuition costs, labor market opportunities and cognitive ability affect age and grade specific schooling transitions. Cognitive ability is viewed as the long-run effect of family and environment on the student. When they do not control for ability, five out of the eleven point gap between black and white college attendance and four out of the seven point gap between Hispanic and white college attendance is due to family income. Once they account for ability, the estimated effects of family income on college attendance become diluted (Cameron and Heckman 1999, 63-68). They also find that family income has a stronger effect on who completes high school than it does on who attends college. Cameron and Heckman conclude that long-term factors such as the family environment are essential to enhancing the abilities and attitudes for college entry (1999, 3).

The determinants of college attendance have been and continue to be scrutinized as economists, sociologists, educators and politicians attempt to define education policies that would achieve increased educational attainment by all groups. The studies discussed

demonstrate that it is important to provide access to higher education and possibly even more important to properly prepare individuals for college.

Empirical Model: College Attendance

I look at the determinants of college attendance for the top ten percent of high school seniors in the THEOP sample, as well as the rest of the THEOP seniors. That is, I examine what influences the student to choose the functioning to attend college. I assume, based on previous literature on college attendance, that college attendance is a function of individual characteristics, individual academic characteristics, perceived choice set, family characteristics, high school characteristics and the availability of financial aid in the form of loans or scholarships. I use a probit model illustrated in the following equation.

$$\begin{aligned} \Pr(\text{collegeattendance}_i = 1) = \theta[\beta_0 + \beta_1 \text{econdisad}_i + \beta_2 \text{rank}_i + \beta_3 \text{gradplan}_i + \beta_4 \text{exp_ects}_i \\ + \beta_5 \text{momcollege}_i + \beta_6 \text{dadcollege}_i + \beta_7 \text{momprest}_i + \beta_8 \text{dadprest}_i + \beta_9 \text{language}_i \\ + \beta_{10} \text{parentloan}_i + \beta_{11} \text{indloan}_i + \beta_{12} \text{scholarship}_i + \beta_{13} \text{male}_i] \end{aligned}$$

where θ is the standard cumulative normal probability distribution. The dependent variable is college attendance. The explanatory variables are the percent economically disadvantaged students in high school, class rank, college prep graduation plan, expecting to go to college, parent education level, parent occupational prestige score, second language spoken at home and the availability of financial aid in the form of loans or scholarship. Based on previous economic literature, there should be some socioeconomic variable in this equation such as family income. Unfortunately, the THEOP data set I am working with does not have an income variable. The data set does have a prestige score for parent occupation that can be used as a socioeconomic variable. I included the second

language spoken at home variable as a portion of the population analyzed is Mexican and there are many areas in Texas where you do not necessarily need to speak English in day to day life. Hence, there could be a negative effect on college attendance both because of individual English skills or the lack of information on the law, college and financial aid to an individual or family.

Table 13 provides summary statistics of the variables used. The variable means for percent economically disadvantaged students in high school, class rank, participation in college prep curriculum, expecting to go to college, parent education level and gender were discussed in the first section (Table 10). The variables added are college attendance, parent occupational prestige scores, second language spoken at home, parent took out loan for college, student took out loan for college and student received scholarship for college. Parent occupational prestige scores are continuous variables where the higher the number the more prestigious the job and hence the better the pay. It is evident that for mothers, Mexican and Hispanic mothers have the lowest average scores, while for the men, black men have the lowest score. The highest average occupational prestige scores among men are for white and Asian men. For women, white women have the highest score followed by black women. Top ten percent ranking students had the highest average of college attendance, with a mean of 0.93, with Asians following with an average at 0.88. For all other races the mean is between 0.70 and 0.79, except the Mexican and Hispanic college attendance means which are significantly lower at 0.59 and 0.62 respectively. As expected, the second language spoken at home variable mean is relatively high for Mexicans, Hispanics and Asians. Of all the financial aid variables, student receiving scholarship for college has a high mean for top ten percent ranking

students. The averages for whites, blacks and Asians are also relatively higher. For both the parent loan and student loan variables, blacks have the highest average, followed by whites.

I expect the percent economically disadvantaged students in high school to have a negative impact on attending college, as the higher the number the poorer the school. The class rank variable should likewise have a negative impact on college attendance, as the higher the number the lower the academic achievement. Participation in college prep curriculum, wanting to go to college and parents having some college completed should have a positive effect on college attendance. The occupational prestige scores should also have a positive effect on college attendance. The second language spoken at home could have either a positive or negative effect, potentially dependent on race/ethnicity. The highest means for parent and student loans are for blacks, while the highest mean for receiving a scholarship is for those ranked in the top ten percent. I use the `dprobit` command in Stata to run the regression on the entire sample. The `dprobit` command reports the marginal effect rather than coefficients. That is, it reports the change in the probability for an infinitesimal change in independent continuous variables and the discrete change in the probability for dummy variables. The results for the sample are in Table 14.

Table 13 – Summary Statistics – Mean of Variables by Race

Variables	All	Top10	White	Black	Mexican	Hispanic	Asian	Other
Student attending college	0.71	0.93	0.76	0.73	0.59	0.62	0.88	0.72
Father's 1989 Occupational Prestige Score	36.11	43.28	43.43	28.70	29.31	32.98	40.07	33.97
Mother's 1989 Occupational Prestige Score	30.99	33.62	35.61	33.79	23.39	24.94	31.34	28.56
Second language spoken at home	0.41	0.39	0.07	0.16	0.86	0.88	0.89	0.50
Parent took out loan for college	0.15	0.21	0.17	0.22	0.09	0.12	0.15	0.13
Student took out loan for college	0.17	0.23	0.17	0.25	0.15	0.14	0.13	0.21
Student received scholarship for college	0.37	0.72	0.41	0.41	0.27	0.30	0.42	0.37
Sample size	4,224	755	1,731	718	1,119	209	306	141

Table 14 – Probit Regression for THEOP Senior Participants in Follow-up Survey by Race/Ethnicity Marginal Effect of Variables Influencing College Attendance

Dependent Variable: College Attendance	Df/dx
% of economically disadvantaged students in high school	-0.00181** (0.000379)
Class rank as a percentage	-0.00136** (0.000218)
College prep graduation plan	0.08507** (.0162401)
Student wanted to go to college	0.287** (0.0208)
Father has some college	0.0251** (0.00512)
Mother has some college	0.0186** (0.00540)
Father's 1989 Occupational Prestige Score	0.000632 (0.000330)
Mother's 1989 Occupational Prestige Score	0.000079 (0.000317)
Second language spoken at home	0.0156 (0.0220)
Parent took out loan for college	0.102** (0.0188)
Student took out loan for college	0.136** (0.0156)
Student received scholarship for college	0.244** (0.0135)
Male	-0.0448** (0.0143)
Race/Ethnicity (Relative to White)	
Black	0.019 (0.0209)
Mexican	0.0531 (0.0247)
Hispanic	0.0174 (0.0351)
Asian	0.0878** (0.0278)
Other race	0.0474 (0.0387)
Observations	4224
Pseudo R ²	0.3503

Zero failures and successes completely determined. Standard errors in parentheses. * significant at 5%; ** significant at 1%

First, the percent of economically disadvantaged students in high school has the correct negative sign and is significant at the one percent level of significance. An increment of one to the variable economically disadvantaged students in high school decreases the probability of college attendance by 0.181 percent. The class rank variable is also the expected negative sign and significant at the one percent level. An increase of one unit to the class rank variable negatively affects the probability of college attendance by 0.136 percent. Participation in a college prep curriculum increases the probability of college attendance by 8.507 percentage points. Also, the variable for student aspiration to go to college increases the probability of college attendance by 28.7 percent. Both of these variables are significant at the one percent level.

Parents having some college completed also have a significant positive impact on the probability of going to college. A father having some college increases the probability by 2.51 percent, while a mother having some college increases the probability by 1.86 percent. The occupational prestige score is not significant for either parent. The second language spoken at home variable is also insignificant.

As for the financial aid variables, all three are significant at the one percent level. A parent taking out a loan increases the probability of college attendance by 10.2 percent, while the student taking out a loan increases the probability by 13.6 percent. Receiving a scholarship increases the probability of attending college by 24.4 percent. The gender variable shows that being male decreases the probability by 4.48 percent. Looking at the race/ethnicity variables, it is evident that relative to whites, Asians have a greater probability of college attendance by 9.8 percent. None of the other races/ethnicities have significant estimates.

A student expecting to go to college, which I also interpret as the student perceiving college in their choice set, has the largest impact on actual college attendance at 28.7 percent. I see this as an important result because it suggests that a student's aspiration and perception of opportunity has a significant impact on the realization of the goal. Although the scholarship variable logically also has a large impact on the probability of going to college, the student's desire to attend has a larger impact. The availability of loans, whether to the parent or student also has a clear positive impact on going to college. This result is expected as tuition is costly and the previous literature on the determinants of college attendance supports this result. Also, not surprisingly, only Asians have a greater probability of college attendance relative to whites.

The results of the same probit separated by race and top ten percent status are in Table 15. The first column has the results for the entire sample without accounting for race/ethnicity.

The first column is the probit regression run for the entire population. The results are similar to those in Table 14, except for the second language spoken at home variable which is now significant and increases the probability of college attendance by 5.06 percentage points. It is the only column where this variable is significant.

Table 15 – Probit Regression for THEOP Senior Participants in Follow-up Survey by Race/Ethnicity
Marginal Effect of Variables Influencing College Attendance

Dependent Variable: College Attendance	All	Top 10%	White	Black	Mexican	Hispanic	Asian	Other
% economically disadvantaged students in high school	-0.00172** (0.000344)	-0.000514 (0.000267)	-0.00256** (0.000697)	-0.00119 (0.000856)	-0.00150** (0.000740)	-0.00179 (0.00174)	-0.00103 (0.000810)	-0.00138 (0.00233)
Class rank as a percentage	-0.00137** (0.000216)	-	-0.00127** (0.000313)	-0.000777 (0.000517)	-0.00118** (0.000506)	-0.00197 (0.00121)	-0.000801** (0.000390)	-0.00215 (0.00136)
College prep graduation plan	0.0876** (0.0163)	0.00423 (0.0171)	0.111** (0.0241)	0.0728 (0.0375)	0.0821** (0.0370)	0.196** (0.0825)	-0.0117 (0.0172)	0.102 (0.100)
Student wanted to go to college	0.290** (0.0208)	0.170** (0.0637)	0.309** (0.0363)	0.293** (0.0509)	0.303** (0.0360)	0.225** (0.0919)	0.170 (0.0946)	0.284** (0.129)
Father has some college	0.0250** (0.00510)	0.00543 (0.00430)	0.0264** (0.00700)	0.0188 (0.0119)	0.0241 (0.0131)	0.0391 (0.0275)	0.00504 (0.00584)	-0.0227 (0.0327)
Mother has some college	0.0180** (0.00539)	0.00601 (0.00434)	0.0191** (0.00755)	0.0156 (0.0122)	0.0201 (0.0134)	0.0485 (0.0293)	1.18e-05 (0.00569)	0.0737** (0.0352)
Father's 1989 Occupational Prestige Score	0.000573 (0.000326)	-2.63e-05 (0.000270)	0.000728 (0.000488)	-0.000347 (0.000706)	0.000458 (0.000802)	0.00145 (0.00171)	0.000481 (0.000387)	0.00151 (0.00196)
Mother's 1989 Occupational Prestige Score	5.89e-05 (0.000317)	0.000148 (0.000250)	-0.000204 (0.000440)	0.000381 (0.000680)	0.000312 (0.000807)	0.000175 (0.00172)	-0.000108 (0.000366)	0.000724 (0.00207)
Second language spoken at home	0.0506** (0.0155)	0.0162 (0.0111)	-0.00362 (0.0371)	-0.0127 (0.0441)	0.0691 (0.0535)	0.121 (0.134)	0.000897 (0.0275)	0.0282 (0.0902)
Parent took out loan for college	0.103** (0.0188)	-0.0100 (0.0171)	0.0569** (0.0275)	0.0802** (0.0363)	0.273** (0.0427)	-0.0374 (0.152)	0.0136 (0.0232)	-
Student took out loan for college	0.135** (0.0157)	0.0197 (0.0110)	0.0502 (0.0264)	0.175** (0.0286)	0.220** (0.0412)	0.354** (0.0526)	0.0330 (0.0194)	0.242** (0.0647)

Table 15 Continued

Dependent Variable: College Attendance	All	Top 10%	White	Black	Mexican	Hispanic	Asian	Other
Student received a scholarship for college	0.244** (0.0135)	0.124** (0.0266)	0.165** (0.0204)	0.296** (0.0302)	0.367** (0.0304)	0.356** (0.0638)	0.106** (0.0304)	0.276** (0.0859)
Male	-0.0439** (0.0142)	-0.0107 (0.0120)	-0.0362 (0.0201)	-0.0765** (0.0338)	-0.0565 (0.0334)	0.0277 (0.0790)	-0.00556 (0.0174)	0.0181 (0.0912)
Observations	4224	755	1731	718	1119	209	306	123
Pseudo R ²	0.3484	0.3411	0.3483	0.3719	0.3127	0.3834	0.4011	0.4252

Zero failures and successes completely determined. Standard errors in parenthesis. * significant at 5%; ** significant at 1%

The second column contains the estimates for only students who graduated in the top ten percent of their high school class. I separate this group out as they were guaranteed admission into college. Hence I wanted to specifically look at this group to see what determined their college attendance. Evident in the results, only two variables are significant; the student expecting to go to college and the student receiving a scholarship for college. Expecting to go to college or perceiving college as a viable option in the capability set increases the probability of attending college by 17 percent. Finally, receiving a scholarship increases the probability of college attendance by 12.4 percent. The magnitude of the results for the top ten percent relative to all of the other categories, except for Asians, is quite small. This suggests that in fact the Top 10 Percent law may be the determining factor for those students. The breakdown of top ten percent students by race/ethnicity is: 50 percent white, 10 percent black, 20 percent Mexican, two percent Hispanic, 16 percent Asian and two percent other race. Looking at the estimates in all categories, if the law was not the determining factor, I would have expected to see a greater number of significant variables, specifically participation in a college prep curriculum and parent education. The result for the top ten percent is supported by the results in Domina (2007). The Top 10 Percent law together with scholarship programs has a positive impact on college access.

As for the results by race/ethnicity, reported in Table 15, the percent of economically disadvantaged students in a high school decreases the probability of attending college. The result is significant for whites and Mexicans. For whites, an increase of one unit to percent economically disadvantaged students in high school decreases the probability of attending college by 0.256 percent. For Mexicans, the

probability decreases by .15 percent. Class rank has the correct negative sign and is significant for whites, Mexicans and Asians. More specifically, an increase of one unit to the class rank variable negatively affects the probability of college attendance by approximately 0.1 percent for each group. Completing a college prep graduation plan increases the probability of attending college significantly for whites, Mexicans and Hispanics by 11.1 percent, 8.21 percent and 19.6 percent, respectively. The college aspiration variable is significant for all groups except for Asians. Wanting to go to college or perceiving college as a viable option increases the probability of attending college for whites (by 30.9 percent), for Mexicans (by 30.3 percent), for blacks (by 29.3 percent), for other race (by 28.4 percent), and for Hispanics (by 22.5 percent). The parent education variables are only significant for whites and other race. A father having some college increases the probability of college attendance for whites by 2.64 percent. A mother having completed some college increases the probability of college attendance for whites by 1.91 percent and 7.37 percent for other race (although the sample size is very small). The prestige score variables and the second language spoken at home variable are insignificant. Parents' taking out a loan for the student increases the probability of college attendance by 27.3 percent for Mexicans, 8.02 percent for blacks and 5.69 percent for whites. Meanwhile, the student taking out a loan increases the probability of college attendance by 35.4 percent for Hispanics, 24.2 percent for other race, 22 percent for Mexicans and 17.5 percent for blacks. A student receiving a scholarship variable is significant across race/ethnicity. Receiving a scholarship increases the probability of college attendance by 36.7 percent for Mexicans, 35.6 percent for Hispanics and 29.6 percent for blacks, 27.6 percent for other race, all of which are significantly larger than

the 16.5 percent for whites and 10.6 percent for Asians. Being a black male significantly decreases the probability of attending college by 7.65 percent.

The results for the Asian group are not robust, as was the case for the perceived capability model. Likewise, the other race category does not offer much insight. For the other race category, the small sample size is more than likely the problem. Asians are more likely than any other group to attend college, which may have affected significance of the explanatory variables. Further, the Asian group also has a relatively small sample size. On that note, the Hispanic sample size is also relatively small.

Academic variables, such as class rank and participation in a college prep curriculum also increase the probability of going to college particularly for whites, and for Mexicans at a smaller magnitude. Overall the estimates for the academic variables have a smaller impact on increasing the probability of college attendance, than student aspiration and the availability of financial aid (in the form of scholarships or loans). I found it surprising that parent occupational prestige score and parent education did not have more robust results. I tried excluding occupational prestige score, as well as using the occupational prestige score as a dummy (equal to one if the score was 50 or above), neither of which produced a significantly different result. Also, I expected that the percent of economically disadvantaged students in the high school would have had a greater magnitude and been significant for blacks and Hispanics. Since both the occupational prestige score and the percent economically disadvantaged students in high school serve as proxies for socioeconomic status (for family and community, respectively), the results suggest that socioeconomic status may be less relevant for minority groups than what previous literature indicates.

As Mexicans are the largest minority in Texas and growing, followed by blacks, those results are most relevant. For both groups, the variable that stands out is receiving a scholarship. This suggests that the continuation of such scholarship programs as the Longhorn and Century scholarships that are given to students from the poorest high schools is very important in allowing for those students to go to college. The availability to take out loans for college is also important, which considering the cost of tuition is logical. Further, whether the loan is available to the individual student rather than parent loans appears to have a greater positive impact on minorities than whites. I look at the financial aid variables as what was available to the student in terms of financial aid, but the questions asked in the survey ask whether the parent or student took out a loan, rather than what was available to the student, suggesting the financial aid variables are endogenous to the model. The Longhorn and Century Scholarships are specific to certain schools, so there is a chance that a student anticipated receiving the scholarship as part of the college enrollment decision. Further, students generally need to know before deciding to go to college how they will pay for it. For example, is the individual willing to take out a loan? Ultimately, the estimates are likely overstated as the financial aid variables I use would likely have a stronger impact on where the student chose to go to college rather than the choice to go to college. The college aspiration variable also stands out. A student perceiving college as a choice has a significant positive impact. Although it seems a logical connection that if a student expected to go to college, they would go to college, the expectation variable is the student's perception of real choices. A student's perception can be influenced (constrained or exaggerated) by a many factors. Hence, this is an important outcome in terms of how it translates into policy. It suggests that creating

policy that makes college a viable option for students regardless of race can increase college attendance. Creating opportunity along with easing financial constraints, based on the results of this study, would increase college attendance, especially for minorities.

Empirical Model: Propensity Score Matching

In order to answer the question of whether the Texas Top 10 Percent law provides students with measurably greater freedom to realize the educational outcomes they desire, one needs to know what those students would do in the absence of the law. To create a “control group” for comparison, I use the National Education Longitudinal Study: 1988-2000 (NELS) data set to create a similar population that is not affected by the law.

Propensity Score Matching: General Framework

I use propensity score matching (PSM) to create a control group with which I can measure the effect of the Texas Top 10 Percent law. Propensity score matching has become increasingly popular in both medical trials and in the evaluation of economic policy as it reduces the bias in the estimation of treatment effects with non-randomized observational data sets (Becker and Ichino 2002, 358). The propensity score is estimated using a standard probability model. The score is then used to pair the treatment group to the control group. This method matches based on observed variables and excludes the outcome variable (Dehejia and Wahba 2002, 161). The basic idea of matching on propensity scores is to compare the outcome of a treated and a control group that is as similar as possible using a single index of all the pre-treatment characteristics.

To better understand the use of propensity score matching, one must understand the evaluation problem. Following Caliendo and Kopeinig (2005), I begin by explaining

the standard model of analyzing the impact of a treatment on the outcome of an individual. Assuming a binary treatment, $D_i = 1$ if individual i receives the treatment and zero otherwise. The potential outcome can be defined as $Y_i(D_i)$ for each individual i where $i = 1, \dots, N$. The treatment effect for individual i can be written as:

$\tau_i = Y_i(1) - Y_i(0)$. That is, the treatment effect is equal to the potential outcome of the treated minus the potential outcome of the not treated. The problem is that $Y_i(0)$, the counterfactual potential outcome is unobserved (Caliendo and Kopeinig 2005, 2-3). As τ cannot be estimated one has to focus on average treatment effects of the population. Specifically, the parameter of interest is the average treatment effect on the treated (ATT) as I am interested in the outcome the treated group would have experienced, on average, had they not had the treatment. The ATT can be defined as:

$$\tau_{ATT} = E(\tau \mid D = 1) = E[Y(1) \mid D = 1] - E[Y(0) \mid D = 1].$$

Again, the counterfactual mean is not observed so one must choose a substitute in order to estimate the ATT. One could use the mean outcome of untreated individuals, $E[Y(0) \mid D = 0]$, but there would likely be a self-selection bias. That is, it is likely that the components that determine the treatment also determine the outcome. Formally the selection bias for ATT is:

$$E[Y(1) \mid D = 1] - E[Y(0) \mid D = 0] = \tau_{ATT} + E[Y(0) \mid D = 1] - E[Y(0) \mid D = 0].$$

The parameter τ_{ATT} is identified by: $E[Y(0) \mid D = 1] - E[Y(0) \mid D = 0] = 0$ in an experiment where the treatment is random. In experiments where the treatment is not random there is a need to identify assumptions to solve the self-selection problem (Caliendo and Kopeinig 2005, 3). One such assumption is the conditional independence

assumption which states that for a given set of observable covariates that are not affected by the treatment, potential outcomes are independent of treatment assignment. More formally, the conditional independence assumption states: $Y(0), Y(1) \perp\!\!\!\perp D \mid X, \forall X$, where $\perp\!\!\!\perp$ denotes independence. Hence the assumption is that selection is based on observable characteristics. The variables that influence treatment assignment and outcome are observed by the researcher. A further problem arises with the dimensionality of vector X . If the vector X contains s dichotomous covariates, then the number of possible matches is 2^s . The solution, suggested by Rosenbaum and Rubin (1983), is to use a balancing score. If potential outcomes are independent of treatment conditional on covariates X , then potential outcomes are also independent of treatment conditional on balancing score, $b(X)$. The probability of an individual to receive treatment conditional on observed covariates is one such balancing score called the propensity score: $P(D = 1 \mid X) = P(X)$. Hence the conditional independence assumption based on propensity score is: $Y(0), Y(1) \perp\!\!\!\perp D \mid P(X), \forall X$. A further necessary assumption is the common support condition: $0 < P(D = 1 \mid X) < 1$. This condition ensures that individuals with the same covariate values have a positive probability of being both in the treatment and control groups (Caliendo and Kopeinig 2005, 4). Assuming the conditional independence assumption and the common support condition holds, the propensity score matching (PSM) estimator can be written as:

$$\tau_{ATT}^{PSM} = E_{P(X) \mid D=1} \{E[Y(1) \mid D = 1, P(X)] - E[Y(0) \mid D = 0, P(X)]\}.$$

That is the propensity score matching estimator for the average treatment effect on the treated is the mean difference in outcomes over the common support weighted by the propensity score distribution of the treated group (Caliendo and Kopeinig 2005, 4).

National Education Longitudinal Study: 1988 – 2000

The National Center for Education Statistics (NCES) of the United States Department of Education began the National Education Longitudinal Studies program to collect and disseminate data for purposes of better understanding students and the educational system (Curtin, Ingels, Wu and Heuer 2002, 2). The program was to study the educational development of students and the factors that influence that development, so to have information with which to make education policy. There currently are four studies or longitudinal data sets that are part of the program: the National Longitudinal Study of the High School Class of 1972 (NLS-72), High School and Beyond (HS&B), National Education Longitudinal Study of 1988 (NELS:88) and the Education Longitudinal Study of 2002 (ELS:2002).

The data sets together cover four decades of educational experiences and the progression from education to the labor market. The NLS-72 began with twelfth graders in 1972 and followed the subjects for twenty-six years. HS&B began in 1980, interviewing tenth graders, with follow-up interviews every two years for twelve years. HS&B provided information about the high school experience in addition to postsecondary education and labor market outcomes. NELS:88 followed subjects beginning in eighth grade for twelve years. The ELS:2002 data is currently in the process of being collected. The first wave of ELS:2002 was of tenth graders. Since then there

have been two follow-ups, the most recent of which was released to the public in January of 2008. For a summarized chart of the National Education Longitudinal Study research design, see the appendix. Of all the data sets, I chose to use the NELS:88 data. First, it was the most recent data set available with comparable variables. The data contains student or dropout responses, parent, teacher, administrator responses and cognitive test scores (Curtin, Ingels, Wu and Heuer 2002, 12). The NELS:88 data has a better Hispanic representation than other data sets. Further, race/ethnicity was broken down so that I could specifically have a greater Mexican American population with which to match THEOP data.

In the spring semester of 1988, NCES initiated a national longitudinal study of 24,599 eighth graders attending 1,052 schools (815 public and 237 private schools) across the United States. A sample of those students was then re-surveyed in 1990, 1992, 1994 and 2000. With each follow-up, cohorts were augmented through a process called “freshening.” Dependent on the year, data was also collected from parents, teachers and schools. I use the public-use NELS data, focusing on the 1992 data where students are seniors and the 1994 data where students, assuming they went to college, are sophomores. The focus of these two follow-ups was to address issues of employment and postsecondary access, which is relevant to my study (Curtin, Ingels, Wu and Heuer 2002, 6). The 1992 survey asked students about academic achievement, their perceptions about their school, curriculum and themselves, their aspirations for the future, family environment and social relations. In order to have a nationally representative sample, freshening the data added 279 new subjects for a final sample size of 20,923 (Curtin, Ingels, Wu and Heuer 2002, 14). The third follow-up (NELS:88/94) specifically focused

on academic achievement, perceptions of school and job, work experience or training and family environment (Curtin, Ingels, Wu and Heuer 2002, 15). Table 16 below provides a comparison of the questions asked in the THEOP survey and the NELS survey that I use to match the samples. The THEOP survey questions are more specific than the NELS questions. The NELS covers a much greater time span and hence has a much wider range of questions. The questions were chosen based on the variables needed in the model described in the “Implementing Propensity Score Matching” section and whether the questions were viable for comparison purposes.

Table 16 – Comparison of Questions Asked in the THEOP and NELS Questionnaires

THEOP	NELS
Are you a male or female?	What sex are you?
What term best describes your racial and ethnic origin?	What is your race?
At the most recent grading period, what was your grade in each of the following subjects: English or Language Arts, Mathematics, History and Social Science, and Science	What is your average grade in: English, Mathematics, Social Studies and Science?
What do you expect will be your primary activity in the fall after you leave high school?	Do you plan to go on to school right after high school?
What was the highest degree or level of school that your mother or female guardian has completed?	How far in school did your parents go? Mother or female guardian and father or male guardian
What was the highest degree or level of school that your father or male guardian has completed?	
What kind of work is your mother or female guardian doing?	Which of the categories below comes closest to describing your mother’s (or female guardian’s) current job?
What kind of work is your father or male guardian doing?	Which of the categories below comes closest to describing your father’s (or male guardian’s) current job?

How many of your brothers and sisters (including adopted, step- or half-) left high school before graduating?	How many of your brothers and sisters left high school before graduating?
Is a language other than English spoken at home?	Is any language other than English spoken in your home?
Are you currently attending school or on summer break and enrolled for next semester?	What is your highest post secondary education level? (Allows for current enrollment as possible answer.)

The NCES descriptive summary report of the NELS:88/94 provides some insight into the sample of students surveyed. The report focuses specifically on access to postsecondary education and choice by gender, race/ethnicity and socioeconomic status. By 1994, 81 percent of eighth graders had received a high school diploma, while another six percent had GED certification. In 1988, 66 percent of eighth graders expected to attain at least a bachelor's degree. By 1992, only 61 percent of that eighth grade cohort expected to attain a bachelor's degree or higher. A greater percentage of females than males expected to obtain a bachelor's degree. In the spring of 1992, approximately 40 percent of 1988 eighth graders had not applied to any postsecondary institution, suggesting that those who had not expected to go on to college, never even tried to apply. By 1994, approximately 63 percent of the eighth grade cohort had attended some type of postsecondary institution. Further, about 71 percent of the cohort who attended a four-year university indicated that the institution they attended was either their first or second choice. More Asians and Pacific Islanders who expected to go to college, graduated from high school and enrolled in college by 1994 than any other racial/ethnic group. Blacks enrolled in private four-year institutions at comparable rates to Asians and whites. Hispanics in the cohort were more likely than any other group to enroll in a two-year

public institution. Not surprisingly, students in the highest socioeconomic status quartile had a higher rate of college going expectations, higher graduation rates, applied in greater percentages to postsecondary institutions and had a smaller percentage of delayed entry into postsecondary education.¹⁴ Aside from the studies prepared by the NCES using the NELS:88 data, there are a vast number of studies covering a wide range of topics across many disciplines that have used this data set.

Implementing Propensity Score Matching

In implementing propensity score matching there are various choices that need to be made. First, one must choose between a logit and probit model for estimating the propensity score. According to Caliendo and Kopeinig (2005), in the case of a binary treatment either can be used as both models yield similar results (5). Using my data, I found that the results of the logit and probit were similar and I ended up using the probit for consistency with the rest of the study. Matching is based on the probability of being treated, in this case being in the top ten percent, creating a control group as similar as possible to the treated group. The outcome of interest is then compared for each group identifying the impact of the treatment. Hence, another important decision is the choice of variables used for the study. The variables used should influence simultaneously receiving the treatment as well as the outcome of interest. The variables should be based on theory, previous research and institutional settings (Caliendo and Kopeinig 2005, 6). The treatment is attaining top ten percent status (which guarantees college admission). The variables chosen hence should help to explain participation in the treatment or a

¹⁴ National Education Longitudinal Study 1988-1994, Descriptive Summary Report, <http://nces.ed.gov/pubs/web/96175hi.asp>

student's choice to perform well academically. The explanatory variables I chose are: race, gender, grade in English, math, social science, history and science, perceived choice set includes college, parent attended college, parent occupational prestige code, whether any siblings dropped out of high school and whether a second language is spoken in the home. I chose grades in English, math, social science, history and science as they reflect academic achievement in individual subjects. Further, I include the variable measuring whether the student perceives college in their choice set as that would influence how hard a student would work in high school. Parents having completed some college and whether a sibling dropped out of high school are used to control for family environment that could influence academic achievement. I include the second language spoken in home variable which I believe could have a potentially negative impact on academic achievement because of the lack of assimilation specifically for the Mexican American population. Finally I include a race and gender variable as there are differences in academic attainment by group as demonstrated in the literature. The outcome variable is whether if the individual expected to go to college, they did or did not. Statistical significance of variables when running the model helped to determine which variables should be kept.

The THEOP data set does not have a specific socioeconomic status variable (SES), such as income, or the SES variable contained in the NELS data set. THEOP does have a parent occupational prestige score that theoretically could be used as a SES variable. I categorized all occupations in both data sets according to the 1980 Census Current Population Survey Occupation Codes. I then separated out the occupations that had a prestige score greater than fifty, creating a dummy variable for basically high

income or low income. When running the regression I found that the created SES variables were insignificant. Although I would prefer to have a SES variable, it would likely influence the quality of schooling more so than academic achievement. Further, unlike in the determinants of college attendance literature where socioeconomic status or financial aid variables are significant, the probability of being in the top ten percent of a high school graduating class is estimated. I am not suggesting that socioeconomic status is irrelevant, but rather that it may not play as prominent a role. Another data constraint was the time difference between the NELS data set and the THEOP data set. To account for this I tried using a variable in the NELS data that gave the percent of 1991 -1992 graduates in a two and four year college to compare to percent of high school graduates going directly to college in 2002 in Texas. The code for the NELS variable was not in percentages and hence could not be used for matching. According to the National Center for Higher Education Management Systems, the percent of high school graduates going directly to college in 1992 was 52.5 percent increasing only by approximately one percent to 53.4 percent in 2002. Although there are likely differences over time by race, the estimates should not be greatly overestimated due to changes in college going behavior.

The results of the probit model estimating the propensity score are in Table 17. The first column represents the entire sample. Most of the parameters are significant. Academic achievement represented by individual grades increases the probability of treatment, as does a parent having some education. The sibling dropping out of high school should have had a negative sign and the second language spoken at home has an unexpected positive effect. The results are reported also by race. I run two other

specifications of the model and report the results in the Appendix. In the first specification I drop the sibling left high school variable and the second language spoken at home variable. I add in the percent of students in the high school enrolled in Advanced Placement courses to account for high school environment. I expected the variable to positively impact the probability of being in the top ten percent. In the simplified specification, the Psuedo R^2 decreases and the new variable, percent of students enrolled in Advanced Placement courses is negative and not significant in the results by race. In the other specification of the model, I use all the variables presented in Table 17 and add the percent of students enrolled in Advanced Placement courses. Again, the variable is not significant, although the Psuedo R^2 increases slightly. The results of those estimations are in the Appendix.

Table 17 – Estimates from Probit Estimation of Propensity Score

	All	White	Black	Mexican	Hispanic	Asian
Male	-0.0881 (0.0480)	-0.1138 (0.0661)	-0.0553 (0.1689)	-0.1112 (0.1402)	-0.2992 (0.3389)	-0.0542 (0.1341)
English grade	0.7225** (0.0615)	0.8357** (0.0868)	0.3707 (0.2348)	0.8906** (0.1810)	1.7449** (0.4063)	0.7118** (0.1722)
Social science/history grade	0.6386** (0.0625)	0.5743** (0.0888)	1.0758** (0.2027)	1.0775** (0.1703)	0.0742 (0.4235)	0.2009 (0.1809)
Math grade	0.2634** (0.0603)	0.2560** (0.0789)	0.8040** (0.2358)	0.5480* (0.1991)	-1.1679* (0.5057)	0.4286* (0.1739)
Science grade	0.2072** (0.0631)	0.1802* (0.0835)	0.3720 (0.2351)	0.5115* (0.1989)	0.6980 (0.4010)	0.2337 (0.1820)
Expected to go to college	0.4517** (0.0787)	0.2343 (0.1131)	0.6390* (0.2593)	0.4290* (0.1769)	0.3317 (0.4203)	0.7497* (0.3534)
Mother has some college	0.0440* (0.0179)	0.0898** (0.0248)	0.1211* (0.0605)	0.0349 (0.0587)	-0.0032 (0.0990)	0.0222 (0.0482)

Father has some college	-0.0182 (0.0165)	0.0449* (0.0228)	-0.0220 (0.0585)	0.0867 (0.0535)	0.1228 (0.0973)	-0.0902 (0.0485)
Sibling dropped out of high school	0.1782* (0.0865)	0.1102 (0.1400)	0.3897 (0.2349)	-0.0328 (0.1949)	-0.2817 0.5974	0.2054 (0.3303)
Second language spoken at home	0.4775** (0.0493)	-0.2450 (0.1273)	0.2835 (0.2547)	0.2570 (0.1884)	-0.1892 0.3569	0.5885* (0.2345)
Constant	- 2.7103** (0.0929)	- 3.0846** (0.1388)	- 2.7409** (0.3106)	- 2.4516** (0.2772)	- 2.7537** (0.5892)	- 2.6034** (0.4332)
Number of observations	9742	6968	757	853	381	670
Pseudo R ²	0.3047	0.3258	0.3553	0.4769	0.3858	0.2218

Outcome variable: Realization of college expectation. Standard errors in parenthesis. * significant at 5%; ** significant at 1%

The next step was to determine which matching algorithm should be used.

Various matching algorithms have been proposed in the literature, some of which are, Nearest Neighbor Matching, Radius or Caliper Matching, Stratification Matching and Kernel Matching. Nearest neighbor matching matches treated individuals to control individuals based on the closest propensity score. The nearest neighbor approach generally increases variance while decreasing bias. Nearest neighbor matching can be done with or without replacement. That is, if matched with replacement a control individual may be used more than once as a match. Allowing for replacement decreases the bias and increases the average quality of matching (Caliendo and Kopeinig 2005, 9). The difference of each matched pair is computed and the average of all those differences is the ATT. When the closest neighbor is far away, there is a risk of bad matches. One can impose a caliper, or in other words, put a maximum constraint on propensity score distance, to avoid bad matches. Caliper matching can provide better quality matching but

can result in increased variance of estimates if fewer matches are performed. A drawback is that there is no a priori way of figuring out the appropriate caliper (Caliendo and Kopeinig 2005, 10). Further, one can use radius matching which allows for the researcher to use all observations in the radius of the caliper. Likewise, using radius matching may provide better estimates as it allows for more good matches decreasing variance, assuming they are available (Dehejia and Wahba 2002, 153-154). Another matching algorithm is stratification matching. The idea here is to create strata or subgroups according to balanced propensity scores. That is, the researcher creates groups of control and treated observations with matched propensity scores. Within each interval or strata, the average outcome is computed and then the average of each strata weighted by each strata is computed to find the ATT (Esquivel and Huerta-Pineda 2006, 20). A drawback of stratification matching is that it discards observations in intervals where either treated or control units are missing (Becker and Ichino 2002, 361). Kernel matching differs from the aforementioned algorithms in that rather than matching one treated observation to a counterfactual control observation, this method uses the weighted average of all individuals in the control group to construct the counterfactual outcome. More specifically, treated observations are matched to a weighted average of the control observations. The weights are inversely proportional to the distance between treated and control propensity scores (Esquivel and Huerta-Pineda 2006, 19). Hence, as more information is used to create the counterfactual, variance should decrease. A negative to this approach is that bad matches will more than likely be used, increasing the bias (Caliendo and Kopeinig 2005, 11).

Caliendo and Kopeinig (2005) demonstrate that there is a trade-off between bias and variance regardless of which algorithm is chosen. They do suggest that the researcher try a number of approaches and if the results are similar the choice of approach may not be overly pertinent. Also, they point out that the data and particularly having a greater number of observations increases the possibility of good matches (Caliendo and Kopeinig 2005, 11-12). Once the algorithm for matching is chosen, the researcher must make sure that the treatment and control observations are within the region of common support, the area where there are enough control and treatment observations for comparison. The easiest way to determine the distribution density of the propensity scores is to graph the control and treated groups. Based on the visual analysis, the researcher can determine how to define the common support. The researcher can either, delete observations whose propensity score is higher than the maximum and lower than the minimum propensity score of the opposite group or trim the common support. Trimming consists of defining the common support in accordance with where observations have a positive density propensity score for both the treated and control group (Caliendo and Kopeinig 2005, 12-13). Certain matching methods, such as nearest neighbor and caliper, tend to be in the common support region as they are based on matching only to the closest neighbor. Caliendo and Kopeinig (2005) warn that in estimating the treatment effect, if a large number of observations are dropped because of the common support restrictions, the estimated effect on the remaining individuals may not be representative (14). I report the results of the nearest neighbor and kernel matching algorithms. I use the nearest neighbor algorithm, allowing for replacement and using the trim at 0.01 option for *psmatch2* (which imposes a common support by dropping a percent of the treatment observations at

which the propensity score density of the control observations is the lowest). I compare the nearest neighbor estimates to the kernel estimates to check for consistency in the results.

The covariates for the matched and control groups need to be balanced. Caliendo and Kopeinig (2005) suggest assessing the matching quality using one of the following indicators: the standardized bias, joint significance and pseudo- R^2 , t-test or stratification test (15-16). The *pstest* command in Stata calculates the t-tests for equality of means in the two groups, before and after matching as well as the pseudo- R^2 before and after matching. Further *pstest* calculates the absolute standardized bias before and after matching as well as the reduction in the bias. The bias is the difference of the sample means for both groups as a percentage of the square root of the average of both sample group variances. The standardized bias is given by:

$$SB_{before} = 100 \cdot \frac{(\bar{X}_1 - \bar{X}_0)}{\sqrt{0.5 \cdot (V_1(X) + V_0(X))}} \text{ for before matching and}$$

$$SB_{after} = 100 \cdot \frac{(\bar{X}_{1M} - \bar{X}_{0M})}{\sqrt{0.5 \cdot (V_{1M}(X) + V_{0M}(X))}} \text{ for after matching, where } X_1 \text{ is the mean}$$

and V_1 is the variance in the treatment group and X_0 is the mean and V_0 is the variance for the control group before matching. The subscript M refers to the matched sample (Caliendo and Kopeinig 2005, 15). According to Caliendo and Kopeinig (2005) a bias reduction below three to five percent is sufficient for a good match. Table 18 provides the sample means of the treatment and control groups along with the percent bias. The before match means and percent bias are in parenthesis.

Table 18 – Variable Means and Percent Bias Before and After Matching

Variables	Treated Mean	Control Mean	% Bias
Male	0.37032 (0.37067)	0.36497 (0.47331)	1.1 (-20.9)
Grade in English A	0.74733 (0.748)	0.72995 (0.15091)	4.4 (150.0)
Grade in Math A	.5615 (0.5627)	0.54545 (0.11277)	3.9 (108.1)
Grade in Social Science/History A	0.76738 (0.768)	0.78476 (0.17527)	-4.3 (147.5)
Grade in Science A	0.61096 (0.612)	0.61631 (0.12567)	-1.3 (116.6)
Student wanted to go to college	0.9385 (0.93867)	0.95187 (0.68483)	-3.6 (68.6)
Mother has some college	0.69385 (0.69467)	0.70722 (0.47231)	-2.8 (46.3)
Father has some college	0.74465 (0.744)	0.7607 (0.51123)	-3.4 (49.6)
At least one sibling dropped out of high school	0.06551 (0.06667)	0.06818 (0.11566)	-0.9 (-17.1)
Second language spoken at home	0.38235 (0.384)	0.38102 (0.20941)	0.3 (38.9)

According to Table 18, all the percent bias results after matching are below the three to five percent sufficiency requirement discussed above. Further, as discussed above, the *pstest* command also reports pseudo- R^2 . According to Caliendo and Kopeinig (2005), the pseudo- R^2 should be fairly low after matching, as there shouldn't be a systematic difference in the distribution of covariates between the groups. The pseudo- R^2 of the unmatched sample is 0.314 and 0.002 for the matched sample, suggesting a good match.

The treatment group, provided by the THEOP data set, consists of the students that reported they were in the top ten percent of their graduating class. The number of treatment observations is 750. The control group, provided by the NELS data set contains

8,992 observations available for matching. Table 19 breaks down the treatment and control groups by race after matching.

Table 19 – Matched Sample by Race
(Number of observations and percent of sample)

Race	Treatment (THEOP)	Treatment Percent of Sample	Control (NELS)	Control Percent of Sample
White	375	50	6,593	73
Black	75	10	682	8
Mexican	150	20	703	8
Hispanic	15	2	366	4
Asian	120	16	550	6
Other Race	15	2	90	1

Using the *psmatch2* command in STATA, the Average Treatment on the Treated Effect (ATT) is reported. Table 20 contains the ATT of the entire sample as well as the ATT by race. The outcome variable that I analyze is a dichotomous variable which is equal to one if the student planned on going to college and realized that goal. Hence, the difference between the treated and control means, in the fourth column, can be interpreted as the effect on the treatment group. Standard errors and t-test results are also presented.

Table 20 - Average Treatment on the Treated Effect for Entire Population by Race and Matching Algorithm

	Treated Mean	Control Mean	Difference	S.E.	P-value for Paired T-test
ATT (NN)	0.9253	0.8320	0.0933	0.0239	0.0021
ATT _{white}	0.9380	0.8491	0.0889	0.0297	0.0111
ATT _{black}	0.8971	0.8382	0.0588	0.0770	0.4619
ATT _{mex}	0.8971	0.6985	0.1985	0.0829	0.0335
ATT _{hispanic}	0.8889	0.8889	0	0.1571	--
ATT _{asian}	0.9655	0.9741	-0.0086	0.0310	0.7842
ATT (Kernel)	0.9253	0.8313	0.0940	0.0137	0.0000

ATT_{white}	0.9380	0.8453	0.0927	0.0173	0.0003
ATT_{black}	0.9041	0.7678	0.1363	0.0624	0.0507
ATT_{mex}	0.8954	0.7457	0.1497	0.0661	0.0473
$ATT_{hispanic}$	0.8125	0.8105	0.0020	0.1285	0.9844
ATT_{asian}	0.9655	0.8786	0.0869	0.0353	0.0331

Evident in the column of treated means, the top ten percent of graduating seniors in Texas (the THEOP sample) are on average likely to realize their college goals. The question is whether this is because of the Texas Top 10 Percent law. The control means, represents a matched sample's average outcome in the absence of the law. The difference between the two tells us if there is a positive or negative effect on the treated group and the magnitude of the effect.

The ATT using the nearest neighbor algorithm for the entire group regardless of race, presented in the first row, shows that the treatment, the Top 10 Percent law, increases the probability of realizing one's goal to go to college by 9.33 percentage points. For whites the treatment increases the probability of realizing college aspirations by 8.89 percent. The average treatment effect for treated blacks is 0.0588, suggesting that the treatment increases probability of realizing college aspirations by 5.88 percent. The ATT for Mexicans is 0.1985, that is, treatment increases probability of going to college if student wanted to go to college by 19.85 percent. For the Hispanic sample there is no average treatment effect, as the mean of the control group is the same as the mean of the treated group. The treatment for Asians decreases the probability of realizing college goals by less than one percentage point. The other race category is completely omitted, as there are too few observations (four) in the treated group that fall within the common support region. The paired t-test demonstrates that the means of the two groups are not

equal. The difference in means is significant and positive for the sample as a whole, whites and Mexicans at at least the 95 percent significance level. This result allows for the inference of causality that the treatment increases the treated mean for the overall group, whites and Mexicans.

In analyzing these results, it is important to note that the results do not show the effect of college going behavior, but rather the effect of the Top 10 Percent law on students' realization of the goal to go to college. That is, the results demonstrate whether the Top 10 Percent law provides greater freedom for individuals by allowing students to achieve their goal, in this case, going to college. The largest effect is on the Mexican sample, with an ATT of 0.1985. Hence, the Top 10 Percent law increases the freedom of Mexican students by increasing the probability of realization of college aspirations by 19.85 percent. As Mexicans are the largest minority in Texas, I expected that the law would have the greatest impact on them. The Top 10 Percent law contributes significantly to the freedom of Mexican students. The white Average Treatment Effect on the Treated of 8.89 percent shows that the law has a relatively smaller impact on increasing the freedom of white students. This result is not as surprising, as whites on average have higher college aspirations and college attendance rates.

The results for blacks, Hispanics and Asians are not significant. As I expected a significant result for blacks, I thought that the result for blacks may have been insignificant because black students may tend to prefer out of state colleges, but the data do not support that argument. Texas has many historically black colleges and universities. Today, Texas is home to nine historically black colleges; two are four-year institutions and 7 are two-year institutions. The ATT for blacks may be insignificant if blacks prefer

to go to schools that have a higher representation of their minority group. Further, as the majority of the historically black colleges are two-year institutions, then guaranteed admission is irrelevant. For Hispanics, there is no effect from the Top 10 percent law. Part of the reason may be because of the small sample size. Another contributing factor could be that Hispanic (not Mexican) groups may be more assimilated into society, as I discussed earlier. The Asian result is not surprising as Asians tend to do better than whites both academically and in college going rates. Hence I wouldn't expect the Texas Top 10 Percent law to have an impact on realizing college aspirations for Asians.

Table 20 also reports the ATT using the kernel matching algorithm. The results are consistent with the ATT using the nearest neighbor algorithm. Specifically, the Texas Top 10 Percent law increases the probability of realizing the educational outcome to go to college by 9.4 percent for the entire sample. Further, the law increases the probability of realizing the educational outcome to go to college for whites by 9.27 percent, for Mexicans by 14.97 percent and for Asians by 8.69 percent. The positive result for Asians does not hold under the other specifications and hence may be a function of bad matches in using the kernel algorithm.

Finally, I look at whether using other probit specifications for determining the propensity score changes the ATT results. The ATT is reported in the Appendix following the probit results for each specification. Using the simple model, I find that the law increases the probability of realizing the goal of college attendance significantly only for the entire group and for whites. When I add the variable, percent enrolled in Advanced Placement courses to the original specification, I find very similar results. I use the nearest neighbor matching algorithm allowing for replacement. The impact of the law

is significant and has a greater impact for the whole group, whites and Mexican when I include the percent enrolled in Advanced Placement classes as part of the original specification. Together, these results suggest that I have captured the effect of the law.

The Texas Top 10 Percent law has the greatest impact on Mexican students as the law enhances freedom by increasing the probability of realization of college expectations. The law further has a positive and significant impact on white students' freedom to realize college expectation, although to a lesser degree.

CHAPTER 6

CONCLUSION

The Texas Top 10 Percent law is a law that uniformly grants college admission at a public college or university of choice to the top ten percent of graduating seniors from public schools. I evaluated this law using Amartya Sen's capability approach to see whether the law provided students with greater freedom to achieve educational outcomes. I use a propensity score matching strategy to identify the impact of the law on students. I find that in fact the Texas Top 10 Percent law does increase the freedom of white and Mexican American students by increasing the probability of realization of college expectation.

I placed my study of the Texas Top 10 Percent law within the contexts of the large literature on education, of the emerging literature that attempts to operationalize Sen's ideas, and of the growing literature on the Top 10 Percent law itself. I reviewed the benefits of education, discussing both the private and social rates of return. The literature provides overwhelming evidence that education is beneficial to the individual and society. By using the capability approach I was able to broaden our understanding of the benefits of higher education by focusing on well-being through increased freedom of choice. I then reviewed the history of educational policies in the United States, elaborating on the various legal battles in the attempt to create equality of opportunity. The Texas Top 10 Percent law, a race neutral policy, came out of this debate. I then

reviewed the literature evaluating the many policies that attempt to increase access to education, finding that overall, reducing the cost of college increases college enrollment.

Before evaluating the law using the capability approach, I reviewed other studies that have attempted to use such an approach. I then reviewed the literature that attempts to place education within the capability approach. Finally, using the capability approach, I explored the student capability set, the chosen functioning and specifically whether the Texas Top 10 Percent law increased the freedom to realize one's expectations to go to college.

Limitations of the Study

In examining the capability set and the chosen functioning, I look at all students in the data set. The analysis of student realization of college expectation only evaluates the impact of the law on students in the top ten percent. I limit the study to this group because of the outcome of interest (realization of college expectation). If for instance, the researcher used an outcome variable measuring academic achievement, one could see if the law creates the incentive for students to work harder which could serve to increase their capability set.

There were various data limitations in this study. Most of the data limitations are addressed in the empirical chapter. One of the main limitations was the lack of a simple measure of socioeconomic status which constrained me from having a full discussion of the impact of the law on low income individuals, which is an important factor that is missing in this analysis. Also, having only two years of data limits other possible

outcomes that would be interesting to evaluate, such as the retention rate of top ten percent individuals from low income high schools.

Main Findings and Implications

I find that in the first few years the Texas Top 10 Percent law increased the freedom of particularly Mexican American students by increasing the probability of realization of college expectation by 19.85 percent (or alternatively 14.97 percent). This is an important result as Texas is a minority majority state and college enrollment rates for Hispanics are the lowest relative to all other race groups. I further find that the law increases the probability of realizing the expectation to go to college for whites by 8.89 percent (or alternatively 9.27 percent). A policy, such as the Top 10 Percent law encourages and rewards academic achievement. By doing so, the policy may inherently increase the student's expectations and hence the capability set. Specifically for minorities, the law guarantees college admission which a student can work towards, where as affirmative action policies do not hold that same guarantee.

In examining the choice set of students, I find that for Mexicans ranking in the top ten percent increases the probability of expecting to go to college by 24 percent. This again is an important result because it reinforces the previous findings that the law positively impacts Mexican American students.

Of course, the law is not the only important determinant of the choice set. Taking part in a college prep curriculum has a positive and significant impact for whites, blacks, Mexicans and Hispanics, increasing the probability of expecting to go to college from between 10.3 percent to 19.8 percent. As a college prep curriculum is not a requirement

of receiving the benefit of top ten percent status, I thought that the law might have the unintended side effect of discouraging students from taking difficult classes. This does not appear to be the case. The impact of parent encouragement impact on the expectation to go to college differs across racial groups. A father's encouragement has a greater impact on a white student's expectation to go to college, whereas a mother's encouragement has a greater impact on a Mexican and black student's expectation to go to college. It is interesting that for the Mexican population, the academic variables had a stronger impact than the family encouragement variables that had the greatest impact on whites. That suggests that in forming education policies, we need to better understand how different races respond to different incentives or rewards.

I examine the determinants of the chosen functioning to attend college. I find that for the top ten percent students, the only variables with statistically significant impact are the expectation to go to college and receiving a scholarship. Receiving a scholarship increases the probability of college attendance for all race groups. Another interesting result is that a parent taking out a loan is significant Mexicans, blacks and whites, whereas a student taking out a loan increases the probability of college attendance for Hispanics, Mexicans and blacks. The magnitude of these financial variables are likely overstated, but if interpreted as financial aid options available to the student, they would have a positive impact as suggested by other literature. Finally, the expecting to go to college variable is significant for all races except Asians. This variable represents the student perceiving college as a viable option in her choice set or capability set. This is important because the policy implication suggests that education policies that increase the

choice set of students can have a greater impact than decreasing the cost for those who may have already decided to attend college.

In the Context of Texas

Although my overall findings are positive, it does not suggest that one law has solved all of Texas' educational challenges. Policies must be examined within the context of the institutions and environment where they are implemented. In May of 2007, a local news station in San Antonio, KSAT, reported that parents were upset in various school districts because they wanted their children to be able to walk at graduation even though the students had failed the required exit exam. The state of Texas requires seniors to pass the Texas Assessment of Knowledge and Skills (TAKS) test in order to graduate. Students get five attempts to pass. Whether students can participate in graduation ceremonies is up to the school district. One student shared her story, saying that she was an "A" and "B" student, who never got in trouble, but failed the science portion of the TAKS. Further, the Texas Education Agency estimated that 40,182 seniors statewide in 2007 wouldn't receive a diploma in the spring because of failing some portion of the TAKS (Ustinova 2007, 1).

Hearing a story such as this immediately brings to light a number of problems. If the student is truly an "A" or "B" student and unable to pass a portion of the TAKS that is written at the "C" average level, one must question the quality of education she received from her high school. Further, students are given five chances to pass the exit exam. Do the TAKS tests really then give a good assessment of student progress?

TAKS testing started in the spring of 2003. Students are tested in the areas of reading, writing, math and science. If one goes to the Texas Education Agency website, one finds that between third and sixth grade, TAKS tests in reading and math can be taken in Spanish.¹⁵ Although it is understandable to cater to a large immigrant population, it becomes questionable as to how beneficial it is to students in the long run to allow them to take state exams in Spanish.

More recently, in 2008 Texas ranked 46th in the country in the Scholastic Assessment Test scores and scored last among states in the percentage of adults with a high school diploma (Scharrer 2009, 1). These are just some of the challenges that face policymakers in Texas.

I undertook this study because I believe it is an important policy goal to create equality of educational opportunity. I argue that, because the decision to go to college depends on more than the price of college, educational policies should focus on the goal of increasing the size of the capability set of students through a variety of means. The introduction of the Texas Top 10 Percent law provided an opportunity to examine a policy that could equalize educational opportunity by encouraging more students from minority groups to consider it possible to go to college, which would then increase the likelihood of actual college attendance.

¹⁵ <http://www.tea.state.tx.us/student.assessment/taks/booklets/index.html>.

APPENDIX A

TIME LINE OF LEGAL HISTORY AND CHANGES TO THE
UNITED STATES' EDUCATIONAL POLICIES

Year	Event
1862	Morrill Act – grant land for colleges
1861-1865	American Civil War
by 1865	Women attending college
1896	<i>Plessy v. Ferguson</i> – separate but equal schools for African Americans
1914 – 1918	World War 1
1919	Women gain right to vote
1939 – 1945	World War 2
1944	G.I. Bill of Rights
1950 -1953	Korean War
1954	<i>Brown v. Board of Education of Topeka</i> – separate schools inherently unequal
1955 -1975	Vietnam War
1958	National Defense Education Act – Established the National Defense Student Loan Program, which offered long-term, low-interest loans to qualified students in the fields of math, science and foreign languages. This program was later known as the National Direct Student Loan Program and today as the Federal Perkins Loan Program.
1964	Civil Rights Act – Affirmative Action

	Economic Opportunity Act – Established the college work study program, today known as the Federal work study program
1965	Higher Education Act – Title IV Programs – student financial aid
1972	Reauthorization of the Higher Education Act – Initiation of the Basic Opportunity Education Grant (later renamed the Pell Grant)
1976	Higher Education Act amended – Requires students to demonstrate academic progress to continue receiving Title IV funds.
1978	Middle Income Student Assistance Act – extended eligibility of the Guaranteed Student Loan Program and the Pell Grant program to middle and upper-middle income students
	<i>Regents of the University of California v. Bakke</i> – Supreme Court finds quota system of affirmative action as unconstitutional. Supreme Court recognizes affirmative action as legal to promote diversity on college campuses.
1980	Higher Education Act amended – officially changing the name of the Basic Education Opportunity Grant Program to the Pell Grant Program and established the Parent Loan for Undergraduate Students (PLUS) program.
1981	Omnibus Reconciliation Act – Congress reversed expansion of loan eligibility and limited loan interest subsidies
1986	Reauthorization of the Higher Education Act – restricted eligibility for loans, Pell grant. Established Supplemental Loan to Students, changed name of National Direct Student Loan Program to Perkins Loan Program
1992	Higher Education Act amended– FAFSA, FFEL Program and Federal Stafford Loan Program named
1993	Student Loan Reform Act - made adjustments to the Federal Family Education Loan Program to comply with the Direct Loan Program
1996	Proposition 209 in California was voted into law, forbidding race as a factor in public institutions.

Hopwood v. the University of Texas – Circuit court stated that consideration of race or ethnicity for purposes of attaining diversity was unconstitutional.

- | | |
|------|---|
| 1997 | Texas H.B. 588 or better known as the Texas Top 10% Law passed into law. |
| 1998 | <p>The State of Washington bans affirmative action in the public sector (Initiative 200).</p> <p>Higher Education Act amended – raised funding to Pell Grant Program, expanded eligibility to programs, extended Pell Grants to post-baccalaureate students who will teach</p> |
| 2003 | <p><i>Gratz and Grutter v. Bollinger, et al.</i> – Supreme Court rules race consideration to attain diversity in colleges is constitutional, upholding the Bakke decision.</p> <p>Higher Education Act amended – increased funding to institutions</p> |
| 2006 | The State of Michigan bans affirmative action in the public sector (Michigan Civil Rights Initiative Proposal 2006-02). |
| 2008 | <p>Higher Education Opportunity Act enacted – reauthorized the amended version of the Higher Education Act, increased Pell Grant, decrease interest on Federal Loans, enacted loan forgiveness for those who chose public service</p> <p>The State of Nebraska bans the use of affirmative action in the public sector (Nebraska Civil Rights Initiative 424).</p> <p>The State of Colorado votes against the Colorado Civil Rights Initiative Amendment 46, maintaining the use of affirmative action.</p> |

APPENDIX B

DESCRIPTION OF FEDERAL PROGRAMS

Federal Programs Program Type Program Terms		Program Requirements
Plus Parent Loan Year enacted: 1980 Last change: 2008	• Loan taken out by parent/guardian of a dependent postsecondary student who is working toward a postsecondary degree or certificate • Must not have an adverse credit history	• Maximum loan amount is the cost of attendance minus other financial aid • Maximum length of loan is 30 years • Interest rate is variable
Perkins Loan Year enacted: 1958 Last change: 2008	• Loan taken out by student pursuing postsecondary educational degree or certificate • Amount based on financial need	• Maximum amount of \$5,500 for undergraduate students (up to \$27,500 for entire undergraduate education) and \$8,000 for graduate students (up to \$60,000 for graduate education, including undergraduate Perkins loans) • Maximum length of loan is 10 years • Fixed interest rate (currently at five percent)
Stafford Loans <i>(Subsidized</i> <i>refers to the government paying the interest on the loan while in school;</i> <i>Unsubsidized</i> <i>refers to interest accruing</i>	• Subsidized loans are based on financial need • Unsubsidized loans are based on grade level, status as a dependent or independent, status as an undergraduate or graduate and total cost of attendance	• Maximum loan amount is between \$5,500 - \$12,500 annually • Subsidized Stafford loan amounts depend on financial need • Unsubsidized Stafford loan amounts depend on grade level, status as a dependent or independent, status as an undergraduate or

through the life of the loan) Year enacted: 1958 Last change: 2008		graduate and total cost of attendance • Maximum length of loan is 10 – 25 years • Interest rate is variable
Pell Grant Year enacted: 1972 Last change: 2008	• Based on financial need	• Does not need to be repaid • Maximum amount of aid available per academic year 2010 – 2011 is \$5,500
Federal Work Study Year enacted: 1964 Last change: 2008	• Based on financial need	• Amount depends on need • Can work on or off campus

Sources: The Federal Family Education Loan (FFEL) Program, The U.S. Department of Education, www.govloans.gov and www.ed.gov

APPENDIX C

STATE PROGRAM DESCRIPTION

State Programs

State - Program	Award Criteria	Award Amount
Alaska - University of Alaska Scholars Award http://www.alaska.edu/scholars/ Year enacted: NA Last change: NA	Class rank – the top 10 percent of graduates from qualified Alaska high schools	\$11,000 total scholarship over 8 semesters at the University of Alaska
Arkansas - Academic Challenge Scholarship http://www.adhe.edu/divisions/financialaid/Pages/fa_acs.aspx Year enacted: NA Last change: NA	GPA, ACT/SAT scores and financial need	\$5,000 per year at a four year institution, \$2500 per year at a two-year institution
Florida - Bright Futures Scholarship http://www.floridastudentfinancialaid.org/SSFAD/bf/ Year enacted: 1997 Last change: 2010-2011 academic year	GPA and ACT/SAT scores	Up to full tuition and fees at public Florida institution or equivalent dollar amount for a Florida private institution
Georgia - HOPE Scholarship http://www.terry.uga.edu/hope/gahope.html Year enacted: 1993 Last change: 2006-2007 academic year	GPA	Full tuition and fees plus book allowance for public Georgia institutions (equivalent to \$5,000) and \$3,000 a year at a Georgia private institution
Illinois - Illinois Merit Recognition	Class rank and ACT/SAT scores	\$1,000 one-time, nonrenewable scholarship

Scholarship http://www.scholarships.com/financial-aid/college-scholarships/scholarships-by-state/illinois-scholarships/illinois-merit-recognition-scholarships/ Year enacted: NA Last change: NA		
Kentucky - Kentucky Educational Excellence Scholarship http://www.kheaa.com/keeshome.html Year enacted: 1998 Last change: NA	GPA and curriculum requirements (can get bonus for SAT/ACT scores, AP tests)	For each year you earn a 2.5 or better GPA, you can earn between \$125 to \$500 to use for college
Louisiana - Taylor Opportunity Program for Students http://www.osfa.la.gov/TOPS.htm Year enacted: 2008 Last change: 2011	ACT/SAT scores	Award dependent on institution
Minnesota - Academic Excellence Scholarship http://www.getreadyforcollege.org/gpg.cf?m?pageid=150 Year enacted: NA Last change: NA	Outstanding ability in one of several subjects: English or creative writing, fine arts, foreign language, math, science, or social science	Full price of tuition and fees for one academic year at a public institution Full tuition and fees for one academic year at private institution or that of a comparable public institution.
Mississippi - Eminent Scholars Program http://www.ihl.state.ms.us/financialaid/mesg.html Year enacted: NA Last change: NA	GPA and ACT/SAT scores	Up to \$2,500 a year not exceeding tuition and required fees
Missouri - Higher Education Academic Scholarship http://www.dhe.mo.gov/ppc/grants/brightflight.php	ACT/SAT scores	Up to \$3,000 a year for those whose scores are in the top 3 percent in Missouri, \$1,000 a year for those whose scores are in the 4 th and 5 th percent

Year enacted: NA Last change: 2010		
Nevada - Millennium Scholarship http://nevadatreasurer.gov/MillenniumScholarship.htm Year enacted: 1999 Last change: 2009	GPA (with curriculum requirements) and state proficiency exam	\$40 per enrolled credit hour at community college, \$80 per enrolled credit hour at university
New Mexico - Lottery Success Scholarship http://www.nmlottery.com/legislative-lottery-scholarships.aspx Year enacted: 1996 Last change: 2010	Must obtain and maintain a 2.5 GPA in a state university	Full tuition coverage for 8 semesters
North Dakota - Scholars Program http://www.ndus.edu/students/paying-for-college/grants-scholarships/#NDAS Year enacted: NA Last change: NA	GPA and ACT/SAT scores	Up to \$6000
South Carolina - LIFE Scholarship http://www.che.sc.gov/New_Web/GoingToCollege/LIFE_Hm.htm Year enacted: NA Last change: 2008	GPA	Cost of tuition or up to \$4,700 plus a \$300 book allowance
Palmetto Fellows Scholarship http://www.che.sc.gov/New_Web/GoingToCollege/PF_Hm.htm Year enacted: 1988 Last change: NA	GPA, ACT/SAT and Class rank – top six percent	Up to \$6,700 a year
Washington D.C. - Tuition Assistance Grant http://seo.dc.gov/seo/cwp/view,a,1226,q	Must be a resident of D.C. or a dependent of a resident	D.C. TAG pays the difference between in-state and out-of-state tuition at public institutions in other states up to \$10,000

564322.asp Year enacted: 1999 Last change: 2004		
West Virginia - Promise Scholarship http://wvhepcnew.wvnet.edu/index.php?option=com_content&task=view&id=93&Itemid=0 Year enacted: NA Last change: NA	GPA and ACT/SAT	Tuition and mandatory fees at a public West Virginia institution or average equivalent dollar amount at a private institution, up to \$4,750 a year

Sources: State program websites.

APPENDIX D

TEXAS HOUSE BILL 588

An act relating to uniform admission and reporting procedures for
institutions of higher education.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF TEXAS:

SECTION 1. Chapter 51, Education Code, is amended by adding Subchapter S to read as follows:

SUBCHAPTER S. UNIFORM ADMISSION POLICY

Sec. 51.801. DEFINITIONS. In this subchapter, "general academic teaching institution," "governing board," "medical and dental unit," and "university system" have the meanings assigned by Section 61.003.

Sec. 51.802. UNIFORM ADMISSION SYSTEM. A general academic teaching institution shall admit first-time freshman students for each semester under the provisions of this subchapter.

Sec. 51.803. AUTOMATIC ADMISSION: ALL INSTITUTIONS. (a) Each general academic teaching institution shall admit an applicant for admission to the institution as an undergraduate student if the applicant graduated in one of the two school years preceding the academic year for which the applicant is applying for admission from a public or private high school in this state accredited by a generally recognized accrediting organization with a grade point average in the top 10 percent of the student's high school graduating class. To qualify for admission under this section, an applicant must submit an application before the expiration of any application filing deadline established by the institution.

(b) After admitting an applicant under this section, the institution shall review the applicant's record and any other factor the institution considers appropriate to determine whether the applicant may require additional preparation for college-level work or would benefit from inclusion in a retention program. The institution may require a student so identified to enroll during the summer immediately after the student is admitted under this section to participate in appropriate enrichment courses and orientation programs. This section does not prohibit a student who is not determined to need additional preparation for college-level work from enrolling, if the student chooses, during the

summer immediately after the student is admitted under this section.

INSTITUTIONS. For each academic year, the governing board of each general academic teaching institution shall determine whether to adopt an admissions policy under which an applicant to the institution as a first-time freshman student, other than an applicant eligible for admission under Section 51.803, shall be admitted to the institution if the applicant graduated from a public or private high school in this state accredited by a generally recognized accrediting organization with a grade point average in the top 25 percent of the applicant's high school graduating class.

Sec. 51.805. OTHER ADMISSIONS. (a) A graduating student who does not qualify for admission under Section 51.803 or 51.804 may apply to any general academic teaching institution.

(b) The general academic teaching institution, after admitting students under Sections 51.803 and 51.804, shall admit other applicants for admission as undergraduate students. It is the intent of the legislature that all institutions of higher education pursue academic excellence by considering students' academic achievements in decisions related to admissions. Because of changing demographic trends, diversity, and population increases in the state, each general academic teaching institution shall also consider all of, any of, or a combination of the following socioeconomic indicators or factors in making first-time freshman admissions decisions:

- (1) the applicant's academic record;
- (2) the socioeconomic background of the applicant, including the percentage by which the applicant's family is above or below any recognized measure of poverty, the applicant's household income, and the applicant's parents' level of education;
- (3) whether the applicant would be the first generation of the applicant's family to attend or graduate from an institution of higher education;
- (4) whether the applicant has bilingual proficiency;
- (5) the financial status of the applicant's school district;
- (6) the performance level of the applicant's school as determined by the school accountability criteria used by the Texas Education Agency;
- (7) the applicant's responsibilities while attending school, including whether the applicant has been employed, whether the applicant has helped to raise children, or other similar factors;
- (8) the applicant's region of residence;
- (9) whether the applicant is a resident of a rural or urban area or a resident of a central city or suburban area in the state;

- (10) the applicant's performance on standardized tests;
- (11) the applicant's performance on standardized tests in comparison with that of other students from similar socioeconomic backgrounds;
- (12) whether the applicant attended any school while the school was under a court-ordered desegregation plan;
- (13) the applicant's involvement in community activities;
- (14) the applicant's extracurricular activities;
- (15) the applicant's commitment to a particular field of study;
- (16) the applicant's personal interview;
- (17) the applicant's admission to a comparable accredited out-of-state institution; and
- (18) any other consideration the institution considers necessary to accomplish the institution's stated mission.

(c) A general academic teaching institution may review other factors in making an admissions decision.

(d) Not later than one year before the date that applications for admission are first considered under this section, each general academic teaching institution shall publish in the institution's catalog a description of the factors considered by the institution in making admission decisions and shall make the information available to the public.

(e) This section does not apply to an institution that has an open enrollment policy.

Sec. 51.806. REPORT TO COORDINATING BOARD. Each general academic teaching institution shall provide a report annually to the Texas Higher Education Coordinating Board describing the composition of the entering class of students admitted under this subchapter. The report shall include a demographic breakdown, including a breakdown by race, ethnicity, and economic status, of the students admitted under Sections 51.803, 51.804, and 51.805.

Sec. 51.807. RULEMAKING. The Texas Higher Education Coordinating Board may adopt rules relating to the operation of admissions programs under this subchapter, including rules relating to the identification of eligible students and the reporting requirements of Section 51.806.

Sec. 51.808. APPLICATION OF ADMISSION CRITERIA TO OTHER PROGRAMS. (a) Each general academic teaching institution or medical and dental unit that offers admissions to undergraduate transfer students or admissions to a graduate,

postgraduate, or professional program shall also adopt a written admission policy applicable to those programs.

(b) The policy shall be published in the institution's or unit's catalog and made available to the public.

Sec. 51.809. SCHOLARSHIP AND FELLOWSHIP AWARDS. (a) A general academic teaching institution or a medical and dental unit that offers competitive scholarship or fellowship awards shall adopt a written policy describing the factors to be used by the institution or unit in making an award.

(b) A policy adopted under this section shall be published in the institution's or unit's catalog and shall be made available to the public in advance of any deadline for the submission of an application for a competitive scholarship or fellowship to which the policy applies.

SECTION 2. (a) The change in law made by this Act applies beginning with admissions and scholarships for the fall term or semester in 1998.

(b) The Texas Higher Education Coordinating Board, each general academic teaching institution, and each medical and dental unit shall adopt rules or policies relating to the admission of students under Subchapter S, Chapter 51, Education Code, as added by this Act, not later than January 1, 1998.

SECTION 3. The importance of this legislation and the crowded condition of the calendars in both houses create an emergency and an imperative public necessity that the constitutional rule requiring bills to be read on three several days in each house be suspended, and this rule is hereby suspended.

Source: <http://www.utexas.edu/student/admissions/research/HB588Law.html>

APPENDIX E

FORMALIZED CAPABILITY APPROACH

Amartya Sen formalized the following relationship in Commodities and Capabilities (1999, 7-9):

- Consider the terms:

x_i = a vector of commodities possessed by person i

$c(\cdot)$ = a function (not necessarily linear) converting x_i into a vector of characteristics

$f_i(\cdot)$ = individual utilization function, used to convert characteristics into functionings

F_i = the set of f_i from which a person can choose

- Achieved functioning is given by:

$$b_i = f_i(c(x_i)).$$

- For the given commodity vector x_i , the feasible functioning set for person i is given by:

$$P_i(x_i) = [b_i | b_i = f_i(c(x_i)), \text{ for some } f_i(\cdot) \in F_i].$$

- If the choice of commodities is restricted to the set X_i , the capability set for person i is given by:

$$Q_i(X_i) = [b_i | b_i = f_i(c(x_i)), \text{ for some } f_i(\cdot) \in F_i \text{ and for some } x_i \in X_i].$$

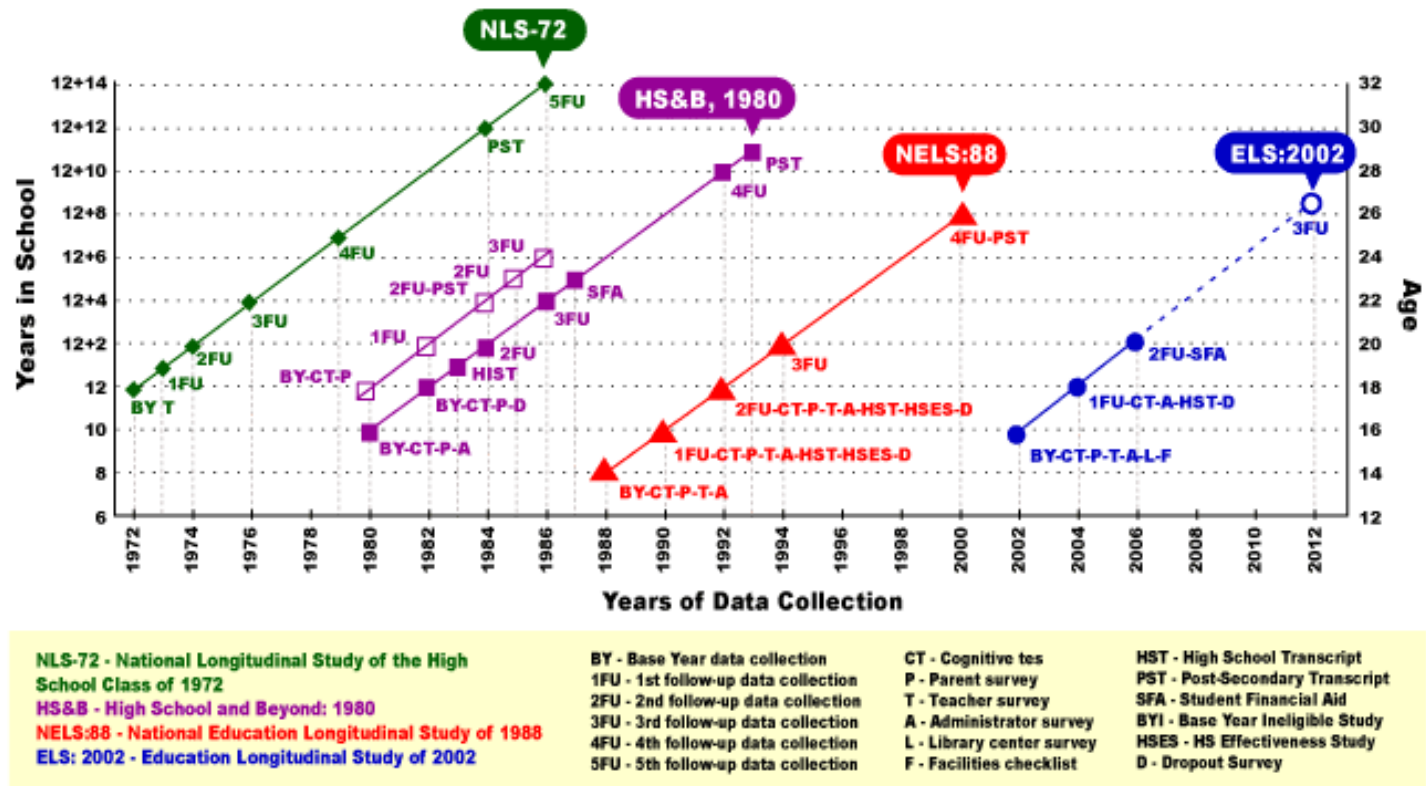
- If v_i is the valuation of the i th person, it is possible to characterize the values of well-being given by:

$$V_i = [v_i | v_i = v_i(b_i), \text{ for some } b_i \text{ in } Q_i].$$

APPENDIX F

NCES' NATIONAL EDUCATIONAL LONGITUDINAL STUDIES

Research Design for the NCES High School Cohorts



Taken directly from the NELS:88 User's Manual. Curtin, Ingels, Wu and Heuer 2002, 3

APPENDIX G

PROBIT ESTIMATES OF PROPENSITY SCORE (OTHER SPECIFICATIONS)

Estimates from Probit Estimation of Propensity Score – Simplified Specification

	All	White	Black	Mexican	Hispanic	Asian
Male	-0.0985* (0.0477)	-0.1096 (0.0667)	-0.1343 (0.1727)	-0.1269 (0.1434)	-0.3232 (0.3447)	-0.0252 (0.1344)
English grade	0.6761** (0.0610)	0.8060** (0.0872)	0.3637 (0.2351)	0.8318** (0.1826)	1.613** (0.3909)	0.6683** (0.1702)
Social science/history grade	0.5876** (0.0619)	0.5378** (0.0888)	1.0327** (0.2028)	1.0255** (0.1724)	0.0719 (0.4209)	0.1842* (0.1815)
Math grade	0.2685** (0.0597)	0.2362** (0.0793)	0.7246** (0.2434)	0.5549* (0.1984)	-1.040* (0.491)	0.4336* (0.1717)
Science grade	0.2184** (0.0625)	0.1893* (0.0838)	0.3237 (0.2353)	0.4972* (0.1987)	0.6961 (0.3944)	0.2456 (0.1795)
Expects to go to college	0.3270** (0.0799)	0.1529 (0.1139)	0.4250 (0.2608)	0.2145 (0.1918)	0.2869 (0.4337)	0.7523* (0.3463)
Mother has some college	0.0288 (0.0179)	0.0909** (0.0251)	0.1137 (0.0628)	0.0069 (0.0598)	0.0046 (0.0989)	0.0303 (0.0490)

Father has some college	-0.0145 (0.0167)	0.0530* (0.0232)	-0.0083 (0.0604)	0.0781 (0.0544)	0.1177 (0.0990)	-0.0956* (0.0487)
Percent students enrolled in AP courses	-0.0004* (0.0017)	-0.0041 (0.0023)	-0.0027 (0.0069)	-0.0079 (0.0058)	0.0091 (0.0139)	-0.0012 (0.0042)
Constant	-2.319** (0.0881)	-2.945** (0.1395)	-2.362** (0.2923)	- 1.96** (0.2095)	-2.89** (0.5187)	-2.030** (0.3738)
Number of observations	8091	5821	615	662	301	609
Pseudo R ²	0.2550	.0.2987	0.3097	0.4316	0.3554	0.1866

Outcome variable: Realization of college expectation. Standard errors in parenthesis. * significant at 5%; ** significant at 1%.

Average Treatment on the Treated Effect for Entire Population by Race

	Treated Mean	Control Mean	Difference	S.E.	P-value for Paired T-test
ATT	0.9256	0.8403	0.0853	0.0229	0.0047
ATT _{white}	0.9372	0.8443	0.0929	0.0283	0.0095
ATT _{black}	0.9063	0.7813	0.1250	0.0871	0.1865
ATT _{mex}	0.8944	0.7465	0.1479	0.0826	0.1071
ATT _{hisp}	0.8333	0.5000	0.3333	0.2085	0.1441
ATT _{asian}	0.9652	0.8783	0.0870	0.0472	0.0989

Based on probit of the simplified specification

Estimates from Probit Estimation of Propensity Score – Original Specification with AP Variable

	All	White	Black	Mexican	Hispanic	Asian
Male	-0.0954* (0.0484)	-0.1096 (0.0667)	-0.1016 (0.1749)	-0.1221 (0.1442)	-0.3393 (0.3475)	-0.0446 (0.1359)
English grade	0.6884** (0.0619)	0.8064** (0.0875)	0.3207 (0.2385)	0.8411** (0.1835)	1.682** (0.4086)	0.6858** (0.1734)
Social science/history grade	0.6061** (0.0629)	0.5390** (0.0892)	1.0777** (0.2054)	1.0305** (0.1733)	0.0512 (0.4256)	0.1464 (0.1850)
Math grade	0.2440** (0.0607)	0.2392* (0.0795)	0.6999* (0.2450)	0.5352* (0.1987)	-1.115* (0.5066)	0.4197* (0.1735)
Science grade	0.2119** (0.0633)	0.1934* (0.0841)	0.3494 (0.2388)	0.5057* (0.2003)	0.6882 (0.3998)	0.2246 (0.1820)
Expects to go to college	0.3401** (0.0821)	0.1477 (0.1170)	0.4658 (0.2703)	0.2132 (0.1930)	0.2391 (0.4370)	0.7144* (0.3624)
Mother has some college	0.0449* (0.0182)	0.0935** (0.0252)	0.1273* (0.0645)	0.0183 (0.0601)	-0.0099 (0.1133)	0.0334 (0.0497)
Father has some college	-0.0116 (0.0169)	0.0571* (0.0234)	-0.0108 (0.0608)	0.0884 (0.0546)	0.1132 (0.1001)	-0.0935 (0.0497)
Sibling dropped out of high school	0.1857* (0.0901)	0.1403 (0.1429)	0.3185 (0.2534)	0.0104 (0.2055)	-0.3064 (0.6172)	0.1885 (0.3332)
Second language spoken at home	0.4950** (0.0503)	-0.2419 (0.1284)	0.3741 (0.2672)	0.3210 (0.1935)	-0.1990 (0.3672)	0.6020* (0.2351)
Percent students enrolled in AP courses	-0.0016* (0.0017)	-0.0040 (0.0023)	-0.0031 (0.0069)	0.0092 (0.0059)	0.0095 (0.0140)	-0.0014 (0.0043)
Constant	-2.551** (0.0970)	-2.965** (0.1437)	-2.528** (0.3200)	-2.2974** (0.3006)	-2.62** (0.6303)	-2.52** (0.4432)
Number of observations	8091	5821	615	662	301	609
Pseudo R ²	0.2749	0.3004	0.3185	0.4356	0.3593	0.1999

Outcome variable: Realization of college expectation. Standard errors in parenthesis. * significant at 5%; ** significant at 1%

Average Treatment on the Treated Effect for Entire Population by Race

	Treated Mean	Control Mean	Difference	S.E.	P-value for Paired T-test
ATT	0.9255	0.8320	0.0935	0.0207	0.0009
ATT _{white}	0.9372	0.8278	0.1093	0.0276	0.0022
ATT _{black}	0.9047	0.8254	0.0793	0.0780	0.3296
ATT _{mex}	0.8889	0.6741	0.2148	0.0826	0.0247
ATT _{hisp}	0.8125	0.7500	0.0625	0.1653	0.7112
ATT _{asian}	0.9652	0.9043	0.0609	0.0437	0.1920

Based on probit of original specification with the AP variable.

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