

# THE GATES SCHOLARS RESEARCH PROGRAM FINAL REPORT

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**Title:** Are Minorities More Likely to Graduate from College if they attend More Selective Institutions? Evidence from a cohort of recipients and non-recipients of the Gates Millennium Scholarship (GMS) program

**Note:** The analyses in this report were done using the new weight variable (r1to3wgt) provided by NORC. I followed the advised provided by NORC and I re-run the programs using the new weight variable.

**Disclaimer:** The views contained herein are not necessary those of the Bill & Melinda Gates Foundation.

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## **Abstract**

The main objective of this study is to evaluate the effect of selectivity of four-year institution attended, on the college completion rates of minorities (i.e. African American, Latino, and Asian or Pacific Islander). Two main research questions guide this inquiry: 1) Are GMS scholars and non-recipients who attended selective<sup>1</sup> institutions (i.e. very selective, highly selective and most selective) more likely to graduate than those who attended non-selective institutions? 2) Is the effect of institutional selectivity mediated by the financial aid (i.e. grants, loans, parental contribution, and hours worked per week) received by the GMS scholars?

This study uses a unique dataset that includes information on a number of factors that according to the theory are related to college persistence and completion (Tinto, 1993). It also uses propensity score matching techniques to control for observable characteristics of students in order to address the issues of sorting and self-selection of students into selective institutions.

The results of this study suggest that the probability of attaining a bachelor's degree increases with selectivity of institution attended. Holding all else constant the scholars who attended either a most, highly or very selective institution as opposed to a non-selective one, were about 4 percent more likely to complete a B.A. or higher within six years. The results from the propensity score matching (PSM) confirm this and suggest that the effect might be even higher; between 12 and 19 percent. There is also evidence of a mediating effect of financial aid on the impact of selectivity of institution attended. The effect of receiving additional grant and loan money, as well as working additional hours per week, varied with type of selective institution attended.

This study provides insights to the Bill & Melinda Gates foundation, scholars, administrators and students, and their families on the effect of selectivity of institution attended on college completion.

**Descriptors:** Selective institutions, minority college completion, and financial aid.

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<sup>1</sup> Educational quality is an elusive concept and very complex to measure (Bogue & Hall, 2003; Melguizo, forthcoming). Institutional selectivity is usually a proxy for the quality of institution attended. For the purposes of this study and comparisons with previous literature, selectivity is measured using the average SAT scores for the freshmen class at each postsecondary institution.

## **Overview of the Study**

Despite the increase in the enrollment and college completion rates of minorities (i.e. African American, Latino, and Asian or Pacific Islander) in higher education in the last three decades, there is a substantial college completion gap between African American and Latino students when compared to their Asian or white peers. In 1976, 15 percent of college students were minorities compared to 31 percent in 2005 (Snyder, Dillow & Hoffman, 2007, Table 210). The college completion rates of minorities during this period also doubled, increasing from 10 to 23 percent (Snyder, Dillow & Hoffman, 2007, Table 267). However, most of the increase was driven by the completion rates of Asians, their rates increased from 1.5 to 6.8 percent. Nonetheless, it is noteworthy that the completion rates of Latinos trebled, but in their case this is confounded with their increasing representation in the overall population.

According to the 2000 Census the percentage of Asian/Pacific Islanders with at least a bachelor's degree was 43 percent compared to 10 percent of Latinos and 14 percent of African Americans (NORC, 2006). It is noteworthy that Asians/Pacific Islanders represented 3.8 percent of the 25 year and older population and had 43 percent of the degrees, compared to Latinos who represent 10 percent of the population but only had 10 percent of the degrees, and African Americans who represented 11 percent of the population and had only 14 percent of the degrees (U.S. Census Bureau, 2001). These results suggest that despite the increase in access to postsecondary education for minorities, inequalities persist in baccalaureate attainment rates between African Americans and Latinos, and their Asians/Pacific Islanders and white peers.

It has been widely documented that the college completion rates increase with the quality/selectivity of the postsecondary institution attended (Astin, 1985; Bowen & Bok, 1998; Carnevale & Rose, 2003). However, trying to isolate the effect of quality/selectivity on baccalaureate attainment is very challenging because better-prepared students attend more selective institutions (Hoxby, 1997). A number of studies have attempted to control for issues of selection in order to estimate the effect of quality/selectivity on baccalaureate attainment (Alon & Tienda, 2005; Dale & Krueger, 2002; Light & Strayer, 2000; Long, 2005; Melguizo, 2008). Even though their results are mixed most of the studies suggest that there is a positive and significant effect of quality/selectivity on baccalaureate attainment, but the coefficient is smaller than the one estimated without controlling for selection.

The conceptual framework used in the study is an extension of a human capital model that tests whether the type of institution attended affects the likelihood of attaining a bachelor's degree (Bowen & Bok, 1998; Dale & Krueger, 2002; Kane, 1998). Interest in the impact of institutional quality on students' educational outcomes and future earnings has grown in recent years as a result of the debate over affirmative action policies. Critics of affirmative action claim that minority students who are admitted to selective institutions having below-average SAT scores are set up for failure because they do not have the academic preparation necessary to succeed (Nieli, 2004; Thernstrom & Thernstrom, 1997). Proponents of affirmative action argue that the probability of baccalaureate attainment for minorities with below-average SAT scores increases with the selectivity of the institution attended (Alon & Tienda, 2005; Bowen & Bok, 1998; Melguizo, 2008). This study contributes to this literature by focusing on a unique sample of students who applied to the Gates Millennium Scholarship (GMS) program.

### **GMS Scholars Program**

The GMS program is a \$1 billion, 20-year project designed to promote academic excellence by providing higher education opportunities to low-income, high achieving minority students. Students can apply to pursue either an undergraduate or a graduate program and they have to meet both a cognitive and non-cognitive eligibility criteria before being admitted. The applicants must demonstrate academic potential and this is fulfilled by a high school grade point average (GPA) of 3.3 over 4.0. In terms of the non-cognitive criteria students are required to answer a questionnaire developed to measure the applicants' non-cognitive abilities (see Sedlacek, 1998, 2003 and 2004). The surveys are graded by trained raters and each applicant is assigned a score. The thresholds on the non-cognitive scores are established and vary by racial/ethnic group and matriculating cohort. These thresholds are used as another selection mechanism. Finally, only citizens or legal residents of the United States who are low income qualify for the program. The final selection pool only includes applicants who are eligible for the federal Pell grant program (Des Jardins & McCall, 2006; Merkwowitz, 2004).

In 2000, the first award year of the program, the United Negro College Fund (UNCF), as the program's administrator, awarded over 4,000 grants to outstanding minority students who were entering college or continuing their undergraduate or graduate work in the 2000-2001 academic year. Every year since then UNCF has awarded close to 1,000 additional scholarships to entering freshmen to fund their studies as they begin and progress through college (NORC, 2006). This is a competitive grant given that every year about 4,000 low-income high achieving minority students apply, and only 1,000 (or 25 percent) of them receive the award. As described in more detail by Des Jardins and McCall (2006) when the students are accepted to the program they receive a scholarship that is a "last dollar" award. This means that the foundation will cover the unmet need remaining after the Pell and any other scholarships or grants are awarded. The GMS scholarship can be used in any type of postsecondary institution in the United States and can be used to pay tuition and fees, books, and living expenses. The average award to freshman is about \$8,000 and about \$10,000-\$11,000 for upper division (junior and senior students). Because of differences in tuition levels, the average awards differ by control of institution attended. Students in public colleges receive about \$8,000

and those in private colleges about \$11,000. As undergraduates, students are eligible for the financial support for up to five years, and they can apply for additional support if they decide to attend graduate school in engineering, mathematics, science, education, or library science.

As mentioned above a special characteristic of the GMS program is that it uses non-cognitive variables to select grantees. The foundation selected from a pool of low-income individuals in good academic standing and that according to their sponsors were exceptional in terms of overcoming challenges and being involved with their communities. In addition, the foundation administered a survey to measure a number of non-cognitive measures, and basically used the score in this survey to select the students. As described in more detail by Merkwitz (2004) the applicants were evaluated on a set of non-cognitive criteria, including: 1) positive self-concept, 2) realistic self-appraisal, 3) understanding/navigation of social system, 4) preference for long-term goals, 5) leadership experiences, 6) community service, 7) non-traditional acquisition of knowledge, and 8) strong support person. This process allows the program to identify nominees who have overcome significant obstacles and possess outstanding abilities.

This selection process provides a unique opportunity to researchers to properly control for a number of traditionally “un-observed” factors that according to the literature also affect persistence and college completion. A substantial majority of previous studies have mostly used different cohorts of students from the longitudinal studies of the National Center of Education Statistics (NCES). These datasets have good measures for school academic preparation and attainment, but it is widely known that they are limited in terms of the data available to provide good controls for un-observed factors such as the students’ motivation.

### **Research Questions**

The main objective of this study is to evaluate the effect of selectivity of four-year institution attended, on the college completion rates of minorities (i.e. African American, Latino and Asian/Pacific Islander).

Two main research questions guide this inquiry:

1) Are GMS scholars and non-recipients who attended selective institutions (i.e. very selective, highly selective and most selective) more likely to graduate than those who attended non-selective institutions?

2) Is the effect of institutional selectivity mediated by the financial aid (i.e. grants, loans, and parental contribution) received by the GMS scholars?

### **Data and Methodology**

This study uses a unique dataset that includes information on a number of factors that according to the theory are related to college persistence and completion (Tinto, 1993). As described in more detail above, the GMS scholars were selected to the program using non-traditional criteria and non-cognitive measures such as psychological

characteristics related to college persistence (Sedlacek, 2004), instead of the traditional SAT scores used by admission committees in selective institutions. The fact that there is information on a number of psychological factors that according to the theory affect persistence, provides a unique opportunity to calculate unbiased estimates of the effect of the selectivity of the institution attended on the student's baccalaureate attainment. Propensity score matching methods are also used to compare groups of students who are similar in their observed characteristics but who enrolled in institutions of different levels of selectivity.

**Cohort 1 (2000-2001)**

*Cohort 1 (2000-2001): The first cohort of the GMS scholars*

To assess the impact of the scholarship program, the Bill & Melinda Gates Foundation asked the National Opinion Research Center at the University of Chicago (NORC) to follow selected cohorts of GMS recipients (Scholars) and comparison samples of non-recipients as they enter and progress through college and beyond. This study includes only the sample of scholars (recipients) and non-recipients undergraduates of the first cohort of the GMS scholars program, (Cohort-1).

NORC's study design involved conducting baseline and follow-up interviews of all scholars and selected non-recipients beginning in 2002 and tracking students between survey rounds through 2006. Tables 1.A and 1.B. outline the key elements of the study (NORC, 2003).

Table 1.A. GMS Tracking and Longitudinal Design

Data Collection	Year 1 (Base) 2002	Year 2 (First Follow-up) 2004	Year 3 (Second Follow-up) 2006
GMS Recipients	Follow-up Cohorts 1: 1,087	Baseline Cohort 1: 877	Follow-up Cohorts 1: 953
Non-Recipients	Follow-up Cohort 1: 742	Baseline Cohort 1: 749	Follow-up Cohort 1: 767
Total Respondents in Tracking System	1,829	1,626	1,720

Table 1.B. Population Counts for Cohort 1 (2000-2001) GMS Nominees by Scholarship Status and Race/Ethnicity

Population	Race/Ethnicity	Recipients	Non-Recipients	Total Nominees
2000-2001 Freshmen Nominees	African American	465 33%	731 36%	1,196 34%
	American Indian	87 6%	116 6%	203 6%
	Asian/Pacific Islander	436 31%	738 36%	1,174 34%
	Hispanic American	442 31%	458 22%	900 26%
	Total	1,430	2,043	3,473

### *Sample*

The sample in this study is composed of 896 scholars and non-recipients who were freshmen in the 2000-2001 academic year, who participated in the base, first and second follow-up surveys, and who had information on all the relevant variables included in the study (about 81 percent of the original sample)<sup>2</sup>. The American Indians were removed from the sample because lack of studies that have explored the effect of selectivity, making the comparison with previous literature challenging.

### *Weights*

The differences between the population of recipients and non-recipients across racial/ethnic groups posed the problem of how to distribute the non-recipient sample within each population of non-recipients. NORC used a stratified sample design that would enable relatively powerful comparisons between recipients and non-recipients at the level of racial/ethnic group (NORC, 2004, page 10). The design effects are likely to produce a design effect for the population estimates of non-recipients as a whole and not proportional within each race/ethnicity and Pell-Grant group. They argue that this loss in precision is likely to be offset, in part, by the stratification. Moreover, comparisons at the level of the population of non-recipients are likely to be powerful even in the presence of a design effect resulting from the relatively large sample sizes (NORC, 2004, page 11). The study used the R1TO3WGT weights in the analysis<sup>3</sup>.

### **The Model**

College completion depends on a variety of factors, not all directly attributable to the characteristics of the college the student attends. Students enter college with different skills gained both at home and in high school. Students also vary in their cognitive and non-cognitive abilities, aspirations, and motivation levels. All of these factors are likely

<sup>2</sup> The total number of recipients and non-recipients available from the dataset was 1,108.

<sup>3</sup> This study used the R1TO3WGT in the descriptive and logistic analysis. The weights were not used in the PSM estimates because this procedure uses weights in the estimates.

to affect college persistence. Five sets of variables correspond to sources of variance in completion: background student characteristics (S), pre-college achievement or cognitive characteristics (C), non-cognitive characteristics (NC), postsecondary institutional characteristics (PI), and financial aid (F). Logit and PSM models are used to estimate the impact of selectivity of institution attended. In addition, interaction terms are used to test the mediating effect of the type of financial aid received by the scholars, and the type of selective institution attended, on college completion.

## Variables

### Dependent Variable

*Baccalaureate attainment or higher*, is related to educational attainment and is a dichotomous variable indicating whether the student who attended a four-year postsecondary institution completed a B.A. or not, within about six years of high school graduation. The variable takes a value of 1 for students completing a B.A. or higher, and 0 for those students who did not complete a BA.

### Explanatory Variables

*Selectivity of institution* attended was used as a proxy variable for institutional quality. Given that individuals could have attended more than one institution, the selectivity of either the graduating institution, the current institution, or the institution last attended by the individual, was used as the main institution attended.

The selectivity of the institution attended was merged using the average scholarly aptitude test (SAT) scores of the freshmen entrant class reported in *Barron's Profiles of American Colleges and Universities*<sup>4</sup>. In order to capture the impact of different levels of selectivity on college completion, a set of dummy variables was included. For comparisons with previous studies, three categories defined by Alon and Tienda (2007) were used to divide postsecondary institutions by level of selectivity. Institutions were categorized as follows: *most selective*, with average freshman SAT or ACT-equivalent scores between than 1250-1600; *highly selective*, with scores between 1150-1250; *very selective*, with scores between 1050-1150; and *non selective*, with scores below 1050.

The following are some examples of the institutions that were included in each of the five categories. *Most selective* institutions includes: Harvard University, Princeton University, Northwestern University, Stanford University, Georgetown University, Massachusetts Institute of Technology (MIT), University of California at Los Angeles, University of Virginia, Yale University, California Technological University (Cal-Tech), Rice University, University of Chicago, University of Pennsylvania, Columbia University, Duke University, John Hopkins University. Some examples of *highly selective* institutions are: University of Florida, University of California at Davis, George Washington University, Cornell University, University of Texas at Austin, Texas A&M University, University of California at San Diego, University of Maryland College Park, University of Minnesota-Twin Cities, University of Colorado at Boulder, University of Southern California, University of California at Santa Cruz, University of Wisconsin at Madison, Pennsylvania State University, University of California at Irvine, Occidental College. Some of the *very selective* institutions attended by the students were: University

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<sup>4</sup> For a more detailed description of Profiles of American Colleges, see Barron's (1999).

of Nebraska-Lincoln, Purdue University, University of Pittsburgh, Michigan State University, Indiana University Bloomington, George Mason University, UC-Riverside, DePaul University, University of Houston-University Park, University of Miami, Arizona State University, Loyola Marymount University. Finally, some of *the non-selective* institutions included in the sample were: Cal-State Fresno, Howard University, University of Texas at San Antonio, New Mexico State University, Portland State University.

#### Financial aid

*Total grants received.* This variable included all the grants reported by the students including the Pell grants, any institutional or state grant received, as well as the grant money that the scholars received from the Gates foundation. The students were asked about the total amount of grants received in the year of the survey. The total grants received were calculated by adding up the values reported in each of the three years of the surveys.

*Total loans received.* The students were asked in the base, first and second follow up surveys about the maximum amount of loans received. This is a self-reported variable and in some cases the values exceeded the legal amount of loans that students can receive. For the purposes of the study the maximum amount of loans reported in one of the surveys was used to calculate the variable.

*Total parental contributions.* This is a self-reported variable that includes the total parental contributions in each of the years of the surveys. The total parental contribution received was calculated by adding up the values reported in each of the three years of the survey.

*Total hours worked per week.* This is a self-reported variable and the students were asked to report the maximum amount of hours worked per week. For the purposes of the study the maximum amount of hours worked per week reported in one of the three surveys was used to calculate the variable.

#### Control Variables

A set of variables was in used to control for the *students' background characteristics*. On the individual level four variables control for gender, race/ethnicity, age, and three variables to control for socio-economic status (SES). *Female* (omitted category being male), *African American* and *Latino* (omitted category being Asian/Pacific Islander), *age*, *Pell Grant recipient* (omitted category being non-Pell grant recipient), *father attained a B.A. or higher* (omitted category attaining less than a B.A.) and *mother attained a B.A. or higher* (omitted category attaining less than a B.A.).

A set of variables were included to control for the *student's cognitive characteristics*. These variables were: the *average SAT scores*, *number of AP exams taken*, and whether the students attended a *private high school* as opposed to a public one. Finally, a variable including the *baccalaureate expectations* of the students by high school was included.

A set of variables to control for the *student's non-cognitive characteristics*.

As explained in more detail above one of the unique characteristics of the GMS program is that it used non-cognitive measures to select the applicants. In this study we control for a number of variables related to the self-concept and self-appraisal, as well as

the composite variable that includes a summary measure of all the non-cognitive variables included in the surveys.

Finally, the control of the graduating, current or last institution attended was included, *dprivate* (omitted category being public institution).

## Empirical Strategy

### *Logistic Regression*

The appropriate method of analysis for a dichotomous dependent variable is logistic regression. This model utilizes maximum likelihood estimators. The logit expression for this model is

$$P(BA_i | S_i, C_i, NC_i, PI_i, F_i) = \frac{e^{(\beta^S S_i + \beta^C C_i + \beta^{NC} NC_i + \beta^{PI} PI_i + \beta^F F_i + \varepsilon_i)}}{1 + e^{(\beta^S S_i + \beta^C C_i + \beta^{NC} NC_i + \beta^{PI} PI_i + \beta^F F_i + \varepsilon_i)}} \quad (1)$$

The dependent variable is whether or not the students completed college by the time of the second follow up, about 6 years. The coefficients for the variables included in PI and F are the primary focus of the analysis. The background student characteristics (S), pre-college achievement or cognitive characteristics (C), non-cognitive characteristics (NC), are used as control variables. The model is estimated separately for the scholars and the non-recipients.

As described earlier, the above estimations could be biased due to sorting of students into specific types of institutions. This means that the categorical variables that measure levels of institutional selectivity are endogenous or choice variables, and might be correlated with un-observables relegated to the error term. To account for the impact of selectivity of an institution on college completion, this study addresses the sorting problem by using PSM techniques to compare individuals who attended individuals who were very similar in terms of the cognitive and non-cognitive characteristics, but who attended institutions of different levels of selectivity. The model and methods used are described in more detail in the following section.

### *Propensity Score Matching*

The rationale behind this technique is to simulate the characteristics of an experimental design by matching groups of students based on observable characteristics so that the only difference is the type of treatment received. Including the propensity score as a control variable removes the component of their correlation that is due to the assignment process (Rosenbaum & Rubin 1983; Winship & Morgan, 1999).

As described in greater detail by Dehejia and Wahba (1999), matching based on observable pre-treatment characteristics approximates randomization by balancing the observables between the treatment and control groups. However, these matched individuals will differ in the “treatment,” and the groups will contain individuals with the same probability of first attending a selective college who attended a non-selective one. Even though this procedure replicates the conditions of experimental design, matching requires a strong ignorable treatment assumption (Rosenbaum & Rubin 1983). In this case, the assumption is that the researcher knows all the factors related to college degree attainment and uses all the observed characteristics to match individuals. However, if

individuals know more about their probabilities of attainment than the researcher does, indicating there are other unobserved factors that cannot be accounted for, this condition necessary for matching will not hold. It is very likely that the ignorable treatment conditions holds for the sample of this study given that individuals were also evaluated on a number of non-cognitive criteria that according to the literature are associated with college persistence.

The following section describes in detail the different steps that were followed to implement PSM (Caliendo & Kopeinig, 2005; Dehejia & Wahba, 2002; Ham, Li & Reagan, 2006): 1) estimation of the propensity score; 2) deciding the matching algorithm; 3) determining the region of common support; 4) balancing tests to assess the matching quality; and 5) estimation of the treatment effects and standard errors.

#### *Estimating the Propensity Score*

In order to estimate the propensity scores, a multinomial probit function was used to calculate the predicted probability that an individual would attend a selective institution (i.e., very, highly, and most selective) versus a non-selective one.<sup>5</sup> The following criterion was used to estimate the variables included in this equation: the variables must influence simultaneously the participation decision (i.e., selective institution versus non-selective) and the outcome variables (i.e., bachelor's degree attainment) (Leuven & Sianesi, 2004; Sianesi, 2004). All of the control variables listed in the previous section are included in the estimation of the propensity score. The results of this model are reported in Table A.1 in the appendix.

#### *Choice of Matching Method*

Once the propensity scores are calculated, the next step is to use a matching estimator that will compare the outcome of a treated individual with outcomes of comparison group members. There are a number of methods that can be used for matching, and Caliendo and Kopeinig (2005) provide a detailed description of all of the different matching algorithms. The local linear (LLM) is used as the algorithm for matching (Ham, Li & Reagan, 2006). This is a non-parametric matching estimator that uses weighted averages of all individuals in the control group to construct the counterfactual outcome. The advantage of this method is that it uses more information than other matching techniques, lowering the variance. However, using more information has a drawback related to possibly using bad matches. This leads to the next step that is related to using the proper common support condition.

#### *Common Support*

One necessary condition for estimating treatment effects is that they are in the region of support. Therefore, a very important step is to check for sufficient overlap in the region of common support between the treatment and comparison groups. There are different ways described in the literature to inspect the region of support (Caliendo & Kopeinig, 2005; Dehejia & Wahba, 2002). The most straightforward one, which has also been widely used in the empirical literature, consists of a visual examination of the

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<sup>5</sup> For a description of advantages and limitations of using different functional forms, see Caliendo and Kopeinig (2005).

density distribution of the propensity score in both treatment and control groups. In this case even though visual examination shows that there are enough cases in the treatment group to compare to those in the control group, there are more individuals from the control group in the lower end of the propensity score distribution than in the higher one. For this reason we decided to use trimming, which is another alternative method to determine the region of support. In particular, we used a trimming level of 5.

#### *Assessing the Matching Quality*

It is necessary to assess the quality of the matching to check whether the matching procedure is able to balance the distribution on the relevant variables in both the control and the treatment groups. Conceptually, the basic idea is to compare the situation before and after matching to check if any differences remain after conditioning on the propensity score. Caliendo and Kopeinig (2005) present a thorough description of different methods to assess the matching quality. This study uses the *t*-test approach proposed by Rosenbaum and Rubin (1985), which consists of checking whether the previous differences in the covariate means between the two groups persist. After determining the level of common support we tested whether the differences in the means across treated and comparison units were statistically significant. These results are reported in Table A.2 in the appendix.

#### *Estimation of the Treatment Effects and Standard Errors*

Unlike logit regression, which only estimates the average treatment effect (ATE), propensity score matching methods estimate two additional effects, the average treatment on the treated (ATT) and the average treatment on the untreated (ATU). The problem with the ATE is that it compares all individuals in the sample, who may differ substantially in their observable characteristics. A more appropriate comparison would be to compare individuals with similar probabilities of being in the “treatment” group, ATT. In this study we focus on the effects of attending a specific type of institution for individuals with similar probabilities of attending these types of institutions. The ATU is the estimate that one would get if we were interested in what would have happened if the students had made a different choice. In other words, the ATU estimates the effect on educational outcomes for those who attended a non-selective college, but could have been forced to attend a selective college. Thus, the most appropriate estimate for the purposes of this study is the ATT but for comparison purposes we also report the ATE and ATU. The calculations of standard errors of the ATT, ATE and ATU were done using bootstrapping.<sup>6</sup>

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<sup>6</sup> The estimation of the standard errors are not straightforward because the estimated variance of the treatment effect also includes the variance due to the estimation of the propensity score, the imputation of the common support, and also the order in which individuals were matched (Caliendo & Kopeinig, 2005). A common technique used in the literature to estimate standard errors is bootstrapping, which enables the inclusion of the first steps of the estimation (Andrews & Buchinsky, 2001; Black & Smith, 2004; Sianesi, 2004).

### *Limitations*

It is important to remind the reader that the estimates obtained from non-experimental data are limited in terms of making causal inferences.

## **Findings**

### *Descriptive Statistics of Scholars and Non-Recipients*

This section presents the individual and pre-college cognitive and non-cognitive characteristics of the scholars and non-recipients of the sample of this study. It also describes the characteristics of the institutions attended as well as the financial aid that they received (see Table 2). It is noteworthy that about 88 percent of the scholars and non-recipients received a B.A. or higher within six years of entering college in 2000. The attainment rate is slightly higher for the scholars although the difference is not statistically significant.

#### *Individual Characteristics*

There were some differences between the individual characteristics of scholars and non-recipients. Even though the three minority groups were equally represented within the scholar group, there was a higher percentage of Asian/Pacific Islander, and a lower percentage of Latino in the non-recipient group. The most striking differences were related to the socio-economic distribution of the students. Not surprisingly, all the scholars were Pell grant recipients (this was one of the criterion for selection) compared to just 6 percent of the non-recipients. Similarly, the educational attainment of both the mother and father of the non-recipients was much higher than the one of the scholars. A slightly higher percentage of non-recipients graduated from private high schools but the difference was not statistically significant.

#### *Pre-college Cognitive and Non-Cognitive Characteristics*

There were also some differences between scholars and non-recipients in terms of their pre-college cognitive and non-cognitive characteristics. In terms of the cognitive characteristics, the most salient difference is that the average combined (verbal and Math) SAT scores of scholars, is slightly lower than the one of non-recipients. The average SAT scores of scholars was 1,147 compared to 1,225 for non-recipients and the difference was statistically significant. The average SAT scores of scholars and non-recipients were higher compared with the re-centered scores of the sample of test takers in 1999 (the year they applicants took the SAT). The national average composite SAT score in 1999 was 1,016, this means that both scholars and non-recipients were above the national average (College Board, 1999; College Board, 2007). The composite score was divided by two to get a sense of the percentile distribution in English and Math. The scholars were in the 71 percentile in Verbal and 67 percentile in Math, whereas the non-recipients were in the 82 percentile in Verbal and 78 percentile in Math<sup>7</sup>. It is noteworthy that the scholars' high school academic preparation measured by traditional proxies of variables related to

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<sup>7</sup> The conversion of the SAT scores to percentiles used the tables available in the College Board website cited in the references.

academic persistence was slightly lower than the one of non-recipients. There were no major differences in terms of the number of AP tests taken by the two groups of students. However, the bachelor's degree aspirations of the scholars were slightly higher than the one of non-recipients.

One of the main objectives of the GMS program was to select participants using a set of characteristics that affect persistence but that have not traditionally been used by admission selection committees at selective institutions. Probably as a result of the substantial impact of U.S. News and World Report (USNWR) rankings, admission selection committees at selective institutions mainly use cognitive measures to select their freshmen classes. One of the measures that USNWR uses to rank institutions is the average SAT scores of the freshmen entrant class. However, there are many other factors that according to the theory also affect student persistence. The foundation decided to use alternative measures developed by Sedlacek (1998, 2003 and 2004) to select from a group of high achieving low-income group of minorities. It is noteworthy that even though the scholars had slightly lower measures on the cognitive scores, they had higher scores on the non-cognitive measures. The overall scores of both recipients and non-recipients in the non-cognitive measures were high, around 90. Looking at specific questions related to the locus of control and self-esteem of students, it was clear that the scholars usually scored higher in questions related to higher self-esteem and control. There were statistically significant differences in two questions of the self control group. These were: "Good luck is more important than hard work for success," and "When I make plans I am almost certain that I can make them work." A smaller percentage of scholars replied positively to the first question, and a much higher percentage replied positively to the second one.

#### *Institutional Characteristics*

It is noteworthy that a substantial majority of the scholars and non-recipients attended selective institutions. Just below 15 percent of the scholars and non-recipients attended non-selective institutions, and the average SAT scores of the institutions attended by both the scholars and non-recipients was above 1,150 (the lowest range of the *highly selective* institutions: 1,150-1,250). There is evidence that high achieving low-income students are under-represented in the most selective institutions (Carnevale & Rose, 2003; Dowd, Cheslock & Melguizo, 2008). The fact that most of the applicants attended a selective institution suggests that these individuals were aware of their academic potential.

#### *Financial Aid*

There were substantial and statistically significant differences between the types and amount of financial aid received by the scholars and the non-recipients. This information is based on the three surveys completed by the scholars and non-recipients between 2002 and 2006. As one would expect the scholars received on average \$11,000 more than the non-recipients; scholars received almost \$34,000 in grants compared to \$23,000 for non-recipients. Even though they also took loans, on average they took about \$10,000 less in debt, and their parent's contribution was also almost \$10,000 less than the one of the non-recipients. The scholars also worked on average 4 hours less per week than the non-recipients. All of this suggests that the scholars had less financial pressures,

and they could devote more time to focus and concentrate on attaining their degrees. However, it is noteworthy that even though the GMS scholarship covered the rent, it does not cover living expenses, so most of the scholars had to work more than 20 hours per week to cover for these expenses.

In summary, the results of descriptive statistics suggest that there are not substantial differences between the scholars and non-recipients in terms of their individual characteristics except for socio-economic status. The non-recipients had slightly higher cognitive measures whereas the recipients had slightly higher scores in the non-cognitive measures. This is consistent with the goals of the program of funding low-income high achieving students who have a strong locus of control and self-esteem, who have been involved in their communities, and who have been successful in overcoming major obstacles in their lives. It is noteworthy that most of the individuals in the sample attended selective institutions. The major differences between the sample of scholars and non-recipients were related to the composition of the financial aid received. Scholars received a much higher percentage of grant aid, and non-recipients had to apply for more loans, they received substantially more financial support from their parents, and they worked more hours per week. In the next section the results of multivariate analysis are described in order to identify the effect of selectivity of institution attended on the attainment rates of scholars and non-recipients.

**Table 2. Descriptive Statistics of Recipients and Non-Recipients of the Gates Millennium Scholarship (GMS)**

	Recipients	Non-Recipients
	Weighted <sup>a</sup>	
Attained a B.A. or higher within six years	88.82	88.25
<b>STUDENT INDIVIDUAL AND BACKGROUND CHARACTERISTICS</b>		
Sex		
Female	67.29	65.73
Age in freshmen year	19	19
Race		
African American	33.11	35.55
Asian American	33.36	40.22
Latino	33.54	24.23
Socioeconomic status		
Pell grant recipient	94.32	5.68
Mother college graduate	23.37	47.13
Father college graduate	22.22	50.91
Graduated from Private High School	8.87	10.7
<b>PRE-COLLEGE CHARACTERISTICS</b>		
Cognitive measures		
SAT scores	1,147	1,225
Number of advanced placement (AP) exams taken	2.13	2.34
Bachelor's degree aspirations	96.41	92.14

**Table 2. (Cont.) Descriptive Statistics of Recipients and Non-Recipients of the Gates Millennium Scholarship (GMS)**

	Recipients	Non-Recipients
	Weighted <sup>a</sup>	
Non-cognitive measures		
Total score	90.29	89.93
Locus of control		
Not enough control over my life	17.21	18.04
Good luck is more important than hard work for success	3.77	9.7
Each time I try to get ahead someone stops me	12.17	14.6
Plans don't work out for me	9.1	7.68
When I make plans I am almost certain that I can make them work	88.37	83.81
Self Esteem		
I feel good about myself	93.52	92.05
I feel a person of worth	96.05	96.09
I feel I can make things as good as other people	93.48	92.48
On the whole I am satisfied with myself	91.29	89.68
I feel useless at times	30.46	33.26
At times I am not good at all	27.72	32.14
I feel that I don't have much to be proud of	8.32	9.71
<b>INSTITUTIONAL CHARACTERISTICS</b>		
Control of graduating or current institution		
Private	40.92	42.7
Selectivity of institution <sup>b</sup> (school-average SAT score in 1999)		
	1,192	1,207
Category of selectivity of institution		
Most Selective	31.94	37.29
Highly Selective	34.72	29.72
Very Selective	18.36	19.13
Non-selective	14.98	13.86

**Table 2. (Cont.) Descriptive Statistics of Recipients and Non-Recipients of the Gates Millennium Scholarship (GMS)**

	Recipients	Non-Recipients
	Weighted <sup>a</sup>	
<b>FINANCIAL AID</b>		
Total grants received	33,957	23,014
Total loans received	14,081	23,940
Total parental contribution received	1,830	10,644
Total hours worked per week	19.9	23.73
N	896	896

<sup>a</sup> Pearson's Chi-square tests and t-test.

<sup>b</sup> Selectivity of graduating institution or selectivity of current or last institution attended.

\* Significant at 10%; \*\* Significant at 5%; \*\*\* Significant at 1%.

Weight used is: r1to3wgt.

Source: Author's calculation using the longitudinal dataset of Cohort 1 (Freshmen 2000)

### *Multivariate*

#### *The Effect of Selectivity of Institution Attended on B.A. Attainment*

##### *Logistic Regression*

Logistic regression was used to identify the effect of selectivity of institution attended on B.A. attainment rates of students. Unlike descriptive statistics that identify differences in the levels of selectivity, multivariate analysis enable us to identify the additional gain in baccalaureate attainment rates for students who attended institutions of different selectivity, holding all the other factors constant.

The models were run separately for scholars and non-recipients (see Table 3). The results suggest that different factors affect the attainment rates of scholars and non-recipients. In the case of scholars, holding all else constant, individuals who attained the *most selective* institutions were almost 4 percent more likely to attain a degree within six years, than those who attended non-selective institutions. Holding all else constant, there was a 6 percent increase in graduation rates for those who attended a *highly selective*, and 4 percent increase for those who attended a *very selective* institution, as opposed to those who attended a non-selective one. There was no statistically significant impact of receiving additional financial aid in the form of grants, loans, or parental contribution, as well as in terms of hours worked per week.

The factors related to attainment for the non-recipients were different. In their case, the type of selective institution attended had no statistically significant effect in graduation. For this group, who received much less financial support in terms of grant money, who had to take a larger amounts of loans, and whose parents had to contribute significantly to their education, the financial aid variables were the ones that were significantly related to attainment. An additional \$1,000 in grant money was related to a 2 percent increase in the B.A. attainment rates of non-recipients. Similarly, an additional \$1,000 in parental contributions translated in a 3 percent increase in attainment.

These results suggest that for the scholars there is a positive and significant effect of selectivity on college completion. This is a powerful finding especially after controlling for a substantial number of non-cognitive factors that are related to college persistence. This result suggests that selective institutions should broaden the admission criteria and include non-cognitive measures related to persistence. The findings of this study showed that even though the scholars had slightly lower cognitive measures than the non-recipients counterparts, this had no negative effect on persistence. The relatively higher graduation rates of scholars, suggest that these non-cognitive measures might have been better predictors of graduation than traditional cognitive measures used by admission committees in selective institutions.

The results also show that the factors related to attainment differ for the non-recipients. In their case, the financial aid in the form of grants and parental contribution had the largest impact. This finding suggests that there might be some mediating effect of financial aid on the effect of selectivity of institution attended on B.A. attainment. The interaction effect between type of financial aid and level of selectivity of institution attended is explored after the PSM estimates are described.

**Table 3. The Effect of Selectivity and Financial Aid on Baccalaureate Attainment  
Recipients and Non-Recipients of the Gates Millennium Scholarship (GMS)  
Logit Regression**

	Recipients	Non-Recipients Weighted
<b>INSTITUTIONAL CHARACTERISTICS</b>		
Category of selectivity of institution		
Most Selective	0.04** (0.02)	0.022 (0.04)
Highly Selective	0.064*** (0.02)	0.015 (0.03)
Very Selective	0.04** (0.02)	-0.08 (0.06)
<b>FINANCIAL AID</b>		
Total grants received (\$1000)	0.001 (0.00)	0.002*** (0.00)
Total loans received (\$1000)	0.000 (0.00)	0.001 (0.00)
Total parental contribution received (\$1000)	0.003 (0.00)	0.003** (0.00)
Total hours worked per week	-0.001 (0.00)	-0.000 (0.00)
<b>CONTROLS<sup>a</sup></b>		
	YES	YES
Chi-Square	62.94***	59.97**
N	524	372

<sup>a</sup> The control variables used include: race, age, gender, father college graduate, mother college graduate, Pell recipient, SAT scores, number of AP exams, graduated from private high school, baccalaureate aspirations and non-cognitive measures, private college.

\* Significant at 10%; \*\* Significant at 5%; \*\*\* Significant at 1%.

Weight used is: r1to3wgt.

Source: Author's calculation using the longitudinal dataset of Cohort 1 (Freshmen 2000)

### *Propensity Score Matching*

Propensity score matching was also used to estimate the effect of selectivity on attainment. An advantage of this technique is that it forces the researcher to compare groups of individuals who mostly differ in terms of the “treatment.” In other words, this technique will only compare individuals who are very similar in their observed characteristics, in this case they could have attended a selective institution, but who chose to attend a non-selective college. By matching individuals in non-selective institutions with individuals in either *very*, *highly*, and *most* selective, this technique obtains the

average treatment on the treated (ATT) effect instead of the average treatment effect (ATE) that has been traditionally obtained in regression analysis.

The estimates of PSM confirm the results of logistic regression. They also suggest that there is a positive and significant impact of selectivity of institution attended on the baccalaureate attainment for scholars (see Table 4). The ATT of attending a *very selective* institution as opposed to a non-selective one is 12 percent. The effect increases for the *highly selective* institutions compared to the non-selective ones, to about 18 percent. However, the effect of the most selective institution although is positive is not statistically significant. The results of the ATE and ATU also suggest a positive and statistically significant effect of increasing selectivity and baccalaureate attainment.

In summary, the results of PSM suggest that the estimates of logistic regression might have a downward bias. The positive effect of attending institutions of higher levels of selectivity is between 12 and 19 percent in the PSM estimation, compared to 4 to 6 in the logistic estimates. This is a powerful finding and again suggests that low-income high achieving minorities have the potential of benefiting extremely from attending selective institutions.

<b>Table 4. The Effect of Selectivity of Institution and Financial Aid on Baccalaureate Attainment</b>				
<b>Recipients of the Gates Millennium Scholarship (GMS)</b>				
<b>Propensity Score Matching</b>				
<b>Attained a B.A. or higher within 6-years</b>				
	<b>Logit</b>	<b>PSM</b>		
		ATT	ATE	ATU
<b>Logit Regression (Weighted)</b>				
Category of selectivity of institution				
Most Selective	0.048*** (0.02)	---	---	---
Highly Selective	0.064*** (0.02)	---	---	---
Very Selective	0.051** (0.02)	---	---	---
<b>Propensity Score Matching -Local Linear Regression</b>				
Category of selectivity of institution				
Most Selective	---	0.14 (0.12)	0.15* (0.09)	0.19*** (0.07)
Highly Selective	---	0.18** (0.07)	0.15** (0.06)	0.15** (0.06)
Very Selective	---	0.12** (0.05)	0.14** (0.05)	0.15** (0.06)
<b>CONTROLS<sup>a</sup></b>				
	YES			
N	524			

<sup>a</sup> The control variables used include: race, age, gender, father college graduate, mother college graduate, Pell recipient, SAT scores, number of AP exams, graduated from private high school, baccalaureate aspirations and non-cognitive measures, private college.

\* Significant at 10%; \*\* Significant at 5%; \*\*\* Significant at 1%.

Weight used is: r1to3wgt.

Source: Author's calculation using the longitudinal dataset of Cohort 1 (Freshmen 2000)

#### *The Mediating Effect of Financial Aid on the Impact of Selectivity of Institution Attended on Baccalaureate Attainment of GMS Scholars*

The differences in the factors related to attainment between the scholars and non-recipients suggested that there might be a mediating effect of the financial aid received on the effect of the level of selectivity of institution attended (See Table 5).

#### *Interaction between Selectivity of Institution Attended and Grants Received*

In order to explore whether the effect of receiving additional financial aid in the form of grants varied between *very*, *highly*, and *most* selective institutions and non-selective institutions, three interaction terms were included in the first model. The results show that only the interaction term between very selective (as opposed to non-selective) and grants was statistically significant. The results of the interactions are displayed visually to ease the interpretation. Figure 1.A. illustrates the negative effect of receiving additional grant money in very selective institutions as opposed to non-selective institutions in the probabilities of attainment. This result is statistically significant, and it is probably suggesting that the graduation rates for the students who received more grant money in very selective institutions are probably lower than the graduation rates of students who received much less grant money at non-selective institutions. One possible explanation for this counterintuitive finding might be related to the relatively high graduation rates of African American at Historically Black Colleges and Universities (HBCUs).

#### *Interaction between Selectivity of Institution Attended and Loans Received*

The results also suggested that there were differences between the effect of accumulating more loans by selectivity of institution attended. The results of the interactions are displayed in Figure 1.B. Here the interaction between attending the most and highly selective institutions (as opposed to a non-selective one) and loans was significant. The results suggest that when the students start accumulating substantial levels of debt in the form of loans, their probabilities of completion decrease. This result suggests that financial aid in the form of loans have a positive impact on attainment up to a certain point. And that once the students start accumulating more than the average cost of a five year college education (i.e. \$50,000), their probabilities of completion decreases. It might also suggest that students who accumulate these substantial amounts of debt might be getting disengaged from their studies. Finally, it is important to remember that this is self-reported data and the very high levels of debt are also suspicious given that all the grantees had guaranteed last dollar amount of grants to cover for tuition, fees, and rent for five years.

#### *Interaction between Selectivity of Institution Attended and Parental Contribution Received*

The amount of parental contribution of the scholars was very small but the results suggest a negative interaction effect between parental contribution and the *most* and *highly* selective institutions. The results are not illustrated graphically but they also suggest that the effect of parental contribution on persistence might shift the effect on completion once it reaches a specific level. Some of the possible explanations are that the students might feel that this is a very big burden to their parents and might want to work more hours to repay their families.

#### *Interaction between Selectivity of Institution Attended and Total Hours Worked Per Week*

The results of the interaction effect between hours worked per week and selectivity of institution attended were statistically significant for all the three types of

selective institutions. The results are illustrated in Figure 1.C. It is noteworthy that the effect of working additional hours is constant in the *very* and *highly* selective institutions compared to the non-selective ones. On the other hand, for students who worked more than 20 hours a week the probabilities of completion decreases substantially at the *most selective* institutions compared to the non-selective ones. This result suggests that the academic demands of the *most selective* institution can only accommodate working half time. Once the student starts to work additional hours this will definitely hurt their academic performance.

In summary, the results of the interaction effects suggest that there is evidence that there is a differential effect of different forms and amounts of financial aid on college completion, and that the effect also differ by selectivity of institution attended. The most salient findings were the negative impact of additional loans, and hours worked per week in the most selective institutions. However, it is important to remember the limitations of the self-reported data.

**Table 5. The Effect of Selectivity of Institution and Financial Aid on Baccalaureate Attainment Recipients of the Gates Millennium Scholarship (GMS) Logit Regression- Interactions**

	Recipients			
	Model 1	Model 2	Model 3	Model 4
<b>INSTITUTIONAL CHARACTERISTICS</b>				
Category of selectivity of institution				
Most Selective	0.06*	0.05**	0.047**	-0.15
	(0.04)	(0.02)	(0.02)	(0.15)
Highly Selective	0.06	0.05**	0.052***	-0.05
	(0.03)	(0.02)	(0.02)	(0.09)
Very Selective	0.07***	0.02	0.034**	-0.11
	(0.02)	(0.02)	(0.02)	(0.02)
<b>FINANCIAL AID</b>				
Total grants received (\$1000)	0.002*	---	---	---
	(0.00)			
Total loans received (\$1000)	---	-0.001	---	---
		(0.00)		
Total parental contribution received (\$1000)	---	---	-0.011	---
			(0.01)	
Total hours worked per week	---	---	---	0.005**

**Table 5. The Effect of Selectivity of Institution and Financial Aid on Baccalaureate Attainment Recipients of the Gates Millennium Scholarship (GMS) Logit Regression- Interactions**

	Recipients			
	Model 1	Model 2	Model 3	Model 4
<b>INTERACTIONS</b>				
<b>Grants</b>				
Most Selective*Grants	-0.003	---	---	---
Highly Selective*Grants	-0.0003	---	---	---
	-			
Very Selective*Grants	0.003**	---	---	---
<b>Loans</b>				
Most Selective*Loans	---	0.003**	---	---
Highly Selective*Loans	---	0.002**	---	---
Very Selective*Loans	---	0.003	---	---
<b>Parental Contribution</b>				
Most Selective*Parents Contribution	---	---	0.026**	---
Highly Selective*Parents Contribution	---	---	0.018*	---
Very Selective*Parents Contribution	---	---	0.011	---
<b>Total Hours Worked per Week</b>				
Most Selective*Tohoursweek	---	---	---	0.005**
Highly Selective*Tohoursweek	---	---	---	0.004**
Very Selective*Tohoursweek	---	---	---	0.006**
<b>CONTROLS<sup>a</sup></b>	YES	YES	YES	YES
N	524			

<b>Table 5 (Cont.). The Effect of Selectivity of Institution and Financial Aid on Baccalaureate Attainment</b>				
<b>Recipients of the Gates Millennium Scholarship (GMS)</b>				
<b>Logit Regression- Interactions</b>				
	<b>Recipients</b>			
	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>	<b>Model 4</b>
<b>Parental Contribution</b>				
Most Selective*Parents Contribution	---	---	0.026**	---
Highly Selective*Parents Contribution	---	---	0.018*	---
Very Selective*Parents Contribution	---	---	0.011	---
<b>Total Hours Worked per Week</b>				
Most Selective*Tothoursweek	---	---	---	0.003*
Highly Selective*Tothoursweek	---	---	---	0.003*
Very Selective*Tothoursweek	---	---	---	0.004**
<b>CONTROLS<sup>a</sup></b>	YES	YES	YES	YES
N	524			

<sup>a</sup> The control variables used include: race, age, gender, father college graduate, mother college graduate, Pell recipient, SAT scores, number of AP exams, graduated from private high school, baccalaureate aspirations and non-cognitive measures, private college.

\* Significant at 5%; \*\* Significant at 1%.

Weight used is: r1to3wgt.

Source: Author's calculation using the longitudinal dataset of Cohort 1 (Freshmen 2000)

Figure 1A Predicted probabilities of completion of Scholars-Grants  
Grants by Selectivity of Institution

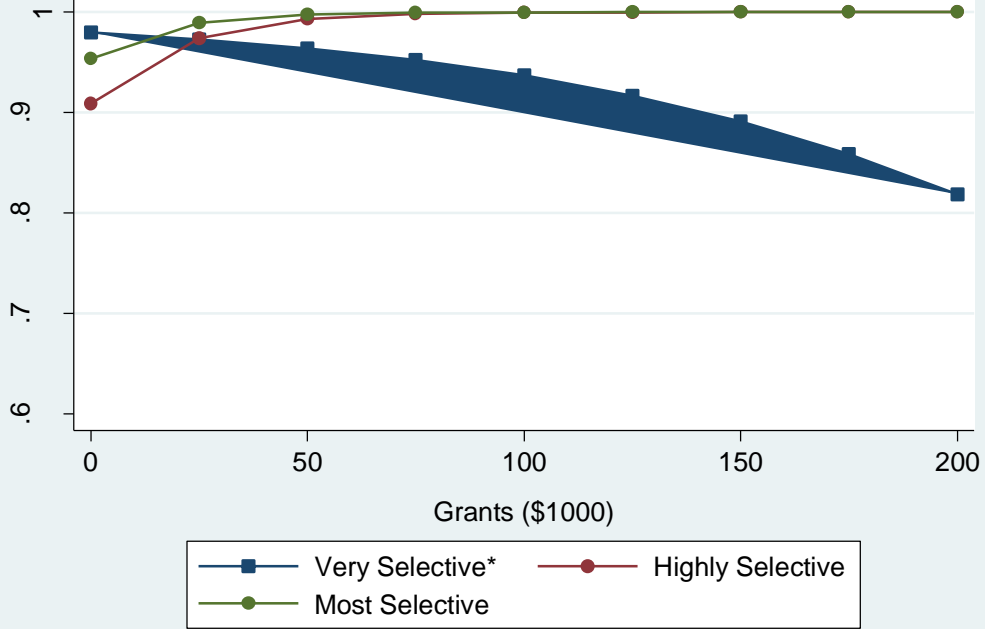
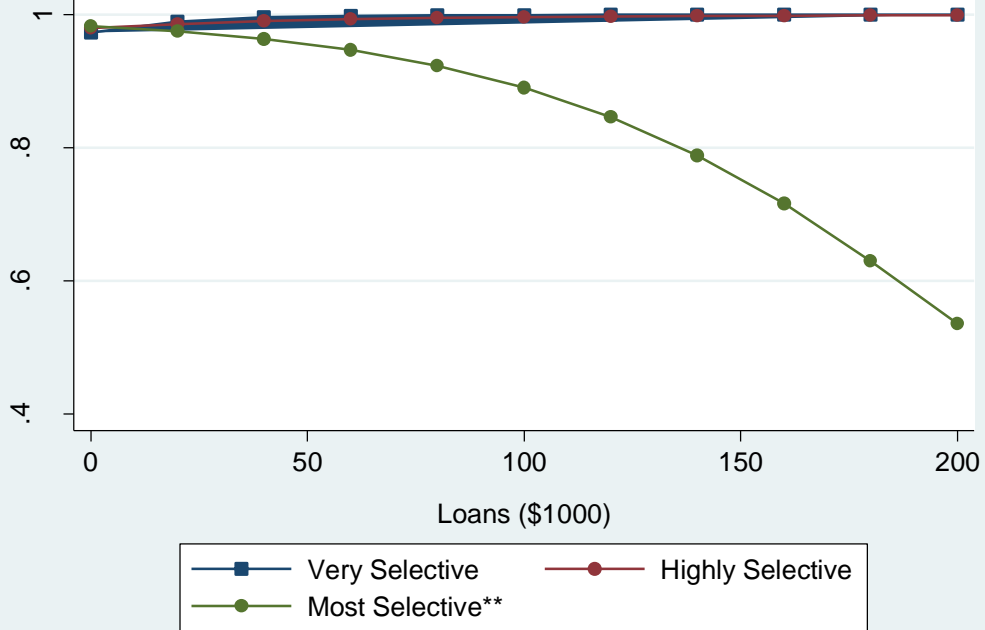
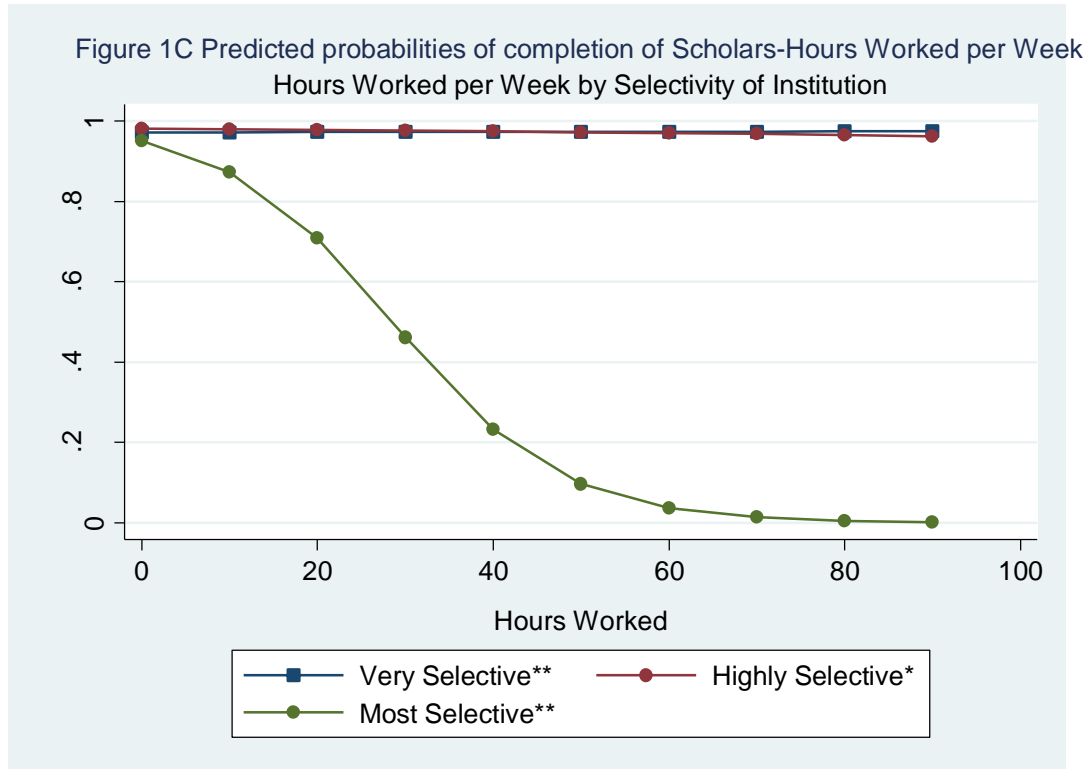


Figure 1B Predicted probabilities of completion Scholars-Loans  
Loans by Selectivity of Institution





### Conclusions and Implications for the Effectiveness of the GMS Program

The results of this study suggest that the probability of attaining a bachelor’s degree increases with selectivity of institution attended. Holding all else constant the scholars who attended either a *very*, *highly*, or *most* selective institution as opposed to a non-selective one, were at least 4 percent more likely to complete a B.A. within six years. The results from the PSM confirm this and suggest that the effect might be even higher; between 12 and 19 percent. There is also evidence of a mediating effect of financial aid on the impact of selectivity of institution attended. The effect of receiving additional grant and loan money, as well as working additional hours per week, varied with type of selective institution attended. For those scholars who attended a *very selective* institution as opposed to a non-selective one, having an additional \$1,000 in grant money translated in a lower probability of B.A. attainment. Similarly, for scholars who attended the *most* selective institutions instead of non-selective ones, having an additional \$1,000 in loans, or working more than 20 hours per week translated in a lower probability of B.A. attainment. This finding illustrates the differential effect of grant and loan money on college completion according to type of institution attended.

This study provides insights to the Bill & Melinda Gates foundation, scholars, administrators, and students and their families, on the positive effect of attending a more selective institution on the baccalaureate attainment rates of high achieving low-income minorities. It is important to mention that given that the scholars from Cohort 1 were notified of the award during the fall semester when they had already enrolled in college, the award had no effect in helping them gain access to more selective institutions,

however, given the differences in the effect of financial aid in the form of grants between scholars and non-recipients, it is likely that the additional funds translated in higher levels of persistence. Also, the findings of the negative effect of loans, and additional hours worked on persistence, suggest that if the scholars have not received these funds their graduation rates could have been lower. Finally, the really high graduation rates and the fact that there were no differences between scholars and non-recipients with slightly higher cognitive scores, suggest that non-cognitive scores also play a significant role in persistence. These findings suggest that admission committees of selective institutions who want to increase the diversity of their students by enrolling higher numbers of low-income high achieving minorities should consider expanding their admission criteria and challenge the much criticized measures of the USNWR.

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## Appendix

<b>Table A.1 Factors Related to Attending Institutions of Different Levels of Selectivity</b>			
<b>Recipients of the Gates Millennium Scholarship (GMS)</b>			
<b>-Multinomial Probit Regression</b>			
	<b>Very Selective</b>	<b>Highly Selective</b>	<b>Most Selective</b>
<b>STUDENT INDIVIDUAL AND BACKGROUND CHARACTERISTICS</b>			
Sex			
Female	0.13 (0.26)	-0.1 (0.26)	-0.42 (0.27)
Age in freshmen year	-0.07 (0.21)	-0.04 (0.21)	0.07 (0.23)
Race			
African American	-0.33 (0.35)	-1.41** (0.33)	-0.65 (0.34)
Latino	-0.42 (0.32)	-0.92** (0.29)	-0.75* (0.30)
Socioeconomic status			
Mother college graduate	-0.38 (0.34)	-0.2 (0.32)	-0.29 (0.33)
Father college graduate	0.66 (0.34)	0.32 (0.33)	0.46 (0.34)
Graduated from Private High School	0.53 (0.42)	0.34 (0.41)	0.89* (0.43)
<b>PRE-COLLEGE CHARACTERISTICS</b>			
Cognitive measures			
SAT scores	0.16 (0.10)	0.11 (0.09)	0.41** (0.09)
Number of advanced placement (AP) exams taken	0.03 (0.08)	0.08 (0.08)	0.34** (0.08)
Bachelor's degree aspirations	-0.02 (0.60)	-0.14 (0.55)	-0.51 (0.64)
Non-cognitive measures			
Total score	0.03 (0.02)	0.03 (0.02)	0.04 (0.02)
Locus of control			
Not enough control over my life	0.79* (0.34)	0.05 (0.34)	0.57 (0.34)
Good luck is more important than hard work for success	1.14* (0.56)	-0.34 (0.61)	0.65 (0.57)

<b>Table A.1 (Cont.) Factors Related to Attending Institutions of Different Levels of Selectivity</b>			
<b>Recipients of the Gates Millennium Scholarship (GMS)</b>			
<b>-Multinomial Probit Regression</b>			
	<b>Very Selective</b>	<b>Highly Selective</b>	<b>Most Selective</b>
Each time I try to get ahead someone stops me	-0.57	-0.31	-0.49
	(0.34)	(0.31)	(0.35)
Plans don't work out for me	-0.69	-0.46	-0.32
	(0.46)	(0.44)	(0.41)
When I make plans I am almost certain that I can make them work	-0.66	-0.1	-0.71
	(0.42)	(0.39)	(0.41)
Self Esteem			
I feel good about myself	0.44	0.31	0.44
	(0.57)	(0.56)	(0.52)
I feel a person of worth	-0.1	-0.2	-0.71
	(0.80)	(0.71)	(0.69)
I feel I can make things as good as other people	-0.19	-0.82	-0.78
	(0.57)	(0.52)	(0.58)
On the whole I am satisfied with myself	0.35	-0.45	0.6
	(0.53)	(0.47)	(0.50)
I feel useless at times	0.42	0.45	0.38
	(0.35)	(0.34)	(0.34)
At times I am not good at all	-0.78*	-0.76*	-0.57
	(0.36)	(0.34)	(0.37)
I feel that I don't have much to be proud of	0.77	0.28	0.71
	(0.51)	(0.47)	(0.47)
<b>INSTITUTIONAL CHARACTERISTICS</b>			
Control of graduating or current institution			
Private	-0.33	-0.57	0.03
	(0.30)	(0.29)	(0.32)

<b>Table A.1 (Cont.) Factors Related to Attending Institutions of Different Levels of Selectivity</b>			
<b>Recipients of the Gates Millennium Scholarship (GMS)</b>			
<b>-Multinomial Probit Regression</b>			
	<b>Very Selective</b>	<b>Highly Selective</b>	<b>Most Selective</b>
<b>FINANCIAL AID</b>			
Total grants received	0.00 (0.01)	0.01** (0.01)	0.02** (0.01)
Total loans received	0.01 (0.01)	0.01 (0.01)	0 (0.01)
Total parental contribution received	0.05 (0.05)	0.09 (0.05)	0.08 (0.05)
Total hours worked per week			
Intercept	129.71 (410.37)	73.3 (408.06)	-150.18 (451.60)
Chi-square	278.51***		
N	524		
<sup>a</sup> Selectivity of graduating institution or selectivity of current or last institution attended.			
* Significant at 10%; ** Significant at 5%; *** Significant at 1%.			
Weight used is: r1to3wgt.			
Source: Author's calculation using the longitudinal dataset of Cohort 1 (Freshmen 2000)			

**Table A.2. Results of Balancing Tests**

Variable	Sample	Mean Treated	Control	%bias	%reduct  bias	t-test t	p> t
Latino	Unmatched	0.34343	0.42029	-15.8		-1.01	0.314
	Matched	0.33684	0.3962	-12.2	22.8	-0.73	0.465
African American	Unmatched	0.39394	0.46377	-14.1		-0.9	0.37
	Matched	0.38947	0.49208	-20.7	-46.9	-1.68	0.096
Age in freshmen year	Unmatched	1981.8	1981.8	0.8		0.05	0.957
	Matched	1981.8	1981.7	8.1	-860.8	0.69	0.49
Female	Unmatched	0.75758	0.78261	-5.9		-0.38	0.707
	Matched	0.75789	0.81671	-13.9	-135	-0.9	0.371
Father college graduate	Unmatched	0.25253	0.11594	35.6		2.21	0.028
	Matched	0.25263	0.14628	27.7	22.1	1.5	0.134
Mother college graduate	Unmatched	0.21212	0.18841	5.9		0.37	0.709
	Matched	0.22105	0.16898	12.9	-119.6	0.76	0.45
SAT scores	Unmatched	11.129	10.556	39.9		2.52	0.013
	Matched	11.198	10.497	48.8	-22.4	3.37	0.001
Number of advanced placement (AP) exams taken	Unmatched	1.6566	1.4203	17.4		1.1	0.274
	Matched	1.6737	1.3193	26.1	-50	2.12	0.036
dprivhs	Unmatched	0.09091	0.05797	12.5		0.78	0.435
	Matched	0.08421	0.05458	11.2	10	0.9	0.371
Bachelor's degree aspirations	Unmatched	0.9697	0.97101	-0.8		-0.05	0.961
	Matched	0.96842	0.97309	-2.7	-254.4	-0.29	0.77
Not enough control over my life	Unmatched	0.19192	0.07246	35.6		2.19	0.03
	Matched	0.17895	0.07356	31.4	11.8	2.01	0.047
Good luck is more important than hard work for success	Unmatched	0.07071	0.02899	19.1		1.18	0.24
	Matched	0.05263	0.02191	14.1	26.4	0.99	0.324
Each time I try to get ahead someone stops me	Unmatched	0.09091	0.18841	-28.2		-1.85	0.066
	Matched	0.09474	0.15035	-16.1	43	-0.8	0.425
Plans don't work out for me	Unmatched	0.06061	0.08696	-10		-0.65	0.517
	Matched	0.06316	0.07932	-6.2	38.7	-0.19	0.847
When I make plans I am almost certain that I can make them work	Unmatched	0.87879	0.92754	-16.4		-1.03	0.306
	Matched	0.87368	0.92972	-18.9	-14.9	-1.16	0.248
I feel good about myself	Unmatched	0.93939	0.94203	-1.1		-0.07	0.944
	Matched	0.94737	0.94952	-0.9	18.2	-0.28	0.782
I feel a person of worth	Unmatched	0.9798	0.98551	-4.3		-0.27	0.785
	Matched	0.97895	1	-16	-268.7	-1.48	0.142
I feel I can make things as good as other people	Unmatched	0.9596	0.95652	1.5		0.1	0.922
	Matched	0.95789	0.9725	-7.2	-375	-0.75	0.456
On the whole I am satisfied with myself	Unmatched	0.93939	0.92754	4.7		0.3	0.762
	Matched	0.93684	0.94722	-4.1	12.5	-0.51	0.611

**Table A.2. (Cont.) Results of Balancing Tests**

Variable	Sample	Mean		%bias	%reduct  bias	t-test	
		Treated	Control			t	p> t
I feel useless at times	Unmatched	0.27273	0.26087	2.7		0.17	0.865
	Matched	0.27368	0.25191	4.9	-83.7	0.59	0.553
At times I am not good at all	Unmatched	0.21212	0.28986	-17.9		-1.15	0.251
	Matched	0.21053	0.26922	-13.5	24.5	-0.39	0.696
I feel that I don't have much to be proud of	Unmatched	0.09091	0.04348	18.9		1.17	0.243
	Matched	0.08421	0.0376	18.6	1.7	1.32	0.188
Non-cognitive measures Total score	Unmatched	90.263	88.725	28.4		1.83	0.069
	Matched	90.379	88.774	29.7	-4.4	1.81	0.072
Total grants received	Unmatched	27.405	25.544	9.3		0.58	0.562
	Matched	27.882	23.799	20.3	-119.4	2.1	0.038
Total loans received	Unmatched	17.071	11.061	25.2		1.55	0.123
	Matched	17.216	11.492	24	4.7	1.53	0.127
Total parental contribution received	Unmatched	1.3235	0.56558	35.3		2.15	0.033
	Matched	1.3634	0.50063	40.2	-13.8	2.78	0.006