UNDERGRADUATE DEBT AND THE PROPENSITY TO PURSUE POST BACCALAUREATE EDUCATION

AN HONORS THESIS

BY

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ABSTRACT

The purpose of this study was to critically analyze the relationship between debt and an individual's propensity to apply and enroll in post baccalaureate study. This study used a model similar to the model developed by Millet in her analysis of 1992-1993 college seniors, as well as gender comparisons originally included in Fox's 1992 study.

The data set for this model was the Baccalaureate and Beyond Longitudinal Study of 2000-2001 College Graduates, a comprehensive survey that provided individualized data, allowing this model to determine the impact that debt and other factors have on a student deciding to pursue post baccalaureate education.

In order to empirically test whether debt was significant, a binary logistic regression was performed. The results showed that debt had a significant impact on whether a student applied to a graduate or professional program, particularly among females. However, debt did not have significant influence on post baccalaureate enrollment.

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1. INTRODUCTION

In today's labor market, education is increasingly essential in order to compete. High school students feel pressure to continue their education at college and graduate or professional schools as record numbers of their peers enroll in institutions of higher learning. Coupled with increased societal pressure valuing the importance of education and the decline of employment opportunities for those with only a high school degree, many view earning at least a college education not as an option but rather a necessity before beginning their careers. In 1970, 36 percent of workers held a high school degree or less, while 14 percent had four or more years at college. These numbers had changed drastically by 2000, when only 13 percent had no more than a high school education and 27 percent had completed at least a college degree (McConnell, Brue, and Macpherson 85).

However, students are struggling now more than ever to obtain their educational goals. Faced with skyrocketing tuition and government reductions to student financial aid, those that choose to pursue higher education often graduate with a substantial amount of debt in the form of student loans. Researchers studying determinants of graduate and professional school enrollment have begun focusing on this steady accumulation of undergraduate debt as a potentially significant factor, and despite numerous studies, there has been no consensus as to whether debt acts as either a catalyst or deterrent to enrollment in graduate school.

The decision to attend graduate or professional after completion of an undergraduate degree is an undeniably complex matter influenced by numerous factors. However, until recently any research concerning these factors was limited either by data not representative of the entire baccalaureate population or by secondary data collected for other purposes, therefore lacking key pieces of information. Only within the last fifteen years have national surveys been

conducted that are useful in determining which factors have a significant impact on the decision to both apply and enroll in a graduate or professional program. Also during this time, researchers' attitudes about possible factors have expanded. Studies in the 1960s focused almost entirely on characteristics of the institution conferring the undergraduate degree, until a study by Astin and Panos found students' personal characteristics as well as their perception of their undergraduate institution were more reliable indicators of graduate or professional school application and enrollment (Pascarella 752).

Even with more applicable data and a greater understanding of relevant factors, this subject still deserves attention as undergraduate tuition, and consequently students' debt levels upon graduation, began a nearly meteoric climb in the early 1990s that is still continuing. The purpose of this study is to critically analyze previous research and to propose an updated model that reflects factors relevant to students facing recent tuition and debt levels.

2. LITERATURE REVIEW

Before describing and analyzing this model, it will be useful to understand the importance of education in today's labor market, as well as how individuals reach a decision to invest in more schooling. It is also important to have a clear and accurate picture of the current levels of debt faced by today's undergraduates and the debt they must consider accruing should they immediately continue to graduate or professional school. Also relevant is an understanding of governmental assistance available to students, which has been allowing more students access to education but may have inadvertently created a barrier to students pursuing master's or doctoral work. The following sections will review applicable economic concepts and previous

studies, explain the empirical and econometric model, and describe the source and type of data used in my analysis.

2.1 Human Capital Theory: Why Students Invest in Education

By investing in their own education and training, individuals are increasing their human capital, an increasingly vital resource in today's labor market. Economists typically define an investment in human capital as "any activity that increases the quality (productivity) of labor" (McConnell, Brue, and Macpherson 84). Gaining labor skills increases productivity, heightening the worker's value to their employer and leading to higher earnings (Wachtel 191-192). Although both education and on-the-job training are considered human capital, this paper will only focus on investments in education through college and graduate or professional schools.

The theory of human capital predicts an earnings differential favoring those with higher levels of education. Individuals that invest in more human capital may expect to earn more than less-educated counterparts. The age-earnings profile illustrated in the appendix depicts the costs and benefits of attending a four-year college. In this model, a high school graduate begins working at the age of eighteen, while a college student does not enter the labor force until graduation at the average age of twenty-two. The area of (1) represents the direct costs—tuition, books, and fees—faced by a college student during their education. Area (2) illustrates the college student's indirect costs, such as foregone income while attending school, while the area of (3) shows the monetary gains received by the college student after graduation (McConnell, Brue, and Macpherson 86).

The costs and benefits of education occur at different points in time, making it more useful to compare monetary aspects at a common point in time. Assuming an individual prefers

consuming now rather than later, using the present value formula allows a comparison between differences in life-long earnings of an individual with a high school degree and one with a college degree.

High School Degree:

$$PV = \sum_{t=18}^{64} Y_t/(1+i)^{t-18} \quad 1.1$$

College Degree:

$$PV = -C_{18}-C_{19}/(1+i)^1-C_{20}/(1+i)^2-C_{21}/(1+i)^3+Y_{22}/(1+i)^4+\ldots+Y_{64}/(1+i)^{t-18} \quad 1.2$$

where,

Y = current value of wage

i = interest rate

t = number of years in the labor force (retirement age of 64)

C = costs of one year at college

By comparing these values, one can determine whether investing in education would be economically beneficial. If the present value of attending college is greater than that of high school, or $PV_C > PV_{HS}$, then continuing on to college would be a sound decision. When $PV_C < PV_{HS}$, a college education would incur more costs than benefits and would not be economically profitable.

Students in graduate and professional schools will incur even greater costs for a longer period of time as they delay entry in the labor market in order to continue their education. They also have fewer years in which to recover the costs of their education. With the cost of college increasing rapidly, it is important to remember that college may not be a wise decision for some.

Results from the present value formula can vary due to an individual's circumstances and preferences—the opportunity cost of delaying work for four years, the desired field of employment and average salary in that field, and the number of years in the labor force before retirement (Borjas 224-225).

There is, however, criticism of the link human capital theory provides between education and earnings. Differences in human capital investment can be caused not only by an individual's preference but also by exogenous factors. A student with higher innate academic ability—including their motivation, discipline, and mental skills—will have a greater demand for human capital and a higher rate of return than a student with less academic ability. Discrimination is another factor affecting one's human capital investment. In groups often discriminated against, such as females or minority ethnic groups, there exists an uncertainty of future earnings that could cause a decrease in education's rate of return, leading to less investment in human capital. The third factor affecting human capital investment is an individual's access to funds. A student from a higher-income family may have more funds available and be forced to take out fewer loans, which would then make it less costly for them to invest in more human capital (Borjas 241). Another criticism of human capital theory is that employers use education as a screening tool of intellectual ability. Workers with higher educational levels not only have the discipline to complete academically rigorous programs but have also gained skills and tools to enhance productivity.

Despite these flaws in human capital theory, empirical evidence supports the benefits of a college education. It is important to note that investing in human capital produces non-monetary benefits as well, but this study will focus on measurable economic benefits. The rate of return on an investment in human capital averages between 10 and 15 percent per year. Statistics show

that the average lifetime earning of a college-educated male is roughly $2.4 million, compared to a high school educated male's earnings of $1.7 million. There is a similar gap between education levels of females, with college graduates receiving $1.5 million and high school graduates earning only $1.1 million (Hecker 5).

Recent trends in the college wage premium—the ratio of a college graduate's earnings to those of a high school graduate—show that individuals that opt out of human capital investment are being left behind at an increasingly greater rate. An illustration of the college wage premium for both males and females between 1973 and 2001 is included in the appendix.

The general decline in the wage premium during the 1970s is primarily due to the overabundance of college graduates as the baby-boomer generation finished their education and encountered a relatively unchanging demand for college graduates. However, since the late 1970s, the college wage premium has risen from 34 percent to 71 percent for men and 36 percent to 74 percent for women (McConnell, Brue, and Macpherson 96-97). This soar in wage premiums can partially be explained by an increased demand for college graduates to work in high technology industries and computer-related fields as well as an increasing number of occupations traditionally requiring only a high school degree now employing college educated workers. As college graduates assume more jobs previously filled by high school educated individuals, the demand for high school graduates decreases as college graduates' demand rises, causing greater income disparity (Hecker 5).

Although historical data predicts that college graduates will continue to fare better than less-educated workers, there are no assurances that a college education will always ensure higher earnings. Because of the current wage differential, more people are choosing to pursue college degrees. Increasing the supply of individuals in the labor market with a college education could

potentially drive wages down and cause a decline in the future wage premium (McConnell, Brue, and Macpherson 97). However, with the economy shifting towards service and technology industries, high school degrees are increasingly obsolete as college graduates become the norm. As record numbers of students attend college, they have been forced to incur high levels of debt to keep up with rising tuition costs, a relatively new issue facing students that will be discussed in the next section.

2.2 The Role of Debt in Financing Higher Education

Individuals pursuing a college or graduate school degree have been faced with much greater difficulty financing their education than previous generations. Students must now not only be concerned with being accepted to the school of their choice but also whether they will accumulate insurmountable student loan debt in the process. Tuition at institutions of higher learning has been growing at a much faster rate than previous decades. Between 1981 and 1995, college tuition jumped a staggering 234 percent, rising three times faster than the median household income (Aizenman 22). According to the 2002 National Student Loan Survey conducted by Nellie Mae, the average debt of an undergraduate is $18,900, up 66 percent from 1997. As one would expect, students at private institutions face higher debt, $21,200, than the $17,100 averaged by their public institution counterparts. However, public school students have seen their tuition climb at a much higher rate than private institutions, increases of 57 percent and 38 percent respectively since 1997 (Baum and O'Malley v-iv). This leaves students intent on earning a four-year degree with few options to minimize costs while reaching their educational goals. Never before have students faced so much debt in order to receive an

undergraduate degree, and many fear a new "debtor generation" being formed as a result (Ladwig 41).

Although these numbers are daunting, students deciding whether to apply and enroll in a graduate or professional program must consider a much higher level of debt. The National Student Loan Survey also reports the current average debt for post baccalaureate study is an additional $31,700 on top of any undergraduate debt, a 51 percent increase from 1997, while the median debt level has risen 72 percent to $23,700. It is important to note that these statistics may be misleading, as the total undergraduate and graduate debt load of $91,700 for those attending professional school—business, law, and medicine—is much higher than the $45,900 accumulated by students in other graduate programs (Baum and O'Malley vi). In the case of these students, the higher salaries received upon completion of their programs may not be adequate to cover the debt they have incurred, with a quarter of recent graduates using more than 20 percent of their monthly income to pay down their debt.

Federal Aid Programs

Government aid such as grants and loans play a crucial role in allowing students to continue their education. Beginning in the 1970s, federal and state guaranteed loan programs were set up to increase students' access to loans (Fox 669). However, as the student loan market increased to $28 billion in 1997, double its level in 1992 (Iida and Racine 4), it is feared that the opposite has occurred, and students now face the problem of excessive debt.

According to the College Board, an average of 59 percent of a student's financial aid package is derived from loans, up from 49 percent ten years ago ("How Heavy" 101). This amount is substantial considering that over half of college students receive financial aid, an increase of over ten percent since 1991. In 1995, undergraduate enrollment reached 14.3 million

students, and the 1995-1996 Federal Student Loan Summary reports that there were 7.6 million loans taken out totaling $27 billion (Snyder and Hoffman 37). Over one-third of today's college students now take out a federal Stafford loan, which provided $14.6 billion in 1992, up from only $6 billion in 1980 (Heilemann 42). Currently, the Department of Education has contracts with twelve lending institutions to provide government-guaranteed student loans, in which the government promises to pay the bank if the student defaults, or fails to pay back their loan (Zimmerman and Miles 775). A loan may either be subsidized, in which the government pays the interest while the student remains in school, or unsubsidized, which begins accruing interest immediately.

However, the amount of aid the government is providing to students is falling (Miles and Zimmerman 543), which could have serious consequences considering the dependency on financial aid developed over the past three decades. The number of subsidized loans offered by the government is decreasing, and between 1981 and 1994, the real value of the Pell Grant fell 22 percent (Aizenman 22). Also, the traditional six month post-graduation grace period on interest—crucial to many students searching for employment after graduation—is in danger of disappearing (Kobliner 111).

Private Lending

With the number of students taking out loans, it is no surprise that the loan industry is becoming increasingly privatized. Financial giants such as Citicorp and Chase have found student loans to be one of their most profitable sectors, offering college students billions in non-guaranteed loans as well as supplemental loans to graduate students (Iida and Racine 4). Perhaps the greatest impact on the private student loan industry came in 1997 with the privatization of the Student Loan Marketing Association, or Sallie Mae. A government-sponsored enterprise created

in 1973 as a federally chartered corporation, Sallie Mae was designed to give liquidity to the relatively small $1 billion student loan industry by buying student loans from banks and reselling them to investors (Domis 4). Backed with government bonds, Sallie Mae was able to keep costs low and offer extremely competitive rates, enabling the company to earn large profits for a government organization ("Are Fannie" 12). Sallie Mae's decision to privatize and become a for-profit body leads to greater competition among student loan agencies. However, the full affects may not be seen for some time, as the company will slowly phase out its government ties over ten years.

2.3 New Alternatives to Finance Education

In an effort to combat the overwhelming debt that many students are now facing, new alternatives to finance education have the potential to allow students to graduate without being saddled with huge loans payments. Both the government and private lenders are exploring loans without a fixed payment plan, allowing greater flexibility in repayment and alleviating some of the burden of debt. One option now available to students is a graduated loan, in which payments increase incrementally over time (Aizenman 24). Assuming that an individual's income will grow with years in the labor market, this option would benefit those whose salaries increase sufficiently within a few years of employment.

Income Contingent Loans

Operating on a "pay as you can" basis, income contingent loans would help both students and graduates from all income levels. By paying a fixed percentage of income, both rises and falls in salary would have the same effect on the loan payment, and an individual would not have to worry about paying more than their income would allow. Implementation of income

contingent loans would also decrease the number of students that default on their payments (Aizenman 22-23), as most defaulters find themselves unable to make payments because of insufficient income. This option would also benefit individuals that want to work in lower-paying employment, such as public-interest law, by giving them peace of mind that they will not be forced to pay back their debt from both college and law school in large payments with no consideration of the low wage they receive and the lack of opportunity for salary gains.

Tuition Postponement Option

A variant of an income contingent loan program, the Tuition Postponement Option was implemented at Yale University in the early 1970s, and although this program was unsuccessful and abandoned several years later, it offers lessons in how to insure success of future income contingent loans. The basis of Yale's program placed students that began repayment in the same year in a cohort of borrowers, and that group was required to continue payments until all loan money had been repaid. This design used surplus payments of high earners to make up monetary shortages of individuals in lower-income jobs, ensuring the full loan amounts are paid back. However, borrowers were put at risk in respect to the probable earnings of their borrowing group, especially the number of low earners included in their cohort. Many students with high earning potential chose to opt out of the program in order to avoid being forced to pay more than they had personally borrowed. Another fault of Yale's program is that the university, as a private institution, did not have access to students' IRS data and income tax statements, making it difficult to confirm an individual's earnings (Heilemann 44). With no way to verify an individual's information, the program was left vulnerable to fraudulent claims by borrowers. However, with a few modifications, the basic program outlined in Yale's 1970 trial could potentially become a viable option in the future of student loans.

Few are aware that the federal government has an income contingent loan program available at this time. Signed by President Clinton in 1993, the bill's flaws have attracted many critics. Similar to Yale's Tuition Postponement Option, this program does not include the IRS, a somewhat nonsensical exclusion. With the IRS involved, the government would not only be able to detect individuals attempting to be dishonest about earnings, but would also allow loan payments to be taken directly out of worker's paycheck, making defaults on loans virtually impossible. Another strange feature of the government's current program is the forgiveness of loans over twenty-five years old. This stipulation, added hastily and without much discussion, is directed at those who do not earn enough income to repay even interest on their loans but punishes individuals that work hard in order to repay their full amount of debt.

The final problem with this program deals with restrictions put on the banking industry in offering "income sensitive" loans. Although the government's program encourages banks to develop income contingent options, private lenders are restricted to a relatively short ten to fifteen year limit on repayment. Considering the large amounts of debt that students are accumulating today, banks need the ability to spread the payment out over a long period of time in order to offer a relatively low income-contingent rate. With only a ten year payment period, lenders would have to take a high percentage of the student's income in order to recover the loan within the time frame, defeating the purpose of income contingent loans, payments that students can manage (Aizenman 24).

Despite its flaws, the government's program could potentially work. However, it has not been tested enough to come to a conclusion. Although students, upon graduation, have the option to consolidate all student loans into one income contingent loan from the government, students at 80 percent of colleges and universities are not aware when they are planning for

school that this is an option (Aizenman 25). The 2002 National Student Loan Survey reports 84 percent of students are repaying their debt with a standard 10-year fixed monthly payment, while 8 percent have consolidated their loans, 6 percent are on a graduated loan program, and only 3 percent are using the income contingent plan (Baum and Saunders 40).

Federal grant and loan programs, private lending, and income-contingent repayment options have all been developed to allow students more equal access to higher education. However, as concerns over accumulated education debt has risen, numerous studies have been conducted to determine whether debt actually inhibits students from continuing their education past the undergraduate level. The next section will discuss influential studies concerning significant factors in the decision to apply or enroll in graduate or professional school.

2.4 Relevant Studies

As previously discussed, numerous studies have attempted to determine the factors contributing to enrollment in gradate or professional school, although adequately representative data only recently became available. With sharp increases in tuition and undergraduate debt levels occurring within the past fifteen years, most researchers before that time did not consider debt as a possible factor in their models. However, they have provided other valuable insights that have allowed others to build on their work.

One of the first national studies of graduate and professional school enrollment was conducted by Baird. After surveying undergraduate seniors in 1971, he completed a follow-up survey with students that had indicated plans to enroll in graduate or professional school immediately upon graduation. His analysis focused on gender and educational performance, with a significantly higher percentage of male enrollment compared to that of females.

Undergraduate performance was also a good indicator of enrollment, with 70 percent of males and 47 percent of females in the A/A+ category enrolled, compared with 56 percent male and 31 percent female enrollment in the B+ category, and 45 percent and 22 percent in the B category (Malaney 149). Although this study shows both gender and educational performance to be important in the decision to enroll, it focuses solely on "high achievers" with at least a "B" average and fails to take into account factors such as race, educational attainment of parents, and debt.

A 1984 study by Pascarella used the American Council on Education's 1975 Cooperative Institutional Research Program to study over 5,000 Caucasian students at 74 predominantly white schools. His model included individual background, secondary school and college achievement, educational aspirations during and upon completion of their baccalaureate program, and the institutional environment, which included the students' perception of intellectual competition, the impersonalism and inaccessibility of faculty, and whether the campus had a prevailing conventional or conformist attitude (Pascarella 755-757). Using path analysis, Pascarella found a student's educational aspirations, the college environment, and cumulative college achievement to be significant factors. In males, an intellectually competitive environment was an important positive factor, while a conformist institutional atmosphere and inaccessible faculty were significant negative factors for females (Pascarella 766-767).

Research similar to that of Baird was completed by Goldberg and Koenigsknecht in 1985 using a more selective group of high achievers. After analyzing trends at fourteen institutions in 1956, 1966, 1976, and 1981, they found a relationship between gender and enrollment similar to that of Baird (Malaney 150).

Malaney's research in 1988 included aspects of Baird as well as Goldberg and Koenigsknecht, with the important addition of several potential enrollment factors. A survey of seniors at a large public research university was conducted, with a minimum GPA of 3.0 needed to be included in the data. Of nearly 800 respondents, 24.3 percent were identified as immediately enrolling in a post baccalaureate program. Malaney's model was comprised of gender, undergraduate field of study, GPA, further educational plans, and whether or not the student participated in an honors program. The resulting regression analysis concluded that gender was the most significant factor, although enrollment percentages were much lower than those of Baird (1976). This difference could be due in part to a growing trend of waiting several years before enrolling in a graduate or professional program, illustrated by the 58.2 percent of survey respondents that thought they would enroll in a post baccalaureate program later (Malaney 151-153).

Influenced by the 1989 research of Bowen and Sosa, who studied whether loan debt deterred new PhD recipients from accepting faculty positions (Weiler 212), Weiler was the first to include debt in the study of graduate and professional school enrollment. The model he developed in 1991 used the 1980 High School and Beyond Survey, as well as its 1986 follow-up, extracting data for individuals that had both graduated from a four-year college and earned at least a "B" average, making them eligible for acceptance into a post baccalaureate program. His model included foregone income while in school, a categorical measure of ability, the amount of educational debt outstanding, whether the student received a financial aid offer from their graduate institution, gender, membership in a racial minority, parental education attainment, whether the undergraduate institution was private, whether the student had maintained an "A" average, and their educational attainment goals while still in high school (Weiler 215-216).

Using regression and utility maximization principles from previous studies, Weiler's analysis yielded gender, graduate school financial aid offers, and educational expectations to be significant enrollment factors. One surprising result is the slight trend making individuals with higher foregone income more likely to enroll in a graduate or professional program instead of immediately entering the labor force. There are several explanations Weiler includes for the insignificance of debt. First, debt's effects may not be linear. When he included the square of debt, there was a negative correlation with enrollment, although significance remained low. Also, students may have come to expect higher income, leading them to feel more comfortable incurring larger amounts of debt. Weiler admitted the limitations of his study, specifically that the data used in his analysis was collected to show the transition from high school to college and not from college to post baccalaureate study. He suggested further research using data specifically focused on undergraduate seniors and their behavior upon graduation (Weiler 217-219).

In 1992, Fox used the Department of Education's 1985-1986 Survey of College Graduates to analyze graduate and professional school enrollment, a much more representative national survey with a sample size of over 12,000 bachelor's degree recipients (Fox 670-671). Fox's model included the competitiveness of the undergraduate institution, undergraduate performance, total debt, gender, age, race, marital status, parents' college attendance, percentages of both parental and student contribution to tuition, the amount of grants and scholarships received, and whether the student enrolled in a post baccalaureate program (Fox 671-672). He found that although the total amount of debt did not alter the likelihood of enrollment, students that had not borrowed at all were more likely to enroll. Undergraduate GPA and selectivity, as well as parents' college attendance, were significant. When separated by

gender, grants had a positive and significant influence for women, with debt acting as a slightly higher deterrent for women as compared to men. Fox also found an unexpected link between debt and the type of program enrolled in. One would expect students with higher debt to switch to master's programs, with a shorter course of study and higher average starting salaries compared with doctoral students. However, Fox found the opposite relationship, as more debt lead to an increase in doctoral enrollment. He hypothesized this could be due to the higher amount of grant money available to doctoral candidates as well as the longer period of study, which allows students to defer loan payments for a longer period of time (Fox 673-675).

Research by Millet (2003) incorporated aspects of numerous past studies of enrollment factors, but the model was also expanded to include factors affecting graduate and professional school application, not just enrollment. Millet used the Department of Education's Baccalaureate and Beyond Longitudinal Study of 1992-93 college graduates, a survey that collected data on 1992-93 college seniors that expected to earn a doctoral degree and tracked their application, admission, and enrollment in master's or doctoral programs (Millet 390). Twenty percent of the 1.1 million students surveyed expected to attend graduate or professional school (Millet 387); however, only thirty percent of those students had enrolled in a post-baccalaureate program within one year of receiving their undergraduate degree. Of the 1,982 students expecting to earn doctoral degrees, 52 percent applied, 86.1 percent of applicants were accepted, and 67.9 percent of accepted applicants enrolled (Millet 403). In order to determine factors that could discourage students from pursuing post-graduate work, Millet conducted a logistic regression that included personal background, the selectivity of the undergraduate institution, college experiences, immediate opportunity costs, whether the student applied to a graduate program, and if admitted, whether they enrolled. Although the Baccalaureate and

Beyond survey asked whether a student applied for financial aid, it only provides information about financial aid awards from the student's first-choice school (Millet 391). Because not all students were accepted or enrolled at their first choice, Millet constructed two models.

The first model focused on students' applications to post-baccalaureate programs, and Millet's results showed debt to be a significant deterrent to application. Other significant factors included undergraduate institution selectivity, GPA, major, gender, race, parents' education level, and foregone earnings (Millet 407). Millet's second model included only those students that applied to their first-choice graduate or professional school. In this model, undergraduate debt became insignificant, while an offer of financial aid from their first-choice school had a significant positive impact (Millet 415).

3. MODEL

The general structure of the model used in this study was influenced by models developed by both Fox and Millet and assumes that an individual's progression to graduate or professional school is a function of personal and educational inputs, financial considerations, and whether their application to a post-baccalaureate program was successful. Variables were included in the analysis based on their classification in these areas.

The process of entering a graduate or professional program can be separated into two distinct instances of choice. First, an individual must decide to apply to a post-baccalaureate program. If a student's application is successful, he must then choose whether to enroll in that program. This method of studying the decision to apply in addition to the decision to enroll was first introduced by Millet.

The function for applying to a post-baccalaureate program is as follows:

$$Y_A = f(PERSONAL, UGEXP, OPPCOST) \quad 3.1$$

where,

Y_A = whether application was completed

PERSONAL = personal inputs

UGEXP = undergraduate experience inputs

OPPCOST = immediate opportunity cost of attending post-baccalaureate program

During the application process, a student has not yet been admitted to a specific school. Therefore, offers of institutional financial aid were not included in this model but were counted in the enrollment function.

The second model, which analyzes the subset of expected graduate and professional school candidates that have actually applied to a post baccalaureate program, is as follows:

$$Y_E = f(PERSONAL, UGEXP, OPPCOST, GFINAID) \quad 3.2$$

where,

Y_E = whether enrolled in a post-baccalaureate program after applying

PERSONAL = personal inputs

UGEXP = undergraduate experience inputs

OPPCOST = immediate opportunity cost of attending post-baccalaureate program

GFINAID = offer of financial assistance from institution offering admittance

4. EMPIRICAL MODEL

4.1 Application Function

The initial application function and subsequent enrollment function was estimated with a binary logistical form. Using this form allowed comparison to the models of both Fox and Millet, and it is the preferred method of analysis when dealing with a dichotomous dependent and independent variables. The application function was specified as follows:

$$\ln Y_A = b_0 + b_1 \ln \text{GENDER} + b_2 \ln \text{RACE} + b_3 \ln \text{PAR\_ED} + b_4 \ln \text{INCOME} + \quad 4.1$$
$$b_5 \ln \text{UG\_COMP} + b_6 \ln \text{CONTROL} + b_7 \ln \text{MAJOR} + b_8 \ln \text{UG\_GPA} +$$
$$b_9 \ln \text{UG\_DEBT} + b_{10} \ln \text{OPP\_COST}$$

where,

$b_1, b_3, b_4, b_5, b_6, b_7, b_8 > 0$

$b_2, b_9, b_{10} < 0$

Y_A = Assigned a value of one if the individual applied for enrollment in a post baccalaureate program

GENDER = Assigned a value of one if male

RACE = Categorical dummy variable created for Caucasian, African American, Hispanic, and Asian American survey respondents*

PAR_ED = Assigned a value of one if parents have attained at least a bachelor's degree

INCOME = Categorical dummy variable created for total family income*

UG_COMP = Categorical dummy variable created for competitiveness of undergraduate institution*

CONTROL = Assigned a value of one if the undergraduate institution is private

MAJOR = Assigned a value of one if the student's major is in a pure field

UG_GPA = Categorical dummy variable created for the student's cumulative undergraduate grade point average*

UG_DEBT = Categorical dummy variable created for the student's level of accumulated undergraduate educational debt*

OPP_COST = Categorical dummy variable created for the student's foregone average annual income*

*A more detailed description of each categorical variable and the corresponding reference category can be found in the appendix.

4.2 Application Function Variable Description and Rationale

OUTPUT:

The output measurement for the application function was whether the student applied to a post-baccalaureate program. As in Millet's study, the sample population consisted of all undergraduate seniors that expected to immediately enter a graduate or professional program. If the individual applied to a program, the dichotomous application variable was assigned a value of one.

INPUT:

After reviewing the numerous relevant studies completed since 1976 on post-baccalaureate enrollment, many variables were included in this model that had proven significant in the past. Because the Baccalaureate and Beyond Survey was designed specifically to collect information concerning the transition from undergraduate study to either graduate study or the labor force, several parameters were available to this study that previous researchers did not have

access to. The following is a list of all variables used in the estimated application function, as well as the rationale behind their inclusion.

Gender

Gender was included as a dichotomous variable with a value equal to one if the individual was male. When running the regression analysis, the number of males enrolled was held out as the control for the gender variable. With the exception of a 1977 study by Bishop that focused on college attendance, all researchers have included gender in their analysis and found it to have a significant impact on enrollment. The difference between males and females in their propensity to pursue post-baccalaureate study could be attributed to many factors, including different educational experiences and perceptions, as well as a female's expectation of lower lifetime earnings due to wage discrimination and temporary absences from the labor force. Fox also hypothesized that females have a slightly higher aversion to debt, leading undergraduate educational debt to have a higher negative impact than on males (670).

Race/ethnicity

Dichotomous variables were created for the categories of White/Caucasian, African American, Hispanic, and Asian American. To allow comparison with Millet's study, students of Native American or Alaskan Native descent were not included, as they accounted for only 1 percent of the sample population. An individual's racial background is not a perfect measure of societal influence, but it represents the influence of historic levels of educational attainment.

Total Family Income

Using previously defined categories (Millet 397), dummy variables were used for those with a family income: (a) at or below $24,999, (b) $25,000 to $49,999, (c) $50,000 to $74,999, (d) $75,000 to $99,999, (e) $100,000 and above. For students no longer classified as dependents,

their individual income was used. The level of income has a direct impact on whether students will view accumulated educational debt as manageable or insurmountable, and income could also indirectly affect whether higher educational attainment is viewed as an expectation or a luxury.

Parents' Education

A value of one was assigned to PAR_ED if the parents had completed a bachelor's degree or higher. According to Weiler (218), numerous studies have shown that the parents' level of education has a greater impact than socioeconomic status of the family.

Selectivity of Undergraduate Institution

Dichotomous variables were created to categorize colleges as noncompetitive or less competitive, competitive, and most or highly competitive. Each institution's selectivity was established using Barron's Profile of American Colleges.

Pure Major vs. Applied Major

A student's major can be classified as pure or applied using Biglan's pure/applied paradigm, originally used in Millet's model. A pure field focuses on research, while an applied field emphasizes practical applications. This classification helps determine the necessity of a post baccalaureate degree in the student's chosen field (Millet 399). A dichotomous variable was created, with a pure major assigned a value of one.

GPA

A student's undergraduate grade point average was measured on a 4.0 scale, with dummy variables created for the categories of 2.74 and below, 2.75 to 3.24, 3.25 to 3.74, and 3.75 and above. GPA is one measure of a student's academic ability, showing their commitment to scholastic pursuits and serving as a predictor of success in a graduate or professional school environment.

Undergraduate Educational Debt

The amount of undergraduate educational debt was measured with dichotomous variables dividing debt into five categories: (a) no undergraduate educational debt, (b) debt of $100 - $4,999, (c) $5,000 - $9,999, (d) $10,000 - $14,999, (e) $15,000 and above (Millet 397). Debt was reported as the dollar amount accumulated through the individual's senior year of college.

Opportunity Cost

The immediate opportunity cost of attending a post-baccalaureate program is measured as the expected average annual salary foregone for the year following graduation from the baccalaureate institution. This amount was determined by undergraduate major using the Spring 2002 Salary Survey published by the National Association of Colleges and Employers, which reports the average salary offer for new bachelor degree recipients. A dummy variable was created for each level of opportunity cost: (a)income less than $25,000, (b) $25,000 - $29,999, (c) $30,000 - $34,999, (d) $35,000 or higher. These categories differ from those originally defined by Millet (398), as average starting salaries had increased significantly since 1992.

4.3 Enrollment Function

Similar to the previous application function, the enrollment function follows the model specified by Millet. This model included only those individuals that had applied to a graduate or professional program, and involved the addition of one variable to the application function. The enrollment function estimated was specified as follows:

$$\ln Y_E = b_0 + b_1 \ln \text{GENDER} + b_2 \ln \text{RACE} + b_3 \ln \text{PAR\_ED} + b_4 \ln \text{INCOME} + b_5 \ln \text{UG\_COMP} + b_6 \ln \text{CONTROL} + b_7 \ln \text{MAJOR} + b_8 \ln \text{UG\_GPA} + b_9 \ln \text{UG\_DEBT} + b_{10} \ln \text{OPP\_COST} + b_{11} \ln \text{GFINAID} \quad (4.2)$$

where,

$b_1, b_3, b_4, b_5, b_6, b_7, b_8, b_{11} > 0$

$b_2, b_9, b_{10} < 0$

Y_E = Assigned a value of one if the individual enrolled in a post baccalaureate program

GENDER = Assigned a value of one if male

RACE = Categorical dummy variable created for Caucasian, African American, Hispanic, and Asian American survey respondents*

PAR_ED = Assigned a value of one if parents have attained at least a bachelor's degree

INCOME = Categorical dummy variable created for total family income*

UG_COMP = Categorical dummy variable created for competitiveness of undergraduate institution*

CONTROL = Assigned a value of one if the undergraduate institution is private

MAJOR = Assigned a value of one if the student's major is in a pure field

UG_GPA = Categorical dummy variable created for the student's cumulative undergraduate grade point average*

UG_DEBT = Categorical dummy variable created for the student's level of accumulated undergraduate educational debt*

OPP_COST = Categorical dummy variable created for the student's foregone average annual income*

GFINAID = Assigned a value of one if student was offered financial aid from the admitting post baccalaureate institution

*A more detailed description of each categorical variable and the corresponding reference category can be found in the appendix.

4.4 Enrollment Function Variable Description and Rationale

OUTPUT:

For the enrollment function, output was measured by whether a student that had applied to a post-baccalaureate program actually enrolled. A dichotomous variable was created, with a value of one assigned if the student enrolled in a post-baccalaureate program.

INPUT:

As stated earlier, one additional variable involving financial assistance was included in this function. This follows Millet, who correctly observed that an institution generally makes an offer of financial aid only once a student has been offered enrollment to the program. Listed below is a description of the additional parameter included in the enrollment function.

Presence of Post-Baccalaureate Financial Aid

Previous studies have varied in their consideration of financial assistance; Fox used the proportion of tuition covered by grants (671-672), while Millet used whether the post-baccalaureate institution awarded the student financial aid (399-400). In this model, a dichotomous variable was created to record the presence of any type of financial assistance, including scholarships, grants, and institutional financial aid awards.

5. DATA DESCRIPTION

5.1 Data Sources

The majority of data for both the application and enrollment functions was collected from the Baccalaureate and Beyond Longitudinal Study of 2000-2001 College Graduates conducted by the National Center for Education Statistics, a division of the Department of Education. This

survey, a later version of the 1992-1993 Baccalaureate and Beyond used by Millet, gives an updated picture of how recent debt levels affect the decision to enroll in post baccalaureate programs.

The Baccalaureate and Beyond is a sub sample of the National Postsecondary Student Aid Study (NPSAS), a survey of institutions, students, and parents designed to provide a nationally representative sample that identifies undergraduate degree completers for inclusion in a Baccalaureate and Beyond cohort. The NPSAS alternates as a base year for both the Baccalaureate and Beyond and the Beginning Postsecondary Student Longitudinal Study (BPS). The first Baccalaureate and Beyond studied roughly 11,000 students that earned their baccalaureate degree in the 1992-1993 academic year, with follow-ups conducted in 1994, 1997, and 2003. This study uses the second Baccalaureate and Beyond cohort, based on NPSAS: 2000, which involved undergraduate degree completers during the 1999-2000 academic year. Further Baccalaureate and Beyond follow-ups will be completed, alternating yearly with BPS (NCES), providing the opportunity for future analysis of the effects of debt on delaying post baccalaureate attendance as well as behavior in the labor market.

The classification of a student's major as either pure or applied was determined by Biglan's pure/applied paradigm. Using the individual's field of study reported by the 2000-2001 Baccalaureate and Beyond, the major was determined to be pure or applied using the same categories as Millet in order to facilitate comparison.

Opportunity cost was determined using the Spring 2002 Salary Survey compiled by the National Association of Colleges and Employers (NACE). This survey used data collected by 142 institutions to determine the average beginning salary offered to new graduates (NACE 1). Average salaries were listed by undergraduate major, which was extracted from the 2000-2001

Baccalaureate and Beyond, and were reported for both April 2001 and April 2002 (NACE 4-5). The data from 2001 was included in the analysis, as it was the closest approximation of average starting salaries faced by new undergraduates entering the labor force in the fall of 2000. The April 2001 salary data provides a close approximation of foregone income should a student delay entry into the labor force by enrolling in a post baccalaureate program.

Selectivity of the undergraduate institution was determined using the 2004 Barron's Profiles of American Colleges, which ranks over 1,650 institutions. Although these ratings are from 2004, four years after the sample population had left their respective undergraduate institutions, selectivity is based on several factors—average entrance exam scores, percent of applicants admitted, and importance placed on nonacademic factors—that change slowly over time and do not typically vary significantly from year to year. Therefore, selectivity within the period between 2000 and 2004 is assumed to be relatively the same.

5.2 Sample Population

As the 2000-2001 Baccalaureate and Beyond contained data similar to that available to Millet, the model used in this study follows her model fairly closely to allow for comparison. As in Millet's study, individuals were included in the sample population based on four criteria. The individual had to be a United States citizen receiving their bachelor's degree between July 1, 1999 and June 30, 2000. Only Caucasian, African American, Hispanic, and Asian American students were included, as American Indians and Alaskan Natives accounted for only one percent of the population. The respondent also had to have answered that they expected to enroll in a graduate or professional program immediately following graduation (Millet 393).

After removing survey respondents that did not meet these criteria, the sample population was reduced from 10,028 to 6,749. The sample size was further reduced through the removal of individuals that did not have data recorded for all variables included in the model, bringing the final sample size for the original application function to 5,386.

The enrollment function was analyzed using a subset of the application function's population. In Millet's study, this population included only those that applied and had been accepted to a post baccalaureate program. However, the 2000-2001 Baccalaureate and Beyond Study only collected data on whether an application had been completed and whether enrollment occurred, without information available on whether the student had actually been accepted to a program. Due to the unavailability of this intermediate step, the population for the enrollment function in this model included all students that submitted an application to a post baccalaureate program, bringing the sample size to 1,423 students. The potential problems this creates will be discussed in a later section.

6. METHOD OF ESTIMATION

6.1 Justification for the Method of Estimation

The functions estimated in equations 3.1, 3.2, 4.1, and 4.2 were specified under the assumption that the influence of certain factors—personal background, undergraduate experience, opportunity costs, and financial aid—have on post baccalaureate participation can be measured by whether an individual applied and later enrolled in a graduate program. This assumption allowed the estimation of the impact that each of these factors has on both application and enrollment in a post baccalaureate program.

The presence of a dichotomous dependent variable creates several conditions that prevent the use of classical regression methods and necessitate the use of binary logistic regression. In order to use classical regression, the dependent variable must be normally distributed with all regression residuals to have a homoskedastic—or constant—variance, and the dichotomous variables in this model violate both of these assumptions. However, logistic regression does not require these conditions to be met in order to estimate the model (Berry).

The utilization of a binary logistic regression not only allowed comparison to Millet's earlier study involving similar data but also provided the ability to calculate odds ratios, which highlight likelihood among the groups of categorical variables. The coefficients returned in a logistic regression of dichotomous variables predict the odds that the variable will equal a value of one. If the coefficient on an independent dichotomous variable is given as b_1, a one unit increase in that variable will cause a b_1 increase in the natural log of the dependent variable's probability. The odds ratio of the dependent variable is determined by calculating $e^{\wedge} b_1$. This value provides insight as to how membership in a certain category affects an individuals' likelihood of applying or enrolling in a graduate or professional program (Berry).

6.1.1 Overstatement of Academic Ability in the Enrollment Function

As mentioned previously, the 2000-2001 Baccalaureate and Beyond did not include data on whether a student's post baccalaureate application led to an offer of admission. Without this information, the sub sample for the enrollment population included all students that applied to a post baccalaureate program, not just those that had been successfully admitted. The inclusion in the sample population of students not admitted leads to the overstatement of some variables that have an impact on admission to post baccalaureate programs. The most obvious of these

variables in undergraduate GPA, as students with a higher GPA are more likely to be admitted to a graduate or professional program. Other qualitative factors that affect post baccalaureate admission—campus and community involvement, leadership skills, and field experience—were not included in this study.

6.1.2 Exclusion of Student Satisfaction

The only notable difference between the independent variables included in this model and those of Millet's is the absence of undergraduate student satisfaction. Millet included dichotomous variables measuring whether a student was satisfied with the ability of instructors, the intellectual life at their undergraduate institution, the course curriculum, and their personal intellectual growth (Millet 396). However, the 2000-2001 Baccalaureate and Beyond did not include this information or any data that could provide a similar measure of undergraduate experiences. The absence of student satisfaction is not expected to have a significant impact on this model, as Millet deleted the majority of these variables from both the application and enrollment functions due to their low significance (Millet 410).

6.1.3 Variable Limitations

As this study depends entirely on secondary data, it is important to recognize variable limitations that may potentially impact results. The unavailability of whether a student's post baccalaureate application was successful as well as measures of student satisfaction have previously been addressed. As the NACE Salary Survey did not subdivide average starting salaries by gender, potential differences between male and female opportunity costs due to wage discrimination were also not accounted for. Another constraint is that this model makes no

distinction between individuals that delay application or enrollment and those that decide never to pursue graduate or professional study. It is not uncommon for students to enter the labor market for several years before continuing in a graduate or professional program. However, this study focused on the immediate transition from baccalaureate to post baccalaureate study. The effects of debt on delaying application or enrollment would be an interesting topic for further study and would be possible after the completion of the next Baccalaureate and Beyond follow-up.

7. EMPIRICAL RESULTS

7.1 Application Function Results

The empirical model of the application function involved nonlinear parameters and variables that were transformed by the use of natural logarithms into a linear form for estimation purposes. The results illustrated the significance of personal inputs, undergraduate experience, and opportunity costs on application to graduate or first professional programs. See Table 7.1.1 for the estimation results of the application function.

Table 7.1.1 Application Function Estimation Results

Variable	Coefficient	Standard Error	Wald Statistic	Significance	Odds Ratio
Gender	.087	.070	1.547	.214	1.091
Race/Ethnicity					
Hispanic	.108	.140	.596	.440	1.114
Asian American	.094	.176	.284	.594	1.099
African American	.655	.123	28.397	.000	1.925
Parents' Education	.175	.070	6.316	.012	1.191
Total Family Income					
$24,999 or less	.025	.108	.053	.818	1.025
$25,000 to $49,999	.070	.109	.004	.948	1.073
$50,000 to $74,999	-.015	.112	.017	.896	.985
$75,000 to $99,999	.009	.119	.005	.943	1.009
Undergraduate Institution Selectivity					
Non, less competitive	-.106	.100	1.115	.291	.899
Competitive	-.064	.076	.699	.403	.938
Control of Undergraduate Institution	.028	.071	.157	.692	1.028
Pure Major	.809	.066	149.235	.000	2.246
Undergraduate GPA					
3.25 - 3.74	-.260	.094	7.699	.006	.771
2.75 - 3.24	-.740	.100	54.495	.000	.477
2.74 or less	-1.146	.124	85.058	.000	.318
Total Undergraduate Educational Debt					
$100 - $4,999	-.073	.144	.256	.613	.930
$5,000 - $9,999	-.214	.126	2.897	.089	.807
$10,000 - $14,999	-.223	.111	4.052	.044	.800
$15,000 or higher	-.174	.080	4.782	.029	.840
Foregone Annual Salary					
$24,999 or less	-.484	.230	4.429	.035	.616
$25,000 - $29,999	-.383	.079	23.429	.000	.682
$30,000 - $34,999	.124	.083	2.263	.133	1.132
Constant	-.820	.149	30.169	.000	.440

Sample Size (*n*)	5,386	Hosmer Lemeshow X^2	7.475
Number of Parameters	24	Sig of Hosmer Lemeshow X^2	0.486
X^2	398.407	-2 Log Likelihood	5823.478
Sig of X^2	0		

The significance of each independent variable was determined by the significance of the corresponding Wald statistic, which is equivalent to traditional significance testing in classical regression methods. At a 95 percent level, the variables that were not significant included gender, Hispanic or Asian ethnicity, total family income, the selectivity and control of the undergraduate institution, and educational debt levels below $10,000. All of the other independent variables in the model were determined to be significant by their Wald statistic.

Accumulation of undergraduate educational debt was determined to be significant once debt levels had reached $10,000. Students with debt between $10,000 and $14,999 had 1.3 times lower odds of applying than students with no debt, who acted as the reference category, and students with debt above $15,000 were 1.2 times less likely to apply. If significance was relaxed to 90 percent, educational debt ranging from $5,000 to $9,999 would also lead to 1.2 lower odds of application. Although race was not significant for Hispanic and Asian American students, it was a significant factor for African Americans, who were 1.9 times more likely to apply than Caucasian students, who acted as the reference category. Parents' highest level of education was also significant, with students 1.19 times more likely to apply if their parents held at least a bachelor's degree. Undergraduate major was shown to be highly significant, as students majoring in a pure field were 2.3 times more likely to apply to post baccalaureate programs. Also highly significant was academic ability; students with a GPA between 3.74 and 3.25 were 1.3 times less likely to apply than students with a GPA of 3.75 or higher, which served as the reference category. Those with GPAs between 3.24 and 2.75 were 2.1 times less likely to apply, and those with a GPA below 2.75 were 3.1 times less likely to apply than students in the highest category of academic ability. Opportunity cost was also shown to be associated with post baccalaureate applications. Students with a foregone average annual salary less than $25,000

were 1.6 times less likely to apply than their peers with a foregone income of at least $35,000, who acted as the reference category. A foregone income between $25,000 and $29,999 led to 1.5 times lower odds of applying when compared to the reference category. Foregone annual income of $30,000 to $34,999 was not significant, even when lowered to the 90 percent level. Although one would typically expect lower opportunity costs to encourage individuals to pursue graduate study, students in fields with relatively low starting wages may expect an insignificant impact on their earnings potential should they complete a post baccalaureate degree, making it difficult to justify the additional time and expense spent on completion of graduate or professional training.

There are several indicators of goodness-of-fit available for a binary logistic regression. The chi-square (X^2) statistic measuring overall fit is 398.407 with a p-value less than .001, showing it to be significant. The -2 Log Likelihood (-2LL) is a measure of badness-of-fit, illustrating error remaining in the model after accounting for all independent variables. The application function's -2LL of 5823.478 is high enough to allow rejection of the null hypothesis that there is significant error remaining in the model. The Hosmer Lemeshow Goodness of Fit test is the most useful measure of fit "when the number of possible combinations of values of the independent variables is equal (or approximately equal) to the number of cases in the analysis" (Millet 408-409). The Hosmer Lemeshow Goodness of Fit assesses the overall model by testing the null hypothesis that all logistic regression coefficients besides the constant are zero (Berry). The application model's Hosmer Lemeshow Goodness of Fit chi-square statistic is 7.475 with a significance of .514, indicating a good fit.

7.2 Enrollment Function Results

The empirical model of the enrollment function was nonlinear in its parameters and variables. Similar to the application function, the model was transformed into linear form for estimation purposes through the use of natural logarithms. The results illustrate the significance of personal inputs, undergraduate experience, opportunity cost, and the offer of post baccalaureate financial aid on enrollment in graduate or professional school. Table 7.2.1 presents the estimation results of the enrollment function.

Table 7.2.1 Enrollment Function Estimation Results

Variable	Coefficient	Standard Error	Wald Statistic	Significance	Odds Ratio
Gender	-.196	.133	2.172	.141	.822
Race/Ethnicity					
Hispanic	.457	.291	2.417	.116	1.579
Asian American	.480	.381	1.585	.208	1.616
African American	-.051	.219	.054	.816	.950
Parents' Education	-.056	.139	.163	.687	.946
Total Family Income					
$24,999 or less	-.403	.220	3.366	.067	.668
$25,000 to $49,999	-.235	.224	1.107	.293	.791
$50,000 to $74,999	-.315	.226	1.945	.163	.730
$75,000 to $99,999	-.308	.240	1.648	.199	.735
Undergraduate Institution Selectivity					
Non, less competitive	-.167	.199	.707	.401	.846
Competitive	-.158	.148	1.133	.287	.854
Control of Undergraduate Institution	-.025	.140	.031	.860	.975
Pure Major	-.075	.133	.314	.575	.928
Undergraduate GPA					
3.25 - 3.74	-.637	.206	9.552	.002	.529
2.75 - 3.24	-1.207	.213	32.008	.000	.299
2.74 or less	-1.416	.255	30.915	.000	.243
Total Undergraduate Educational Debt					
$100 - $4,999	-.612	.257	5.664	.017	.542
$5,000 - $9,999	-.225	.244	.846	.358	.799
$10,000 - $14,999	-.141	.222	.401	.527	.868
$15,000 or higher	-.036	.158	.053	.818	.965
Foregone Annual Salary					
$24,999 or less	.176	.501	.123	.725	1.192
$25,000 - $29,999	-.110	.154	.506	.477	.896
$30,000 - $34,999	.284	.163	3.040	.081	1.328
Offer of Post Baccalaureate Financial Aid	-.667	.886	.566	.452	.513
Constant	2.420	.318	57.889	.000	11.246

Sample Size (*n*)	1423	Hosmer Lemeshow X^2	17.971
Number of Parameters	25	Sig of Hosmer Lemeshow X^2	0.021
X^2	84.872	-2 Log Likelihood	1531.268
Sig of X^2	0.000		

At a 95 percent level, variables determined to be insignificant included gender, race, parent's educational attainment, total family income, undergraduate institution control and selectivity, undergraduate major, and foregone income.

Educational debt was significant for students with accumulated loans between $100 and $4,999, showing them 1.9 times less likely to enroll than students with no debt. Higher debt levels, although insignificant, showed the expected negative impact on enrollment. Academic ability was also determined to be highly significant, as students with a GPA between 3.74 and 3.25 were 1.1 times less likely to enroll than students with a GPA of at least 3.75. Students with a GPA between 3.24 and 2.75 had 1.9 times lower odds of enrollment, and those with GPAs below 2.75 were 3.3 times less likely to enroll.

When relaxed to a 90 percent level, several other variables become significant. Students with a total family income below $25,000 are 4.2 times less likely to enroll when compared to students with a family income of at least $100,000. Family income above $25,000 remains insignificant at a 90 percent level, although likelihood of enrollment increases with higher family income. Individuals with a foregone income between $30,000 and $34,999 are 1.3 times more likely to enroll than their peers with an average starting salary of at least $35,000, a relationship similar to the application function. Foregone income below $30,000 remained insignificant at the 90 percent level.

The chi-square statistic for this model was 84.872 and was shown to be significant ($p<.001$), signaling a good fit. The -2LL of 1531.268 indicates that there is not significant error remaining in the model. The Hosmer Lemeshow Goodness of Fit chi-square statistic was reported as 17.971, with a p-value of .021, also confirming a good fit.

7.3 Comparison of Debt Effects on Males and Females

In order to determine whether debt affects males and females differently, separate regressions were run on sub samples that divided males and females in both the application and enrollment populations. In the application function, debt was not shown to be significant in the male sample, even when relaxed to 90 percent. However, debt was associated with female post baccalaureate applications. At a 95 percent level, females with debt between $10,000 and $14,999 were 1.4 times less likely to apply than females with no debt, and those with debt of at least $15,000 had 1.2 times lower odds of applying. When significance was relaxed to 90 percent, debt between $5,000 and $9,999 also yielded 1.4 times lower odds than those with no debt. This supports earlier research by Fox, who found that debt acted as a slight deterrent among females (670).

Similar regressions were run on male and female sub samples of the enrollment population. However, as debt was not determined to be a significant factor of enrollment in the full population, it was also shown to be insignificant in both the male and female samples.

7.4 Comparison of Results with Previous Research

As mentioned previously, the use of data from the 2000-2001 Baccalaureate and Beyond Study provided the opportunity to compare results with those of Millet, who used similar data from the 1992-1993 academic year, in order to determine whether the relative impact of debt on post baccalaureate participation has increased over time.

The findings of this model were similar to those of Millet in terms of debt, with undergraduate educational debt having a negative impact on application but not enrollment. It is interesting to note that the presence of educational debt seems to exert less negative influence on

enrollment than it did in Millet's study, perhaps as students become accustomed to accumulating debt in order to achieve their educational goals.

Other similarities between the results of this model's application function and Millet's results include the odds ratios for African American students, parents' educational levels, and academic ability. Foregone income also showed a similar relationship, but as salary categories were adjusted to account for wage increases, a direct comparison of odds ratios is not possible (Millet 407).

Although the results of this model's enrollment function did not resemble those of Millet as closely as the application function results, there were similarities in the variables found to be insignificant. Both models determined gender, race, parents' educational attainment, undergraduate institutional control, major, and foregone annual salary to be insignificant determinants of enrollment in a post baccalaureate program (Millet 410).

8. SUMMARY AND CONCLUSIONS

The application function results seemed relatively consistent with expectations of each variable's impact on application to graduate or professional programs. Results supported the hypothesis that debt acts as a deterrent when considering application to a post baccalaureate program. However, it appears that the presence of debt is more significant than the actual amount accumulated. The significance and impact of race, parents' educational attainment, undergraduate major, academic ability, and foregone income were consistent with the findings of past researchers. As stated earlier, this model did not include measures of student satisfaction or account for potential differences in foregone income based on gender.

The enrollment function also produced results consistent with previous research, as debt became insignificant in the decision to enroll while total family income became influential. This change in the significance of debt could possibly be attributed to the "weeding out" of students for whom debt was a deterrent, as those students were less likely to apply to a post baccalaureate program. Again, this model's enrollment function included all students that submitted an application to at least one graduate or professional program, though they may not have been admitted, leading to the potential overstatement of the impact of academic ability.

The results of these two models seem to suggest that debt has a negative impact on students considering graduate or professional study, particularly among females. It is, however, encouraging to see that the relative negative impact of debt on the odds of applying has not increased when compared to data collected in the 1992-1993 Baccalaureate and Beyond. Further analysis using even more current data will provide greater insight as to the changing impact of debt. The significance of debt on post baccalaureate participation highlights the need for further consideration of alternative education financing options, such as income contingent repayment plans and other methods discussed earlier in this paper, which may be viable options to help decrease students' debt burdens.

This model could be further developed through the use of future Baccalaureate and Beyond follow-up studies. By analyzing students' behavior several years after completion of their baccalaureate degree, one could determine if students originally discouraged because of debt simply delayed application or enrollment for several years or whether they abandoned their original plans of post baccalaureate attainment altogether.

In conclusion, this study provided a more current analysis on the impact that recent debt levels had on post baccalaureate participation. As previous researchers used data from a variety

of sources not specifically focused on the transition from baccalaureate to post baccalaureate study, their models were restricted by availability of relevant data. The wealth of information available in the Baccalaureate and Beyond study and the ability to compare results to those of Millet provided the first glimpse of how the impact of debt on post baccalaureate participation in changing over time, an analysis that contributes to the existing body of research. This model can continue to be used in analysis of later Baccalaureate and Beyond cohorts or similar studies, helping to determine whether the impact of debt changes significantly in the future.

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APPENDIX

Figure A.1

Age Earnings Profile

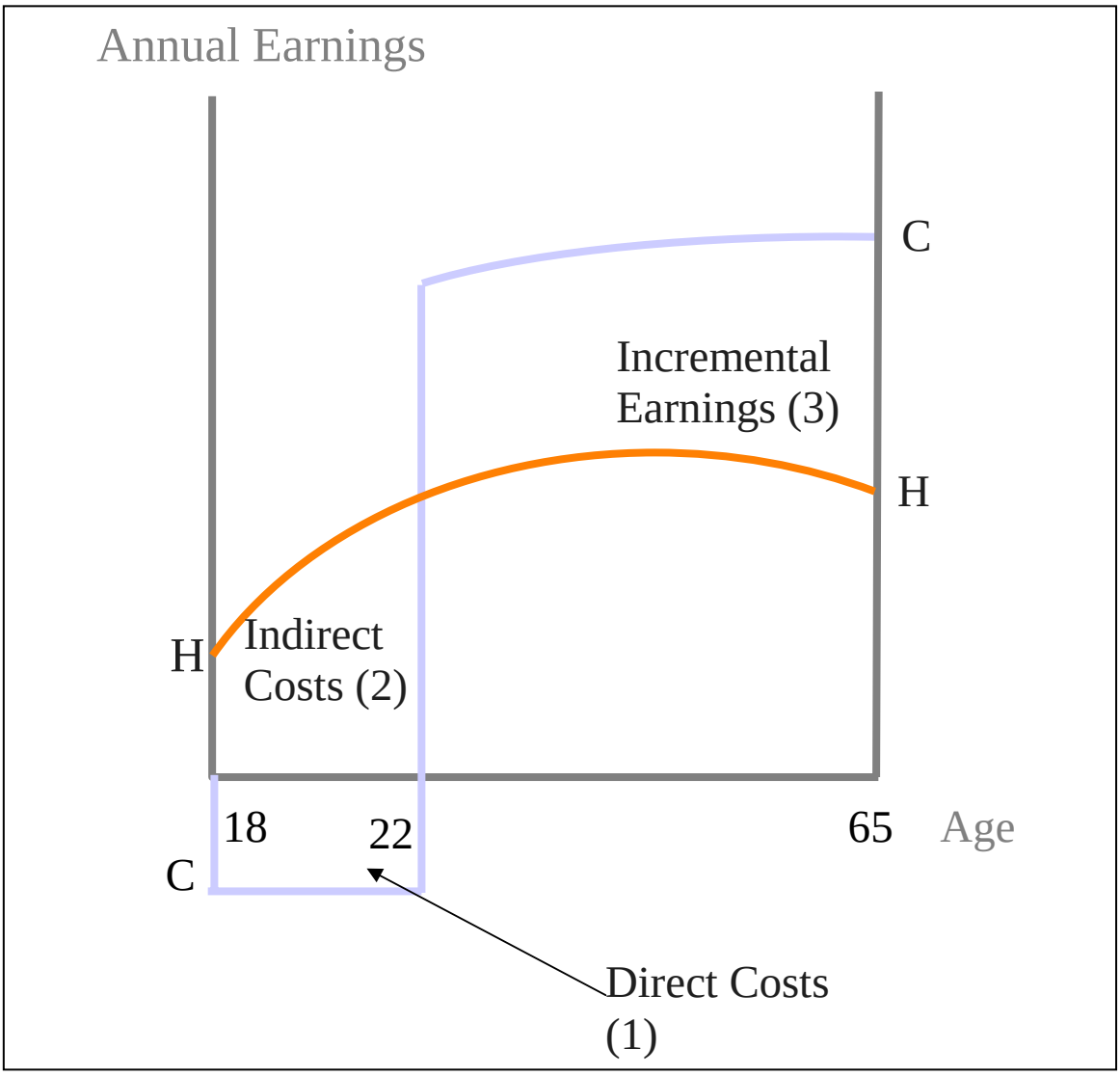

Figure A.2

College Wage Premium

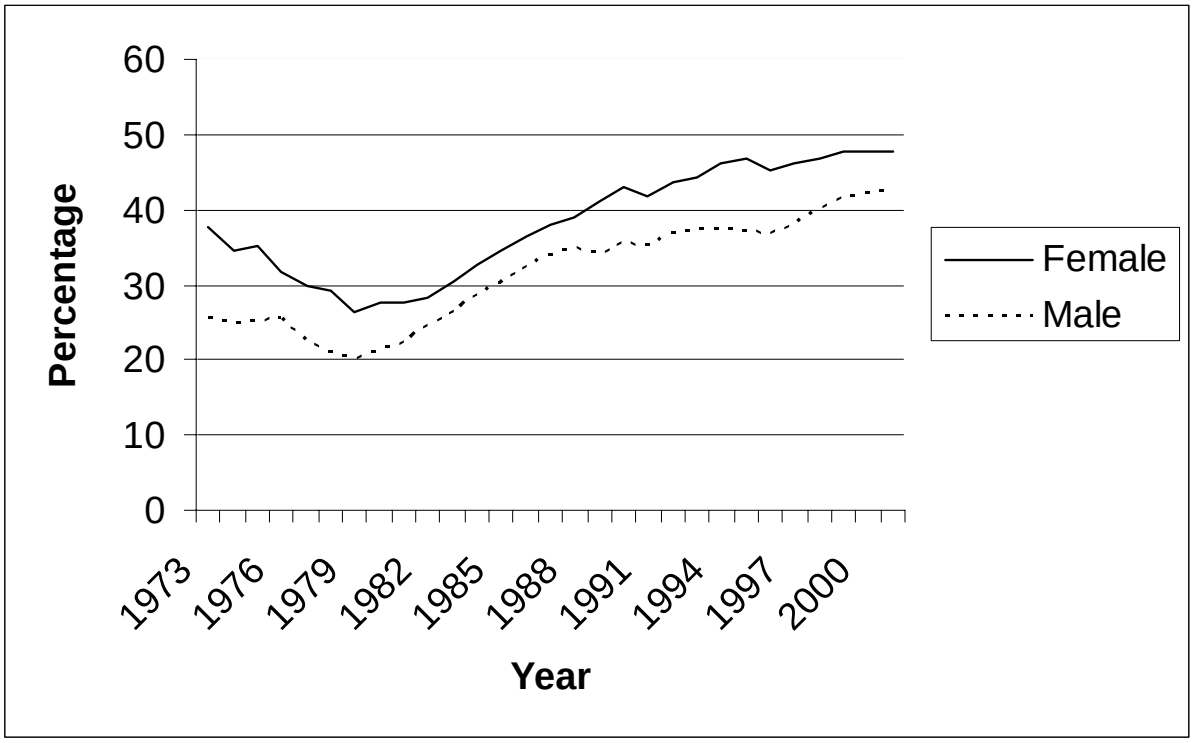

Table A.1

Independent Categorical Variables

PERSONAL INPUTS:	
Gender	A dummy variable assigned a value of one if the student is male
Race/Ethnicity	
Hispanic	A dummy variable assigned a value of one if the student is Hispanic
Asian American	A dummy variable assigned a value of one if the student is Asian American
African American	A dummy variable assigned a value of one if the student is African American
Caucasian*	A dummy variable assigned a value of one if the student is Caucasian
Parents' Education	A dummy variable assigned a value of one if the students' parents have attained at least a bachelor's degree
Family Income	
$24,999 or less	A dummy variable assigned a value of one if total income is less than $24,999
$25,000 to $49,999	A dummy variable assigned a value of one if total income is between $25,000 and $49,999
$50,000 to $74,999	A dummy variable assigned a value of one if total income is between $50,000 and $74,999
$75,000 to $99,999	A dummy variable assigned a value of one if total income is between $75,000 and $99,999
$100,000 and above*	A dummy variable assigned a value of one if total income is $100,000 or greater
UNDERGRADUATE EXPERIENCE:	
Undergraduate Institution Selectivity	
Non, less competitive	A dummy variable assigned a value of one if the student attended a school ranked by Barron's as noncompetitive or less competitive
Competitive	A dummy variable assigned a value of one if the student attended a school ranked by Barron's as competitive
Very/highly/most competitive*	A dummy variable assigned a value of one if the student attended a school ranked by Barron's as very, most, or highly competitive
Undergraduate Institution Control	A dummy variable assigned a value of one if the student's undergraduate institution was private

Table A.1 (Continued)

Pure vs. Applied Major	A dummy variable assigned a value of one if the student's major was in a field classified as pure by the Biglan pure/applied paradigm
Undergraduate GPA	
2.74 or less	A dummy variable assigned a value of one if the student's cumulative undergraduate GPA is 2.74 or lower
2.75 to 3.24	A dummy variable assigned a value of one if the student's cumulative undergraduate GPA is between 2.75 and 3.24
3.25 to 3.74	A dummy variable assigned a value of one if the student's cumulative undergraduate GPA is between 3.25 and 3.74
3.75 or higher*	A dummy variable assigned a value of one if the student's cumulative undergraduate GPA is 3.75 or higher
Undergraduate Educational Debt	
No Debt*	A dummy variable assigned a value of one if the student has accumulated less than $100 of educational debt
$100 - $4,999	A dummy variable assigned a value of one if the student has accumulated educational debt between $100 and $4,999
$5,000 - $9,999	A dummy variable assigned a value of one if the student has accumulated educational debt between $5,000 and $9,999
$10,000 - $14,999	A dummy variable assigned a value of one if the student has accumulated educational debt between $10,000 and $14,999
$15,000 or higher	A dummy variable assigned a value of one if the student has accumulated educational debt of $15,000 or more
<u>OPPORTUNITY COST:</u>	
Foregone Annual Salary	
$24,999 or less	A dummy variable assigned a value of one if the student's expected foregone income is $24,999 or less
$25,000 - $29,999	A dummy variable assigned a value of one if the student's expected foregone income is between $25,000 and $29,999
$30,000 - $34,999	A dummy variable assigned a value of one if the student's expected foregone income is between $30,000 and $34,999
$35,000 or higher*	A dummy variable assigned a value of one if the student's expected foregone income is $35,000 or higher
<u>FINANCIAL AID:</u>	
Post Baccalaureate Financial Aid	A dummy variable assigned a value of one if the student was awarded financial aid by the admitting post baccalaureate institution

* Denotes the variable held out to serve as the reference category