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How Undergraduate Loan Debt Affects Application and Enrollment in Graduate or First Professional School

In 1989, Senator Claiborne Pell, Chairman of the Labor and Human Resources Subcommittee on Education, Arts and the Humanities and the person for whom the Pell Grant program is named, voiced his concern that students who successfully completed college were overburdened by large debts. Senator Pell felt that college students were at risk of becoming a "new class of indentured servants" whose career choices and personal lives were being distorted by the significant loan debt they had acquired to get an education (Kosterlitz, 1989, p. 921). Senator Pell's sentiment reflects the prevailing national policy of attempting to ensure that the financial aid college students receive does not become such a burden that it constrains their options when they graduate.

Despite the sentiment of national policymakers, a growing number of students are accumulating larger debts in pursuit of their bachelor's degrees, and the rate of increase in loan amounts is more than three times the rate of inflation. Table 1 shows that 31.4% more 4th and 5th year seniors attending public colleges and universities relied upon loans to cover their college expenses in 1995–96 than in 1989–90, increasing

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from 38.5% to 50.6%. The corresponding change at private institutions was 16.9% from 47.2% to 55.2%. Over the same time the increase in the average cumulative amount borrowed was approximately 87.7% for 4th or 5th year seniors at public 4-year institutions from $5,848 to $10,976, and 73.3% at private 4-year institutions from $7,551 to $13,086 (U.S. Department of Education. National Center for Education, 2000b).

Recent publications such as *College Debt and the American Family, Student Loan Debt: Problems and Prospects, Life After Debt: Results of the National Student Loan Survey,* and *Condemning Students to Debt* are evidence that Senator Pell is one among many who are concerned about the influence of undergraduate financial indebtedness upon students' post collegiate choices (The Education Resources Institute & The Institute for Higher Education Policy, 1995, The Institute for Higher Education Policy, Sallie Mae Education Institute and The Education Resources Institute, 1988, Fossey & Batement, 1998). Typically, concern has been voiced about how undergraduate debt impedes student borrowers from buying cars, buying a home, having children, or moving out of their parents' home after graduating (The Education Resources Institute & The Institute for Higher Education Policy, 1995; Baum & Saunders, 1998).

Understanding the consequences of such instruments of public policy as undergraduate educational loans and debt accumulation upon graduate school participation is yet another important indicator for informing policymakers about changes that may be necessary to address unintended negative outcomes of current financial aid policies. In this context, the question is whether undergraduate debt acts as an impediment to student access to graduate school and to the production of a trained doctoral workforce. Concern about the nation's ability to maintain a trained doctoral workforce was raised at the end of the 1990s by the Council of Graduate Schools. Syverson (2000) observed that "while the number of doctorates granted by U.S. universities reached an all-time high of 42,683 in 1998, the annual rate of increase has fallen from 4% in the early 1990s to well less than 1% in the last year" (Syverson, 2000, p. 8). Manski and Wise (1983) stated that "whatever purposes federally sponsored aid should serve, policy evaluation is facilitated by knowledge of the impact that existing programs have" (Manski & Wise, 1983, p. 118). While the federal student loan programs were not specifically designed for the purpose of easing student transition from undergraduate to graduate school, they were certainly not intended to be impediments; therefore, it is important to evaluate their unintended consequences and influences upon students who seek to pursue graduate and first professional degree programs.

Around 20% of the 1.1 million 1992–93 bachelor's degree recipients

TABLE 1

Percentage of All Undergraduates by Undergraduate Class Level Attending in 1989–90, 1992–93, And 1995–96 Who Had Ever Received Federal Stafford Loans or Supplemental Loans to Students (SLS), and the Average Cumulative Amount Borrowed: Public and Private 4-Year Institutions

	1989–90		1992–93		1995–96		% Change in Percent Who Borrowed			% Change in Amount Borrowed		
	% who ever borrowed	Average cumulative amount	% who ever borrowed	Average cumulative amount	% who ever borrowed	Average cumulative amount	89–90 to 92–93	89–90 to 95–96	92–93 to 95–96	89–90 to 92–93	89–90 to 95–96	92–93 to 95–96
Public 4-year Institutions												
1st year	18.2	$2,473	24.5	$2,858	39.5	$3,386	34.6%	117.0%	61.2%	15.6%	36.9%	18.5%
2nd year	26.3	$3,531	30.8	$3,910	42.0	$5,546	17.1%	59.7%	36.4%	10.7%	57.1%	41.8%
3rd year	30.3	$4,366	34.2	$5,237	47.6	$8,146	12.9%	57.1%	39.2%	19.9%	86.6%	55.5%
4th or 5th year	38.5	$5,848	38.4	$6,994	50.6	$10,976	−0.3%	31.4%	31.8%	19.6%	87.7%	56.9%
Private 4-year Institutions												
1st year	28.5	$2,672	35.5	$2,981	48.0	$3,677	24.6%	68.4%	35.2%	11.6%	37.6%	23.3%
2nd year	40.6	$4,273	39.5	$4,700	51.0	$6,610	−2.7%	25.6%	29.1%	10.0%	54.7%	40.6%
3rd year	43.7	$5,792	45.7	$6,307	56.3	$9,803	4.6%	28.8%	23.2%	8.9%	69.3%	55.4%
4th or 5th year	47.2	$7,551	46.7	$9,013	55.2	$13,086	−1.1%	16.9%	18.2%	19.4%	73.3%	45.2%

SOURCE: Trends in Undergraduate Borrowing: Federal Student Loans in 1989–90, 1992–93, and 1995–96 (NCES Report 2000–151)

stated that they expected to earn a doctoral degree.[1] But, there appears to be a large gap between the number who expected to attain a doctoral degree and the number who actually pursued either a graduate (master's or doctoral) or first professional degree within a year of receiving their bachelor's degree. During the year immediately after receiving their baccalaureate degrees, only 5% of those who aspired to pursue a doctoral degree enrolled in a doctoral degree program, while 21% enrolled in a master's degree program, 4% enrolled in a first professional degree program, and 70% did not enroll in a graduate or first professional degree program.

The rather large gap between the high degree expectations of recent bachelor's degree recipients and their low rate of enrolling in graduate school raises questions about how accessible graduate education is to recent U.S. college graduates. It also raises questions about the role that undergraduate debt and other factors play as potential impediments to immediate entry to graduate or first professional school. Given the increasing reliance upon debt, is graduate school really an immediate option for all who aspire to earn a doctoral degree? Aside from knowing the size of the eligible pool of students for graduate admissions and the number of people who enter graduate programs, very little is known about the access that students have to graduate and first professional school. Little is known for example, about the characteristics or the circumstances that distinguish aspirants for the doctoral degree who enroll immediately in graduate or first professional degree programs from those who do not. One circumstance that may deter some students from applying or enrolling in graduate or professional school is having undergraduate debt. The amount of debt may also be a deterrent for some recent college graduates.

Literature Review on the Effect of Undergraduate Debt on the Transition to Graduate School

Several prominent researchers (Ethington & Smart, 1986; Hearn, 1987; Isaac, Malaney, & Karras, 1992; Malaney & Isaac, 1988) in the 1980s and 1990s excluded the influence of undergraduate debt in their examination of student transitions from college to graduate school. Other scholars (Consortium on Financing Higher Education, 1983, 1988, 1996; Ekstrom, Goertz, Pollack & Rock, 1991; Fox, 1992; Murphy, 1994; Nettles, 1989; Sanford, 1980, Schapiro, O'Malley & Litten, 1991; Tsapogas & Cahalan, 1996; Weiler, 1991, 1994; Wilder & Baydar, 1991) have examined the role of debt in the transition to graduate

school, and taken together, they are equivocal about the role that debt plays in students' decisions to enroll in graduate school.

One group (Baum & Saunders, 1998; Baum & Schwartz, 1988; Consortium on Financing Higher Education, 1983, 1988, 1996; Ekstrom, Goertz, Pollack, & Rock, 1991; Nettles, 1989; Schapiro, O'Malley, & Litten, 1991; Weiler, 1991, 1994) concluded that debt was not a significant factor in students' decisions to enter graduate school. In his study of graduate students at Florida State University, Rutgers University, Ohio State University, and the University of Maryland at College Park, Nettles (1989) examined the variation in entry-level debt burdens among Whites, Hispanics, and African Americans who enrolled in doctoral programs. He reported that 46% of African Americans and 43% of Hispanics compared to 36% of Whites had taken out loans to finance their undergraduate education. Nettles reported that students who took more time off had relatively lower undergraduate debt, but debt did not appear to have a significant relationship to their decision to enter graduate school immediately after graduating from college.

In a review of the National Longitudinal Study of 1972 and High School and Beyond (HS&B), Ekstrom, Goertz, Pollack, and Rock (1991) found that undergraduate debt did not significantly affect the propensity of students to apply to or enroll in graduate school. Defining debt of $10,000 or higher in 1982 and 1984, and $12,500 or higher in 1989 as "high debt," Schapiro, O'Malley, & Litten (1991) reported that undergraduate debt influenced neither positively nor negatively student intentions to enroll in graduate school in the arts and sciences for graduates of colleges and universities that were members of the Consortium on Financing Higher Education (COFHE).[2] Using HS&B, Weiler (1991) found that debt (measured as the sum of the amount borrowed for each year) did not deter students from attending postbaccalaureate degree programs. In another study that examined HS&B, Weiler (1994) found that while the expectation to attend graduate school decreases as the expected amount borrowed increases, the amount borrowed did not have a statistically significant affect on postbaccalaureate attendance. The 1983 COFHE study of 1982 seniors by level of loan debt failed to detect a clear pattern of difference in the consideration of attending graduate school or graduate school attendance. Approximately 15% of students with no loan debt and 15% of students with $10,000 or more of debt entered graduate school in the fall. For those 1982 graduating seniors who planned to delay entry into graduate school, the two primary reasons they reported for their decision to delay were the need for non-academic experiences for personal development (65%), and the need to improve their personal finances (46%). Having very high current educational

debts was reported by only 17% of the cases as a reason for delaying their graduate school attendance.

The 1987 COFHE follow-up study found that undergraduate debt did not prevent the attainment of further education for 1982 seniors who delayed entry into graduate school, did not lead COFHE seniors to abandon their educational aspirations, or their arts and science degree goals in favor of professional fields. In 1996 COFHE also found that student decisions to attend graduate or first professional school were not deterred by the amount of their debt.

In a study of 2,000 borrowers under the Massachusetts Guaranteed Student Loan Program, Baum and Schwartz (1988) found that 35% of the people who decided not to go to graduate school said that concern over borrowing was "very or extremely important" in their decision. In a later follow-up study, the 1997 National Student Loan Survey (NASLS), Baum and Saunders (1998) reported that 43% of cases who did not go to graduate school cited the level of their undergraduate debt as extremely or very important in preventing them from going to graduate school, while 28% reported undergraduate debt being unimportant. Baum and Saunders did not find significant differences by race on the influence of student loans.

A second group of researchers (Fox, 1992; Tsapogas & Cahalan, 1996; Wilder & Baydar, 1991) found debt to have a significant negative influence on student transition to graduate school. Analyzing a sample of cases who took the Graduate Record Examination (GRE) in 1986–87, Wilder and Baydar (1991) found that undergraduate debt was a modest deterrent to people applying to graduate school, but not for being accepted or enrolling. Using the Survey of 1985–86 College Graduates, Fox (1992) reported that undergraduate debt had a modest negative effect upon enrollment in graduate school for his overall sample and for a subsample of women, but was not significant for the subsample of men. In an analysis of the 1993 National Science Foundation's National Survey of Recent College Graduates (NSRCG), Tsapogas and Cahalan (1996) found that having undergraduate loan debt had a significant negative effect on the likelihood of attaining a degree or enrolling full-time in graduate school, while the amount of debt had an extremely small negative effect. Their separate analyses of men and women uncovered a negative relationship that having undergraduate debt had upon males only.

A third group of researchers (Murphy, 1994; Sanford, 1980) found debt to have a positive affect upon the transition to graduate school. In an analysis of NLS-72, Sanford (1980) learned that when only the effects of loans on graduate school attendance is considered, college

graduates with debt, regardless of the amount, were more likely to attend graduate or first professional school than college graduates who did not have loans. Using HS&B, Murphy (1994) found that undergraduate debt had a minimally positive influence upon students' plans to pursue doctoral level graduate work.

While researchers over the past 16 years have contributed to our knowledge of the influence of financial indebtedness on the transition, they have not reached a consensus on its relationship to graduate school attendance. It is important to acknowledge the limitations of this collection of work. The literature projects an ambiguous image of the role of indebtedness. For some (Fox, 1992; Tsapogas & Cahalan, 1996; Wilder & Baydar, 1991) debt was found to be an impediment; for others (Murphy, 1994; Sanford, 1980) it was not found to be an impediment; still others (Ekstrom et al., 1991; Nettles, 1989; Schapiro et al., 1991; Weiler, 1991, 1994) found it had no effect.

How can researchers be so inconsistent in their findings? The answer is found in the data they are analyzing and their research methods. The limitations of the extant research are based on the analysis of samples that do not represent the larger population of students who are making the transition to graduate school (Consortium on Financing Higher Education, 1983, 1988, 1996; Isaac et al, 1992; Malaney & Isaac, 1988; Nettles, 1989; Schapiro et al. 1991) and the use of secondary data analysis where neither debt nor access to graduate school were the primary purposes for collecting the data (Ethington & Smart, 1986; Murphy, 1994; Weiler, 1991, 1994).

This study examines the postbaccalaureate decisions of 1992–93 bachelor's degree recipients who indicated during their senior year of college that they expected to pursue a doctoral degree. The focus is upon the influence of accumulated undergraduate debt upon students' decisions to apply and if accepted, to enroll in graduate or first professional school within a year of graduating from college. Several assumptions were made for these analyses. First, examining the experiences of students in the year immediately after graduating from college is important. One has the choice of examining the long-term decisions or the short-term decisions. The short term is the focus of this research and it is important because it may provide an explanation of the influence of debt on doctoral degree aspirants' decision-making processes. Implicit in the analyses is the assumption that the students who do not apply or enroll in graduate or first professional school immediately may or may not apply or enroll in the future. Second, the decision to study application to graduate or first professional school is based upon the structure of education in the United States presented in the *Digest of Education Statis-*

tics 1999, which shows that students may progress to the doctoral degree after completing either master's degree study or professional school study (U.S. Department of Education. National Center for Education Statistics, 2000b).

By focusing upon how undergraduate debt and other factors relate to graduate or first professional school application and attendance for students who say that they expect to achieve a doctoral degree, this study may help us to explain how debt affects students who are the most likely prospects for entering graduate and professional school. The study addresses the following question:

> What is the relationship of undergraduate educational indebtedness to the decisions of recent bachelor's degree recipients who expect to earn doctoral degrees, to apply to and if accepted, to enroll in a graduate or first professional degree program immediately after completing their bachelor's degree?

Methodology and Data Analyses

The Sample

The sample for this research is taken from the Baccalaureate and Beyond (B&B) Longitudinal Study of 1992–93 college graduates. It includes recent bachelor's degree recipients who expect to earn a doctoral degree and examines their application to a graduate or first professional school, and if admitted, their enrollment in either a graduate or first professional degree program within the year immediately following their graduation from college with a bachelor's degree. The B&B is a subsample of the National Postsecondary Student Aid Study (NPSAS), a nationally representative sample of all postsecondary students. NPSAS:93 provided the baseline data for B&B. B&B was designed to be representative of postsecondary students in the United States who completed their bachelor's degrees in the academic year 1992–93.[3]

Four criteria were used for selecting students for the sample for this study: (a) students were U.S. citizens, (b) students received their baccalaureate degree between July 1, 1992 and August 31, 1993, (c) students were not American Indians or Alaskan Natives,[4] and (d) students stated in the NPSAS interview that they expected to earn a doctoral degree. From the original B&B sample of 10,080, selecting U.S. citizens reduced the sample to 9,862, receiving a bachelor's degree reduced the sample to 9,734, selecting non-American Indians or Alaskan Natives reduced the sample to 9,613 cases, and expecting to earn a doctoral degree further reduced the sample to the 1,982 cases that constitute the focus of this study.

Modeling the Graduate School Attendance/Choice Process

The conceptual model for this study depicts the relationship of students' academic and personal backgrounds to their transition to graduate and first professional school immediately after completing college. The premise of the model is that undergraduate debt along with students' personal background characteristics, the characteristics of their baccalaureate institution, their college experiences, and their immediate opportunity costs to attend graduate school, individually and collectively influence students' decisions to apply to graduate school and, if accepted, their decision to enroll in graduate school. The model incorporates the critical components of research by Hanson and Litten (1982), Hossler, Braxton and Coopersmith (1989), and Paulsen (1990), on college choice; the research of Ekstrom, et al. (1991), Ethington and Smart (1986), Hearn (1987), Nettles (1989), and Wilder and Baydar (1991) on persistence to graduate school; and the research of Fox (1992), Murphy (1994), Nettles (1989), Sanford (1980), Schapiro et al. (1991), Tsapogas and Cahalan (1996), and Weiler (1991, 1994) on the influence of financial indebtedness. The model is based upon the work of Ekstrom et al. (1991) and Wilder and Baydar (1991).

One predictor of enrollment in graduate or first professional school that may offset the influence of undergraduate debt is the offer of financial aid. With the exception of the mixed results of Ekstrom et al. (1991), earlier research (Baird, 1976, 1982; Butler-Nalin, Sanderson, & Redman, 1983; Ethington & Smart, 1986; McClain, Vance, & Wood, 1984; Remus & Isa, 1983; Wilder & Bayder, 1991) found that receiving financial aid has a strong positive influence on graduate school enrollment. The B&B asked students if they applied for financial aid at any of the graduate schools to which they applied for admission, but the B&B did not collect data to show whether and how much students received. Therefore it is not possible to measure the influence that receiving graduate school financial aid had on the odds of students enrolling in a graduate or first professional degree program unless the analyses are restricted to students' first choice school. The B&B collected information on whether students received offers of financial aid at the first two graduate schools to which they applied. In order to learn about the influence of the offer of financial aid on enrollment decisions two analyses will be presented. The first will be the analysis of students general application and enrollment if accepted in graduate or first professional school without considering the influence of an offer of financial aid. The second will be the analysis of students' application to their first choice graduate or first professional school and their enrollment, if accepted into their

first choice graduate or first professional school with the offer of financial aid being included in the analysis.

Figure 1 presents the model of student flow into graduate school. The model contains five categories of independent variables that were derived from the literature review and two categories of dependent variables reflecting how students make the transition from undergraduate to graduate school and the factors that contribute to the two steps in the transition. The five categories of independent variables are: (a) personal background, (b) characteristics of the baccalaureate institution, (c) college experiences, (d) immediate opportunity costs to attend graduate or first professional school, and (e) offer of financial aid from the first choice graduate or first professional program if accepted (limited to the second set of analyses). The conceptual model shows the expected relationship of these categories of variables to students' decisions to apply to graduate or first professional school at the end of college, and their enrollment in a graduate or first professional degree program immediately upon receiving a bachelor's degree. The outcome (dependent) variables in the model are: (a) students' application to graduate or first professional school, with a second analysis for application to their first choice institution, and (b) if admitted, student enrollment in either a graduate or first professional degree program, with a second analysis for their first choice institution. The model displays the independent variables in categories simply as a means of illustrating the overall conceptual relational framework. Each independent variable, however, may exert independent influence throughout the model and will be analyzed in that way rather than as part of categories.

Variables

B&B variables were selected for inclusion in the analyses on the basis of their fit into the seven major categories: (a) personal background, (b) characteristics of the baccalaureate institution, (c) college experiences, (d) immediate opportunity costs to attend graduate or first professional school, (e) offer of financial aid from first choice graduate or first professional program if accepted (this will only be entered for the first choice enrollment regression), (f) application to a graduate or first professional school, (g) enrollment in a graduate or first professional degree program if applied and admitted (see Table 2). Table 2 presents the variables used in the analyses of factors related to graduate or first professional school application and enrollment.

Independent Variables

Personal background characteristics include sex, race/ethnicity, total income (parents and independent students) and parents' education. Sex

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┌─────────────────────────────────────────┐
│ (1) Personal Background                  │
│                                          │
│ •Sex                                     │
│ •Race/Ethnicity                          │
│ •Parents' Highest Level of Education     │
│ •Total Income (Parents & Independent)    │
└─────────────────────────────────────────┘

┌─────────────────────────────────────────┐
│ (2) Characteristics of the Baccalaureate Institution │
│                                          │
│ •Selectivity of Undergraduate Institution │
│ •Private Undergraduate Institution       │
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┌─────────────────────────────────────────┐
│ (3) College Experiences                  │
│                                          │
│ •Major in Pure Field                     │
│ •Undergraduate Grade Point Average       │
│ •Satisfaction - Ability of Instructors   │
│ •Satisfaction - Intellectual Life of School │
│ •Satisfaction - Course Curriculum        │
│ •Satisfaction - Intellectual Growth      │
│ •Undergraduate Educational Debt          │
└─────────────────────────────────────────┘

┌─────────────────────────────────────────┐
│ (4) Immediate Opportunity Costs to Attend │
│     Graduate or First Professional School │
│                                          │
│ •Average Annual Salary                   │
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┌─────────────────────────────────────────┐
│ (5) Offer of Financial Aid From First Choice Graduate │
│     or First Professional Program if Accepted │
│                                          │
│ •Offer of Finacial Aid                   │
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┌─────────────────────────────────────────┐
│ (6) Application to a Graduate or          │
│     First Professional Program            │
│                                          │
│    (a) Application in General            │
│    (b) Application to First Choice       │
│    Graduate or First Professional        │
│    School                                │
└─────────────────────────────────────────┘

Both 6 & 7

┌─────────────────────────────────────────┐
│ (7) Enrollment in Graduate or First       │
│     Professional Program if               │
│     Applied and Admitted                  │
│                                          │
│    (a) Enrollment in General             │
│    (b) Enrollment at First Choice        │
│    Graduate or First Professional        │
│    Program                               │
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(6b) and (7b) only
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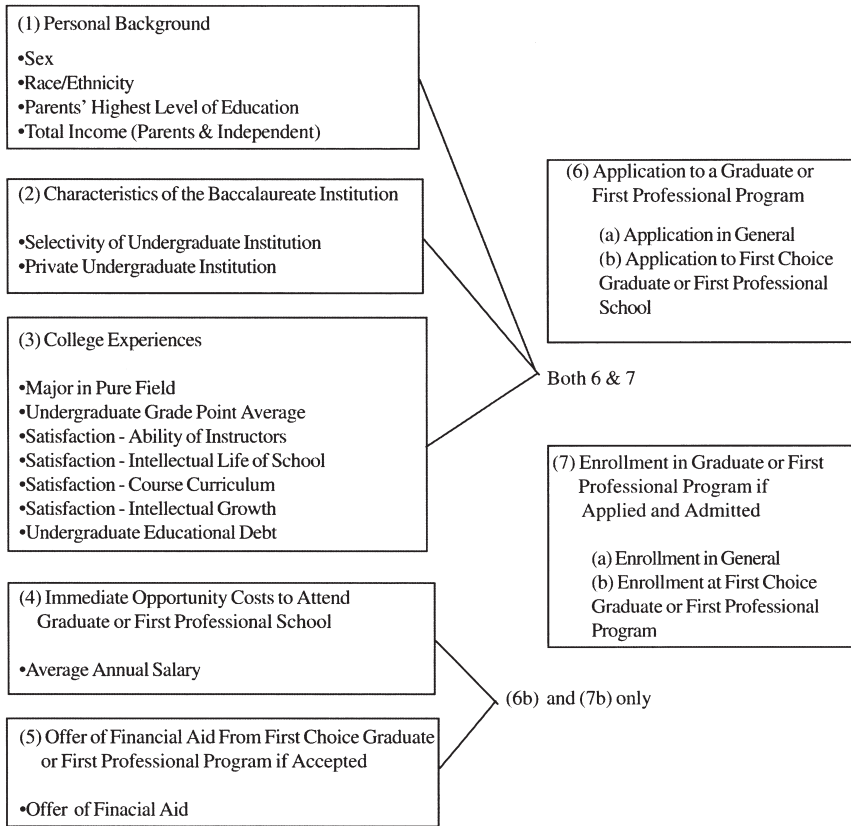
Fig. 1. Model of student flow into graduate school or first professional school for doctoral degree aspirants

Note: Variable derived from Baccalaureate and Beyond

is a dichotomous variable with male having a value of 1. For race/ethnicity dichotomous variables were created for Black, Hispanic, and Asian American with Whites serving as the reference category. For total income dichotomous variables were created for income below $24,990 or less, income between $25,000 and $49,999, income between $50,000 and $79,999, income between $75,000 and $99,999 with income of $100,000 or higher serving as the reference category. Parents' education is a dichotomous variable with 1 indicating that parents' highest level of education is a bachelor's degree or higher.

The characteristics of the baccalaureate institution includes the selectivity of the undergraduate institution and the institutional control.

TABLE 2

Variables Used in Analyses of Factors Related to First Choice Graduate or First Professional School Application and Enrollment

Variable Name	Definition
INDEPENDENT VARIABLES	
(1) Personal background	
Sex	A dummy equal to one if the student is male
Race/ethnicity	
African American	A dummy equal to one if the student is African American
Asian American	A dummy equal to one if the student is Asian American
Hispanic	A dummy equal to one if the student is Hispanic
White	A dummy equal to one if the student is White
Parent's highest level of education	A dummy equal to one if the student's parents' highest level of education is a bachelor's degree or higher
Family Income	
$24,999 or less	A dummy equal to one if the total income is $24,999 or less
$25,000 to $49,999	A dummy equal to one if the total income is between $25,000 -$49,999
$50,000 to $74,999	A dummy equal to one if the total income is between $50,000 −$74,999
$75,000 to $99,999	A dummy equal to one if the total income is between $75,000 −$99,999
$100,000 or higher	A dummy equal to one if the total income is $100,000 or higher
(2) Characteristics of Baccalaureate Institution	
Selectivity of college	
Less competitive, non competitive	A dummy equal to one if the student attended a Barron's or special selectivity ranked less competitive, non-competitive or special undergraduate college or university
Competitive	A dummy equal to one if the student attended a Barron's selectivity ranked competitive undergraduate college or university
Most, highly or very competitive	A dummy equal to one if the student attended a Barron's selectivity ranked most competitive, highly competitive or very competitive undergraduate college or university
Control	A dummy equal to one if the student attended a private undergraduate college or university
(3) College Experiences	
Pure	A dummy equal to one if the student majored in a field of study classified as pure by the Biglan classification system
Undergraduate GPA	
2.74 or less	A dummy equal to one if the student's undergraduate GPA is less than or equal to 2.74
2.75 -3.24	A dummy equal to one if the student's undergraduate GPA is between 2.75 -3.24
3.25 -3.74	A dummy equal to one if the student's undergraduate GPA is between 3.25 -3.74
3.75 or higher	A dummy equal to one if the student's undergraduate GPA is between equal to or higher than 3.75

TABLE 2 (*Continued*)

Variable Name	Definition
Ability of instructors	A dummy equal to one if the student is satisfied with the ability of instructors
Intellectual life of school	A dummy equal to one if the student is satisfied with the intellectual life of the school
Course curriculum	A dummy equal to one if the student is satisfied with the course curriculum
Intellectual growth	A dummy equal to one if the student is satisfied with his/her intellectual growth
Total undergraduate educational debt	
$100–$4,999	A dummy equal to one if the student's undergraduate educational debt is between $100 and $4,999
$5,000 -$9,999	A dummy equal to one if the student's undergraduate educational debt is between $5,000 and $9,999
$10,000 -$14,999	A dummy equal to one if the student's undergraduate educational debt is between $10,000 and $14,999
$15,000 or higher	A dummy equal to one if the student's undergraduate educational debt is equal to or greater than $15,000
No debt	A dummy equal to one if the student has no undergraduate educational debt
(4) Immediate opportunity costs to attend graduate school	
Foregone average annual salary	
Less than $21,000	A dummy equal to one if the student's estimated foregone earnings is less than $21,000
$21,000 -$23,999	A dummy equal to one if the student's estimated foregone earnings is between $21,000 and $23,999
$24,000 -$26,999	A dummy equal to one if the student's estimated foregone earnings is between $24,000 and $26,999
$27,000 or higher	A dummy equal to one if the student's estimated foregone earnings is equal to or greater than $27,000
(5) Offer of Financial Aid from First Choice Graduate or Professional School	
Financial aid offer	A dummy equal to one if the student is accepted and offered financial aid from the first choice graduate or first professional school
DEPENDENT VARIABLES	
(6a) Application to graduate or first professional school	A dummy equal to one if the student applies to a graduate or first professional program
(6b) Application to first choice graduate or first professional school	A dummy equal to one if the student applies to his/her first choice graduate or first professional program
(7a) Enrollment in graduate or first professional program	A dummy equal to one if the student enrolls in a graduate or first professional program having applied and been accepted
(7b) Enrollment in first choice graduate or first professional program	A dummy equal to one if the student enrolls in his/her first choice graduate or first professional program having applied and been accepted

Using Barron's Profile of American Colleges, selectivity ratings were assigned to colleges and universities. The dichotomous variables less competitive, noncompetitive, or special and competitive were created with very, highly, or most competitive institutions serving as the reference category. Control is a dichotomous variable with private having a value of 1.

College experiences include whether students majored in a pure or applied field, their undergraduate GPA, their satisfaction with the ability of instructors, their satisfaction with the intellectual life of their undergraduate school, their satisfaction with their undergraduate curriculum, their satisfaction with their own intellectual growth, and their undergraduate educational debt. Undergraduate major is classified using Biglan's (1973) pure/applied paradigm (see Appendix for a complete listing). Pure/applied focuses on whether a department emphasizes pure research or the practical application of subject matter. Chemistry is an example of a pure field, while engineering is an example of an applied field. The rationale for this choice is that the Biglan's pure/applied paradigm allows for the classification of fields in a manner that is compatible with Davis' (1964) level of necessity of graduate school. In addition, analysis of the April 1994 activities of B&B students by the Department of Education reported that college graduates who had majored in the arts and sciences (18%) were more likely to enroll in further education full time than those who majored in professional fields (9%)[5] (U.S. Department of Education. National Center for Education Statistics, 1996).

Students' undergraduate GPA is measured on a 4.0 scale. Dichotomous variables were created for undergraduate GPA: 2.74 or less, 2.75 to 3.24, 3.25 to 3.74, and 3.75 or higher, which is the reference category. The four student satisfaction measures are each dichotomous variables with one being a yes: satisfaction with the ability of instructors, satisfaction with the intellectual life of the school, satisfaction with course curriculum, and satisfaction with intellectual growth. Students' undergraduate debt is a series of dichotomous variables: $100 to $4,999, $5,000 to $9,999, $10,000 to $14,999, $15,000 or higher and no debt, which is the reference category.

The immediate opportunity cost to attend graduate school is measured by students' projected average annual salary in the year following their graduation from college. The earnings projections are based upon the average September 1993 salary offers by major field of study for 1992–93 bachelor's recipients as reported by the National Association of Colleges and Employers (see Appendix).

The offer of financial aid variable was created on the basis of three other values: (a) applying to a master's, doctoral, or first professional

degree program at their first choice institution, (b) being accepted to their first choice institution,[6] and (c) being offered financial aid by their first choice post-baccalaureate institution.[7]

Dependent Variables

The transition from undergraduate school to graduate school is comprised of two steps. These two steps are measured as two separate dichotomous variables. The first step is application to a graduate or first professional school. The second step is enrollment in a graduate or first professional program, having been accepted.

Two versions of each of the dependent variables are presented for analysis in order to learn about the influence of the offer of financial aid on the graduate and first professional enrollment decision. The general application variable is based on students' general application to graduate or first professional school. The second version of the application variable is restricted to their application to their first choice graduate or first professional school. The first choice application variable was created on the basis of students reporting that (a) they applied to graduate or first professional school and (b) that they applied to a master's, doctoral, or first professional degree program at their first choice school. If cases answered yes to both of these questions, they were coded as applying to a first choice graduate school.

The second step is enrolling in a graduate or first professional degree program, having applied and been accepted. The general enrollment variable was created based on students enrolling in a graduate or first professional program, having been accepted. The first choice enrollment variable was created on the basis of students reporting that (a) they were accepted to their first choice graduate or first professional school, (b) they reported being enrolled at their first choice post-baccalaureate institution in 1993–94, and (c) they enrolled in a master's, doctoral, or first professional program in 1993–94. In order to determine if students enrolled in their first choice institution, IPEDS identification numbers for their first choice graduate or first professional school (B&B variable GS01CODE) were compared to the IPEDS identification numbers for the three possible institutions that students could have reported being enrolled in 1993–94 (B&B variables PB01IPED, PB02IPED, PB03IPED).

Limitations of the Variables

An important issue in secondary data analysis is to acknowledge missing constructs. One important indicator missing from the analysis is the composition of the financial aid offer (fellowships, research or

teaching assistantships, or loans). Therefore, it is not possible to determine the influence that particular types of graduate school aid such as fellowships, research or teaching assistantships, or loans had on the odds of students enrolling in a graduate or first professional degree program. B&B also does not contain information about students' attitude toward educational debt or their behavior with managing their debt (both educational and noneducational). We can only make inferences about their attitudes on educational debt on the basis of their actions.

Because B&B is the NCES college senior cohort study, it does not collect a great deal of retrospective data on students' college experiences that could be used to estimate senior year educational expectations. Given the research of Hearn (1987) and Pascarella (1984), who both found that freshman year educational aspirations had a positive influence on educational aspirations in later years, using B&B to estimate a model to predict educational aspirations in the senior year of college would be inappropriate since it would not include important predictor variables. The NCES Beginning Postsecondary Study (BPS) would be a more suitable data base to use for predicting senior year educational expectations. Since the primary focus of our study was to examine the application and enrollment behaviors of students who expressed an interest in earning a doctorate, students were selected for the sample if they stated in their senior year of college that they expect to earn a doctoral degree. This created a nonrandom sample of college graduates who applied to and enrolled in graduate or first professional school.

Acceptance to graduate school is the intermediate step between application and enrollment. In B&B, the factors that contribute to the graduate and first professional institutions admission decision are not collected. B&B only collects case reports about whether they were accepted to graduate or first professional school. Consequently, the factors that affect acceptance cannot be adequately determined.

A second issue that had to be addressed in constructing variables was how to handle missing data. While GRE scores were included in B&B, only 21.6% of the cases that expect to earn a doctoral degree reported total GRE scores. Hence, GRE scores were not included in the analyses. Because college grade point average and GRE scores are substantially correlated, this omission is not considered problematic.

A third issue in creating the variables for analysis was the constraint on creating the dependent variables for application and enrollment. These binary variables compared students who attend graduate or professional school immediately after college with a group that combines two dissimilar groups—those who delay their attendance and those who do not attend as well as those who delay their enrollment and those who

do not enroll. Given the inability to distinguish between these two different groups because adequate time has not elapsed, it is not possible to know what the constraining effect of debt may be on these doctoral degree aspirants. For some members of the group the constraining effect of debt will be to postpone their application or enrollment decision, while for others debt may lead them to abandon their doctoral degree aspirations.

Statistical Analyses

Weights are used to ensure that the sample is representative of the population of recent bachelor's degree recipients who are U.S. citizens, non-American Indians, or Alaskan Natives who expect to earn a doctoral degree. A sample weight was calculated using the design effect from the B&B 93/94 for all students who applied to graduate school (2.21), the B&B nonresponse adjusted weight (bnbwt1) and the mean of the weighting variable for the entire sample.

Deffwt = [1/2.21 * bnbwt1] \47.8852

The unweighted sample has 1,982 cases, the weighted sample has 94,909 cases, and the adjusted weighted sample has 1,982 cases. Students will be selected for continuation in the analysis if they (a) apply to graduate or first professional school, and (b) apply to graduate or first professional school and are accepted to graduate or first professional school.

The data analyses performed to address the research question are both descriptive and relational. Since the two outcome variables in the model of student post-baccalaureate transitions are dichotomous, logistic regressions are used. Logistic regression is used for predicting the likelihood that an event such as application to graduate or first professional school will occur. The enter method for model selection will be employed. The initial model will contain all the variables presented in Table 2 plus several interaction terms. The variables that have been entered will then be examined to see if they meet removal criteria. The removal criteria will be a p-value greater than 0.05. The interaction terms will first be examined to see if they meet the criteria for removal and then the other variables will be examined. The variable with the highest p-value greater than 0.05 will be removed, and the model will be rerun until no variables meet the criteria for removal.

Separate logistic regressions will be presented for application to graduate or first professional school and for enrollment in a graduate or first professional degree program. Each table of results includes the individ-

ual parameter estimates, asymptotic standard errors, and the significance level, odds ratios (change in the odds of applying or enrolling) and delta-P statistics (change in the probability of applying) of the estimates (see Petersen, 1985, and Cabrera, 1994, for details about the delta-P statistic). The results of the logistic regressions are presented as odds ratios for the likelihood of an event occurring. Odds ratios greater than one mean that the odds of an event occurring are increased, while odds ratios less than one mean that the odds of an event occurring are decreased. When the odds ratio is one, the odds are unchanged (Menard, 1995).

Findings

General Process of Applying and Enrolling in Graduate or First Professional School

Descriptive analyses. A total of 1,982 of the cases were U.S. citizens who received a bachelor's degree, were not American Indians or Alaskan Natives, and who expected to earn a doctorate. Approximately 52% of the sample applied to graduate or first professional school (see Figure 2). Of the 1,036 students who applied to graduate or first professional school, the overwhelming majority (86.1%) were accepted (*n* = 890). Of the 890 students who applied and were accepted, 67.9% enrolled in either a graduate or first professional degree program as their highest degree program after receiving their bachelor's degrees (*n* = 603). Of the 603 students who enrolled in graduate or first professional degree programs, 70% enrolled in a master's degree program, 18% enrolled in a doctoral degree program, and 12% enrolled in a first professional degree program. Among the 285 (32.1%) who did not enroll in a graduate or first professional degree program, 57 (20%) enrolled in other educational programs, such as a nondegree program or an associate's degree program, and 228 (80%) reported that they were not enrolled in an educational program.

Table 3 presents the analyses that show that undergraduate debt has an effect on students' decisions to apply to graduate or first professional school. Students with $100 to $4,999, $5,000 to $9,999, or $10,000 to $14,999 were equally likely to not apply or apply to graduate or first professional school ([49.4% vs. 50.6%], [52.4% vs. 47.6%], [53.4% vs. 46.6%]). Students with $15,000 or higher in debt were less likely to apply to graduate or first professional school (53.9% vs. 46.1%). In contrast, nearly 59% of the students without undergraduate debt applied to graduate or first professional school compared to 41% who did not.

Approximately 70% of students with no educational debt enrolled in

(1) US citizen
(2) Received baccalaureate degree
(3) Not an American Indian/Alaskan Native
(4) Expects to earn a doctoral degree

n = 1,982

Applied to a graduate or first professional program

n = 1,036 (52.3%)

Did not apply to a graduate or first professional program

n = 946 (47.7%)

Accepted to a graduate or first professional program

n = 890 (86.1%)

Not accepted to a graduate or first professional program

n = 143 (13.9%)

Enrolled in a graduate or first professional program

n = 603 (67.9%)

Not enrolled in a graduate or first professional program

n = 285 (32.1%)

(1) US citizen
(2) Received baccalaureate degree
(3) Not an American Indian/Alaskan Native
(4) Expects to earn a doctoral degree

n = 1,982

Applied to first choice graduate or first professional program

n = 993 (50.1%)

Did not apply to a first choice graduate or first professional program

n = 989 (49.9%)

Accepted to first choice graduate or first professional program

n = 725 (78.9%)

Not accepted to first choice graduate or first professional program

n = 194 (21.1%)

Enrolled in first choice graduate or first professional program

n = 453 (65.6%)

Not enrolled in first choice graduate or first professional program
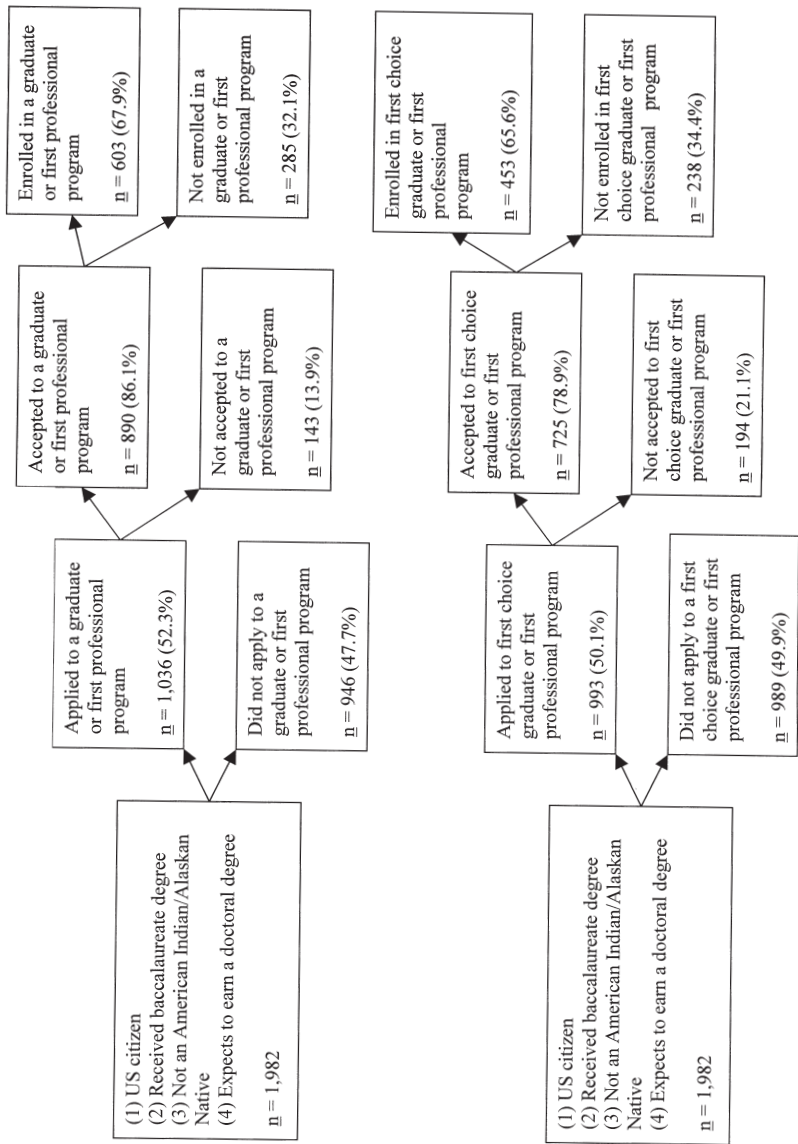
n = 238 (34.4%)

FIG. 2. Student attrition through the process of completing a bachelor's degree, applying to graduate or first professional school, gaining acceptance, and enrolling in a graduate or first professional program by general process and first choice

TABLE 3

Total Undergraduate Debt for the 1993/94 Baccalaureate and Beyond Sample Who Apply and Do Not Apply to Graduate or First Professional School Within One Year of Receiving a Bachelor's Degree

	Did Not Apply	Applied	Total
$100–$4,999	128	131	259
Row %	49.4%	50.6%	100%
Col %	14.1%	12.9%	13.5%
$5,000–$9,999	152	138	290
Row %	52.4%	47.6%	100%
Col %	16.7%	13.6%	15.1%
$10,000–$14,999	124	108	232
Row %	53.4%	46.6%	100%
Col %	13.6%	10.7%	12.1%
$15,000 Or Higher	144	123[a]	267
Row %	53.9%	46.1%	100%
Col %	15.8%	12.1%	13.9%
No Debt	362	514[a]	876
Row %	41.3%	58.7%	100%
Col %	39.8%	50.7%	45.5%
Totals	910	1,014	1,924
% within Row	47.3%	52.7%	100%
% within Col	100%	100%	100%

NOTE: Since multiple comparisons were made, the critical *p*-value was adjusted down to 0.05/5 = 0.01 as the adjusted critical cut off point for each row comparison. In order to claim a comparison significant at the overall level of 0.05 an individual row comparisons must be significant at the 0.01 level.
[a]Significant difference between applying and not applying for students with this level of debt at $p < 0.05$

graduate or first professional school. Similar rates of enrollment were found for students with educational debt: 69.4% for students with $100 to $4,999, 71.9% for students with $5,000 to $9,999, 60.6% for students with $10,000 to $14,999, and 62.6% for students with $15,000 or higher. The difference in enrolling in graduate or first professional programs between students with educational debt and students without was not statistically significant.

Regression analyses. Before the logistic regressions were executed, a linear regression was run for both the application and enrollment models using the variables listed in Table 2 to conduct collinearity diagnostics (Menard, 1995). In both the application model and the enrollment model, all of the tolerances exceeded 0.70, indicating no serious problem of collinearity. Logistic regression analyses were executed and are presented in this section to show the contribution of student background characteristics, undergraduate characteristics, collegiate performance,

indebtedness, and foregone income after controlling for other factors in the model for each of the two dependent variables in the model: (a) application to graduate or first professional school and (b) enrollment in a graduate or first professional degree program, having applied and been accepted.

Applying to a Graduate or First Professional School

In the full-model analysis, the independent variables sex, race, total income, parents' education, selectivity of the undergraduate college or university, being in a pure major as an undergraduate, GPA, satisfaction with the ability of instructors, satisfaction with intellectual life of the undergraduate college or university, satisfaction with the undergraduate curriculum at the undergraduate college or university, satisfaction with students' intellectual growth, undergraduate debt, and forgone income along with the interaction terms Race x Totaldebt, Income x Totaldebt, Control x Totaldebt, and Pure x Totaldebt were regressed on application to graduate or first professional school. The full logistic regression modeled the categorical variables as categoricals using dummy variables and included several interaction terms for a total of 64 parameter estimates and involved 1,668 cases. The final model had 19 parameter estimates and involved 1,739 cases (see Table 4).[8]

After controlling for all other factors, undergraduate debt was a significant predictor of applying to graduate or first professional school in the final model ($p < 0.05$). Students with debt of \$5,000 to \$9,999 had 1.6 times lower odds of applying to graduate or first professional school than students with no undergraduate debt (the reference category) ($p < 0.001$).[9] Students with debt ranging from \$10,000 to \$14,999 had 1.4 times lower odds of applying to graduate or first professional school than students with no undergraduate debt ($p < 0.05$). When the p-value is relaxed to 0.06 for significance, students with undergraduate debt ranging from \$15,000 or higher had 1.3 times lower odds of applying to graduate or first professional school than students with no undergraduate debt. Having debt of \$100 to \$4,999 did not significantly change the odds of students applying to graduate or first professional school compared to their peers without debt.

After controlling for all other factors, GPA had a powerful effect on the odds that a student who aspired to a doctoral degree would apply to graduate or first professional school. Students with a GPA of 2.74 or less were 3.5 times less likely to apply to graduate or first professional school compared to their peers with a GPA of 3.75 or higher (the reference category) ($p < 0.001$). Students with a GPA of 2.75 to 3.24 were 2.1 times less likely to apply than their peers with a GPA of 3.75 or higher

TABLE 4

Application to Graduate or First Professional School—Reduced Model

	Parameter Estimate	Standard Error	*p*-value	Odds Ratio	Delta-P
Sex	0.433	0.109	0.000	1.541	0.105
Race/Ethnicity			0.010		
African American	0.569	0.190	0.003	1.767	0.135
Asian American	0.398	0.265	0.133	1.489	0.096
Hispanic	−0.124	0.239	0.603	0.883	−0.031
Parent's have a BA or higher	0.204	0.107	0.055	1.227	0.050
Selectivity of college			0.022		
Less competitive, non					
competitive or special	−0.412	0.151	0.006	0.663	−0.103
Competitive	−0.181	0.115	0.116	0.834	−0.045
Pure	0.748	0.114	0.000	2.113	0.174
Undergraduate GPA			0.000		
2.74 or less	−1.252	0.193	0.000	0.286	−0.287
2.75–3.24	−0.748	0.178	0.000	0.473	−0.182
3.25–3.74	−0.427	0.176	0.015	0.652	−0.106
Total Undergraduate Educational					
Debt			0.010		
$100–$4,999	−0.279	0.159	0.080	0.757	−0.070
$5,000–$9,999	−0.485	0.151	0.001	0.615	−0.120
$10,000–$14,999	−0.366	0.169	0.030	0.694	−0.091
$15,000 or higher	−0.294	0.156	0.060	0.745	−0.073
Foregone average annual salary			0.000		
Less than $21,000	−0.181	0.171	0.291	0.834	−0.045
$21,000–$23,999	−0.340	0.173	0.049	0.712	−0.085
$24,000–$26,999	−0.689	0.166	0.000	0.502	−0.169
Constant	0.749	0.225	0.001	2.115	0.174

Unweighted *n*	1745	PCP		0.64
Weighted *n*	1739	X^2		176.646
Number of Parameters	19	Sig of X^2		0.000
Baseline Po	0.5336	Hosmer Lemeshow X^2		11.421
−2 Log likelihood	2225.502	Sig of Hosmer Lemeshow		0.179
df	1726			

SOURCE: U.S. Department of Education. National Center for Education Statistics, Baccalaureate and Beyond Longitudinal Study (1996).

($p < 0.001$). Students with a GPA of 3.25 to 3.74 were 1.5 times less likely to apply to graduate or first professional school than their peers with a GPA of 3.75 or higher ($p < 0.05$). Undergraduate major was an-other predictor of applying to graduate or first professional school. Students who majored in a pure field as undergraduates were 2.1 times more likely to apply to graduate or first professional school than students who majored in an applied field ($p < 0.001$).

Men were 1.5 times more likely to apply to graduate or first professional school than women ($p < 0.001$). Race was a significant predictor of applying to graduate or first professional school ($p < 0.01$). After controlling for all other factors, the odds of African American students applying to graduate or first professional school were 1.8 times higher than those of White students (the reference category) ($p < 0.01$). Being either Hispanic or Asian American, however, did not significantly change the odds of applying to graduate or first professional school compared to those of White students. Students whose parents' highest level of educational attainment was a bachelor's degree or higher were 1.2 times more likely to apply to graduate or first professional school than their peers whose parents had not attained a bachelor's degree or higher ($p < 0.10$).

The selectivity of students' undergraduate college or university was also associated with applying to graduate or first professional school ($p < 0.05$). Students who attended a less competitive, noncompetitive or special undergraduate college or university were 1.5 times less likely to apply to graduate or first professional school compared to their peers who attended most, highly, or very competitive colleges and universities (the reference category) ($p < 0.01$). Attending a competitive undergraduate college or university did not significantly change the odds of applying to graduate or first professional school compared to students who attended most, highly, or very competitive colleges and universities. Forgone earnings were also associated with applying to graduate or first professional school ($p < 0.001$). Students with a foregone income of \$21,000 to \$23,999 were 1.4 times less likely to apply to graduate or first professional school compared to their peers with foregone incomes of \$27,000 or higher ($p < 0.05$). Students with a foregone income of \$24,000 to \$26,999 were 2 times less likely to apply to graduate or first professional school compared to their peers with foregone incomes of \$27,000 or higher ($p < 0.001$).

Several measures of assessing the fit of the final model were reviewed. The chi-square statistic for overall fit although presented ($X^2 = 176.646$) and significant ($p < 0.001$) is not a valid measure of goodness of fit for the model because of the sparseness of the data. This particular statistic is not an acceptable procedure when assessing goodness of fit when the number of covariate classes is approximately equal to the number of observations, which occurs in this dataset (Hosmer & Lemeshow, 1989, pp. 138–139). While the -2 LL statistic is presented (2255.502), Menard (1995) contends that the "Hosmer Lemeshow goodness-of-fit index may have some advantage over D_M (-2 LL) when the number of possible combinations of values of the independent variables is equal (or approximately equal) to the number of cases in the analyses but other-

wise tends to produce results consistent with D_M" (Menard, 1995, pp. 20–21). The Hosmer Lemeshow Goodness of Fit test chi square value was 11.421 with a *p*-value of 0.179 (see Table 4). Therefore, we accept the null hypothesis that this particular model is a good fit at the 5% level.[10]

Enrollment in a Graduate or First Professional Degree Program

In the full model, the independent variables along with the interaction terms for Race x Totaldebt, Income x Totaldebt, Control x Totaldebt, and Pure x Totaldebt for a total of 64 parameter estimates were regressed on enrolling in a graduate or first professional degree program. The logistic regression on enrollment involved 779 cases. In the reduced model, 14 parameter estimates were regressed on enrolling in a graduate or first professional degree program for 809 cases (see Table 5). In the reduced model, undergraduate debt did not have a significant effect on enrollment in a graduate or first professional degree program.

Two variables had a significant effect on enrollment in a graduate or first professional degree program (see Table 5). The odds of students with total incomes of $24,999 or less enrolling in a graduate or first professional program were 2.4 times lower than those of their peers with family incomes of $100,000 or higher (the reference category) ($p < 0.01$). Students with total incomes ranging from $25,000 to $49,999 were 2.1 times less likely to enroll in a graduate or first professional program than their peers with family incomes of $100,000 or higher ($p < 0.05$). Students with total incomes ranging from $50,000 to $74,999 were 2 times less likely to enroll in a graduate or first professional program than their peers with family incomes of $100,000 or higher ($p < 0.05$). Students who attended less competitive, noncompetitive or special undergraduate colleges or universities were 1.8 times less likely to enroll in a graduate or first professional degree program than their peers who attended most, highly, or very competitive undergraduate colleges or universities ($p < 0.05$).

If the *p*-value is relaxed to the 0.06 level, then two other variables had a significant effect on enrollment in a graduate or first professional degree program. The odds of students who were satisfied with the undergraduate course curriculum enrolling in a graduate or first professional degree program were nearly 1.5 times greater than the odds of students who were not satisfied. Students with foregone incomes of $21,000 or less were 1.6 times less likely to enroll in a graduate or first professional program than their peers with foregone incomes of $27,000 or higher. Students with foregone incomes of $21,000 to $23,999 were 1.5 times

TABLE 5

Enrollment in Graduate or First Professional School—Reduced Model

	Parameter Estimate	Standard Error	*p*-value	Odds Ratio	Delta-P
Total Income			0.005		
$24,999 or less	−0.884	0.300	0.003	0.413	−0.213
$25,000 to $49,999	−0.725	0.309	0.019	0.484	−0.173
$50,000 to $74,999	−0.672	0.306	0.028	0.511	−0.160
$75,000 to $99,999	0.067	0.394	0.865	1.069	0.015
Selectivity of college			0.016		
Less competitive, non competitive or special	−0.571	0.224	0.011	0.565	−0.135
Competitive	0.033	0.175	0.853	1.033	0.007
Undergraduate GPA			0.091		
2.74 or less	−0.412	0.268	0.125	0.662	−0.096
2.75–3.24	−0.217	0.240	0.366	0.805	−0.049
3.25–3.74	0.118	0.240	0.623	1.125	0.025
Satisfaction with course curriculum	0.418	0.219	0.056	1.519	0.084
Foregone average annual salary			0.022		
Less than $21,000	−0.461	0.243	0.058	0.631	−0.108
$21,000–$23,999	−0.438	0.226	0.053	0.645	−0.102
$24,000–$26,999	0.080	0.250	0.749	1.083	0.017
Constant	1.427	0.422	0.001	4.167	0.221

Unweighted *n*	842	PCP		0.67
Weighted *n*	809	X^2		51.343
Number of Parameters	14	Sig of X^2		0.000
Baseline Po	0.6761	Hosmer Lemeshow X^2		11.979
−2 Log likelihood	966.269	Sig of Hosmer Lemeshow		0.152
df	828			

less likely to enroll in a graduate or first professional program than their peers with foregone incomes of $27,000 or higher.

As with the application model, the sparseness of the data in the enrollment model raises questions regarding the appropriateness of several of the goodness of fit measures that are generated. The Hosmer Lemeshow chi square test for the final enrollment model was 11.979, and the significance of the Hosmer Lemeshow test was 0.152, indicating a good fit (see Table 5).

The Process of Applying and Enrolling in First Choice Graduate or First Professional School

Descriptive analyses. Similar to the general process of applying and enrolling in graduate school, approximately 50.1% of the sample ap-

plied to a first choice graduate or first professional school (see Figure 2). Of the 993 students who applied to a first choice graduate or first professional school, the majority (78.9%) were accepted (*n* = 725). Of the 725 students who applied and were accepted, 65.6% enrolled in their first choice graduate or first professional degree program as their highest degree program after receiving their bachelor's degrees (*n* = 453). Of the 453 students who enrolled in graduate or first professional degree programs, 332 (73.5%) were enrolled in a master's degree program, 79 (17.5%) were enrolled in a doctoral degree program and 42 (9.1%) were enrolled in a first professional degree program. Among the 238 (34.4%) who did not enroll in a first choice graduate or first professional degree program, 58 (24%) were enrolled in a graduate or first professional degree program that was not their first choice, 28 (11.8%) were enrolled in other educational programs, such as a nondegree program or an associate's degree program, and 152 (64.1%) reported that they were not enrolled in an educational program.

Regression analyses. The regression analyses presented in this section show the contribution of student background characteristics, undergraduate characteristics, collegiate performance, indebtedness and foregone income and the offer of financial aid (enrollment model only) after controlling for other factors in the model for each of the two dependent variables in the model: (a) application to first choice graduate or first professional school and (b) enrollment in a first choice graduate or first professional degree program, having applied and been accepted.

Applying to a First Choice Graduate or First Professional School

In the full model, the independent variables sex, race, total income, parents' education, selectivity of the undergraduate college or university, being in a pure major as an undergraduate, GPA, satisfaction with the ability of instructors, satisfaction with intellectual life of the undergraduate college or university, satisfaction with the undergraduate curriculum at the undergraduate college or university, satisfaction with students' intellectual growth, undergraduate debt, and forgone income along with the interaction terms Race x Totaldebt, Income x Totaldebt, Control x Totaldebt, and Pure x Totaldebt for a total of 64 parameter estimates were regressed on application to first choice graduate or first professional school. The full model analysis included 1,668 cases. The reduced logistic regression model on application to first choice graduate or first professional school included 19 parameter estimates and involved 1,813 cases (see Table 6).

TABLE 6

Application to First Choice Graduate or First Professional School—Reduced Model

	Parameter Estimate	Standard Error	p-value	Odds Ratio	Delta-P
Sex	0.345	0.106	0.001	1.412	0.085
Race/Ethnicity			0.006		
African American	0.522	0.181	0.004	1.685	0.127
Asian American	0.541	0.258	0.036	1.717	0.131
Hispanic	−0.103	0.232	0.657	0.902	−0.026
Total Income			0.002		
$24,999 or less	−0.599	0.192	0.002	0.550	−0.146
$25,000 to $49,999	−0.491	0.197	0.013	0.612	−0.121
$50,000 to $74,999	−0.272	0.197	0.166	0.762	−0.068
$75,000 to $99,999	−0.015	0.245	0.952	0.985	−0.004
Selectivity of college			0.045		
Less competitive, non competitive or special	−0.367	0.148	0.013	0.693	−0.091
Competitive	−0.108	0.112	0.336	0.898	−0.027
Pure	0.782	0.112	0.000	2.185	0.184
Undergraduate GPA			0.000		
2.74 or less	−1.142	0.186	0.000	0.319	−0.261
2.75–3.24	0.629	0.170	0.000	0.533	−0.153
3.25–3.74	0.277	0.168	0.101	0.758	−0.069
Foregone average annual salary			0.000		
Less than $21,000	−0.240	0.167	0.150	0.786	−0.060
$21,000–$23,999	−0.415	0.169	0.014	0.660	−0.103
$24,000–$26,999	−0.740	0.162	0.000	0.477	−0.179
Constant	0.884	0.259	0.001	2.421	0.205

Unweighted n	1826	PCP		0.63
Weighted n	1813	X^2		177.381
Number of Parameters	18	Sig of X^2		0.000
Baseline Po	0.5135	Hosmer Lemeshow X^2		7.740
−2 Log likelihood	2332.435	Sig of Hosmer Lemeshow		0.459
df	1808			

In the final model, after controlling for all other factors, undergraduate debt was not a significant predictor of applying to a first choice graduate or first professional school. Income, however, was a significant predictor of applying to a first choice graduate or first professional school. Students with income of $24,999 or less had 1.8 times lower odds of applying to their first choice graduate or first professional school than students with family incomes of $100,000 or higher (the reference category) ($p < 0.01$). Students with incomes of $25,000 to $49,999 were 1.6 times less likely to apply to graduate or first professional school compared to their peers with incomes of $100,000 or higher ($p < 0.05$). Hav-

ing total income of $50,000 to $74,999 did not significantly change the odds of students applying to graduate or first professional school compared to the odds of their peers with total incomes of $100,000 or higher.

After controlling for all other factors, GPA had a strong effect on the odds that a student who aspired to a doctoral degree would apply to a first choice graduate or first professional school. Students with a GPA of 2.74 or less were 3.1 times less likely to apply to a first choice graduate or first professional school compared to their peers with a GPA of 3.75 or higher (the reference category) ($p < 0.01$). Students with a GPA of 2.75 to 3.24 were 1.9 times less likely to apply than their peers with a GPA of 3.75 or higher ($p < 0.01$). Having a GPA of 3.25 to 3.74 did not significantly change the odds of students applying to a first choice graduate or first professional school compared to students with a GPA of 3.75 or higher. Undergraduate major was another predictor of applying to a first choice graduate or first professional school. Students who majored in a pure field as undergraduates were 2.2 times more likely to apply to a first choice graduate or first professional school than students who majored in an applied field ($p < 0.001$).

Men were 1.4 times more likely to apply to a first choice graduate or first professional school than women ($p < 0.001$). Race was a significant predictor of applying to a first choice graduate or first professional school ($p < 0.01$). After controlling for all other factors, the odds of African American students applying to first choice graduate or first professional school were 1.7 times higher than the odds for White students (the reference category) ($p < 0.01$). The odds of Asian American students applying to a first choice graduate or professional school were 1.7 times higher than the odds for White students ($p < 0.05$). Being Hispanic, however, did not significantly change the odds of applying to graduate or first professional school compared to those of White students.

The selectivity of students undergraduate college or university was also associated with applying to a first choice graduate or first professional school. Students who attended a less competitive, noncompetitive or special undergraduate college or university were 1.4 times less likely to apply to a first choice graduate or first professional school compared to their peers who attended most, highly, or very competitive colleges and universities (the reference category) ($p < 0.05$). Forgone earnings were also associated with applying to a first choice graduate or first professional school. Students with a foregone income of $21,000 to $23,999 were 1.5 times less likely to apply to a first choice graduate school, and students with a foregone income of $24,000 to $26,999 were 2.1 times less likely to apply to a first choice graduate or first professional school compared to their peers with foregone incomes of $27,000

or higher (the reference category). For the final model, the Hosmer Lemeshow chi square test was 7.740, and the significance of the Hosmer Lemeshow test was 0.459, indicating a good fit.

Enrollment in a First Choice Graduate or First Professional Degree Program

In the full model, the independent variables in the application model along with a dichotomous variable indicating whether students were offered financial aid and the interaction terms for Race x Totaldebt, Income x Totaldebt, Control x Totaldebt, Pure x Totaldebt, and Offer of Financial Aid x Totaldebt were regressed on enrolling in a first choice graduate or first professional degree program. The logistic regression on enrollment in a first choice program with the 69 parameter estimates involved 540 cases. The reduced first choice enrollment model included 12 parameter estimates and 607 cases (see Table 7). Like the general enrollment model, undergraduate debt did not have a significant effect on enrollment in their first choice graduate or first professional degree program in the reduced model, but income did have a significant effect. The odds of students with total incomes of $24,999 or less enrolling in their first choice graduate or first professional program were 2.9 times lower than their peers with family incomes of $100,000 or higher (the reference category) ($p < 0.01$). Both students with total incomes ranging from $25,000 to $49,999 and students with total incomes ranging from $50,000 to $74,999 were 2.5 times less likely to enroll in a first choice graduate or first professional program than their peers with family incomes of $100,000 or higher ($p < 0.01$).

In the reduced model, the offer of financial aid was a significant predictor of enrollment in first choice graduate or first professional school enrollment. Students who were offered financial aid by their first choice graduate or first professional school were 2 times more likely to enroll than their peers who were not offered aid ($p < 0.001$).

Race had a significant effect on enrollment in a first choice graduate or first professional degree program (see Table 7). The odds of African American students enrolling in a first choice graduate or first professional program were 3.4 times lower than those of their White peers (the reference category) ($p < 0.001$). Hispanic students were 2.4 times less likely to enroll in a first choice graduate or first professional program than their White peers ($p < 0.01$). If the p-value is relaxed to 0.06, then Asian American students were 2.4 times less likely to enroll in their first choice graduate or first professional school than their White peers.

Students with foregone incomes of less than $21,000 were 2 times less likely to enroll in a first choice graduate or first professional pro-

TABLE 7

Enrollment in First Choice Graduate or First Professional School—Reduced Model

	Parameter Estimate	Standard Error	*p*-value	Odds Ratio	Delta-P
Race/Ethnicity			0.000		
African American	−1.217	0.306	0.000	0.296	−0.294
Asian American	−0.892	0.475	0.060	0.410	−0.215
Hispanic	−0.884	0.378	0.019	0.413	−0.213
Total Income			0.012		
$24,999 or less	−1.056	0.352	0.003	0.348	−0.256
$25,000 to $49,999	−0.928	0.359	0.010	0.396	−0.224
$50,000 to $74,999	−0.913	0.353	0.010	0.401	−0.221
$75,000 to $99,999	−0.248	0.435	0.568	0.780	−0.057
Foregone average annual salary			0.022		
Less than $21,000	−0.670	0.290	0.021	0.512	−0.160
$21,000 -$23,999	−0.547	0.266	0.040	0.579	−0.129
$24,000 -$26,999	−0.046	0.291	0.873	0.955	−0.010
Offer of Financial Aid	0.694	0.191	0.000	2.001	0.131
Constant	1.650	0.371	0.000	5.207	0.241

Unweighted *n*	645	PCP		0.71
Weighted *n*	607	X^2		62.288
Number of Parameters	12	Sig of X^2		0.000
Baseline Po	0.6738	Hosmer Lemeshow X^2		4.252
−2 Log likelihood	705.176	Sig of Hosmer Lemeshow		0.750
df	633			

SOURCE: U.S. Department of Education. National Center for Education Statistics, Baccalaureate and Beyond Longitudinal Study (1996).

gram than their peers with foregone incomes of $27,000 or higher (the reference group) ($p < 0.05$). Students with foregone incomes of $21,000 to $23,999 were 1.7 times less likely to enroll in a graduate or first professional program than their peers with foregone incomes of $27,000 or higher. Students with foregone incomes of $24,000 to $26,999 did not have significantly different odds of enrolling in their first choice graduate or first professional program than their peers with foregone incomes of $27,000 or higher. The Hosmer Lemeshow chi square test was 4.252, and the significance of the Hosmer Lemeshow test was 0.750, indicating a good fit for the final model.

Summary and Conclusions

Undergraduate Debt

In this study of 1992–93 college students who expect to earn a doctoral degree, undergraduate loan debt does appear to lead to a new class

of indentured servants who appear to be impaired by their debt from making the transition to graduate school within one year of earning their bachelor's degree. Students with debt of $5,000 or higher are significantly less likely to apply to graduate or first professional school than their peers who did not have educational debt (see Table 4).

Forty-six percent of the 1992–93 college graduates who expected to earn a doctoral degree did not have educational debt; the other 54% accumulated an average debt of $10,691. Among the 1992–93 college graduates, students with accumulated educational debt greater than $5,000 represented 41% of the students who expected to earn a doctoral degree. Of the students who have debt and expect to earn a doctoral degree 75% had educational debt greater than $5,000 (see Table 3).

It is important to know who the students are who have educational debt. If we know who these students are, then we may be able to address the obstacles that hinder students with educational debt from applying to graduate or first professional school. Table 8 shows that compared to students without educational debt, students who have educational debt are more likely to have parents who have not earned a bachelor's degree. Nearly a third of the students who have less than $5,000 in debt, 31.7% of student with $5,000 to $9,999 in debt, 42% of students with $10,000 to $14,999, and 28.1% of students with debt of $15,000 or more have parents whose highest education level is high school or less. By contrast, 19.5% of the students who have no educational debt had parents whose highest education level is high school or less. In comparison, 40.2% of students without educational debt have parents whose educational attainment is an advanced degree, whereas approximately 25% of students who reported having educational debt have parents with an advanced degree.

TABLE 8

Undergraduate Indebtedness by Parents' Educational Attainment

	High School or Less	Some Postsecondary Education	Bachelor's	Advanced
Less than $5,000	34.0%	23.8%	15.2%	27.0%
$5,000–$9,999	31.7%	17.6%	25.5%	25.2%
$10,000–$14,999	42.0%	16.4%	18.6%	23.0%
$15,000 or more	28.1%	25.1%	19.0%	27.8%
No debt	19.5%	13.9%	26.4%	40.2%
Total	27.2%	17.7%	22.8%	32.3%

NOTES: X^2 (12, n = 1,891) = 110.92, $p < 0.001$.

Important differences are also found when family income is considered (see Table 9). Approximately 41% of the students who have less than $5,000 in educational debt, 44.6% of students with $5,000 to $9,999 in educational debt, 46.8% of students with educational debt of $10,000 to $14,999 and 50.4% of students with $15,000 or higher in educational debt reported 1991 family incomes of less than $24,999 compared to 18.6% of students without educational debt. At the other end of the income continuum, 2% of students with educational debt had family incomes of $100,000 or higher compared to 17% of students without educational debt. This shows that educational debt is related to family income. The lower the family income, the more likely recent college graduates are to have educational debt.

This study has found that 1992–93 bachelor's degree recipients who expected to earn a doctoral degree appeared not to be adversely affected by financial indebtedness in enrolling in graduate or first professional degree programs if they apply and are accepted. The offer of financial aid by the student's first choice graduate or first professional program was a significant predictor of enrolling. This finding suggests that offers of financial aid may mitigate the effect of having educational debt on students' decisions to continue their educational careers. Because the B&B does not have financial aid packages or amounts awarded to students who do not enroll, it is not possible to examine the precise effects of financial aid.

One surprising finding in this study was that students with lower opportunity costs defined as foregone earnings are less likely to apply to or enroll in graduate or first professional school than their peers with higher foregone earnings. This finding contradicts undergraduate college-choice research (Bishop, 1977, Fuller, Manski, & Wise, 1982; Kohn, Manski, & Mundel, 1976; Manski & Wise, 1983) that examines

TABLE 9

Educational Indebtedness by 1991 Family Income

	$24,999 or less	$25,000 to $49,999	$50,000 to $74,999	$75,000 to $99,999	$100,000 or higher
Less than $5,000	40.8%	29.0%	21.6%	7.5%	1.2%
$5,000–$9,999	44.6%	32.2%	17.6%	4.5%	1.0%
$10,000–$14,999	46.8%	28.3%	18.9%	3.9%	2.1%
$15,000 or more	50.4%	21.3%	19.8%	4.5%	4.1%
No debt	18.6%	22.7%	29.7%	12.0%	17.0%
Total	33.3%	25.5%	24.1%	8.2%	8.9%

NOTES: X^2 (16, $n = 1,921$) = 292.47, $p < 0.001$

students choosing between enrollment in a college or university or selecting other alternatives, such as work or military service. The college-choice research posits that an individual student will select college or university attendance if the perceived benefits of attendance outweigh the perceived benefits of the noncollege alternative.

Two studies (Tsapogas & Cahalan, 1996, and Weiler, 1991) examined the influence of foregone income on enrollment in graduate or professional school. Using HS&B, Weiler (1991) constructed a foregone income variable to measure the income that cases forego when they enroll in graduate or professional school. Foregone income had a negative effect upon the decision to enroll in a master's program but was not a significant effect upon enrolling in graduate or professional programs. Tsapogas and Cahalan (1996) estimated foregone income using the average salary for those employed full-time by major by sex. They found that students who majored in fields where they were able to command relatively high salaries without graduate degrees were less likely to go to graduate school. Separate analyses for males and females yielded similar findings. Tsapogas and Cahalan also found that bachelor's degree holders in the life sciences, social sciences, and the physical sciences were more likely to enroll in graduate studies to acquire further education before they began a career compared to their peers with degrees in engineering or the computer sciences.

On the basis of this research, students with relatively high foregone income can be less likely to apply or less likely to enroll in graduate or professional school than students with comparatively low foregone incomes. Perhaps Hauptman's (1986) observation that the pool of applicants and their perception of labor market conditions, as well as the availability of financial aid, affect who goes to graduate school begins to shed light on the multiple facets of the decision-making process of selecting graduate school.

Applications for Educational Policymakers

The effect of educational indebtedness on the transition to graduate school for U.S. citizens is an important consideration for educational policy makers. In 1976–77, nonresident aliens represented 11% of the doctoral degree recipients at U.S. graduate schools, by 1993–94 their representation had more than doubled (26%). This raises questions about whether American graduate and professional education are becoming less accessible to American students than for their counterparts from abroad. U.S. educational policymakers are in a position to make doctoral education an appealing choice and a plausible option for recent college graduates.

On the basis of the finding from this study that undergraduate indebtedness is a deterrent to application to graduate or first professional school for 41% of the doctoral degree aspirants in 1992–93, policymakers could argue that the federal student loan program, as it was constructed in the early 1990s, does not meet the requirements established by Senator Pell that debt not be an impediment to students. The federal government appears to have provided student loans that enabled students to gain access to college, but in this study, having educational loans greater than $5,000 prohibited 1992–93 college graduates who expect to earn a doctoral degree from pursuing further their educational goals in the year immediately after they graduated from college. This is particularly important in light of the shift in balance of federal financial aid policy from grants to loans. Table 1 shows that the increase in the percentage of students who borrowed from 1992–93 to 1995–96 was 32% for seniors at public 4-year institutions and 18% for seniors at private institutions, while the percentage change in amount borrowed over the same time period was a 57% increase at public institutions and a 45% increase at private institutions. Policymakers may want to heed the finding that lower socioeconomic students who aspire to doctoral degree programs are choosing not to make the transition to graduate or first professional school.

In addition, on the basis of the findings from this study policymakers could examine sex and race as other factors that contribute to doctoral degree aspirants not making the transition to graduate or first professional school. Men were more likely to apply than women. African Americans were more likely to apply than Whites, but they were less likely to enroll in their first choice graduate or first professional school than Whites. While it may be inappropriate to include such demographic characteristics as race and sex criteria for type and amount of loan and debt burden, the evidence from this research suggests that policymakers should take a closer look at strategies for encouraging women and African Americans to apply to graduate or first professional school immediately after receiving their bachelor's degrees given the different influence that debt appears to have upon their decisions to apply for graduate and first professional school. Since African Americans are so severely underrepresented in graduate and first professional degree programs, this research lends support for the need to at the very least continue programs that have been successful in encouraging underrepresented minorities and women like the Patricia Roberts Harris fellowships[11] and also justifies establishing additional programs to reduce racial effects of debt burden.

Policymakers should be disturbed by the findings of the negative

influence of loans for 41% of the college graduates of 1992–93. It is important to conduct routine analyses of the effect of loans upon students' post-baccalaureate educational opportunities in order to assess whether student loan debt is becoming more of a burden than it is intended to be. Only by continually examining the effects of federal financial aid policy changes will we know if the 1992–93 findings represent one brief moment in time or a new trend in the nation's federal financial aid program.

APPENDIX

Undergraduate Major by the Biglan Classification and the CPC Salary Estimate for 1992–93

Pure/ Applied Label	Broad Major Area	B&B Variable-UGMJCODE	CPC Salary or Mean Sub or Overall Mean Sub	CPC Major
Applied	Other	Agricultural Science	$25,378	Other agricultural sciences
Applied	Other	Agriculture	$25,378	Other agricultural sciences
Applied	Lifephys	Natural Resources	$22,442	Natural Resources
Applied	Lifephys	Forestry	$25,378	Other agricultural sciences
Applied	Other	Architecture	$23,676	Architectural & Environmental Design
Pure	Socsci	American Civilization	$22,684	Social Sciences -Other
Pure	Humanity	Area Studies	$24,373	Humanities-Other
Pure	Humanity	African-American Studies	$24,373	Humanities-Other
Pure	Humanity	Ethnic Studies, Not Black/Area Studies	$24,373	Humanities-Other
Applied	Business	Accounting	$27,493	Accounting
Applied	Business	Finance	$24,555	Economics and Finances (incl. Banking)
Applied	Business	Business/Management Systems	$26,083	Business Admin (including Management Science)
Applied	Business	Management/Business Administration	$24,555	Business Admin (including Management Science)
Applied	Business	Secretarial	$25,335	Mean Starting Business Salary
Applied	Business	Business Support	$25,335	Mean Starting Business Salary
Applied	Business	Marketing/Distribution	$24,361	Marketing/Marketing Management (inc. Research)
Applied	Other	Journalism	$20,583	Journalism
Applied	Other	Communications	$21,498	Communications
Applied	Other	Communication Technology	$23,450	Telecommunications/ Broadcasting
Applied	Matheng	Computer Programming	$31,329	Computer Science
Applied	Matheng	Computer and Information Sciences	$29,723	Information Sciences and Systems

Pure/ Applied Label	Broad Major Area	B&B Variable-UGMJCODE	CPC Salary or Mean Sub or Overall Mean Sub	CPC Major
Applied	Educ	Education: Early Childhood	$16,463	Pre-elementary Education
Applied	Educ	Education: Elementary	$20,097	Elementary Education
Applied	Educ	Education: Secondary	$20,097	Elementary Education
Applied	Educ	Education: Special	$21,837	Special Education
Applied	Educ	Education: Physical	$21,376	Physical Education
Applied	Educ	Education: Other	$19,943	Mean Starting Education Salary
Applied	Matheng	Engineering: Electrical	$34,313	Electrical
Applied	Matheng	Engineering: Chemical	$39,482	Chemical
Applied	Matheng	Engineering: Civil	$29,211	Civil
Applied	Matheng	Engineering: Mechanical	$34,450	Mechanical
Applied	Matheng	Engineering: all other	$32,924	Mean Starting Engineering Salary
Applied	Matheng	Engineering Technology	$29,236	Engineering Technology
Pure	Humanity	Spanish	$23,025	Foreign Languages
Pure	Humanity	Foreign Langs: non-European	$23,025	Foreign Languages
Pure	Humanity	Foreign Langs: European, Not Spanish	$23,025	Foreign Languages
Applied	Health	Allied Health: Dental/ Medical Tech	$29,208	Allied Health
Applied	Health	Allied Health: Community/ Mental Health	$29,208	Allied Health
Applied	Health	Health/Phys Ed/Recreation (HPER)	$27,944	Mean Starting Health Sciences Salary (excl. Pharmacy)
Applied	Health	Allied Health: Nurse Assisting	$29,208	Allied Health
Applied	Health	Allied Health: General and Other	$29,208	Allied Health
Applied	Health	Health: Audiology	$27,944	Mean Starting Health Sciences Salary (excl. Pharmacy)
Applied	Health	Health: Clinical Health Science	$27,944	Mean Starting Health Sciences Salary (excl. Pharmacy)
Applied	Health	Health: Dentistry	$27,944	Mean Starting Health Sciences Salary (excl. Pharmacy)
Applied	Health	Health: Medicine	$27,944	Mean Starting Health Sciences Salary (excl. Pharmacy)
Applied	Health	Health: Veterinary Medicine	$22,060	Animal Science
Applied	Health	Health: Nursing	$31,064	Nursing
Applied	Health	Health: Health/Hospital Admin.	$27,944	Mean Starting Health Sciences Salary (excl. Pharmacy)
Applied	Health	Health: Public Health	$27,944	Mean Starting Health Sciences Salary (excl. Pharmacy)

APPENDIX (*Continued*)

Pure/ Applied Label	Broad Major Area	B&B Variable-UGMJCODE	CPC Salary or Mean Sub or Overall Mean Sub	CPC Major
Applied	Health	Health: all other	$27,944	Mean Starting Health Sciences Salary (excl. Pharmacy)
Applied	Health	Health: Dietetics	$27,944	Mean Starting Health Sciences Salary (excl. Pharmacy)
Applied	Other	Textiles	$21,769	Textiles and Clothing
Applied	Other	Home Economics: all other	$21,106	Mean Starting Home Economics Salary
Applied	Other	Vocational Home Econ: Child Care	$21,106	Mean Starting Home Economics Salary
Applied	Other	Law: Paralegal, includes pre-Law	$22,680	Criminal Justice
Applied	Other	Law	$22,680	Criminal Justice
Pure	Humanity	Letters: English/American Lit.	$21,285	Letters
Pure	Humanity	Letters: Creative/Technical Writing	$21,285	Letters
Applied	Humanity	Liberal Studies	$24,373	Humanities-Other
Pure	Lifephys	Biol. Sci.: Zoology	$22,179	Other Physical and Earth Sciences
Pure	Lifephys	Biol. Sci.: Botany	$24,000	Plant Science
Pure	Lifephys	Biol. Sci. Biochemistry	$28,002	Chemistry
Pure	Lifephys	Biol. Sci.: all other	$21,558	Biological
Pure	Matheng	Mathematics: Statistics	$25,524	Mathematics (incl. Statistics)
Pure	Matheng	Mathematics: Not Statistics	$25,524	Mathematics (incl. Statistics)
Pure	Other	Military Sciences	$26,886	Overall mean starting salary (70 salaries)
Pure	Humanity	Women's Studies	$24,373	Humanities-Other
Pure	Lifephys	Interdisciplinary: Environmental Stud.	$22,179	Other Physical and Earth Sciences
Pure	Lifephys	Interdisciplinary: Biopsychology	$21,558	Biological
Pure	Lifephys	Interdisciplinary: all other	$26,448	Mean Starting Sciences Salary
Applied	Other	Leisure Studies	$26,886	Overall mean starting salary (70 salaries)
Applied	Other	Basic/Personal Skills	$26,886	Overall mean starting salary (70 salaries)
Pure	Humanity	Philosophy	$24,373	Humanities-Other
Pure	Humanity	Religious Studies	$24,373	Humanities-Other
Pure	Humanity	Clinical Pastoral Care	$24,373	Humanities-Other
Pure	Lifephys	Physical Sci.: Chemistry	$28,002	Chemistry
Pure	Lifephys	Physical Sci.: Earth Science	$22,179	Other Physical and Earth Sciences

APPENDIX (*Continued*)

Pure/ Applied Label	Broad Major Area	B&B Variable-UGMJCODE	CPC Salary or Mean Sub or Overall Mean Sub	CPC Major
Pure	Lifephys	Physical Sci.: Physics	$26,896	Physics
Pure	Lifephys	Physical Sci.: Not Chem/ Physics/Earth	$22,179	Other Physical and Earth Sciences
Pure	Socsci	Psychology	$20,571	Psychology
Applied	Other	Protective Services	$26,886	Overall mean starting salary (70 salaries)
Applied	Socsci	Social Work	$22,684	Social Sciences—Other
Applied	Business	Public Administration, Not Social Work	$25,335	Mean Starting Business Salary
Pure	Socsci	Anthropology/Archaeology	$22,684	Social Sciences—Other
Pure	Socsci	Economics	$26,902	Economics and Finances (incl. Banking)
Pure	Socsci	Geography	$22,684	Social Sciences—Other
Pure	Socsci	History	$23,839	History
Pure	Socsci	Sociology	$22,079	Sociology
Pure	Socsci	Political Science	$24,478	Political Science/ Government
Pure	Business	International Relations	$25,576	Economics and Finances (incl. Banking)
Applied	Other	City Planning	$23,676	Architectural & Environmental Design
Applied	Other	Industrial Arts: Construction	$23,676	Architectural & Environmental Design
Applied	Matheng	Industrial Arts: Electronics	$28,701	Industrial Technology
Applied	Humanity	Commercial Art	$20,591	Visual and Performing Arts
Applied	Other	Precision Production	$26,886	Overall mean starting salary (70 salaries)
Applied	Humanity	Design	$20,591	Visual and Performing Arts
Pure	Humanity	Speech/Drama	$20,591	Visual and Performing Arts
Pure	Humanity	Music	$20,591	Visual and Performing Arts
Pure	Humanity	Art History/Fine Arts	$24,373	Humanities—Other
Pure	Humanity	Fine and Performing Arts: all other	$20,591	Visual and Performing Arts
Applied	Other	No major	$26,886	Overall mean starting salary (70 salaries)

Notes

[1]Bachelor's degree recipients are defined as U.S. citizens who were not American Indians or Alaskan Natives.

[2]The Consortium on Financing Higher Education includes Amherst College, Barnard College, Brown University, Bryn Mawr College, Carleton College, Cornell University, Dartmouth College, Duke University, Georgetown University, Harvard University, Johns Hopkins University, Massachusetts Institute of Technology, Mount Holyoke College,

Northwestern University, Oberlin College, Pomona College, Princeton University, Rice University, Smith College, Stanford University, Swarthmore College, Trinity College, University of Chicago, University of Pennsylvania, University of Rochester, Washington University, Wellesley College, Wesleyan College, Williams College, Yale University.

[3]Received or expected to receive a baccalaureate degree between July 1, 1992 and June 30, 1993.

[4]Because American Indians and Alaskan Natives represent less than 1% of the sample, they were not included in the analyses.

[5]Professional fields included business and management, education, engineering, health professions and public affairs/social services. Arts and sciences fields included biological sciences, mathematics and other sciences, social science, history, humanities, and psychology.

[6]If a student responded "hadn't heard" for being accepted at first choice and they enrolled in their first choice post-baccalaureate institution, they were coded as accepted.

[7]If a student responded "hadn't heard" for being offered financial aid by their first choice institution, and they reported receiving financial aid in graduate or first professional school they were coded as being offered financial aid. Students who did not apply for financial aid were not included in the analyses.

[8]The number of cases in the regression was dependent on missing data for the variables included in the regression.

[9]Formula is (1/odds ratio). (1/0.615 = 1.6)

[10]With the number of covariate classes approximately equal to the number of observations, we encounter sparseness (empty cells) when trying to apply the –2LL test. In the B&B data set constructed for this article, the number of observations in the full application model is 1,668, and the number of covariate classes is 1,228,800 (2*4*2*5*3*2*2*4*2*2*2*5*4). In order to apply the normal –2LL test, the number of observations per class should be greater than 1 (I used 5 as a rough threshold). In this case, at least 6,144,440 (5*1,228,888) total observations are required with a minimum of 5 observations in each class in order to legitimately use the –2LL test.

[11]The Patricia Roberts Harris Fellowship Program provides grants, through institutions of higher education, to women and individuals from minority groups that are underrepresented in master's level, first professional, and doctoral education programs.

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