Graduate Education Attainment and Salary: An Examination of Institutional Type, Major Choice, Gender, Race/Ethnicity, Parental Education and Work Experience Differences

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Doctor of Philosophy

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This dissertation titled
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Major Choice, Gender, Race/Ethnicity, Parental Education and Work Experience
Differences

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ABSTRACT

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Graduate Education Attainment and Salary: An Examination of Institutional Type, Major Choice, Gender, Race/Ethnicity, Parental Education and Work Experience Differences

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This study investigated two major sources of influence (institution and individual characteristics) on the earnings of graduate degree recipients. These factors have been shown in previous research to influence the initial earnings of graduates at the undergraduate level. This research seeks to build on previous studies by Perna (2003, 2005) that focused on the benefits of education to undergraduate students based on racial and gender differences; and Strayhorn (2008) that focused on the relationship between African American graduates from an Historical Black College or University (HBCU) and the graduates economic outcomes (i.e. occupational status, and job satisfaction). This study is designed to extend this line of inquiry by examining the salary of 1993 baccalaureate graduates who attained a graduate degree by 2003, ten years after earning a bachelor’s degree. Descriptive and multiple regression analyses were used to explore institutional type, major choice, gender, race/ethnicity, parental education and work experience using the Baccalaureate and Beyond (B&B: 93/03) survey.

Major findings of institutional characteristics revealed higher salaries for individuals who attained a graduate degree. Attending a private institution and majoring in a STEM graduate program were also found to be positive salary determinants.
Individual characteristics indicated that men earned higher salaries than females across all variables. For example, on average, women earned almost $20,000 less than men who attained a graduate degree. Race/ethnicity did not have a significant impact upon earnings. The salary of individuals whose parents earned a bachelor’s degree or higher earned more than those whose parents earned less than a bachelor’s degree. Graduate degree holders with less than six years work experience earned more than those who with seven or more years work experience.

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TABLE OF CONTENTS

Abstract .................................................................................................................................. 3
Acknowledgments ................................................................................................................ 5
List of Tables .......................................................................................................................... 9
CHAPTER 1: Introduction ..................................................................................................... 10
  Return on Graduate Education ......................................................................................... 11
  Theoretical Framework ..................................................................................................... 17
  Statement of the Problem ............................................................................................... 19
  Significance of Study ......................................................................................................... 19
  Purpose of Study .............................................................................................................. 21
  Research Questions .......................................................................................................... 22
  Definition of Terms ........................................................................................................... 23
  Delimitations ..................................................................................................................... 25
  Limitations ......................................................................................................................... 25
  Organization of Study ....................................................................................................... 26
CHAPTER 2: Review of literature .......................................................................................... 27
  Introduction ......................................................................................................................... 27
  Educational Attainment .................................................................................................... 27
  Institutional Characteristics ............................................................................................. 33
  Individual Characteristics ............................................................................................... 36
  Summary ............................................................................................................................. 47
CHAPTER 3: Methodology ..................................................................................................... 50
LIST OF TABLES

Table 1: Description of Data..................................................................................................67
Table 2: Highest Degree Attained by 2003........................................................................69
Table 3: Highest Degree Attained by 2003 & Gender.......................................................70
Table 4: Highest Degree Attained by 2003 & Race/Ethnicity...........................................72
Table 5: Highest Degree Attained by 2003 & Parental Education.................................74
Table 6: Highest Degree Attained by 2003 & Work Experience......................................76
Table 7: Institution Type.....................................................................................................78
Table 8: Institution Type & Gender....................................................................................79
Table 9: Institution Type & Race/Ethnicity.........................................................................80
Table 10: Institution Type & Parental Education...............................................................82
Table 11: Institution Type & Work Experience.................................................................84
Table 12: Graduate Major...................................................................................................85
Table 13: Graduate Major and Gender...............................................................................87
Table 14: Graduate Major and Race/Ethnicity.................................................................89
Table 15: Graduate Major and Parental Education...........................................................91
Table 16: Graduate Major and Work Experience.............................................................93
Table 17: Mean and Standard Deviation of Independent and Dependent Variables.........95
Table 18: Correlations among Independent and Dependent Variables............................96
Table 19: Multiple Regression Analysis by Highest Degree Attained.............................100
CHAPTER 1: INTRODUCTION

The economics of education formally appeared in the educational literature in the early 1960s. However, its central thesis originated from the work of Smith (1937), who found that education and experience had the capacity to increase employee productivity the same way that a new machine increased the productive capacity of a factory. Expenditures on education and training are therefore seen as investments in human capital (Becker, 1964; Mincer, 1962; Schultz, 1961).

Each type of investment has both direct and indirect costs in the resource expended and an economic return in the output and income produced. Direct cost includes tuition, room, board, and transportation costs. Indirect costs represent opportunity costs or income foregone by students while completing their education (Levin, 1989). Individuals contribute to the aggregate cost of higher education in three possible ways: (1) they forego income to the extent that they study and do not work; (2) they sacrifice present and future consumption to the extent of future earnings; and (3) they pay taxes or make donations over their lifetime, part of which are allocated to support higher education (Daniere, 1972).

There are private and social benefits in educational investments. Leslie and Brinkman (1988) described private benefits as those that are retained by the individual being educated. Benefits to society arise in the form of improved public service such as improved productivity and stimulation of intellectual and cultural life of the community. Taxpayers supporting state colleges and universities may benefit due to availability of
institutions offering both general and particular programs of interest (Baum & Payea, 2004).

The economic return on education reveals substantial financial benefits resulting from college participation (Ehrenberg, 2004; Leslie & Brinkman., 1988; Paulsen, 1998; Perna, 2005; Thomas & Perna, 2004). The benefits of graduate education are wide ranging. For example, individual benefits include higher lifetime earnings, particularly in certain fields (science, technology, engineering, and mathematics); professional or employment prospects are enhanced; the graduate’s viewpoints and understanding are widened; personal prestige is expanded; and the graduate may find personal satisfaction in the challenge of graduate study and research (Leslie & Brinkman., 1998).

Song, Orazem & Wohlgemuth (2008) found financial premium by graduate degree recipients over undergraduate recipients rose from 32% to 67% between 1976 and 1998. Weiss (1971) found there were significant economic returns for certain advanced degrees. For example, the average lifetime rate of return for individuals who attained a master’s degree in chemistry was almost 17%, but only 3% for those who attained a master’s degree in social science. The next section provides a brief overview on the return on investment of graduate education studies.

Return on Graduate Education

Among the limited studies that examine the returns on graduate education, Ashenfelter and Mooney (1968) found that without additional years of experience, master’s degree recipients had little or no earning power. Jaeger and Page (1996) and
Graham and Smith (2005) suggested a return of around 5% per year to graduate education.

Perhaps one of the biggest challenges of economics of education studies is determining the optimal level and distribution of education for individuals and society as a whole (Campbell & Curtis, 1975). Some have argued that there was an overinvestment in graduate education (Dodger & Stager, 1972; Taubman & Wales, 1973). Others have challenged the role of ability when examining the rate of return on graduate education studies. For instance, Maxwell (1970) contended that individuals with the most ability were more likely to pursue a graduate degree thus ability affected the distribution of income. Wessel (1971) argued that the graduate-educated person does not necessarily have more ability than the non-graduate degree holder. Taubman and Wales (1973) concluded that up to half of the net earnings differential between degree holders is the employers’ use of educational attainment as a screening device for high paying positions.

According to the U.S. Bureau of Labor Statistics (BLS) projections, “pure college” occupations are projected to grow 19 percent overall, faster than the 13 percent average growth for all occupations (Crosby & Moncarz, 2006). Thus, advanced education is becoming vital in our new information economy.

Return on investment studies have used different factors in their analyses but most are grouped into two categories: individual characteristics and institutional characteristics. The consensus in the education literature is that individual characteristics, such as gender, race/ethnicity, and socio-economic status contribute to student gains during their education (Astin, 1968; Dumont & Troelstrup, 1981; Pascarella & Terenzini,
1991). It is also commonly accepted that institutional characteristics, such as type of institution attended and academic major impacts future earnings (Eide, 1994). The next section provides a brief overview of each these characteristics.

**Institutional Characteristics**

**Institution Type**

In the United States, institutions vary dramatically in terms of size, geography, sector, selectivity and mission. These institutions range from flagship state universities to private liberal arts colleges and two-year community colleges. Volumes of research have shown that many factors affect student’s decisions to attend particular institutions (Fuller, Manski, & Wise, 1982; Hearn, 1990; Sewell, 1978; Sewell & Hauser, 1975). An underlying assumption of these choices is the notion that college graduates are likely to receive a greater return from attending college than engaging in alternative activities.

The literature on institutional type also demonstrates how the direct cost of attending a particular college has a strong impact on student perception. While attributes such as location, size, and academic quality have been identified as important non-financial factors in the college choice process, the net cost of attending has been identified as the most important financial determinant (Hossler, Braxton, & Coopersmith, 1989). In a human capital framework, students consider the value added benefits of attending a highly selective institution (Thomas, 2000). Educational attainment research has also shown that earnings of college graduates are affected by their choice of academic major. The next section gives a brief overview of the economic outcomes of college graduates by academic major.
Academic Major

The economic return on a college degree varies from one academic major to another. For example, degrees in fields such as engineering and business tend to yield higher salaries than students with degrees from other disciplines (James, Alsalam, Conaty, & To, 1989; Rumberger, 1984; Rumberger & Thomas, 1993).

Since the differences are well known, they have the potential to influence the choices students make when deciding what major to select in college (Berger, 1988; Freeman, 1976). For instance, Daymont and Andrisani (1984) found substantial changes in the choice of college major by men and women. They concluded that women shifted out of traditional areas such as education into non-traditional areas such as business. For example, between 1965 and 1980, the percentage of male college graduates obtaining degrees in education fell 3.5% points from 10% to 6.5%, while the percentage of female graduates obtaining degrees in education fell 23.4% from 42.5% to 19.1%. Over the same period, the percentage of male graduates obtaining business degrees rose 6.6% points from 19.6% to 26.2%, while the percentage of female graduates obtaining business degrees rose 11.4% points from 2.4% to 13.8%.

Individual Characteristics

Gender

Despite policies such as the Equal Pay Act of 1963 and Title VII of the Civil Rights Act of 1964 (later amended in 1972), which were created to eliminate sex discrimination in the employment sector, many studies have found that women earn less than men, and the rate of return on a year of education is lower for women than men.
(Angle & Wissman, 1981; Blau, 1977; Hauser & Featherman, 1976). Hines Tweeten and Redfern (1970) found that even when men and women worked in the same occupation, they were segregated by industry and sector which usually resulted in more pay for men.

Daymont and Andrisani (1984), Weinberger (1998) and Gerhart (1990) found that 40-50% of the salary gap was accounted for by gender differences in academic majors. Joy (2003) reached a different conclusion, indicating gender differences accounted for only 10% of the wage gap. For instance, today as compared to 25 years ago, women are more likely to major in business, the sciences, mathematics and engineering (Jacobs, 1995, 1996; Joy, 2003; Wilson & Boldizar, 1990). The trajectory for racial and ethnic groups has also changed in terms of educational attainment and earnings. The next section gives a brief overview of policies that may have influenced some of the change.

Race/Ethnicity

A common theme in recent research is that the education gap based on race/ethnicity has narrowed and employment discrimination has declined largely as a result of numerous laws and policies, such as Equal Employment Opportunity Act, and affirmative action programs (Barrow & Rouse, 2005, O’Neil, 1990, Roksa, 2005). O’Neil (1990) found the return on an additional year of college increased by .3% a year for Whites and Blacks ages 20-34. O’Neil also found the earnings increment associated with an occupation requiring an additional year of training increased by .2% among Whites and Blacks. Barrow and Rouse (2005) found an additional year of education accounted for a 7.3% increase in annual earnings for Blacks and an 8.5% increase for Whites.
Parental Education

The influence of family background on education and earnings has been the focus of many studies (Altonji & Dunn, 1996; Blau & Duncan, 1967; Bowles & Gintis, 2002). The strength of that influence however remains unclear. Bowles and Gintis (2002) argued that the main explanatory factor of income inequality is family background, or as they prefer to call it, social class. In this framework education is viewed as a vehicle by which the wealth of the upper classes is transmitted from generation to generation. Bowles and Gintis (2002) maintained that rather than serve as an equalizer of opportunity; those from lower socioeconomic backgrounds are relegated to lower quality institutions.

In contrast, the social theory of educational and social attainment argues that there is a pattern of cross-generation uplift, with gains in parent education and occupation status in one generation having a positive influence on the next generation (Blau & Duncan, 1967). Corcoran and Jencks (1979) claimed that family background explained only a small amount of the variation in adult economic status. The smaller estimates ranged from 3 to 20%. On the other hand, Bowles (1972) and Taubman (1976) suggested that the influence was much stronger ranging from 30 to 50%.

Work Experience

The link between work experience and wages is a key issue in theoretical and empirical analyses of earnings determination and job mobility. Previous studies have established that job seniority has a strong positive relationship with wage rates (Bartel & Borjas, 1977; Mellow, 1981; Mincer & Jovanovic, 1981). The most prominent explanation is the theory of human capital which states that growth of wages with tenure
(holding experience constant) is attributed to the workers share of investments in specific skills (Becker, 1962; Mincer, 1974). Lazear (1981) provided an alternative explanation for wage growth which is based on a supervision model in which a company defers compensation as way to reduce attrition of workers. Murphy and Welch (1989) found a wage increase of 5% when one had one-to-five years of work experience. Altonji and Shakotko (1987) concluded that ten years of experience led to a wage increase of 6.6%, with much of the increase occurring in the first year on the job.

Ashenfelter and Rouse (1998) found the return to an additional year of education rose from 6.2% in 1979 to nearly 10% in 1993. Coleman (1993) found that salary increased for graduates with one to five years of work experience. For example, salary increased 45 percentage points for White men, 30 percentage points for White women, 27 percentage points for Black men and a 3 percentage point decrease for Black women.

**Theoretical Framework**

This study of graduate education attainment and salary was informed by human capital theory (Becker, 1962; Schultz, 1961). In this framework, (Mincer, 1989) claims "human capacities are in large part acquired and developed through informational and formal education at home and at school, and through training, experience, and mobility in the labor market"(p.27). Therefore the quantity and quality of education and the amount of on the job training are expected to raise productivity, thus also raising earnings (Becker, 1962; Schultz, 1961).

Human capital theory also assumes that individuals consider both financial and non-financial benefits in their calculation of the total expected benefits of higher
education (Becker, 1992). The decision to spend private resources on education is both an investment and personal decision. Another assumption of human capital theory is that individuals choose among alternative investments, selecting education when the expected lifetime earnings exceed anticipated education costs by a margin sufficient to yield a rate of return greater than anticipated costs (Schultz, 1961).

Mincer (1974) claimed that, income varies according to the amount of investment in education and training undertaken by individuals or groups of workers. Mincer (1974) developed an earnings function model commonly referred to as the “Mincer Function,” which used econometric techniques to estimate the rate of return on education. The Mincer Function has two variations. First, the simple method estimates the semi-logarithmic regression, in which one regresses the logarithm of income over the years of the study, age, or experience in the labor market. The estimated coefficient associated with the years of study represents the marginal effect of one additional year of education on labor income or the rate of return of an additional year of education.

The second variation is the elaborate method: (Mincer, 1974) that consists of estimating the rate of return on education by distinguishing between years of education completed or the last level of education of education attained by graduates, based on a series of dichotomous variables. Once the earnings function is estimated, the rate of return associated with the various levels of education can be derived by comparing the adjacent coefficients of the dichotomous variables.

Cooper and Cohn (1997) considered human capital theory useful for two reasons. First, it permits comparison of different forms of investment, such as education, physical
capital, or financial assets. Second, the rate of return is a widely understood concept in the financial community as well as fields outside of education. This study combines five factors of education attainment (institutional type, academic major, gender, race/ethnicity, parental education and work experience) on salary.

Statement of the Problem

Although researchers have explored the relationship between the return on education in undergraduate students (Altonji & Dunn, 1996; Ashraf, 1994; Blaug, 1972; Cooper & Cohn, 1997; Daniere, 1972; Levin, 1989; Paulsen, 1998; Perna, 2003; Psacharopoulos, 1972; Rumberger & Thomas, 1993), studies of the returns on graduate education are not as common (Ashenfelter & Mooney, 1968; Ehrenberg, 1992; Graham & Smith, 2005; Jaeger & Page, 1996; Song, Orazem & Wohlgemuth, 2008; Taubman & Wales, 1973). Likewise, no study exists that explores how these factors may vary by certain demographic characteristics. Further examination is needed on the nature of the relationship between salary and graduate education attainment based on background traits and demographic characteristics such as gender, race/ethnicity, parental education, and work experience.

Significance of Study

An increase in lifetime earnings is the most easily observed benefit that accrues to individuals who invest in higher education (Perna, 2003). Generally, the most common approach to quantify the related increase in earnings is to compare the difference in earnings between college graduates and high school graduates (Leslie & Brinkman, 1988). However, a segment of this body of research provides evidence that graduate and
post-baccalaureate professional degrees are primary gateways to high-status and high paying careers (Eide, Brewer, & Ehrenberg, 1998; Knox, Lindsey, & Kolb, 1993; Pascarella, Wolniak, Pierson, & Flowers, 2004).

Most examinations of the increase in earnings that are associated with higher education focus on aggregates for all individuals who graduate from college. According to Cooper and Cohn (1997) though, the earning premium associated with higher education varies based on individual characteristics such as gender, race, and family income. A report by Bradbum, Nevill, and Cataldi (2006) indicate that women received the majority of degrees awarded at the associate (60%), bachelor’s (57%), and master’s (59%) level; however men continue earn the majority of first professional (54%) and doctoral degrees (55%). Further, African Americans and Hispanics are underrepresented in all levels of the educational pipeline (Paulsen, 2001; Perna, 2003, 2004, 2005).

The societal benefits of investing in higher education are fundamental to the well being of our society however receive less attention than the individual benefits. For example, when compared to their non-college counterparts, poverty and incarceration rates are lower for college graduates and they have higher civic and voting participation than non-college graduates (Baum & Payea, 2004; Bowen, 1996; Leslie & Brinkman, 1988).

In the past, these benefits have served as justification for the mounting costs of higher education. According to Hall (2000) the public has become dissatisfied with aspects of educational system in the United States as student achievement steadily
declines. Thus, efforts to improve the educational system remain a pervasive topic in the educational literature.

Understanding the earning premium associated with higher levels of educational attainment is important in order to examine issues of equity and factors that affect income distribution. This study is different from previous research in several ways. First, prior research consists largely on single-institutions or small samples (Link, 1975). This analysis was based on nationally representative data drawn from the Baccalaureate and Beyond (B&B: 93/03) survey that consists of students from multiple institutions and across various academic majors. Second, previous studies typically compare the rate of return of college graduates to non-college graduates (Perna, 2003; 2005; Strayhorn, 2008). This study seeks to examine the salaries of graduate degree recipients compared to bachelor’s degree recipients. Finally, this investigation examined graduate education and earnings using institutional and individual characteristics. In the past, graduate education studies have focused on an aggregate of student ability, school quality, and earnings (Link, 1975; Wessel, 1971).

Purpose of Study

This research seeks to build on previous studies by Perna (2003, 2005) that focused on the benefits of education to undergraduate students based on racial and gender differences; and Strayhorn (2008) that focused on the relationship between African American graduates from an Historical Black College or University (HBCU) and the graduates economic outcomes (i.e. occupational status, and job satisfaction). This study is designed to extend this line of inquiry by examining the salary that 1993 baccalaureate
graduates realized from graduate education by 2003, ten years after earning a bachelor’s degree.

Research Questions

The following research questions will guide the study:

1. How do the salaries of 1993 baccalaureate graduates who completed a graduate degree by 2003 compare to those who did not complete a graduate degree by 2003? To what extent do the salaries of 1993 baccalaureate graduates who completed a graduate degree by 2003 differ by gender, race/ethnicity, parental education or work experience? To what extent do the salaries of 1993 baccalaureate graduates who did not complete a graduate degree differ by gender, race/ethnicity, parental education or work experience?

2. How do the salaries of 1993 baccalaureate graduates who received a graduate degree from a public institution by 2003 compare to those who received a graduate degree from a private institution by 2003? To what extent do the salaries of 1993 baccalaureate graduates who received a graduate degree from a public institution by 2003 differ by gender, race/ethnicity, parental education, or work experience? To what extent do the salaries of 1993 baccalaureate graduates who received a graduate degree from a private institution by 2003 differ by gender, race/ethnicity, parental education, or work experience?

3. How do the salaries of 1993 baccalaureate graduates who majored in a STEM graduate program by 2003 compare to those who did not major in a STEM graduate program by 2003? To what extent do the salaries of 1993 baccalaureate
graduates who received a graduate degree in a STEM graduate program by 2003 differ by gender, race/ethnicity, parental education, or work experience? To what extent do the salaries of 1993 baccalaureate graduates who received a graduate degree in a non-STEM graduate program by 2003 differ by gender, race/ethnicity, parental education, or work experience?

4. How do the salaries of 1993 baccalaureate graduates who received a graduate degree by 2003 vary with type of institution, major choice, gender, race/ethnicity, parental education or work experience?

Definition of Terms

The following terms are defined for the purposes of this study:

*Baccalaureate and Beyond Longitudinal Study 93/03:* refers to a longitudinal study that examined students’ education and work experience after completing a bachelor’s degree.

*Highest degree attained by 2003:* includes the following (1) bachelor’s degree, (2) master’s degree, (3) first-professional degree, and (4) doctoral degree.

*Salary:* includes current/most recent salary in 2003.

*Institutional Type Post Bachelor's Degree:* indicates the institution type of the school in which the respondent was awarded their highest degree and includes the following: (1) public, 4-year, Ph.D. granting; (2) public, 4-year non-Ph.D. granting; (3) private, not-for-profit; Ph.D. granting; and (4) private, not-for-profit, non-Ph.D. granting.
*Graduate Major*: includes the following categories: (1) humanities, (2) social & behavioral sciences, (3) life sciences and physical sciences, (4) engineering/computer science/math, (5) education, (6) business management, (7) health, (8) law, and (9) other.

*STEM*: includes majors in following areas: (1) science (including physical sciences and biological sciences), (2) technology (including computer information science), (3) engineering, and (4) mathematics.

*Race/Ethnicity*: includes White/non-Hispanic, Black/non-Hispanic, Hispanic, and Asian/Pacific Islander as defined by the B&B: 93/03 survey.

*Parental Education*: includes the highest educational attainment of either parent based on responses from the NPSAS.

*Work Experience*: refers to respondents who had worked at some point between the 1997 and 2003 interviews. Respondents selected from a minimum of one year to a maximum of twenty-eight years. The average number of years worked was approximately six years.

*Internal Rate of Return*: the discount rate which equates the present value of the extra lifetime earnings attributable to a certain amount or type of additional education to the present value of costs of that extra education.

*Private Rate of Return*: benefits that are computed after tax and costs include only what the individual actually pays or foregoes.

*Social Rate of Return*: benefits are determined by the gross of tax and costs include the full cost of higher education.
Delimitations

As with all research, this study has delimitations. First, the focus of this research is on graduate education and salary attainment. Therefore, the analytic sample is limited to students who earned a graduate degree by 2003 and who participated in the 1993, 1997, and 2003 follow-ups.

A second delimitation is that the sample is restricted to cases that reported income in 2003. Therefore, these patterns must be interpreted with caution as they seek to capture a picture of the financial returns on graduate education. However, it is important to note that the effects of higher education are not limited to a specific outcome at a point in time but are generated and accumulated over the course of an individual’s lifetime.

A third delimitation is that while there are both private benefits (i.e., increased earning potential) and social benefits (i.e., income taxes paid, an informed citizenry, etc.) to education, this study will focus only on the private benefits as defined by salary of graduate education. Although financial returns serve as the motivation for some students to pursue graduate education, other students pursue graduate education for non-financial reasons. For instance, college professors have some non-financial advantages associated with their position. These include academic freedom, flexibility in work, contact with students, and the joy of teaching and research (Weisbrod, 1962).

Limitations

Limiting factors should be taken into consideration when generalizing the results of this study. The first limitation relates to the use of a secondary database, the Baccalaureate & Beyond: 93/03 longitudinal study conducted by the National Center for
Education Statistics (NCES). This study is limited to factors that can be defined and operationalized by the B&B: 93/03 survey.

The second limitation relates to the availability of the B&B: 93/03 dataset. Although the last follow-up for the B&B: 93/03 was completed in 2003, the data was not released until 2007. Therefore the data contained in this study is the most recent for analysis.

Third, respondents to the survey decreased over the longitudinal study time frame. Initially, there were approximately 16,000 participants in the B&B: 93 sample. However, this number had decreased to 10,640 by 2003.

Organization of Study

This study is organized into five chapters. The first chapter includes an introduction to the study, statement of the problem, theoretical framework, the purpose of the study, research questions, significance of study, definitions of terms, delimitations and limitations of the study, and organization of the study. The second chapter reviews relevant literature including an examination of the benefits of undergraduate education and graduate education, with consideration given to institutional type, choice of major, gender, race/ethnicity, parental education, and work experience. The third chapter describes both the methodology employed data analysis procedures. Chapter four reports the results of the research. Finally, chapter five discusses results and implications for policy and future research.
CHAPTER 2: REVIEW OF LITERATURE

Introduction

The purpose of this study is to examine the financial return on graduate education that 1993 baccalaureate graduates realized by 2003, ten years after earning a bachelor’s degree. This review is divided into four sections. The first section explores the body of research pertaining to educational attainment and the economics of education. The next section examines the impact of institution and academic major on the financial returns on graduate education. The third section discusses the individual characteristics of gender, race, parental education or work experience and their influence on earnings. The final section summarizes the literature reviewed.

Educational Attainment

There has been a plethora of literature on educational attainment and returns on education. This section focuses on a general overview and selected undergraduate studies that use human capital theory. Since its inception in the early 1960s, human capital theory has provided a theoretical basis for the analysis of the demand for education, based on the social and private rate of return. The basic premise of human capital is that earnings and other labor market outcomes are determined by an individual’s productivity, the investments an individual has made in their productivity; and the supply of and demand for workers with similar levels and types training and expertise (Perna, 2005).

In an early study, Psacharopoulos (1972) examined the economic returns on higher education in twenty-five countries from 1957 to 1968. Although the private and social rate of return was not provided for every country, the private rate of return was
usually higher than the social rate of return by a few percentage points. According to Psacharopoulos the rate of return on alternative investment opportunities was lower than the social and private rates of return on higher education in developing countries. Psacharopoulos concluded that developing countries subsidized higher education more than advanced countries.

Willis and Rosen (1979) examined education as an investment at an individual level. The authors presented a structural model of the demand for postsecondary education in which individuals made their educational decisions in response to the incomes associated with two education levels (college attendees vs. high school graduates). They found no selectivity bias for the initial earnings of high school graduates and showed higher rates of growth compared with the pattern for those who entered college. On the other hand, positive selection bias was shown for the initial earnings of college attendees and negative bias for earnings growth. The authors concluded that lifetime earnings for college attendees exceeded the earnings for high school graduates.

Perna (2003) used data from the 1992 follow-up to the High School and Beyond Longitudinal Study of 14,825 high school sophomores in 1980. The study explored the percentage of earning premium that was attributable to completion of a bachelor’s degree and how earnings varied by sex, race and socioeconomic status. Perna concluded that earning premiums increased with the level of educational attainment. Students who attained a bachelor’s degree in 1992 earned 36% more than high school diploma recipients ($13,678 vs. $10,066). Earnings were higher for men when compared to women ($12,570 vs. $9,406); however there was no difference in the relationship
between educational attainment and earnings for women and men. In terms of race, earnings varied by racial/ethnic groups. Earnings were lowest for American Indians ($9,248) and Blacks ($9,919), and highest for Asians ($13,632). Finally, earnings varied with SES for individuals in the lowest SES quartile compared to those in the highest quartile ($9,388 vs. $13,314).

In a later study, Perna (2005) used the National Educational Longitudinal Study (NELS:92/02) to examine the economic and non-economic benefits of 9,773 high school graduates in 1992 compared to those who attained a college degree by 2000 by sex, race, and socioeconomic status. Perna found that the average income for individuals who attained a bachelor’s degree was substantially higher ($30,570) than those with: no postsecondary education ($25,237), some postsecondary education ($24,611); a certificate or license ($23,707), or an associate degree ($26,130). After controlling for sex, race/ethnicity, socioeconomic status, and test scores, average incomes in 1999 were 19% higher for high school graduates who attained a bachelor’s degree than for high school graduates with no postsecondary education.

Results of the non-economic benefits showed that attaining a bachelor’s degree rather than no postsecondary education was associated with lower rates of smoking cigarettes, more frequent attendance at plays and concerts, and greater civic involvement as measured by both regular voting and volunteering in a civic or community organization.

The economic payoff to educational attainment was greater for women than for men in terms of income, greater likelihood of holding health insurance, lower likelihood
of receiving public assistance, and greater perceived connection between higher education and employment-related benefits. Although completing a bachelor’s degree gave women a higher premium, women still had lower salaries than men at each level of educational attainment. The racial/ethnic group and socioeconomic status (SES) comparisons showed that differences by race/ethnicity and SES in college enrollment were not attributable to differences across groups in the actual benefits of postsecondary educational attainment (Perna, 2005).

This section reviewed selected literature about educational attainment and the economics of education at the undergraduate level. The next section reviews literature on the returns on graduate education.

**Returns on Graduate Education**

In one of the earliest attempts to estimate the returns on graduate education, Hanoch (1967) presented estimates of the private rate of return on different types and length of graduate education. Using a sample of 1,000 people from the 1960 census, Hanoch provided earning profiles for those with 17+ years of education. Hanoch concluded the best estimate of internal private rate of return on 17+ years of education was approximately 7%.

In a later study, Weiss (1971) provided estimates of rates of return associated with different types and levels of graduate education. The sample consisted of 5,686 scientists from the National Register of Scientific and Technical Personnel in 1966. The scientists were classified into eight fields: chemistry, physics, earth sciences, mathematics, biology, agriculture, psychology, and the social sciences. Weiss found salary increased in all fields
(chemistry, 39%; physics, 41%; earth sciences, 62%; mathematics, 64%; biology, 50%;
agriculture, 61%; psychology, 64%; and social sciences, 57%) with higher levels of
education. The average rate of return from the Ph.D. program in all fields was
approximately 12%.

In another study, Bailey and Schotta (1972) examined the private and social rates
of return on education of faculty members from 829 of the highest paying colleges and
universities in the United State during the 1966 academic year. Through the use of human
capital, estimates of lifetime earnings of individuals who attained a bachelor’s degree in
various occupations were used to represent the basic opportunity cost of not entering the
job market. The income of 860,000 employees was derived from the California State
Board salary survey. Participants were categorized by income and industry (academic,
government, non-profit, and business). The 1966 published salary and promotion scales
from the University of California were then used as benchmarks to compare salary
differentials for faculty in the United States between eleven faculty salary patterns. The
internal rate of return for education beyond the bachelor’s degree ranged from a high of
11.6 percent to zero. The private and social rate of return on graduate education was
either zero or less than one percent.

In a recent study, Song, Orazem, and Wohlgemuth (2008) examined the returns
on graduate and professional education to determine if an increase in the returns on
graduate education could be explained by changes in the quality of a recent cohort of
graduate students relative to their older colleagues. The data was obtained from the 1993
Scientist and Engineer Statistics Data System (SESTAT) and collected by the National
Science Foundation (NSF). The sample included 67,565 individuals who received a bachelor’s degree between 1963 and 1986. Sample weights were used to replicate means for the relevant universe.

Using least-squares estimate of returns on graduate education, Song, Orazem, and Wohlgemuth (2008) found positive and significant results. According to the authors estimates increased after controlling for” endogeneity” of the choice of pursuing an advanced degree. For example, master’s degree recipients received an annual return of 7.3%. Doctoral recipients received a 12.8% annual return and professional degree recipients received an annual return of 13.9%. The authors also found students in majors with higher average quantitative graduate records exam (GRE) scores were less likely to attend graduate school. The opposite was also true, in that students in majors with higher average verbal GRE scores were more likely to attend graduate school. The authors concluded that changes in verbal and quantitative GRE scores played a minor role in explaining the large increase in returns on education.

This section contained a review of selected literature on the economics of graduate education. A substantial body of research is devoted to the rate of return on undergraduate studies (Becker, 1962; Mincer, 1958; Perna, 2003, 2005; Psacharopoulos, 1972; Schultz, 1961). However, the majority of these studies have examined only selected economic benefits of education. The sections that follow examine the financial returns on education by institution type, graduate major, gender, race and ethnicity, parental education and work experience.
Institutional Characteristics

Institutional Type

Studies on the return on investment of education by institutional type have used various measurements to describe institutional characteristics. For instance, Toukoushian and Smart (2001) used variables such as public vs. private, size, selectivity, mission and level of expenditures to describe institutional characteristics. Others (Solomon & Wachtel 1975) have used quality to describe an institutional characteristic as measured by average faculty salaries, educational and general expenditures per student costs. Quality-related student characteristics have also included grade point average (GPA), average Scholastic Aptitude (SAT) scores of entering students and percent of applicants accepted. At the graduate level, faculty productivity in publishing and institutional size is a measurement of program quality. Finally, reputation ratings have also been used as a measurement of institutional quality (Solomon, 1975).

Solmon and Wachtel (1975) examined the effect of income on the type of college attended and how the effects of ability and socioeconomic class affect earnings. The authors found that “quality” of academic institution affected later income more than it influenced income immediately upon entering the labor force. These results held even after controlling for certain occupational choices, individual ability and socioeconomic background.

Later studies (Brewer & Ehrenberg, 1996; Ehrenberg, 2004) support Solmon and Wachtel’s (1975) findings by concluding that educational attainment from selective private institutions yields extra economic advantages for students. Mullen, Goyette, and
Soare (2003) found that the odds of entering first-professional programs was 1.90 times greater for graduates of private research institutions, while the odds for graduates of public research institutions was 1.92 times higher for enrolling in doctoral programs. The results showed that the odds of graduates of liberal arts institutions entering a doctoral program was 2.24 times greater (1.74 times greater for entering a professional program) than for those from comprehensive institutions. Finally, graduating from a private research institution increased one’s odds of attending a master’s program.

Monks (2000) examined the earnings differentials by individual and institutional characteristics. The study used the National Longitudinal Survey of Youth (NLSY). The participants were aged between 14 and 22 at the beginning of the survey, in 1979 and aged between 28 and 36 in 1993. Results indicate significant returns on college quality. There was also a demand for those students graduating from a graduate degree granting or research institution versus those graduating from a liberal arts college.

Graduate Major

A large body of research on choice of academic major has recognized that academic major has a considerable impact on earnings (Berger, 1988; Eide, 1994; Grogger & Eide, 1995; James, Alsalam, Conaty, & To 1989; Rumbeger, 1984; Rumberger & Thomas, 1993). Rumberger (1984) examined major fields of graduate study. The expected private rate of return was highest in medicine, law, engineering, and business, ranging from 12 to 16.4%. The expected private rate was lower for advanced training in teaching, natural science, and social science, ranging from -0.08 to +8.9%.
Eide (1997) examined how changes in major distribution and major-specific premium accounted for changes in college wage premium between 1978 and 1986 by race and gender. Eide used data from The National Longitudinal Survey of the High School Class of 1972 (NLS72) of roughly 21,000 high school seniors who graduated in 1972. Data was also retrieved from The High School and Beyond (HSB) survey which was a similar panel of about 12,000 members of the high school class from 1980 to the mid-1980s.

Eide (1997) found that major distribution accounted for a significant portion of the aggregate premium changes for men. For instance, there was an increase for both White and non-White men who graduated in business and engineering 30 and 13 percentage points. The results also increased for White and non-White women who majored in business or engineering (22% and 21%, respectively). The major wage specific- premium changes accounted for a significant part of the college wage premium for each group except for White men. For example, the wage premium for White men was 8% less than White men with a high school education. The wage premium for non-White men was 7%. The wage premium for White women was 15% and highest for non-White women at 26%. The authors concluded that college graduates from each race and gender entered more technical fields and left less technical fields between the 1970s and the mid-1980s.

Thomas (2000) examined three sources of influence (college major, academic performance, and college quality) on the initial earnings of college graduates and on the debt ratios of those graduates borrowing money to finance their educational costs. Results
from this study indicate that college major had an important impact on both earnings and
debt ratios. For example, graduates from health related and engineering majors
commanded the highest salaries. Engineering graduates were most likely to have
borrowed while those graduating in the social science areas were least likely to borrow
(48% vs. 63%). Graduates with the lowest relative earnings were those majors in
education and the humanities. College performance had a positive impact on earnings and
a negative impact on debt ratios. College quality affected the initial earnings of graduates
but did not have a discernable impact on debt ratios.

Individual Characteristics

Gender

Many studies have found that women earn less than men, and that the financial
return on a year of education is lower for women than men. Occupational segregation
models attempt to explain why the male occupational distribution differs from the female.
The model suggests preference or taste differentiate male and female occupations, such
as: (1) income potential; (2) opportunities to make an impact on society; (3) the chance to
display leadership skills; and (4) opportunities to work with people rather than things.
Thus, individuals or groups are funneled into different types of occupational roles and
tasks, such that there are two (or more) separate labor forces (Goldin, 1986). Charles and
Gusky (2004) refer to the separate labor forces as “occupational ghettos” in which
women work almost exclusively with other women in service oriented, non-manual
occupations. Men, on the other hand, are clustered into manual and technical occupations
such as engineering and computer programming so that there is little effective competition between men and women.

In an early study, Woodhall (1973) suggested that rate of return depends on earning differentials between educated and less educated women. This was because women with higher education were more likely to work after marriage and returned to work after rearing their children. Thus, the difference in rates of return were believed to be dependent on differences in labor force participation by educational level, the extent of part-time work among women, and the extent of labor market discrimination against women. Others (Cohen, 1971; Gwartney & Stroup, 1973; Sanborn, 1964) have concluded that a large part of the income difference between men and women could be explained by differences in hours of work, seniority, on-the-job training, and occupational distribution.

In a later study, Angle and Wissmann (1981) used the National Longitudinal Surveys of Labor Market Experience to examine whether the academic major people chose in college affected the gap between earnings and rate of return for men and women. The sample consisted of 1,677 observations of 764 women aged 24-31. There were also 2,831 observations of 1,359 men, aged 24-33 who were in the labor force and who worked at least 30 hours per week. The authors found that controlling for field of study reduced the gap only slightly. For example, men were concentrated in natural sciences, engineering, technical fields, and business which tend to have higher earnings than other fields. Women were more likely to major in humanities and education. The authors also found that women earned 69.3% as much as men. Although women had a higher rate of return on a year of college education than men the authors concluded that the returns on
education were roughly the same for men and women graduates, and that a substantial part of the earnings difference was due to discrimination against women (Angle & Wissmann, 1981).

Joy (2000) used data from the Baccalaureate and Beyond Longitudinal Study 93/94 (B&B) of 10,686 students. The study explored gender differences in education, salary, occupation, and opportunity of college graduates in their first jobs. Joy defined 29 major groups as “gender-dominated” if more than two-thirds men or women were represented in the major. Among the 29 majors, women-dominated 10, men-dominated 1, and 18 were considered gender-neutral.

Joy found 47.4% of women graduated from a gender-neutral major. On the other hand, men were more likely to graduate from female dominated or gender neutral major majors than the one male-dominated major of engineering. In terms of salary, men earned more than women for the majority of majors or occupations. The two exceptions were science and humanities majors. Results of gender differences in occupations showed 23% of women first jobs were female-dominated. Seventy-two percent of men and women worked in gender-neutral first jobs. In regards to opportunity, Joy found that women reported that their first job as the only job offer. Men reported more and better job selection for their first jobs which contributed higher pay and quality of job. Joy concluded that men were likely to obtain full-time jobs that require a degree, which increased career potential.

In a recent study, Bobbitt-Zeher (2007) examined the role of education in the income gap by gender of 12,144 individuals. Using data from the National Educational
Longitudinal Survey (NELS), Bobbitt-Zeher found gender segregation of college major. For example, men were more likely to major in business, math, natural sciences and engineering while women were more likely to major in social science, humanities and education. Results of income differences by gender showed women earned 83% of what their male counterparts earned. When controlling for race and socioeconomic (SES) background, major accounted for 39% of the income difference by gender. Results of educational factors such as cognitive skills, degree attainment, and college selectivity accounted for 10% of the income gap of men and women. Institution selectivity explained only 4% of the income gap when controlling for race and SES background. The author also found that even when women had similar educational credentials as their male counterparts, women still earned $4,436 less. Bobbitt-Zeher concluded that college major accounted for 14% of the income gap for men and women.

Race

Over the years, considerable evidence has accumulated in the research literature to demonstrate that the returns on education differ significantly among various groups in society. Hanoch (1967), for example, provided rate of returns by race (Whites versus non-Whites) and the rate of return were generally lower for Blacks than for Whites. Much of the discrepancy in Black-White returns was attributed to the quality of education received as well as to the area where an individual lived.

Hauser (1972) suggested that returns on education differ for Blacks and Whites because of overt and covert discrimination in the job market against Blacks. His claim was based on his examination of the 1962 Current Population Survey (CPS) along with a
supplemental “Occupational Changes in a Generation” (OCG) questionnaire. The study consisted of a sample of 15,540 males that included Blacks and non-Blacks, aged 20-64. The supplement ascertained information about the socioeconomic standing and composition of the respondent’s family or origin and about his own first job after leaving school.

Results from the study showed a return on an additional year of education for all men was worth about 9%. The occupational return on education for Black men was less than 1%. The influence of the father’s status and occupational return on education was also just under 1%. Hauser (1972) concluded that a year of education was worth more to a son of a rich man than to the son of a poor man in the status of his first job.

In another study, Hauser and Featherman (1974) examined trends in educational attainment, occupational status, and income from 1962 to 1972. The study consisted of 20,700 Black and White men in the United States ages 35-44, 45-54, and 55-64 using a structural equation model. Data was obtained from the 1962 Current Population Survey (CPS) and a supplemental questionnaire, the Occupational Changes in a Generation (OCG). Results from this study showed that educational attainment ranged from 6% to 9% per year among Whites and from .09% to 1.8% per year among Blacks. In terms of occupation status, the range was 1.5 to 2.5 points among Whites and from 5.5 to 6.1 points for Black men. The monetary increase was substantial for men of both races, $1,450 for White men compared to $1,800 to $2,100 among Black men.

Hauser and Featherman (1974) concluded that since educational attainment was higher for Whites than Blacks, the smaller effect of changing educational attainment was
attributed to Blacks receiving lower returns for their education than Whites. In other words, Blacks need to increase their education by a larger amount than Whites to reflect an increase in occupational status.

In another study, Carliner (1976) examined the financial returns on education for Blacks, Whites, and five Hispanic groups. Using data from the 1971 Current Population Survey, respondents were asked to specify their ethnic background from a list that included: Black, Mexican, Puerto Rican, Cuban, Central or South American, other Hispanic. Additionally, seven European groups and two miscellaneous categories (other and don’t know) were also included. Results showed considerable differences among the ethnic groups. Blacks had the lowest education coefficient (.043). Cubans and Central or South Americans receive considerably more (.088 and .090) than did Whites (.069) for additional years of education, while other Hispanic and Puerto Ricans received nearly as much (.064 and .068). The largest of the Spanish groups, Chicanos, had a significantly lower education coefficient (.049) than Whites (.069). Carliner concluded that differences among the returns on education related to class background.

Ashraf (1994) conducted a longitudinal study examining the difference in returns on education for Black and White individuals over a twenty year period, 1967-1986. Results from the study showed that White workers in the south earned 16.7% less than in other parts of the country in 1967. However by 1986, this number decreased to only 4.88%. Blacks in the south followed a similar trend earning 21.33% less than their counterparts in the rest of the country in 1967 but, in 1986, they only earned 3.92% less.
Kominski and Adams (1994) suggested that in 1993, the earnings among 25-34 year old Black males were only 83% of that of White males in the same age range. Educational attainment was identified as the primary factor in the earnings gap. For example, the proportion of 25-29-year old Black males who were college graduates was half that of White males in the same age range (12.6% vs. 24.4%).

In a more recent study, Barrow and Rouse (2005) examined whether returns on education varied by race and ethnicity. The study used the U.S. Decennial Census and the National Longitudinal Survey of Youth, 1979 (NLSY79). The Decennial Censuses sample was restricted to individuals aged 25-65 who were: U.S. citizens, born in the United States, worked at least one week in the previous year, and earned at least one-half of the minimum wage. The NLSY79 included youth aged 14-21 in 1979. Respondents were limited to those with hourly pay greater than one-half of the minimum wage in 1993 and less than $300 per hour, not self-employed, not enrolled in school, and not currently enrolled in the military.

Results from the study indicated that in 1979, an additional year of education was associated with a 7.3% increase in annual income for Blacks and an 8.5% increase in annual income for Whites. The estimated return on education increased for all races between 1979 and 1989 (10.7%-12.3%). However the increase in estimated returns on education was smaller between 1989 and 1999 (10.2%-13.6%). Based on the results the authors concluded that the estimated return on education for Blacks is roughly the same as that for Whites, while the return for Hispanics was somewhat lower.

*Parental Education*
Most studies on educational attainment take the view that family background affects education by influencing the amount of education individuals obtain while holding the rate of return on education constant (Rumberger, 1983). The indirect effect contends that children from higher social standing get more and better education and, as a result, get better jobs, more salary, and prestige. On the other hand, the direct effect suggests that social origin may operate independent of education which could result in differences in social destinations from individuals with similar education but different social backgrounds (Featherman & Hauser, 1976).

In an early study, Sewell and Shah (1967) examined the influence of socioeconomic status and measured intelligence on the attainment of higher education. Data were obtained from a questionnaire survey of all high school seniors in Wisconsin (public, private, and parochial schools in 1957) and a follow-up study conducted in 1964-1965 of 10,321 students. The authors found 20.5% of males in the low socioeconomic status category attended college and 7.5% graduated. On the other hand, 73.4% of males in the high socioeconomic status category attended and 42.1% graduated. Among females in the low socioeconomic status category, 8.5% attended college and 2.7% graduated. However 62.6% of females in the high socioeconomic status category attended college and 35% graduated. Of the males in the low intelligence category, 15% attended college and 3.2% graduated. Among males in the high intelligence category, 73.8% attended college and 47.2% graduated. Of the females in the low intelligence category, 11.4% attended college but 1.8% graduated. Among females in the high intelligence category, 54.9% attended college and 33.5% graduated.
Rumberger (1983) examined the extent to which wealth explained the relationship between family background and adult economic status for White and Black males. Data was derived from a matched subsample of fathers and sons constructed from two cohorts in the National Longitudinal Surveys of Labor Market Experience (NLS). The older men were 45-59 years old and the younger men were 14-24 years old in 1966. A total of 482 respondents were included in the study (366 Whites, 109 Blacks, and 7 others races). Wealth was ascertained in several surveys through a series of questions on the net value of family assets, including the respondent’s home, real estate, business, savings and outstanding debt.

Rumberger (1983) found family background characteristics explained more of the variance in the ability of Blacks than Whites (.431 vs. .175). Parental wealth had a positive effect for both races in that it increased educational level by .3 years for Blacks and one year for Whites. In the structural earnings equation parental wealth had a direct and independent effect of approximately 8% increase in earnings for Whites. On the other hand no family background variables were statistically significant for Blacks. The reduced form estimates showed that family background variables explained a small amount of the variance in earnings for both Whites and Blacks (.047 and .105 respectively).

Altonji and Dunn (1996) examined how the labor market payoff to a year of education varied with family background. The sample was based on the National Longitudinal Study of Market Experience of Young Men and Young Women (NLS) and the Panel Study of Income Dynamics (PSID). The NLS sample consisted of men aged
14-24 years old who were first surveyed in 1966, and surveyed up to 12 times between 1966 and 1981. Women aged 14-24 were surveyed up to 15 times between 1968 and 1988. The PSID sample was based on the 1968-1989 release of the PSID. The sub-sample consisted of respondents aged 24 to 55, was out of school, had completed four years of education, and was head of household or the spouse.

Altonji and Dunn (1996) found a substantial effect on mother’s education in the NLS, but not the PSID. The pooled sample (of men and women) did not find much of an effect of parental education. The pooled PSID results showed a modest positive effect on mother’s education and were roughly equal to the average of the separate results for men and women.

Work Experience

Historically the college premium has been higher for those with higher levels of work experience than those with less. Mincer (1974) suggested identifying approximate thresholds of labor market entry of different educational levels and using them to calculate years of potential experience. This is a common approach to measuring work experience. At the graduate level there appears to be no consensus on the number of years required to complete various levels of graduate education. For example, Bailey and Schotta (1972) estimated a graduate school career ranged between two and six years. Thus, they selected four years as the average length of time physically spent in graduate school however the National Academy of Sciences indicates that 5.1 years spent in graduate school (Bailey & Schotta, 1972).
Murphy and Welch (1989) estimated that between 1979 and 1986, the college wage premium rose sharply compared to wage premiums between 1971 and 1979. The authors used two indexes to describe work experience. The first refers to all levels of experience (1-40 years of experience) which included those aged 20-59 for high school graduates and those aged 24 through 64 for college graduates. The second refers to young workers (1-5 years of experience) that compared the earnings of 24-28 years old with the earnings of high school graduates who were 20-24 years old. The earnings premium for all college graduates earned 47% more than all high school graduates. Whereas young college graduates earned 41% more than high school graduates (Murphy & Welch, 1989).

According to Murphy and Welch from approximately 1970 to 1980 the wage premium for all college graduates declined from a peak of 61% in 1971 to 48% in 1979. The decline in college wage premium for young workers was more pronounced at 46% to 31% from 1971 to 1976 and remained relatively constant between 1976 to 1979. Since 1979, the college premium increased almost 20% from 48% in 1979 to 67% in 1986. The increase in the college wage premium for young workers with 1-5 years of experience more than doubled (from 32% to 70%).

Altonji and Shakoto (1987) used an instrumental variable technique measuring the difference between current and average tenure within a given job using the 1968-1981 Panel Study of Income Dynamics. They estimate that 10 years of tenure led to a wage increase of 6.6%, with much of the increase occurring in the first year on the job. These findings are consistent with Dustman and Meghir (2005) who examined the returns based on experience, sector tenure and time spent in the firm tenure of workers in
Germany. Participants included both skilled (apprenticeship) and unskilled (no apprenticeship). They found the return based on experience in the first two years after formal training decreased from 7% to 6% in a year. The returns declined to approximately 1-2% per year thereafter. Unskilled workers received substantial returns in the first two years (10% and 8%) however, dropped to zero beyond three years of work. The return on the same sector was 1% for skilled workers and zero for unskilled workers. The time spent in the firm for skilled workers was 2-4%. On the other hand, the returns to unskilled workers for the first five years were 4% (Dustman & Meghir, 2005).

This section examined institution type, graduate major, gender, race/ethnicity, parental education, and work experience as they relate to the financial return on graduate education. The next section will summarize the literature reviewed for this study.

Summary

Human capital studies by Becker (1964), Mincer (1958), and Schultz (1961) demonstrated that education was a way for individuals to invest in themselves by incurring financial costs today in order to enhance future earnings.

Both the return on undergraduate and graduate education (Bailey & Schotta, 1972; Hanoch, 1967; Perna, 2003, 2005; Song, Orazmen, & Wohlgemuth, 2008; Weiss, 1971) of several studies was reviewed. These studies focused on selected characteristics such as different types and lengths of graduate study, selected majors (science, engineering, and business), and returns to graduate education by quality.

Next, institutional characteristics such as type of institution and graduate major were also explored. Studies on the return on investment by institutional type used various
measurements (i.e. public vs. private, size, and selectivity). In general these studies found that educational attainment from selective private institutions yielded extra economic advantages for students (Ehrenberg, 2004; Eide, Brewer, & Ehrenberg, 1998). In terms of graduate majors and the returns on education, Rumberger (1984) found the expected private rates of return were highest in medicine, law, engineering, and business majors. On the other hand the expected private rates were lower for advanced training in teaching, natural science, and social science majors.

Then individual characteristics of gender, race/ethnicity, parental education and work experience were explored. Previous research indicated that women were notably under-represented in higher earnings majors such as business, science, math, or engineering. However, women were more than twice as likely as men to major in health sciences (Angle & Wissmann, 1981). On the contrary, women were almost three times as likely to major in education, the major area associated with the lowest postgraduate earnings. Thomas (2000) concluded that earning inequalities for women remain largely due to choice of academic major and the type of job taken after graduation.

The literature on race and ethnicity was mixed. For example, Hanoch (1967) found significantly lower returns for Blacks than for Whites, particularly in the South. However, Hauser (1972) suggested that returns on education differ for Blacks and Whites because of overt and covert discrimination in the job market against Blacks.

The bulk of research examining the relationship between earnings and family background suggested that family background tends to have a greater influence on an individual’s propensity to invest in higher education and the choice of the institution in
which the investment is made than on income directly (Altonji & Dunn, 1996, Rumberger, 1983; Thomas, 2000). This chapter also explored work experience as it relates to return on investment of college graduates.

Finally, as demonstrated in this review the literature on the economic benefits of education has almost exclusively focused on college graduates compared to high school graduates. The research on the economic returns of graduate education is scant. This study seeks to address this gap by building on previous studies by Perna (2003, 2005) that focused on the financial benefits of education to undergraduate students based on racial and gender differences. This study is designed to extend this line of inquiry by presenting a comparative picture of the influences of institutional type, graduate major, gender, race/ethnicity, parental education, and work experience differences on the attainment of graduate education and salary using a recent cohort of graduate students from The Baccalaureate and Beyond Longitudinal 93/03 survey created by the National Center for Education Statistics (NCES, 2005).
CHAPTER 3: METHODOLOGY

This chapter describes the methods and data analysis procedures used to complete the study of graduate education attainment and salary. First, the research questions under are presented. Next, the Baccalaureate and Beyond (B&B: 93/03) methodology is described along with sampling and data collection procedures. The third section describes the survey questionnaire, data collection process and integrity of the data. The fourth section provides an overview of the researcher’s methodology. Finally, the chapter provides variable definitions, and concludes with a summary of the chapter.

Research Questions

This study examines the 2003 annual salaries of 1993 baccalaureate graduates and those individuals who obtained graduate degrees. The research questions are as follows:

1. How do the salaries of 1993 baccalaureate graduates who completed a graduate degree by 2003 compare to those who did not complete a graduate degree by 2003? To what extent do the salaries of 1993 baccalaureate graduates who completed a graduate degree by 2003 differ by gender, race/ethnicity, parental education or work experience? To what extent do the salaries of 1993 baccalaureate graduates who did not complete a graduate degree differ by gender, race/ethnicity, parental education, or work experience?

2. How do the salaries of 1993 baccalaureate graduates who received a graduate degree from a public institution by 2003 compare to those who did not receive a graduate degree from a private institution by 2003? To what extent do the salaries
of 1993 baccalaureate graduates who received a graduate degree from a public institution by 2003 differ by gender, race/ethnicity, parental education or work experience? To what extent do the salaries of 1993 baccalaureate graduates who received a graduate degree from a private institution by 2003 differ by gender, race/ethnicity, parental education or work experience?

3. How do the salaries of 1993 baccalaureate graduates who majored in a STEM graduate program by 2003 compare to those who did not major in a STEM graduate program by 2003? To what extent do the salaries of 1993 baccalaureate graduates who received a graduate degree in a STEM graduate program by 2003 differ by gender, race/ethnicity, parental education, or work experience? To what extent do the salaries of 1993 baccalaureate graduates who received a graduate degree in a non-STEM graduate program by 2003 differ by gender, race/ethnicity, parental education or work experience?

4. How do the salaries of 1993 baccalaureate graduates who received a graduate degree by 2003 vary with type of institution, major choice, gender, race/ethnicity, parental education or work experience?

Baccalaureate and Beyond Longitudinal Study Methodology

B&B: 93/03 Overview

The Baccalaureate and Beyond Longitudinal Study was conducted by Research Triangle Institute International (RTI) International and MPR Associates, INC (MPR) for the National Center for Education Statistics (NCES) (Wine, Cominole, Wheerless, Dudley, & Franklin, 2005). The survey was designed to collect policy relevant data on
baccalaureate recipients initially identified in the 1992-1993 National Postsecondary Student Aid Study (NPSAS: 93). The NPSAS: 93 is a national study designed to provide information on how students and their parents finance the cost of postsecondary education. Students awarded the bachelor’s degree at the time of the NPSAS: 93 interviews were eligible for membership in the B&B: 93 longitudinal cohort.

**B&B: 93/03 Institution Sample**

The 1990-1991 Integrated Postsecondary Education Data System (IPEDS) was used to obtain the institution sample. Institutions were excluded if they did not meet the following criteria:

- Offer an education program designed for persons who have completed secondary education; offer an academically, occupationally, or vocationally oriented program of study; offer courses to students not employed by the institution; offer more than just correspondence courses; offer at least one program requiring at least 3 months or 300 clock hours of instruction.

Based on discrepancies in the IPEDS enrollment data five institutions were ineligible. The sample included 1,360 institutions (Wine et al., 2005). After institutions were sampled, students were sampled from the institutions.

**B&B: 93/03 Sample**

The study included individuals who were eligible to participate in the NPSAS: 93 study and earned a bachelor’s degree from a college or university in the United States, District of Columbia, or Puerto Rico. These individuals were first interviewed in 1993 as a part of NPSAS: 93 “The B&B: 93 cohort consisted of students who completed the
NPSAS: 93 interview, were identified to be baccalaureate recipients, and those NPSAS: 93 non-respondents who were potentially eligible for B&B: 93 who had a least some data” (Wine et al, 2005).

**B&B: 93/03 Student Population**

Inclusion in the student population required that students were enrolled in a NPSAS-eligible institution between July 1, 1992 and June 30, 1993. Other student requirements included: (1) enrollment in credit courses toward a degree or formal award; (2) enrollment in a degree or formal award program of at least 3 months; or (3) enrollment in an academically, occupationally, or vocationally specific program requiring at least 3 months or 300 clock hours of instruction; (4) non-enrollment in high school; and (5) non-enrollment in a general equivalency diploma (GED) or other high school completion program (Wine et al., 2005).

**B&B: 93/03 Student Sample**

Sample institutions identified those students eligible to receive the bachelor’s degree during the 1992-1993 academic years. During the CATI, students self-reports of receiving a baccalaureate degree during 1992-1993 were also included. In total, the NPSAS: 93 sample included 16,320 baccalaureate degree recipients eligible for participation in the B&B: 93 cohort (Wine et al., 2005).

A total of three follow-up studies (1994, 1997, and 2003) on the B&B: 93 cohort were conducted. As with the nature of longitudinal studies, the total number of participants was reduced due to non-respondents and deceased students. After accounting for such cases, the final sample for B&B: 93/03 was 10,440 (Wine et al., 2005).
**B&B: 93/03 Weighting**

Due to the complex sampling design, appropriate sampling weights must be applied when approximating the population 1992-1993 bachelor’s degree recipients in the longitudinal sample. The panel weight also was appropriate for this study to “minimize the influence of sample sizes on standard errors while also correcting for the oversampling of some groups, each case is weighted by the panel weight divided by the average weight for the sample (the relative weight)” (Perna, 2004, p. 492). The panel weight was also selected because it included respondents from all three surveys (Wine et al, 2005).

**B&B: 93/03 Data Collection Procedures**

The data collection process involved pre-data collection activities that included web design, advance tracing activities, preparation of notification materials, pre-notification mailing, notification mailing, and interview design. The actual data collection activities involved specialized training of the various data collection staff (Wine et al., 2005).

As an incentive to complete the interview within the first weeks of data collection, respondents were offered a $20 check. The survey could be completed at home, work, library, etc at a time convenient to the respondents. Password-protected logins, encrypted data transmission, and automatic logout after idle periods were used to secure the individuals responses. If respondents encountered problems with the self-administered
interview, they could complete the survey with a telephone interview by calling the help
desk (Wine et al., 2005).

Once the three-week web period ended, telephone interviews using CATI
software began. The CATI software used an embedded automated call-scheduler to
assign and deliver cases to interviews. This method allowed calls to be scheduled by case
priority, time of day, and increased the chances of reaching and interviewing sample
members from prior call outcomes (Wine et al., 2005). If sample members could not be
located at the known telephone number, interviewers used fast data, directory assistance
services, and previous contact information shared by the sample members. If cases could
not be located still, they were first sent for intensive tracking in RTI’s TOPS unit, then to
the field for locating or to intensive tracing in (TOPS2). Field interviews were conducted
four months after the start of CATI in geographic areas with the highest concentration of
B&B: 93/03 sample members (Wine et al, 2005).

As an incentive, a letter was mailed to encourage participation to three types of
non-respondents: (1) those who initially refused the interview; (2) those for whom
intensive tracking yielded a good mailing address but no telephone number; (3) and those
identified as hard to reach (i.e., 15 or more call attempts) (Wine et al., 2005). The letter
indicated that respondents would receive a $20 check upon completion of the interview.

*B&B: 93/03 Questionnaire*

The Baccalaureate and Beyond Longitudinal study focused on the experiences of
bachelor’s degree recipients over time. Specific topics included on the questionnaires
were demographic information, enrollment, education financing, the length of time to
complete a degree, the pursuit of additional postsecondary education beyond the bachelor’s degree, and employment outcomes.

A web-based questionnaire was used to collect data. Respondents had three options to access the questionnaire: (1) self-administered via the internet; (2) administered with a trained interviewer over the telephone using the computer assisted telephone interview (CATI); and (3) administered with a trained interviewer in person using the computer assisted personal interviewing (CAPI) (Wine et al., 2005).

**B&B: 93/03 Data Integrity**

Several instruments were designed in the B&B: 93/03 study to assess the quality of the data collected. The first relates to developing a web survey that was user friendly. This involved usability testing, evaluating two types of on-screen motivators and development of effective on-screen help text and coding systems. In addition, general help screens were available that provided information on the type of internet browser to use and how to answer the survey. A toll-free number to the B&B: 93/03 help desk was provided and counters were used to determine the number of times a screen was accessed. Help text usage rates for most screens in the B&B: 93/03 interview was under 1%. Coding experts examined coding results throughout the data collection process to ensure accuracy of codes (Wine et al., 2005).

Response reliability was obtained by re-interviewing a random subsample of 500 respondents (250 self-administered and 250 telephone interviews) to assess stability of interview items. The re-interviews were conducted three weeks after the initial interviews.
and in the same way as the initial interview. The agreement rates ranged from 71% to 97% (Wine et al., 2005).

Finally, effectiveness of the data quality was measured through “quality assurance monitoring and quality circle meetings”. Monitoring sessions were conducted during the day, evenings and on the weekend by monitors who both listened and viewed progress of interviews via remote telephones and computer equipment. After listening to approximately 20 questions, the monitors evaluated the interviewer performance based on (1) correct delivery of questions (error in delivery) and (2) accurate keying of the response (error in data entry). A total of 10,640 items were monitored, of which, 115 delivery errors and 66 data entry errors were observed (Wine et al., 2005). Quality circle meetings were also conducted to give interviewers a chance to discuss data collection issues with project staff. All aspects of data collection were open for discussion and summary of the discussions were provided in a newsletter to all the interviewers (Wine et al., 2005).

Researcher’s Methodology

Data Acquisition

The Data Analysis System (DAS) was used to obtain descriptive statistics and to conduct multiple regression analyses. The DAS is a software application created by the National Center Education Statistics (NCES) for analysis of NCES datasets. The DAS can generate tables and covariance analyses. The tables include estimates, standard errors, and weighted sample sizes for the estimates. Standard errors take into account the
complex sampling designs used in NCES surveys. The DAS can also generate weighted least square regressions and logistic regression.

Data Analysis Procedures

Several analytical procedures were used to investigate the research questions. First, descriptive analyses were used to identify differences in salary by educational attainment, gender, race/ethnicity, parental education and work experience.

Independent $t$-tests were used to determine differences between institutional characteristics in three areas: (1) 1993 baccalaureate graduates who received a graduate degree compared to those not completing a graduate degree by 2003; (2) 1993 baccalaureate graduates completing a graduate degree from a public institution compared to those completing a graduate degree from a private institution; (3) 1993 baccalaureate graduates who majored in a STEM graduate program compared to those who did not major in a STEM graduate program by 2003. The $t$-test was also used to evaluate the hypothesis that the variance in the two groups was equal. Therefore, if the $t$-test was significant at $p < .05$ then null hypothesis was deemed incorrect and the variances were interpreted as significantly different. If the $t$-test was non-significant (i.e. $p > .05$) then the hypothesis was accepted (Field, p. 301).

Finally, multiple regression techniques were used to make statements about how well the independent variables (institutional type, graduate major, gender, race/ethnicity, parental education, and work experience) predicted the value on the dependent variable (salary). The multiple regression equation is:

$$y=b_1x_1+b_2x_2+...+b_nx_n+c. \quad (1)$$
The outcome is denoted as $y$, and each predictor variable is denoted as $x_n$. Each predictor has a regression coefficient $b_1$ associated with it and $b_0$ is the value of the outcome when all predictors are zero (Field, p.192).

The forced entry regression technique in which all the predictors were entered into the model at the same time was used to measure factors such as institutional type, graduate major, gender, race/ethnicity, parental education, and work experience on salary (Field, p. 160). The $b$-value indicates the relationship between salary and each predictor. Positive values were interpreted to mean there was a positive relationship between the predictor and the salary whereas negative values were interpreted to mean there was a negative relationship between the predictor and salary (Field, p. 192). Each of the beta values have an associated standard error indicating to what extent the values vary. The standard errors were then used to determine whether or not the $b$-value differed significantly from zero. If the $b$-value was significant (i.e. $p < .05$) then the predictor was interpreted as making a significant contribution to the model. The standardized beta indicates the number of standard deviations that salary would change as a result of one standard deviation change in the predictor (Field, p. 193).

Twenty-eight null hypotheses were proposed to answer the four research questions. Each hypothesis is addressed in chapter four and is detailed in Appendix A.

Assumptions of Statistical Techniques

*Independent t-test:* is guided by four basic assumptions that must be met to ensure the results are accurate: (1) data are normally distributed; (2) homogeneity of variance;
(3) data are measured with equal intervals throughout the scale; and (4) independence of response. If the assumptions are violated, the \( p \) value should not be trusted (Field, p.301).

**Multiple Regression:** shares all the assumptions of correlation such as (1) linearity of relationships, (2) same level of relationship throughout the range of the independent variable (homoscedasticity), (3) normally distributed errors, (4) absence of outliers, (5) no perfect multicollinearity, and (6) data whose range is not truncated (Field, p.170). When these assumptions are not met the results may not be trustworthy, resulting in a Type I or Type II error or over or under-estimation of significance or effect size.

**Variable Definitions**

The variables that will be used in this study are defined as:

**Current/Most Recent Salary 2003** (B3CRSAL) is a continuous variable for all respondents. Respondents who reported salaries greater than $500,000 were recoded to $500,000.

**Highest degree completed as of 2003** (B3HDG03) is a categorical variable. Four values were analyzed for highest degree attained by 2003: (1) bachelor’s degree, (2) master’s degree, (3) first professional degree, and (4) doctoral degree. Values two, three and four were combined in the DAS to represent graduate degree. Value one was used as the reference group in the Data Analysis System (DAS) to compare bachelor degree attainment to graduate degree attainment.

**Institutional Type Post Bachelor’s Degree** is a categorical variable. Four values were analyzed for institutional type: (1) public, 4-year, Ph.D. granting; (2) public, 4-year non-Ph.D. granting; (3) private, not-for-profit, Ph.D. granting; and (4) private, not-for-
profit, non-Ph.D. granting. Values one and two, public, Ph.D. granting and non-Ph.D. granting institutions were lumped together in the Data Analysis System (DAS) to represent public institution type. Values three and four were also combined in the DAS to represent private institution type. Public institution was used as the reference group.

Graduate Major (MAJROS4) is a categorical variable. Nine values were analyzed for graduate major: (1) humanities; (2) social behavioral sciences; (3) life sciences and physical sciences; (4) engineering/computer science/math; (5) education; (6) business management; (7) health; (8) law; and (9) other. Values three and four were combined in the DAS to represent STEM majors. Values one, two, five, six, seven, eight, and nine were lumped together in the DAS to describe non-STEM majors and represent the reference group.

Gender (GENDER) is a categorical variable and describes the sex of the respondent. The two values analyzed for gender include: (1) male and (2) female. Male represents the reference group.

Race/Ethnicity (B2ETHNIC) is a categorical variable and refers to the respondent’s race. Five values were analyzed for race/ethnicity: (1) American Indian/Alaska Native; (2) Asian/Pacific Islander; (3) Black/non-Hispanic; (4) Hispanic; and (5) White/non-Hispanic. Values one, two, three and four were combined in the DAS to represent non-White. White/non-Hispanic was used as the reference group.

Parental Education (PEDUC) is a categorical variable and describes the highest level of education completed by either parent. Six values were used to describe the highest level of education by either parent: (1) not high school graduate or equivalent; (2)
high school graduate or equivalent; (3) some postsecondary education (less than two years); (4) two years or more postsecondary education, associate degree, (less than bachelor’s); (5) bachelor’s degree; and (6) advanced degree. Values one, two, three, and four were combined in the DAS to represent parents’ highest education level as less than a bachelor’s degree. Values five and six were combined in the DAS to represent parents’ highest education as bachelor’s or higher and served as the reference group.

*Work Experience* (B3YRSJOB) is a continuous variable that refers to respondents who had worked at some point between the 1997 and 2003 interview. Respondents selected from a minimum of one year to a maximum of twenty-eight years. Previous studies (Edie, Brewer & Ehrenberg, 1998) have used post-college undergraduate earnings about six-to-ten years out to measure college premium. In this study, the average number of years worked was approximately six years. Thus, the number of years worked was re-coded to dichotomize the variable. The first group includes those who worked at the job for one to six years. The second group includes those who worked at the job seven to twenty-eight years and served as the reference group.

**Summary**

This chapter described methods that were used to complete the current study of graduate education attainment and salary. Data was obtained from the Baccalaureate and Beyond 1993 (B&B: 93/03), which stems from the National Postsecondary Student Aid Study 1992-1993 (NPSAS: 93). The following were discussed in this chapter: institution population and sample, student population and sample, weighting, data collection procedures, data integrity, and data analysis.
CHAPTER 4: RESULTS

This chapter presents the results from the data analysis described in chapter three. The first section provides descriptive statistics of the salaries of 1993 baccalaureate graduates and graduate degree recipients by 2003. The second section presents the results for institutional characteristics in three areas: (1) 1993 baccalaureate recipients who completed a graduate degree compared to those who did not complete a graduate degree by 2003 (2) 1993 baccalaureate graduates who completed a graduate degree from a public institution compared to graduates who completed a graduate degree from a private institution; and (3) 1993 baccalaureate graduates who majored in a STEM graduate program compared to those who did not major in a STEM graduate program by 2003. The third section provides multivariate results for those individuals who earned a graduate degree by institutional and individual characteristics by 2003.

Description of Data

The National Center for Education Statistics (NCES) Data Analysis System (DAS) were used to generate estimates and related standard errors from the Baccalaureate and Beyond 1993/2003 dataset (B&B: 93/03). Descriptive results for this analysis are divided up by the respective independent variable categories. Table 1 shows the results for each variable.

Highest Degree Attained by 2003

There were approximately 1,149,000 weighted bachelor’s degree recipients by 2003. A bachelor’s degree was the highest degree attained by approximately 830,000 weighted recipients who reported income in 2003. The average salary for bachelor’s
recipients was $54,166 and the standard error was $686. Among the 1,149,000 weighted bachelor’s degree recipients there were approximately 300,000 who went on to attain a graduate degree. The average salary for graduate recipients was $61,413 and the standard error was $1,168.

**Institution Type**

Among the 300,000 weighted graduate degree recipients only 134,000 attained a graduate degree from a public or private Ph.D. granting institution. Missing data was not included in the analysis therefore the sample size was reduced to approximately 134,000 weighted recipients. Among the 134,000 recipients, 82,000 attended a public institution. The average salary was $57,483 and the standard error was $1,644 for those who attended a public institution. There were 52,000 recipients who attended a private institution. The average salary for those who attended a private institution was $68,265 and the standard error was $4,223.

**Graduate Major**

Among the 300,000 weighted graduate degree, a total of 227,000 majored in a non-STEM graduate program. The average salary was $59,333 and the standard error was $1,380 for those who majored in non-STEM graduate program. The remaining 75,000 individuals majored in a STEM graduate program. The average salary was $67,542 and the standard error was $1,833 for those who majored in a STEM graduate program.

**Gender**

Among the 300,000 weighted graduate degree recipients 134,000 were male. The average salary was $72,291 and the standard error was $2,051 for males. There were
166,000 female graduate degree recipients. The average salary was $52,787 and the standard error was $933 for females.

Race/Ethnicity

Approximately 246,000 weighted graduate degree recipients were White. The average salary was $60,964 and the standard error was $1,210 for Whites. There were approximately 50,000 weighted non-White graduate degree recipients by 2003. The average salary for non-Whites was $62,417 and the standard error was $2,018 for non-Whites.

Parental Education

There were approximately 170,000 weighted graduate degree recipients who had parents who earned a bachelor’s degree or higher. The average salary was $64,458 and the standard error was $1,617 for those whose parents earned a bachelor’s degree or higher. There were approximately 118,000 weighted graduate degree recipients who had parents who earned less than a bachelor’s degree. The average salary was $57,467 and the standard error was $1,528 for those individuals whose parents earned less than a bachelor’s degree.

Work Experience

There were approximately 125,000 weighted graduate degree recipients who possessed one to six years of work experience. The average salary was $65,244 and the standard error was $1,884 for those with one to six years of work experience. There were approximately 64,000 weighted graduate degree recipients who possessed between seven
to twenty-eight years of work experience. The average salary was $54,010 and the
standard error was $1,830 for those with seven to twenty-eight years of work experience.
Table 1

*Description of Data*

<table>
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<th>Variable</th>
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<td>Non-White</td>
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<td>Less than Bachelor’s</td>
<td>$57,467</td>
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<td>$54,010</td>
<td>$1,830</td>
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Research Question One

The first research question compared the salary of 1993 baccalaureate graduates who completed a graduate degree by 2003 to those who did not complete a graduate degree by 2003, and examined how their salaries differed by gender, race/ethnicity, parental education, or work experience. The results for this analysis are divided up by their respective independent variable categories.

Highest Degree Attained by 2003

Table 2 presents the results by highest degree attainment. The average salary for individuals who attained a bachelor’s degree was $54,166. The average salary for individuals who attained a graduate degree was higher at $61,413. The results for the comparison of individuals who attained a bachelor’s degree compared to those who attained a graduate degree were deemed statistically significant. ($t=5.35, p<.05$).

Therefore the null hypothesis of no difference in the 2003 annual salary of 1993 baccalaureate graduates who received a graduate degree by 2003, as opposed to those who did not receive a graduate degree by 2003, is rejected.
Table 2

*Highest Degree Attained by 2003*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Bachelor’s</th>
<th>$SE$</th>
<th>Graduate</th>
<th>$SE$</th>
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<td>Highest Degree</td>
<td>$54,166$</td>
<td>$686$</td>
<td>$61,413$</td>
<td>$1,168$</td>
<td>5.35*</td>
</tr>
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</table>


*p < .05. **p < .01. ***p < .001.
Gender

The average salary for males who attained a bachelor’s degree was higher ($65,461) than that ($44,423) of their female counterparts. The difference in the comparison of males and females who attained a bachelor’s degree was also statistically significant ($t=16.51, p < .05$). Therefore, the null hypothesis that there is no difference in the 2003 annual salary of 1993 baccalaureate graduate not completing a graduate degree by gender is rejected.

The results for the distribution of males and females who attained a graduate and bachelor’s degree can be seen in Table 3. The average salary for males who attained a graduate degree was higher ($72,291) than that ($52,787) of their female counterparts. This difference fell within statistically significant territory ($t=8.66, p < .05$). Thus, the null hypothesis that there is no difference in the 2003 annual salary of 1993 baccalaureate graduate who received a graduate degree by gender is rejected.

Table 3

<table>
<thead>
<tr>
<th>Highest Degree Attained by 2003 &amp; Gender</th>
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</thead>
<tbody>
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<td>2003 Annual Salary</td>
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<table>
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<th>Female</th>
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<tbody>
<tr>
<td>Bachelor's Degree</td>
<td>$65,461</td>
<td>$1,128</td>
<td>$44,423</td>
<td>$592</td>
<td>16.51*</td>
</tr>
<tr>
<td>Graduate Degree</td>
<td>$72,291</td>
<td>$2,051</td>
<td>$52,787</td>
<td>$933</td>
<td>8.66*</td>
</tr>
</tbody>
</table>


*p < .05. **p < .01. ***p < .001.
Race/Ethnicity

The results for the distribution of those individuals who attained a graduate and bachelor’s degree by race/ethnicity can be seen in Table 4. The average salary for Whites who attained a graduate degree was $60,964. The average salary of non-Whites who attained a graduate degree was $62,417. The results for the comparison of Whites who attained a graduate degree compared to non-Whites who attained a graduate degree were not statistically significant. Therefore the researcher failed to reject the null hypothesis that there is no difference in the 2003 annual salary of the 1993 baccalaureate graduates who received a graduate degree by race/ethnicity.

The average salary for Whites who attained a bachelor’s degree was $54,734. The average salary for non-Whites who attained a bachelor’s degree was $51,102. The comparison of Whites and non-Whites who attained a bachelor’s degree was statistically significant ($t=2.00, p < .05$). The null hypothesis that there is no difference in the 2003 annual salary of 1993 baccalaureate graduates not completing a graduate degree by race/ethnicity is rejected.
Table 4

Highest Degree Attained by 2003 & Race/Ethnicity

<table>
<thead>
<tr>
<th>Variable</th>
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<th>Non-White</th>
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<td>Bachelor's Degree</td>
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<td>$740</td>
<td>$51,102</td>
<td>$1,662</td>
<td>2.00*</td>
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</table>

*p < .05. **p < .01. ***p < .001.
Parental Education

Table 5 displays parental education of individuals who attained a graduate or bachelor’s degree. The average salary for individuals who attained a graduate degree and parents attained a bachelor’s degree or higher was $64,457. The average salary for individuals who attained a graduate degree and whose parents attained less than a bachelor’s degree was $57,467. The comparison for individuals who attained a graduate degree and whose parents highest education level was a bachelor’s degree or higher versus those who attained a graduate degree and whose parents highest education level was less than a bachelor’s degree showed statistically significant results ($t=3.14, p < .05$). Thus the null hypothesis that there is no difference in the 2003 annual salary of the 1993 baccalaureate graduates who received a graduate degree by parental education is rejected.

The average salary for individuals who attained a bachelor’s degree and parents attained a bachelor’s degree or higher was $56,966. The average salary for individuals who attained a bachelor’s degree and whose parents attained less than a bachelor’s degree was $51,865. The comparison for individuals who attained a bachelor’s degree and whose parents attained a bachelor’s degree or higher versus those who attained a bachelor’s degree and whose parents highest education level was less than a bachelor’s degree was deemed statistically significant ($t=3.68, p < .05$). The null hypothesis that there is no difference in the 2003 annual salary of 1993 baccalaureate graduates not completing a graduate degree by parental education is rejected.
Table 5

*Respondent Highest Degree Attained by 2003 & Parental Education*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Bachelor’s or Higher</th>
<th>SE</th>
<th>Less than Bachelor’s</th>
<th>SE</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graduate Degree</td>
<td>$64,457</td>
<td>$1,617</td>
<td>$57,467</td>
<td>$1,528</td>
<td>3.14*</td>
</tr>
<tr>
<td>Bachelor’s Degree</td>
<td>$56,966</td>
<td>$1,078</td>
<td>$51,865</td>
<td>$874</td>
<td>3.68*</td>
</tr>
</tbody>
</table>


*p < .05. **p < .01. ***p < .001.
Work Experience

Table 6 shows the distribution for individuals who attained a graduate or bachelor’s degree and work experience. The average salary for individuals who attained a graduate degree with work experience between one to six years was $65,244. The average salary for individuals who attained a graduate degree and whose work experience was seven to twenty-eight years was $54,010. The results of the comparison for individuals who attained a graduate degree and whose work experience was one to six years compared to those who attained a graduate degree and whose work experience was seven to twenty-eight years was statistically significant ($t=4.28, p < .05$). The null hypothesis that there is no difference in the 2003 salary of the 1993 baccalaureate graduates who received a graduate degree by work experience is rejected.

The average salary for individuals who attained a bachelor’s degree and whose work experience was one to six years was $57,474. The average salary for individuals who attained a bachelor’s degree and work experience was seven to twenty-eight years was $51,435. The results for the comparison for individuals who attained a bachelor’s degree and whose work experience was one to six years compared to those who attained a bachelor’s degree and work experience was seven to twenty-eight years was statistically significant ($t=3.23, p < .05$). Therefore the null hypothesis that there is no difference in the 2003 annual salary of 1993 baccalaureate graduates not completing a graduate degree by work experience is rejected.
Table 6

*Highest Degree Attained by 2003 & Work Experience*

<table>
<thead>
<tr>
<th>Variable</th>
<th>1-6 Years</th>
<th>SE</th>
<th>7-28 Years</th>
<th>SE</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graduate Degree</td>
<td>$65,244</td>
<td>$1,884</td>
<td>$54,010</td>
<td>$1,830</td>
<td>4.28*</td>
</tr>
<tr>
<td>Bachelor's Degree</td>
<td>$57,474</td>
<td>$1,283</td>
<td>$51,435</td>
<td>$1,360</td>
<td>3.23*</td>
</tr>
</tbody>
</table>


*p <.05. **p <.01. ***p < .001.*
Research Question Two

The second question compared the salaries of 1993 baccalaureate graduates who received a graduate degree from a public institution by 2003 to those who received a graduate degree from a private institution by 2003, and examined how the salaries differed by gender, race/ethnicity, parental education, or work experience. The results for this analysis are divided up by their respective independent variable categories.

Institution Type

Table 7 shows the distribution for individuals who attained a graduate degree by institution type. The average salary for individuals who attended a public institution was $57,483. The average salary for individuals who attended a private institution was $68,265. The comparison for individuals who attended a public institution compared to individuals who attended a private institution was statistically significant ($t=2.38, p < .05$). The hypothesis that there is no difference in the 2003 annual salary of 1993 baccalaureate graduates who received a graduate degree from a public institution compared to those who received a graduate degree from a private institution by 2003 is rejected.
### Table 7

**Institution Type**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Public</th>
<th>SE</th>
<th>Private</th>
<th>SE</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institution Type</td>
<td>$57,483</td>
<td>$1,644</td>
<td>$68,265</td>
<td>$4,223</td>
<td>2.38*</td>
</tr>
</tbody>
</table>


*p < .05. **p < .01. ***p < .001.
Gender

Table 8 presents the results for individuals who attended a public or private institution by gender. The average salary for males who attended a public institution was $67,479. The average salary for females who attended a public institution was $49,674. The comparison of males who attended a public institution versus females who attended a public institution was statistically significant ($t=5.44, p < .05$). Therefore the null hypothesis that there is no difference in the 2003 salary of 1993 baccalaureate graduates who received a graduate degree from a public institution by gender is rejected.

The average salary for males who attended a private institution was $84,576. The average salary for females who attended a private institution was less ($54,250) than that of their male counterparts. The comparison of males versus females who attended a private institution was statistically significant ($t=3.92, p < .05$). The null hypothesis that there is no difference in the 2003 salary of 1993 baccalaureate graduates who received a graduate degree from a private institution by gender is rejected.

Table 8

<table>
<thead>
<tr>
<th>Institution Type &amp; Gender</th>
<th>2003 Annual Salary</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
</tr>
<tr>
<td>Public</td>
<td>$67,479</td>
</tr>
<tr>
<td>Private</td>
<td>$84,576</td>
</tr>
</tbody>
</table>


*p < .05. **p < .01. ***p < .001.
Race/Ethnicity

Table 9 presents the results for individuals who attended a public or private institution by race/ethnicity. The average salary for Whites who attended a public institution was $57,941. The average salary for non-Whites who attended a public institution was $55,211. The comparison of Whites versus non-Whites who attended a public institution was not statistically significant. Thus, the researcher failed to reject the null hypothesis that there is no difference in the 2003 salary of 1993 baccalaureate graduates who received a graduate degree from a public institution by race/ethnicity.

The average salary for Whites who attended a private institution was $68,890. The average salary for non-Whites who attended a private institution was $65,151. The comparison of Whites versus non-Whites who attended a private institution was not statistically significant. Therefore, the researcher failed to reject the null hypothesis that there is no difference in the 2003 salary of 1993 baccalaureate graduates who received a graduate degree from a private institution by race/ethnicity.

Table 9

<table>
<thead>
<tr>
<th>Institution Type &amp; Race/Ethnicity</th>
<th>2003 Annual Salary</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>White</td>
</tr>
<tr>
<td>Public</td>
<td>$57,941</td>
</tr>
<tr>
<td>Private</td>
<td>$68,890</td>
</tr>
</tbody>
</table>

*p < .05. **p < .01. ***p < .001.
Parental Education

Table 10 presents the results for individuals who attended a public or private institution by parental education. The average salary for individuals who attended a public institution whose parents attained a bachelor’s degree or higher was $60,461. The average salary for individuals who attended a public institution whose parents attained less than a bachelor’s degree was $54,778. The comparison of individuals whose parents attained a bachelor’s degree or higher versus individuals whose parents attained less than a bachelor’s degree and attended a public institution was not statistically significant. The researcher failed to reject the null hypothesis that there is no difference in the 2003 salary of 1993 baccalaureate graduates who received a graduate degree from a public institution by parental education.

The average salary for individuals who attended a private institution whose parents attained bachelor’s degree or higher was $71,800. The average salary for individuals who attended a private institution and parents attained less than a bachelor’s degree was $63,964. The comparison of individuals whose parents attained a bachelor’s degree or higher versus individuals whose parents attained less than a bachelor’s degree and attended a private institution was not statistically significant. Therefore, the researcher failed to reject the null hypothesis that there is no difference in the 2003 salary of 1993 baccalaureate graduates who received a graduate degree from a private institution by parental education.
Table 10

*Institution Type & Parental Education*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Bachelor’s or Higher</th>
<th>SE</th>
<th>Less than Bachelor’s</th>
<th>SE</th>
<th>( t )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public</td>
<td>$60,461</td>
<td>$2,302</td>
<td>$54,778</td>
<td>$2,041</td>
<td>1.85</td>
</tr>
<tr>
<td>Private</td>
<td>$71,800</td>
<td>$6,135</td>
<td>$63,964</td>
<td>$5,780</td>
<td>0.93</td>
</tr>
</tbody>
</table>


*\( p < .05 \). **\( p < .01 \). ***\( p < .001 \).
Work Experience

Table 11 shows the distribution for individuals who attended a public or private institution and work experience. The average salary for individuals who attended a public institution and whose work experience was one to six years was $63,168. The average salary for individuals who attended a public institution and work experience was seven to twenty-eight years was $51,132. The results for the comparison for individuals who attended a public institution and whose work experience was one to six years compared to those who attended a public institution and whose work experience was seven to twenty-eight years was statistically significant ($t=2.91, p < .05$). The null hypothesis that there is no difference in the 2003 salary of the 1993 baccalaureate graduates who received a graduate degree from a public institution by work experience is rejected.

The average salary for individuals who attended a private institution and whose work experience was one to six years was $73,537. The average salary for individuals who attended a private institution and work experience was seven to twenty-eight years was $63,312. The results for the comparison for individuals who attended a private institution and whose work experience was one to six years compared to those who attended a private institution and whose work experience was seven to twenty-eight years was not statistically significant. Therefore, the researcher failed to reject the null hypothesis that there is no difference in the 2003 annual salary of 1993 baccalaureate graduates not completing a graduate degree by work experience.
Table 11

Institution Type & Work Experience

<table>
<thead>
<tr>
<th>Variable</th>
<th>1-6 Years</th>
<th>SE</th>
<th>7-28 Years</th>
<th>SE</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public</td>
<td>$63,168</td>
<td>$3,448</td>
<td>$51,132</td>
<td>$2,297</td>
<td>2.91*</td>
</tr>
<tr>
<td>Private</td>
<td>$73,537</td>
<td>$6,176</td>
<td>$63,312</td>
<td>$8,104</td>
<td>1.00</td>
</tr>
</tbody>
</table>


*p < .05. **p < .01. ***p < .001.
Research Question Three

The third question compared salaries of 1993 baccalaureate graduates who majored in a STEM graduate program by 2003 to those who did not major in a STEM graduate program by 2003, and examined how the salaries differed by gender, race/ethnicity, parental education, or work experience. The results for this analysis are divided up by their respective independent variable category.

Graduate Major

Table 12 shows the average 2003 salaries of individuals by graduate major. The average salary for individuals who majored in a STEM graduate program was $67,542. The average salary for individuals who majored in a non-STEM was $59,333. The results for the comparison of individuals who majored in a STEM versus a non-STEM graduate program was statistically significant \( t = 3.58, p < .05 \). Therefore, the null hypothesis that there is no difference in the 2003 annual salary of 1993 baccalaureate graduates who majored in a STEM (science, technology, engineering, or mathematics) graduate program compared to those who majored in a non-STEM graduate program by 2003 is rejected.

Table 12

Graduate Major

<table>
<thead>
<tr>
<th>Variable</th>
<th>STEM</th>
<th>SE</th>
<th>Non-STEM</th>
<th>SE</th>
<th>( t )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graduate Major</td>
<td>$67,542</td>
<td>$1,833</td>
<td>$59,333</td>
<td>$1,380</td>
<td>3.58*</td>
</tr>
</tbody>
</table>


\*\( p < .05 \). **\( p < .01 \). ***\( p < .001 \).
Gender

Table 13 presents the results for individuals who majored in a STEM (science, technology, engineering, or mathematics) or non-STEM graduate program by gender. The average salary for males who majored in a STEM graduate program was $72,688. The average salary for females who majored in a STEM graduate program was $58,484. The results for the comparison of males who majored in a STEM graduate program versus females who majored in a STEM graduate program was statistically significant \((t=4.52, p < .05)\). The null hypothesis that there is no difference in the 2003 annual salary of 1993 baccalaureate graduates who majored in a STEM graduate program compared to those who majored in a STEM graduate program by gender is rejected.

The average salary for males who majored in a non-STEM graduate program was $71,771. The average salary for females who majored in a non-STEM graduate program was $51,806. A comparison of males who majored in a non-STEM graduate program versus females who majored in a non-STEM graduate program produced statistically significant results \((t=6.56, p < .05)\). The null hypothesis that there is no difference in the 2003 annual salary of 1993 baccalaureate graduates who majored in a non-STEM graduate program compared to those who majored in a non-STEM graduate program by gender is rejected.
Table 13

Graduate Major & Gender

<table>
<thead>
<tr>
<th>Variable</th>
<th>Male</th>
<th>SE</th>
<th>Female</th>
<th>SE</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>STEM</td>
<td>$72,688</td>
<td>$2,389</td>
<td>$58,484</td>
<td>$2,037</td>
<td>4.52*</td>
</tr>
<tr>
<td>Non-STEM</td>
<td>$71,771</td>
<td>$2,859</td>
<td>$51,806</td>
<td>$1,047</td>
<td>6.56*</td>
</tr>
</tbody>
</table>


*p < .05. **p < .01. ***p < .001.
Table 14 presents the results for individuals who majored in a STEM or non-STEM graduate program by race/ethnicity. The average salary for Whites who majored in STEM graduate program was $66,628. The average salary for non-Whites who majored in a STEM graduate program was $71,097. The comparison of Whites versus non-Whites who majored in a STEM graduate program was not statistically significant. Thus, the researcher failed to reject the null hypothesis that there is no difference in the 2003 salary of 1993 baccalaureate graduates who majored in a STEM (science, technology, engineering, or mathematics) graduate program by race/ethnicity.

The average salary for Whites who majored in a non-STEM graduate program was $59,337. The average salary for non-Whites who majored in a non-STEM graduate program was $57,168. The comparison of Whites versus non-Whites who majored in a non-STEM graduate program was not statistically significant. Therefore, the researcher failed to reject the null hypothesis that there is no difference in the 2003 salary of 1993 baccalaureate graduates who majored in a non-STEM by race/ethnicity.
Table 14

Graduate Major & Race/Ethnicity

<table>
<thead>
<tr>
<th>Variable</th>
<th>White</th>
<th>SE</th>
<th>Non-White</th>
<th>SE</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>STEM</td>
<td>$66,628</td>
<td>$2,037</td>
<td>$71,097</td>
<td>$4,520</td>
<td>0.90</td>
</tr>
<tr>
<td>Non-STEM</td>
<td>$59,337</td>
<td>$1,384</td>
<td>$57,168</td>
<td>$2,296</td>
<td>0.81</td>
</tr>
</tbody>
</table>


*p < .05. **p < .01. ***p < .001.
**Parental Education**

Table 15 presents the results for individuals who majored in a STEM or non-STEM graduate program by parental education. The average salary for graduate degree recipients who majored in a STEM program and whose parents attained a bachelor’s degree or higher was $67,025. The average salary for graduate degree recipients who majored in a STEM program whose parents attained less than a bachelor’s degree was $68,592. The comparison of individuals whose parents attained a bachelor’s degree or higher versus individuals whose parents attained less than a bachelor’s degree and majored in a STEM graduate program was not statistically significant. The researcher failed to reject the null hypothesis that there is no difference in the 2003 salary of 1993 baccalaureate graduates who majored in a STEM graduate program by parental education.

The average salary for individuals who majored in a non-STEM graduate program and parents attained bachelor’s degree or higher was $63,403. The average salary for individuals who majored in a non-STEM graduate program and whose parents attained less than a bachelor’s degree was $54,409. The comparison of individuals whose parents attained a bachelor’s degree or higher versus individuals whose parents attained less than a bachelor’s degree and majored in a non-STEM graduate program was statistically significant ($t=3.44, p < .05$). The null hypothesis that there is no difference in the 2003 annual salary of 1993 baccalaureate graduates who majored in a non-STEM graduate program by parental education is rejected.
Table 15

*Graduate Major & Parental Education*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Bachelor’s or Higher</th>
<th>SE</th>
<th>Less than Bachelor’s</th>
<th>SE</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>STEM</em></td>
<td>$67,025</td>
<td>$1,952</td>
<td>$68,592</td>
<td>$3,302</td>
<td>0.41</td>
</tr>
<tr>
<td><em>Non-STEM</em></td>
<td>$63,403</td>
<td>$2,239</td>
<td>$54,409</td>
<td>$1,352</td>
<td>3.44*</td>
</tr>
</tbody>
</table>


*p < .05. **p < .01. ***p < .001.*
**Work Experience**

Table 16 presents the results for individuals who majored in a STEM or non-STEM graduate program by work experience. The average salary for individuals who majored in STEM graduate program with work experience between one to six years was $68,193. The average salary for individuals who majored in a STEM graduate program and whose work experience was seven to twenty-eight years was $61,102. The comparison of individuals who majored in a STEM graduate program and worked one-to-six years versus individuals who majored in a STEM graduate program and worked seven to twenty-eight years was not statistically significant. Thus, the researcher failed to reject the null hypothesis that there is no difference in the 2003 salary of 1993 baccalaureate graduates who majored in a STEM (science, technology, engineering, or mathematics) graduate program by work experience.

The average salary for individuals who majored in a non-STEM graduate program and whose work experience was one to six years was $64,140. The average salary for individuals who majored in a non-STEM graduate program with work experience from seven-to-twenty eight years was $52,588. The comparison of individuals who majored in a STEM graduate program with work experience from one to six years versus individuals who majored in a non-STEM graduate program with seven to twenty-eight years work experience was statistically significant ($t=3.53$, $p < .05$). Therefore, the null hypothesis that there is no difference in the 2003 salary of 1993 baccalaureate graduates who majored in a non-STEM by work experience is rejected.
Table 16

*Graduate Major & Work Experience*

<table>
<thead>
<tr>
<th>Variable</th>
<th>1-6 Years</th>
<th>SE</th>
<th>7-28 Years</th>
<th>SE</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>STEM</em></td>
<td>$68,193</td>
<td>$2,462</td>
<td>$61,102</td>
<td>$3,744</td>
<td>1.58</td>
</tr>
<tr>
<td><em>Non-STEM</em></td>
<td>$64,140</td>
<td>$2,394</td>
<td>$52,588</td>
<td>$2,225</td>
<td>3.53*</td>
</tr>
</tbody>
</table>


*p < .05. **p < .01. ***p < .001.
Research Question Four

The fourth question examined how the salaries of 1993 baccalaureate graduates who received a graduate degree from a public, private, STEM, or non-STEM graduate program by 2003 vary with gender, race/ethnicity, parental education, or work experience.

Table 17 provides the means, standard deviation and a description for all the variables in the regression analysis. Approximately 81% of the respondents had completed a graduate degree. Approximately 36% of the respondents attended a private institution. Approximately 26% of the respondents majored in a STEM graduate program. Approximately 57% of the respondents were female. Approximately 14% of the respondents were non-White. Approximately 44% of the respondent’s parents earned less than a bachelor’s degree. Approximately 57% of the respondents had one- to-six years of work experience.
Table 17

*Mean and Standard Deviation of Independent and Dependent Variables*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Label</th>
<th>$M$</th>
<th>$SD$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salary</td>
<td>Job 2003: annual salary</td>
<td>$60,506.07</td>
<td>$43,005.07</td>
</tr>
<tr>
<td>Highest Degree</td>
<td>Graduate Degree</td>
<td>0.8148</td>
<td>0.3900</td>
</tr>
<tr>
<td>Institution Type</td>
<td>Private</td>
<td>0.3583</td>
<td>0.4813</td>
</tr>
<tr>
<td>Graduate Major</td>
<td>STEM</td>
<td>0.2609</td>
<td>0.4408</td>
</tr>
<tr>
<td>Gender</td>
<td>Female</td>
<td>0.5723</td>
<td>0.4996</td>
</tr>
<tr>
<td>Race/Ethnicity</td>
<td>Non- White</td>
<td>0.1439</td>
<td>0.3523</td>
</tr>
<tr>
<td>Parents Education</td>
<td>Less than BA</td>
<td>0.4426</td>
<td>0.4986</td>
</tr>
<tr>
<td>Work Experience</td>
<td>1-6 Years</td>
<td>0.5720</td>
<td>0.4975</td>
</tr>
</tbody>
</table>

Table 18

**Correlations among Independent and Dependent Variables**

<table>
<thead>
<tr>
<th>Correlations</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Salary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Highest Degree</td>
<td>.1225</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Institution Type</td>
<td>.1484</td>
<td>.1447</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Major</td>
<td>.0880</td>
<td>.0725</td>
<td>-.0731</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Gender</td>
<td>-.2921</td>
<td>-.0663</td>
<td>-.0581</td>
<td>-.2029</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Race/Ethnicity</td>
<td>-.0234</td>
<td>.0163</td>
<td>-.0081</td>
<td>.0318</td>
<td>.0563</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Parents Education</td>
<td>-.0972</td>
<td>-.0669</td>
<td>-.0592</td>
<td>-.0605</td>
<td>.0328</td>
<td>.0448</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Work Experience</td>
<td>.1343</td>
<td>.1121</td>
<td>.0592</td>
<td>.1380</td>
<td>-.1723</td>
<td>.0912</td>
<td>-.1408</td>
<td></td>
</tr>
</tbody>
</table>

A Pearson correlation coefficient was used to assess the degree that independent variables were linearly related in the sample. The results for the analysis can be seen in Table 18 and are not biased by multicollinearity. In other words, the correlation matrix does not demonstrate correlations of .90 or higher which suggests that variables are measuring the same information.

Table 19 shows the results for the regression model and the related variables. Field (2005) recommends using the conventional levels of significance of $p < .05$, $p < .01$, $p < .001$ to determine statistical significance. Two variables were found to be significant. First, highest degree attained was significant at the alpha=.05 level. Second, gender was significant at the alpha =.001 level. The model also shows highest degree attained, institution type, graduate major, gender, race/ethnicity, parental education and work experience explained 11% of the change in 2003 salary, $R^2 = .11$ $F(7,38)=8.38$, $p<.001$. Thus, the null hypothesis that there is no significant relationship in the 2003 annual salary of 1993 baccalaureate graduates with the variables highest education level, type of institution, (public or private), major choice (STEM or non-STEM), gender, race/ethnicity, parental education, or work experience is rejected.

**Highest Degree Attained by 2003**

The results for highest degree attained by 2003 were deemed statistically significant. The results show a positive standardized coefficient. ($\beta = .096$, $p = .012$). The results suggest that individuals earning a graduate degree earned more than their baccalaureate counterparts.
Institution Type

Institution type had a positive standardized coefficient however was not statistically significant. Based on the results, individuals who attended a private institution earned more than individuals who attended a public institution.

Graduate Major

The results for graduate major were not deemed statistically significant. The positive standardized coefficient indicates that individuals who majored in a STEM graduate program earned more than individuals who majored in a non-STEM graduate program.

Gender

The results for gender was statistically significant ($\beta = -.238$, $p = .000$). The negative standardized coefficient indicates that females earned less than males by highest degree attained.

Parents Highest Education

Individuals whose parents’ education was less than a bachelor’s degree were not statistically significant and had a negative standardized coefficient. The results suggest that individuals whose parents attained less than a bachelor’s degree tended to have lower income than individuals whose parents attained a bachelor’s degree or higher.

Work Experience

Work experience did not show statistically significant results but had a positive standardized coefficient. The results suggest that individuals whose work experience was
one to six years earned more than individuals whose work experience was seven to twenty-eight years.
Table 19

*Multiple Regression Analysis by Highest Degree Attained*

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>$B$</th>
<th>SE</th>
<th>$\beta$</th>
<th>SE</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest Degree</td>
<td>$10,612.51$</td>
<td>$4,065.68$</td>
<td>0.096</td>
<td>0.037</td>
<td>0.012*</td>
</tr>
<tr>
<td>Institution Type</td>
<td>9,377.35</td>
<td>5,246.68</td>
<td>0.100</td>
<td>0.056</td>
<td>0.081</td>
</tr>
<tr>
<td>Major</td>
<td>3,834.91</td>
<td>5,047.42</td>
<td>0.039</td>
<td>0.051</td>
<td>0.451</td>
</tr>
<tr>
<td>Gender</td>
<td>-21,484.95</td>
<td>4,857.43</td>
<td>-0.238</td>
<td>0.054</td>
<td>0.000***</td>
</tr>
<tr>
<td>Race/Ethnicity</td>
<td>-258.23</td>
<td>2,668.49</td>
<td>-0.002</td>
<td>0.022</td>
<td>0.923</td>
</tr>
<tr>
<td>Parents Education</td>
<td>-4,674.15</td>
<td>3,799.33</td>
<td>-0.052</td>
<td>0.042</td>
<td>0.225</td>
</tr>
<tr>
<td>Work Experience</td>
<td>5,785.49</td>
<td>3,856.06</td>
<td>0.064</td>
<td>0.043</td>
<td>0.141</td>
</tr>
</tbody>
</table>


* $p < .05$. ** $p < .01$. *** $p < .001$. 
Summary

This chapter presented the results for the four research questions under study. Major findings of institutional characteristics revealed higher salaries for individuals who attained a graduate degree. Attending a private institution and majoring in a STEM (science, technology, engineering, or mathematics) graduate program were also found to be positive salary determinants. Individual characteristics indicated that men earned higher salaries than females across all variables. For example, on average, women earned almost $20,000 less than men who attained a baccalaureate or graduate degree. Race/ethnicity did not have a significant impact upon earnings. The salary of individuals whose parents earned a bachelor’s degree or higher earned more than those whose parents earned less than a bachelor’s degree. Individuals with less than six years work experience earned more than those who with seven or more years work experience.
CHAPTER 5: DISCUSSION

The purpose of this study was to examine the financial return that 1993 baccalaureate graduates realized from graduate education by 2003, ten years after earning a bachelor’s degree. Data were obtained from the Baccalaureate and Beyond (B&B: 93/03) survey. Descriptive statistics and multiple regression analyses were utilized to answer the four research questions under study. The first section of this chapter discusses the findings and summarizes the results of the study. The next section discusses policy implications. The chapter concludes with recommendations for future research followed by a discussion on limitations of the study.

This study analyzed the salaries of bachelor’s and graduate degree recipients to compare the impact of salary with increased levels of education. Four research questions guided the study:

Research Question One

How do the salaries of 1993 baccalaureate graduates who completed a graduate degree by 2003 compare to those who did not completed a graduate degree by 2003? To what extent do the salaries of 1993 baccalaureate graduates who completed a graduate degree by 2003 differ by gender, race/ethnicity, parental education, or work experience? To what extent do the salaries of 1993 baccalaureate graduates not completing a graduate degree differ by gender, race/ethnicity, parental education, or work experience?

Descriptive statistics indicated the annual salary of individuals who received a graduate degree was higher than individuals who earned a bachelor’s degree among all variables (institution type, graduate major, race/ethnicity, parental education, and work
experience). In general, this finding confirms and expands on Perna’s (2003) undergraduate study that examined the percentage of earning premium attributable to completing a bachelor’s degree in comparison to completing a high school diploma. The study also examined how the earnings varied by sex, race, and socioeconomic status. Perna (2003) concluded that earning premiums increased with the level of educational attainment. Students who attained a bachelor’s degree earned 36% more than high school diploma recipients ($13,678 vs. $10,066). This study demonstrated similar results when extended to graduate degree recipients in comparison to bachelor’s degree recipients. For example, students who attained a graduate degree earned 13% more than bachelor’s degree recipients ($61,413 vs. $54,166).

The current study also corroborates previous studies that have shown the economic disparities of women (Betz & Fitzgerald, 1987; Summer & Brown, 1996). For example, men who received a graduate degree earned substantially more than women who earned a graduate degree ($72,291 vs. $52,787). The explanations of wage differences for men and women in the educational literature ranged from educational attainment level, tastes, hours of work, on-the-job, training, occupation distribution, and discrimination (Mincer, 1974; Woodhall, 1973). Although attempts to prevent sex discrimination, such as the Equal Pay Act of 1963, the current research reinforced findings of earlier studies that showed women remained economically disadvantaged (Angle & Wissman, 1981; Blau, 1977; Hauser & Featherman, 1976; Hines, Tweeten & Redfern, 1970).
The results for the average 2003 salary of non-White individuals were higher than Whites who earned a graduate degree ($62,417 vs. $60,964). This finding may be an indication that affirmative action programs have effectively increased the amount and interest in social attainment of non-Whites. Another possible explanation for this finding is that there were fewer non-White graduates than White graduates in the sample (50,000 vs. 246,000), which could have placed non-Whites in higher demand by companies seeking a diverse workforce. Interestingly, non-Whites did not realize the same financial premium at the undergraduate level. For instance, non-Whites earning less than a graduate degree earned less than their White counterparts ($51,102 vs. $54,734). This result is consistent with previous research (Perna, 2003, 2005) that indicated African Americans and Hispanics earned less than their White counterparts. This finding suggests that non-Whites interested in economic mobility should be encouraged to pursue graduate education.

The salary for individuals whose parents earned a bachelor’s degree or higher was approximately $8,000 more than those whose parents earned less than a bachelor’s degree. This study focused on the intergeneration effect, which is the increment in a person’s education that can be ascribed to the education level of the parent (Swift & Weisbrod, 1965). Past studies attempting to examine the influence of family background on education and occupational aspirations have been grouped into two categories: the social-psychology of the family, which includes value orientations, parental expectations, and parental encouragement; and the structural characteristics of the family, which includes the level of education and occupational achievements of the parents, their
income, size of family, and number and order of siblings (Sewell & Shah, 1968). The findings in this study are consistent with previous studies that indicated family background impacts degree attainment of their children (Hearn, 1984, Karabel & Astin, 1972; Rumberger, 1983; Sewell & Shah, 1968; Thomas, 2000).

Finally, graduate degree holders who possessed one to six years of work experience earned more than individuals with work experience of seven-to twenty-eight years ($65,244 vs. $54,010). The findings of this study are contrary to the conventional wisdom. Typically, individuals with seniority are perceived as more stable and productive than individuals with less seniority. Thus, some employers may choose to pay them higher wages than those with less seniority. These results were counter to Murphy and Welch’s (1989) study that estimated the college premium was higher for those with higher levels of work experience. The authors concluded that individuals with higher levels of education received higher pay than individuals with less education.

Research Question Two

How do the salaries of 1993 baccalaureate graduates, who received graduate degree from a public institution by 2003 compare to those who received a graduate degree from a private graduate institution by 2003? To what extent do the salaries of 1993 baccalaureate graduates who received a graduate degree from a public institution by 2003 differ by gender, race/ethnicity, parental education, or work experience? To what extent do the salaries of 1993 baccalaureate graduates who received a graduate degree from a private institution by 2003 differ by gender, race/ethnicity, parental education, or work experience?
Generally speaking, the results of this study indicated that graduates from private institutions earned more than graduates from public institutions. This finding is consistent with studies at the undergraduate level that suggested graduates from highly or most selective institutions had a positive impact on graduate’s earnings (Brewer & Ehrenberg, 1996; Eide, 1994; Eide, Brewer, & Ehrenberg, 1998). The wage gap was widened for males who received a graduate degree from a private institution in comparison to their female counterparts ($84,576 vs. $54,250). This finding is supported by Monks (2000) who concluded that males received a higher return on investment compared to females who attend a private institution. The results in this study revealed the importance of evaluating the impact of institutional type on the returns on education by gender.

The results were not significant for institution type by race/ethnicity. For example, Whites earned slightly more than non-Whites who attended a public or private institution. Despite the non-significant findings, the salary for Whites and non-Whites who attended a private institution was almost $10,000 more than their public school counterparts. The results of this study suggest there is a financial premium for both Whites and non-Whites who attended a private institution. This finding is consistent with Card and Kruger’s (1992) study which found the returns on education were initially lower for Blacks than for Whites, but the returns converged over time. The authors concluded that improvement in relative quality of schools attended by Blacks was an important casual factor as well as the demand for educated Black labor which resulted from anti-discrimination legislation (Card & Kruger, 1992).
The salary by institution type and parental education level did not yield statistically significant results. Sewell and Shah (1968) concluded that individuals were more likely to complete a given level of education if their parents are (or were) more highly educated. Therefore, parents’ social standing was believed to have an impact on their children’s educational and occupational opportunities. Altonji and Dunn (1996) also found that having a more educated parent was associated with a higher rate of return on education.

The results for institution type and work experience showed significant results for individuals who attended a public institution. The salary was higher for individuals with one to six years of work experience ($63,168) compared to individuals with seven to twenty-eight years work experience ($51,132. This finding is supported by Dustmann and Meghir (2005) findings which suggested the returns on education and work experience increased initially starting at 7% and eventually falling to 1-2% per year beyond 4 years.

Research Question Three

How do the salaries of 1993 baccalaureate graduates who majored in a STEM graduate program by 2003 compare to those who did not major in a STEM graduate program by 2003? To what extent do the salaries of 1993 baccalaureate graduates who received a graduate degree in a STEM graduate program by 2003 differ by gender, race/ethnicity, parental education, or work experience? To what extent do the salaries of 1993 baccalaureate graduates who received a graduate degree in a non-STEM graduate program by 2003 differ by gender, race/ethnicity, parental education, or work experience?
The finding for the comparison by graduate major produced statistically significant results. The average salary for individuals who majored in a STEM graduate program was higher than those who majored in non-STEM across all the variables (institution type, graduate major, gender, race/ethnicity, parental education, and work experience). This study is consistent with previous studies that have shown college graduates who majored in engineering tend to demand higher salaries than students who major in other disciplines (Rumberger, 1984; Rumberger & Thomas, 1993).

The results of this study are similar to research by Blaug (1972) which found that even when men and women held similar jobs, women earned disproportionately lower salaries than men. The wage differences for men and women may be explained by the following: women limiting their job search in order to stay home, women have lower salary expectations and women have lower salary negotiation skills (Joy, 2003). This may appear to blame women for their lower starting salaries without acknowledging structural difficulties. On the contrary, employers may contribute to the inequity of pay of women by hiring men at the higher end of the pay scale than equally qualified women. Joy (2003) concluded that even if women came to the labor market with the same educational credentials and labor market preferences as men, the labor market would still value them less.

Although men earned more than women who majored in both STEM and non-STEM graduate programs, the difference was reduced when women majored in a STEM field ($72,688 vs. $58,484). In contrast, men who majored in a non-STEM earned almost
$20,000 more than women who majored in a non-STEM graduate program ($71,771 vs. $51,806).

The findings for graduate major by race/ethnicity were not statistically significant. Interestingly, non-Whites earned almost $5,000 more than Whites who majored in a STEM graduate program. These findings do not support existing research which shows widespread earning differences among race and ethnic groups. The same was not true however for non-Whites who majored in non-STEM graduate programs. On average Whites earned $59,337 compared to non-Whites who earned slightly less $55,168. Based on the results, non-Whites interested in financial mobility should be encouraged to pursue STEM graduate programs.

The results for graduate major by parental education were mixed. Individuals who majored in a STEM graduate program did not have statistically significant results. For example, individuals whose parents attained a bachelor’s degree or higher earned lower salaries compared to those whose parents attained than a bachelor’s degree ($67,025 vs. $68,592). On the other hand, individuals who majored in a non-STEM graduate program fell within statistically significant territory. For instance, individuals whose parents attained a bachelor’s degree or higher earned higher salaries compared to individuals whose parents attained less than a bachelor’s degree ($63,403 vs. $54,409). Rumberger & Thomas (1993) found family background did not influence the starting salaries of respondents. However other studies (Hearn, 1984; Rumberger, 1984) found that family background tended to have a greater impact on how much education individuals received and on the kind of institution they attended than on earnings of college graduates.
The findings for the comparison of graduate major and work experience were not statistically significant for STEM majors. On average, the salary of individuals who majored in a STEM graduate program and work experience was one to six years was approximately $7,000 more than those with work experience of seven-to-twenty eight years. The salary differences for individuals who majored in a non-STEM graduate program were statistically significant. Non-STEM recipients with one to six years work experience earned approximately $12,000 more than non-STEM recipients with seven-to-twenty eight years work experience.

Research Question Four

How do the salaries of 1993 baccalaureate graduates receiving a graduate degree from a public, private, STEM, or non-STEM graduate program by 2003 differ with gender, race/ethnicity, parental education, or work experience?

Holding degree attainment constant and comparing salary across institutional and individual characteristics, two variables were found to be statistically significant. First, the results showed that there was a premium to earning higher levels of education. The results are supported by the vast majority of economic of education literature that emphasizes enhanced earnings with increased degree attainment. For instances, both financial and non-financial benefits of education are considered in human capital theory (Becker, 1962). However, an alternative view of human capital claims that education merely emphasizes credentialism (Becker, 1992).

Others have argued that the increase in earnings associated with higher levels of educational attainment may be caused by variables other than attendance, such as ability.
or motivation (Taubman & Wales, 1973; Weiss, 1971). In other words, individuals who attain higher levels of education would earn more because they have greater academic ability and higher levels of motivation than individuals with lower levels of educational attainment (Perna, 2003).

Second, the results of this study also showed that women earned less than their male counterparts. This finding is consistent with previous studies that have demonstrated women earn less than men and that the rate of return of a year of education is lower for women than for men (Angle & Wissmann, 1981). Many researchers have concluded that discrimination in the labor market account for the wage differences of men and women. Others have argued that women are disadvantaged in terms of entry, pay and promotion (Graham & Smith, 2005; Roska, 2005). Without more information about the individual’s job selection process decision after graduation, no conclusion could be made about discrimination.

Although the overall results of this study demonstrated that women earned lower salaries than their male counterparts across all variables; the salary gap was reduced with increased degree attainment. For instance, the average salary for men who attained a bachelor’s degree was 47% higher than women who attained a bachelor’s degree ($65,461 vs. $44,423). On the other hand, the average salary for men who attained a graduate degree was only 37% higher than women who attained a graduate degree ($72,291 vs. $52, 787).

The findings of this study also confirmed that women cannot afford to forego the attainment either. When women’s credentials are less they suffer even greater salary
disadvantages. For example, the average salary for men who attained a graduate degree was 63% higher compared to women who attained a bachelor’s degree ($72,291 vs. $44,423).

Policy Implications

There are several policy implications that can be drawn from this study. One of the major findings of this study demonstrated that salary was higher with increased educational attainment. The results have implications for academic counselors working with students to determine career options. According to Paulsen (2001), students from low income families tend to underestimate the earnings premium associated with increased levels of educational attainment. Early intervention programs designed to connect low income students with mentors to help navigate through the academic process might aid in increasing awareness of the economic value of higher education. Service learning and job shadowing opportunities might also provide hands-on experience that is often helpful in clarifying career choices. The finding of this study will also be of significance not only to those interested in higher education, but also to students interested in financial mobility.

This study also found that women earned substantially lower salaries than men. Given the dramatic gains in higher education participation of women during the past twenty years, the salary differentials have implications for policymakers interested in pay equity. If the lower returns on education for females are due to wage discrimination, then this would strongly support the case for enhanced equal pay policies.
Finally, another major finding from this study indicated that majoring in science, technology, engineering, or mathematics (STEM) graduate program significantly increased the income of students. As the demand for a highly skilled workforce increases, university faculty and administrators will need to respond to the market needs by providing innovative professional graduate programs. These programs will need the support of policymakers through increased funding in STEM fields for students at both the master’s and doctoral levels.

Future Research

There are many other interesting ways in which the financial benefits of graduate education attainment may be examined. For example, this study focused only on the financial benefits of graduate education. The analysis is incomplete because it ignored the investment cost of education. Thus far, only a couple of researchers have systematically compared the net benefit of higher education (Hansen & Weisbrod, 1969). Future research should explore the net financial returns of graduate education. A study of the differences in the net benefits of educational attainment across groups could inform our understanding of barriers impeding graduate degree attainment.

This study detailed the financial benefits associated with increased education and placed an emphasis on the private benefits of graduate education. Another interesting approach to this study would include an examination of how factors other than income may influence the decision to obtain a graduate degree. For instance, to say decisions are influenced by expected current and future pecuniary benefits does not provide any insight into how these expectations are formed. For example, do graduate students look at
starting salaries at the time they are making the decision or do they project what starting salaries are likely to be when they complete their program? Future research should examine economic and non-economic benefits of graduate education.

Finally, there are many challenges that limit the quantification of the benefits of graduate education. One of the difficulties has been accessing relevant cohort data. Therefore, long-term implications of such investments have not been clear. This study made the presumption that students progressed directly from a bachelor’s program into a graduate program, followed by full-time employment. However, any attempt to measure graduate education should consider that the effects of higher education are accumulated over an individual’s lifetime. Future research should explore the economic impact of graduate attainment over a longer period.

Limitations

As with all research, this study is not without limitations. The first limitation relates to the use of the B&B: 93/03 survey. As with most secondary data used in education research, simple random sampling was not an option in the B&B: 93/03 survey. Therefore, the lack of respondents with certain characteristics (i.e., certain racial/ethnic groups, those at different types of postsecondary institutions) presents a problem when trying to make inferences about the population. Another limitation of the survey design surrounds the clustering of observations. According to Thomas and Heck (2001), this leads to problems when making inferences about variability in the population and increases the likelihood of making Type I errors. In the present study, this limitation was corrected by using the B&B: 93/03 panel weight described in Chapter 3.
Finally, this study was limited to individuals who attained a graduate degree and reported income in 2003. This only allowed individuals ten years to enroll in a graduate program and gain employment. Most graduate programs take two to six years to complete. Therefore individuals only had a few years to establish themselves in their career fields. Thus, generalizing the findings may be limited. Nevertheless, this was an important study to conduct and contributes to our understanding of graduate degree attainment and salary.
REFERENCES


APPENDIX: NULL HYPOTHESES

Research Question One:

$H_01$: There was no difference in the 2003 annual salary of 1993 baccalaureate graduates who received a graduate degree by 2003 compared to those who did not receive a graduate degree by 2003.

$H_02$: There was no difference in the 2003 annual salary of 1993 baccalaureate graduate who received a graduate degree by gender.

$H_03$: There was no difference in the 2003 annual salary of the 1993 baccalaureate graduates who received a graduate degree by race/ethnicity.

$H_04$: There was no difference in the 2003 annual salary of the 1993 baccalaureate graduates who received a graduate degree by parental education.

$H_05$: There was no difference in the 2003 annual salary of the 1993 baccalaureate graduates who received a graduate degree by work experience.

$H_06$: There was no difference in the 2003 annual salary of 1993 baccalaureate graduates not completing a graduate degree by gender.

$H_07$: There was no difference in the 2003 annual salary of 1993 baccalaureate graduates not completing a graduate degree by race/ethnicity.

$H_08$: There was no difference in the 2003 annual salary of 1993 baccalaureate graduates not completing a graduate degree by parental education.

$H_09$: There was no difference in the 2003 annual salary of 1993 baccalaureate graduates not completing a graduate degree by work experience.
Research Question Two:

H$_{010}$: There was no difference in the 2003 annual salary of 1993 baccalaureate graduates who received a graduate degree from a public institution compared to those who received a graduate degree from a private institution by 2003.

H$_{011}$: There was no difference in the 2003 annual salary of 1993 baccalaureate graduates who received a graduate degree from a public institution by gender.

H$_{012}$: There was no difference in the 2003 annual salary of 1993 baccalaureate graduates who received a graduate degree from a public institution by race/ethnicity.

H$_{013}$: There was no difference in the 2003 annual salary of 1993 baccalaureate graduates who received a graduate degree from a public institution by parental education.

H$_{014}$: There was no difference in the 2003 annual salary of 1993 baccalaureate graduates who received a graduate degree from a public institution by work experience.

H$_{015}$: There was no difference in the 2003 annual salary of 1993 baccalaureate graduates who received a graduate degree from a private institution by gender.

H$_{016}$: There was no difference in the 2003 annual salary of 1993 baccalaureate graduates who received a graduate degree from a private institution by race/ethnicity.

H$_{017}$: There was no difference in the 2003 annual salary of 1993 baccalaureate graduates who received a graduate degree from a private institution by parental education.

H$_{018}$: There was no difference in the 2003 annual salary of 1993 baccalaureate graduates who received a graduate degree from a private institution by work experience.
Research Question Three:

$H_0^{19}$: There was no difference in the 2003 annual salary of 1993 baccalaureate graduates who majored in a STEM (science, technology, engineering, or mathematics) graduate program compared to those who majored in a non-STEM graduate program by 2003.

$H_0^{20}$: There was no difference in the 2003 annual salary of 1993 baccalaureate graduates who majored in a STEM (science, technology, engineering, or mathematics) graduate program by gender.

$H_0^{21}$: There was no difference in the 2003 annual salary of 1993 baccalaureate graduates who majored in a STEM (science, technology, engineering, or mathematics) graduate program by race/ethnicity.

$H_0^{22}$: There was no difference in the 2003 annual salary of 1993 baccalaureate graduates who majored in a STEM (science, technology, engineering, or mathematics) graduate program by parental education.

$H_0^{23}$: There was no difference in the 2003 annual salary of 1993 baccalaureate graduates who majored in a STEM (science, technology, engineering, or mathematics) graduate program by work experience.

$H_0^{24}$: There was no difference in the 2003 annual salary of 1993 baccalaureate graduates who majored in a non-STEM (science, technology, engineering, or mathematics) graduate program by gender.
\(H_025\): There was no difference in the 2003 annual salary of 1993 baccalaureate graduates who majored in a non-STEM (science, technology, engineering, or mathematics) graduate program by race/ethnicity.

\(H_026\): There was no difference in the 2003 annual salary of 1993 baccalaureate graduates who majored in a non-STEM (science, technology, engineering, or mathematics) graduate program by parental education.

\(H_027\): There was no difference in the 2003 annual salary of 1993 baccalaureate graduates who majored in a non-STEM (science, technology, engineering, or mathematics) graduate program by work experience.

Research Question Four:

\(H_028\): There was no significant relationship in the 2003 annual salary of 1993 baccalaureate graduates with the variables highest education level, type of institution (public or private) major choice (STEM or non-STEM), gender, race/ethnicity, parental education, or work experience.