# Class Matters: Class of Origin, College Rank, and Variation in Earnings with a Bachelor's Degree

By

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Dissertation

Submitted to the Faculty of the

Graduate School of Vanderbilt University

in partial fulfillment of the requirements

for the degree of

DOCTOR OF PHILOSOPHY

in

Leadership and Policy Studies

August, 2015

Nashville, Tennessee

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## Acknowledgments

I thank the Chair of my committee, John Braxton, for his helpful comments along the way. They led to substantial improvement in the dissertation's theoretical framing and organization. I also thank the other members of my committee, Christopher P. Loss, William R. Doyle, and Liang Zhang for their input. Liang's work, for which he was awarded the same dissertation grant that I have been awarded, helped guide this study. Will answered numerous questions regarding the many methodological decisions that needed to be made. Chris was the advisor with whom I was matched upon my entry to the PhD program. He has mentored me and provided helpful words of encouragement through the years.

Ozan Jacquette is responsible for a notable improvement in the validity in the estimates where they involve the influence of institutional expenditure. He gave me a revised version of the Integrated Postsecondary Education Data System's financial expenditure and enrollment variables. Ozan himself had spent many hours editing the data such that analyses would be less negatively impacted by some of the data's structural characteristics.

This research was supported by a grant from the American Educational Research Association, which receives funds for its "AERA Grants Program" from the National Science Foundation under Grant #DRL-0941014. Opinions reflect those of the author and do not necessarily reflect those of the granting agencies.

## Table of Contents

Acknowledgments ..... iii

List of Tables ..... vi

List of Figures ..... viii

Chapter 1: Introduction ..... 1

Theoretical Framework ..... 3

Analytic Framework ..... 18

Contribution and Significance of Study ..... 24

Chapter 2: Literature Review ..... 27

Economic Return to Higher Education ..... 27

Variation in the Economic Return to a Degree by Institutional Type ..... 30

Variation in the Economic Return to a Degree by Social Class ..... 35

Other Influences on the Economic Return to a Degree ..... 41

Summary and Significance ..... 47

Chapter 3: Methodology ..... 50

Data and Sample ..... 50

Research Design ..... 60

Analytic Design ..... 67

Chapter 4: The Influences on Earnings Ten Years after Graduation ..... 102

Descriptive Statistics ..... 102

Findings ..... 112

Discussion ..... 129

Conclusion ..... 134

Chapter 5: Change over Time in the Influences on Earnings ..... 137

Descriptive Statistics for the 92/93 and 07/08 Cohorts ..... 137

Findings: Research Question Three ..... 155

Discussion ..... 165

Conclusion ..... 178

Chapter 6: Conclusion ..... 181

Limitations ..... 182

Questions and Hypotheses ..... 186

Higher Education and Social Stratification ..... 188

References ..... 198

## List of Tables


1. Characteristics of Unmatched and Matched Samples……... 87
2. Means for Earnings and Predictors……..105
3. Means for Earnings and Predictors, by College Rank……107
4. Means for Earnings and Predictors, by SES……109
5. Model Set One: OLS & HLM Effect of SES Quintile on Earnings……114
6. Model Set One: OLS & HLM Effect of Elite SES on Earnings……..115
7. Model Set Two: OLS & HLM Effect of SES Quintile on Earnings, by Rank……117
8. Model Set Two: OLS & HLM Effect of Elite SES on Earnings, by Rank……..118
9. Model Set Three: OLS & HLM Effect of College Rank on Earnings, by SES Quintile.121
10. Model Set Three: OLS & PSM Effect of College Rank on Earnings, by SES Quintile..122
11. Model Set Three: OLS & HLM Effect of Individual and Institutional Characteristics on Earnings, Bottom Quintile……...127
12. Model Set Three: OLS & PSM Effect of Individual and Institutional Characteristics on Earnings, Bottom Quintile……...128
13. 92/93 Cohort: Means for Earnings and Predictors……...139
14. 92/93 Cohort: Means for Earnings and Predictors, by College Rank……..141
15. 92/93 Cohort: Means for Earnings and Predictors, by SES……143
16. 07/08 Cohort: Means for Earnings and Predictors……...148
17. 07/08 Cohort: Means for Earnings and Predictors, by College Rank……..150
18. 07/08 Cohort: Means for Earnings and Predictors, by SES……152

19. Model Set Four, Configuration One: OLS Effect of SES Quintile on Earnings, 92/93 & 07/08 Cohorts……...158
20. Model Set Four, Configuration One: OLS Effect of Elite SES on Earnings, 92/93 & 07/08 Cohorts…….159
21. Model Set Four, Configuration Two: OLS Effect of SES Quintile on Earnings, by Rank, 92/93 & 07/08 Cohorts……161
22. Model Set Four, Configuration Two: OLS Effect of Elite SES on Earnings, by Rank, 92/93 & 07/08 Cohorts……162
23. Model Set Four, Configuration Three: OLS Effect of College Rank on Earnings, by SES Quintile, 92/93 & 07/08 Cohorts…….164

## List of Figures

1. The mechanisms through which college graduates' social class of origin influences their earnings……....4
2. Distribution of propensity scores in Treatment and Control groups……..85
3. Region of support in propensity scores in Treatment and Control groups……86
4. Quantile-Quantile plot of parental income in Treatment and Control groups……...90
5. Distribution of parental income in Treatment and Control groups……90
6. Quantile-Quantile plot of test score in Treatment and Control groups……..91
7. Distribution of test score in Treatment and Control groups……..92
8. Quantile-Quantile plot of months to college in Treatment and Control groups……92
9. Distribution of months to college in Treatment and Control groups……93

## Chapter 1: Introduction

Given the increasingly high cost of higher education and a recent economic slump, the media has presented frequent discussion of the economic "worth" of higher education (Martin & Lehren, May 12, 2012; Stewart, September 13, 2013). Some have argued that "college isn't for everyone," that it may not be "worth it" for everyone (Stainburn, August 2, 2013; Vedder, April 09, 2012). Given the threat of high student loan debt, one might argue that students with few financial resources should not pursue a degree. However, empirical evidence suggests that higher education is indeed worth the cost and can in fact be more "worth it" for students from low-income families than for students from high-income families, especially if they earn degrees from elite colleges (Brand & Xie, 2010; Dale & Krueger, 2002; Zhang, 2005).

This project explores variation in college graduates' earnings as a function of their parents' socioeconomic status. College type is an important influence on this variation. Empirical research has indicated that low-income origin graduates of highly-selective colleges earn more than low-income graduates of non-selective colleges (Bowen, Kurzweil, & Tobin, 2005; Zhang, 2005). However, they earn less than high-income graduates of those same highly-selective colleges (Bowen et al., 2005). I explore the institutional and individual student characteristics that explain these class-based gaps in post-graduation earnings.

In this study, I give attention to the characteristics of elite colleges that promote greater upward mobility for their low-income origin graduates, relative to the mobility of low-income graduates of lower-ranking institutions. It may simply be innate qualities of students at elite colleges, such as great discipline and ability, that drive their success, but it may also be that elite colleges provide more resources than less-selective institutions. In addition, I wanted to know

why low-SES graduates of elite colleges have lower earnings than their high-SES peers. The findings have implications for actions that all colleges can take to improve the post-graduation outcomes of their low-SES students. Because the focus in this study is on the persistent influence of parents' socioeconomic status, the term "SES" in the descriptors "low-SES student" or "low-SES graduate" shall refer to the socioeconomic status of a student's parents, not the socioeconomic status that a student attains after earning a bachelor's degree.

The data from the National Center for Education Statistics's Baccalaureate and Beyond Longitudinal Study provide an opportunity to explore change over time in the phenomena described above. I analyze change over time in the variation in the return to a college degree by comparing the one-year post-graduation outcomes of 1993 and 2008 college graduates. The 1993 data reflect a more prosperous time, while the 2008 data reflect the beginning of an economic recession. It may be that a more-competitive job market exacerbated the immediate post-graduation gap in economic outcomes between low-SES and high-SES graduates, or between low-SES graduates of highly-selective colleges and low-SES graduates of less-selective colleges.

My research questions are as follows:

1. What is the post-graduation earnings gap between high-SES origin and low-SES origin college graduates?
    a. How does the earnings gap differ according to institutional ranking?
    b. Among low-SES origin graduates, is a degree from a high-ranking institution associated with higher earnings than a degree from a low-ranking institution?
2. What student or college characteristics help to explain the post-graduation earnings gap between high-SES origin and low-SES origin students?

a. If some low-SES origin graduates have higher earnings than others, what factors explain this phenomenon? Can it be explained by different student or college characteristics?
b. If a degree from an elite college is associated with higher earnings among low-SES origin graduates, what characteristics of elite colleges promote higher earnings?

3. Did the post-graduation earnings gap, or the factors that influence it, change over time?

These research questions address the complex relationships between the social class in which one grows up, one's educational experiences, and one's earnings as an adult. There are many processes at work in these relationships, which I outline in a theoretical framework.

**Theoretical Framework**

Due perhaps to a dearth of other research about the relationship between class of origin and post-graduation earnings, no other scholar has established a theoretical framework to explain this relationship. In this section, I outline an original theoretical framework that explains the processes by which class of origin influences the earnings of bachelor's degree holders. The processes within the framework are based upon evidence from the literature and well-known sociological theories.

The theoretical framework is illustrated in Figure 1. The mechanisms by which class of origin influences the earnings of college graduates are organized into four categories: social capital, cultural capital, institutional characteristics, and collegiate qualifications. Parents' socioeconomic status influences each of these factors—the amount of social and cultural capital one has, the type of college one attends, and the qualifications with which one graduates. These

factors proceed to influence earnings following college graduation. The processes through which this occurs are enumerated in this section.

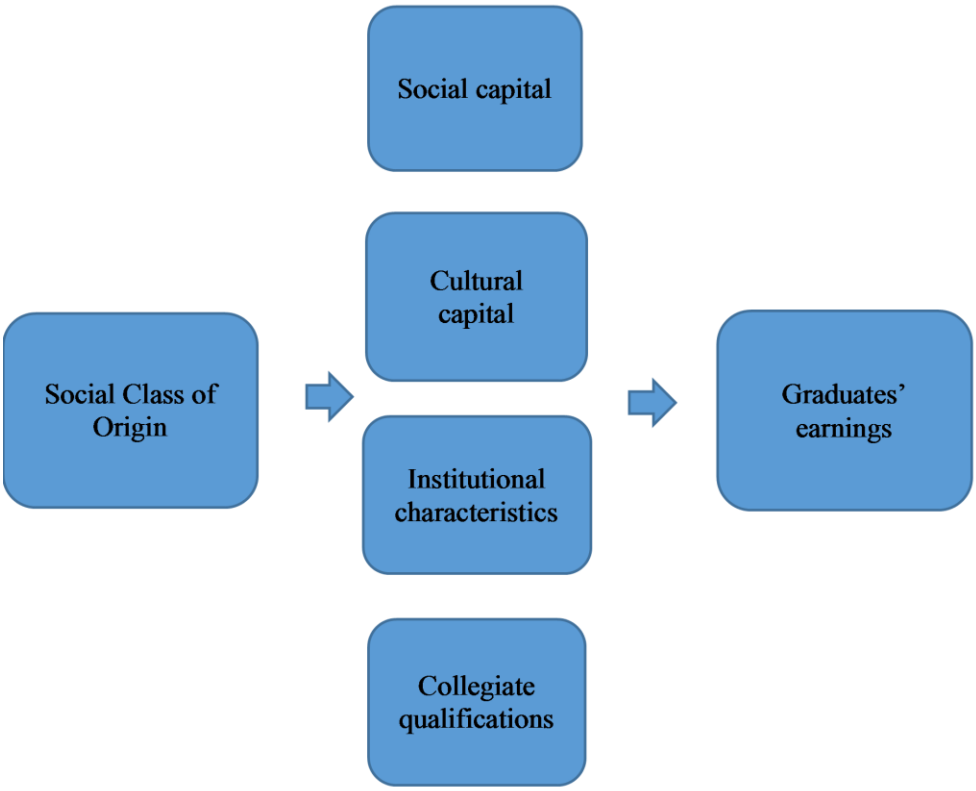


Figure 1. The mechanisms through which college graduates' social class of origin influences their earnings.

**Social capital**

One's class of origin influences one's social capital, which then influences one's earnings. Social capital consists of two elements: the number and quality of social connections, and the capital available to a person through these connections (Bourdieu, 1986; Portes, 1998). The capital possessed by one's social connections increases one's own capital. One can benefit both materially or symbolically from one's social capital. One can receive goods or services

through social relationships (material benefits), or one can benefit from the prestige of a group with which one is associated (Bourdieu, 1986). In summary, social capital refers to the benefits that one can receive through one's social network.

In the context of this project, the social capital that matters are social connections who can provide benefits related to employment appropriate for a college graduate. Students from high socioeconomic backgrounds have more of this type of social capital because they have more family and friends who work in well-paying occupations that require at least a bachelor's degree. Social capital helps high-SES graduates find employment, including employment that pays a high salary (Armstrong & Hamilton, 2013; Bourdieu, 1977). Conversely, a lack of social capital hurts low-SES graduates' labor market outcomes (Armstrong & Hamilton, 2013; Bourdieu, 1977; Tholen, Brown, Power, & Allouch, 2013).

In their book, *Paying for the Party*, Armstrong and Hamilton (2013) show that social capital by way of well-connected parents can be critical to obtaining a position appropriate for a college graduate, in one's desired field, in a desirable location (i.e., a large city). Social capital is particularly important for students who are not academically high-achieving or not on professional paths. Armstrong and Hamilton describe a group of students on the "party pathway," who spend an inordinate amount of time socializing, typically have "easy" majors such as business, media, tourism, or fitness, and earn low grade point averages. Some of these students, the "socialites"—from the upper-middle or upper class—have wealthy, well-connected parents who, through their social connections, help them obtain jobs in "glamour industries" such as media and fashion that are located popular cities such as New York City and Washington, D.C. These are fields in which "networks, charm, and fashion sense were more relevant than GPA" (p. 217).

The glamour industry jobs do not necessarily pay well, but it does not matter for the socialites, whose families are so wealthy that they need not be financially self-sufficient. Students from less-privileged families, who have the same "easy" majors and poor academic performance, have trouble findings jobs that are in their desired fields and pay enough for them to live independently in desirable cities (Armstrong & Hamilton, 2013). The experiences of the graduates in Armstrong and Hamilton's study suggest that even among graduates of similar colleges, who leave college with similar qualifications, there will be disparities in labor market outcomes according to social class of origin.

### Cultural capital

As with social capital, the social class in which one is raised has a strong effect on one's level of cultural capital, which in turn influences labor market outcomes. Cultural capital is a broad concept but can be summarized as consisting of the "verbal facility, general cultural awareness, aesthetic preferences, information about the school system, and educational credentials" characterizing the higher social classes (Swartz, 1997, p. 75). One acquires cultural capital from two sources: one's family and one's schooling. Students who acquire cultural capital from their families before they begin school are at an advantage because the acquisition of cultural capital in school requires cognitive tools that are themselves a form of cultural capital. These cognitive tools consist "mainly of linguistic and cultural competence and that relationship of familiarity with culture which can only be produced by family upbringing when it transmits the dominant culture" (Bourdieu, 1977, p. 494). Students with more cultural capital will perform better, academically, because the education system is structured to reward cultural capital.

High-SES origin students have more cultural capital, therefore, than low-SES origin students because their families have more of it to transmit to them, and because they were better able to acquire cultural capital throughout their schooling. Their greater cultural capital leads to higher academic performance, which in turn results in higher academic qualifications (Bourdieu, 1977). Academic qualifications are an institutionalized form of cultural capital that legitimate higher socioeconomic positions. In this way, the education system acts as a mechanism of social reproduction (Bourdieu, 1977, 1986).

Academic qualifications can open doors to middle-class occupational positions for low-SES origin students. On the one hand, the increasing importance of academic qualifications in the labor market means that familial transmission of cultural capital within the upper classes is not the only path of entry to positions of power (Bourdieu, 1986). On the other hand, academic qualifications are not necessarily enough to enable low-SES origin graduates to reach the highest ranks of the labor market. The reason is that reaching the top also requires economic and social capital. Graduates who are the offspring of heads of industry will have these in greater quantities than low-SES origin graduates and will be at an advantage, especially if they also have the academic qualifications to legitimize their high socioeconomic positions (Bourdieu, 1977).

Cultural capital is institutionalized in the form of academic qualifications, but it is also embodied within individuals in the form of a cultured disposition or "habitus" (Bourdieu, 1986). A working-class student may earn academic qualifications such as a bachelor's degree despite having less embodied cultural capital than middle- or upper-class students, but this qualification does not mean that the student has accumulated the level of cultural capital embodied in her higher-class peers. Low-SES graduates' dearth of embodied cultural capital negatively affects their prospects in the labor market.

The low-achieving, less-privileged students in *Paying for the Party* (Armstrong & Hamilton, 2013) had trouble finding jobs not only because they had less social capital than their similarly low-achieving but privileged peers. The less-privileged students also had less cultural capital, which made finding employment in fields that valued a refined disposition more difficult. A Canadian study examined the relationship between cultural knowledge and the skill and complexity of thought required in one's job (Garnett, Guppy, & Veenstra, 2008). The authors measured participants' familiarity with works of literature, magazines, athletes, and artists. They examined the influence of two types of cultural capital: "omnivore" cultural capital, which is familiarity with a large number of cultural artifacts, and "highbrow" cultural capital, which is familiarity with the cultural artifacts with which few people are familiar. Both types of capital predicted occupational skill and complexity when controlling for level of education.

Another study describes the importance of cultural capital in gaining access to high-paying jobs in elite investments banks, law firms, and management consulting firms (Rivera, 2011). The recruiters not only hire primarily from very few, elite colleges, but they prefer candidates who have participated in extracurricular activities associated with the upper-middle class, such as lacrosse, squash, and crew. They perceive candidates who have participated in the "right" extracurricular activities as having superior social and time-management skills and being enjoyable to be around during long working hours. Another aspect of one's cultural disposition, or habitus, is one's occupational expectation for oneself. Low-income students may have lower earnings because they have lower expectations for themselves than do high-income students, both in terms of their academic attainment and the prestige and power of their occupation, even if they attend a highly-selective college (Aries & Seider, 2007).

Inequalities in social capital or any of the aforementioned manifestations of cultural capital lead to different earnings among people with bachelor's degrees. As we shall see in the next section, college experiences can reduce such inequalities in capital, but it is unlikely that they can be eliminated completely.

### Institutional characteristics

The third mechanism that mediates the relationship between SES of origin and post-graduation earnings are the characteristics of the college one attends. Classic works have discussed the mediating effect of education and educational experiences on the relationship between family SES and current SES (Blau & Duncan, 1967; Sewell & Hauser, 1975; Smart & Pascarella, 1986). Smart and Pascarella (1986), for example, show that family SES has an indirect effect on current SES through college selectivity and academic integration. In this project, the institutional characteristics of focus are institutional rank, financial resources, and expenditures.

#### *Institutional rank*

One's socioeconomic status is related to the rank of college one is likely to attend: low-income students attend lower-ranking institutions than high-income students, on average (Baum, Ma, & Payea, 2013; Thomas & Bell, 2008). However, it is to low-income students' benefit to attend high-ranking institutions; a number of studies have shown that higher college rank and selectivity are associated with higher earnings after graduation (Behrman, Rosenzweig, & Taubman, 1996; Black & Smith, 2006; Brewer, Eide, & Ehrenberg, 1999; Long, 2008, 2010; Monks, 2000; Mueller, 1988; Solmon & Wachtel, 1975; Thomas, 2000, 2003; Trusheim & Crouse, 1981; Zhang, 2005). College rank can influence earnings in several ways: high-ranking

colleges may signal high ability to employers, or they may provide their students with more human, social, and cultural capital than lower-ranking colleges.

The Wall Street recruiters in Rivera's (2011) study preferred graduates of a few elite colleges not because the graduates had the specific skillset needed for the job, but because the graduates were perceived as being very intelligent. The graduates were also perceived as having superior moral characteristics such as the good judgment and foresight to choose to attend an elite college. A study about students at Britain's Oxford University and France's elite Science Po illustrated the same phenomenon. These students had access to elite organizations and positions because the employees, who were themselves often graduates of the most elite colleges in their country, believed graduates of high-ranking colleges to be highly-able and intelligent (Tholen et al., 2013).

The signaling effect allows for the possibility of an illusion: although graduates of elite colleges are perceived to have superior qualities, they may not. It is also possible, however, that higher-ranking colleges increase earnings because they truly provide their students with more human, social, and cultural capital than lower-ranking colleges (Gerber & Cheung, 2008). An education at an elite institution may impart more human capital, which is knowledge and cognitive skill. Braxton and Nordvall (1985) found evidence of this when they compared exam questions between more- and less-selective liberal arts colleges. They discovered that students at the more-selective institutions were asked to use higher-order cognitive skills more frequently than students at less-selective colleges.

College rank is also related to the social capital that students have the opportunity to gain. High-ranking colleges provide opportunities to access elite career networks. In her study of recruitment into elite Wall Street positions, Rivera (2011) reports that the firms actively recruit

from only about five core target colleges, and applicants who are not associated with one of the approximately ten to twenty recruitment colleges do not receive attention. The study about students at Britain's Oxford University and France's elite Science Po showed how high-ranking colleges provide access to elite labor market positions (Tholen et al., 2013). Students at these colleges have exclusive access to elite employment networks because many positions are advertised only to them. Recruitment for a full-time position or internship often occurs only at elite institutions. Elite institutions host networking events and guest speakers, and students at these institutions may be invited to external corporate recruitment events. Alumni, faculty, student peers, and students at other elite institutions also offer this privileged kind of social capital.

In addition to providing social capital, colleges are sources of cultural capital. Several scholars have described the cultural transformations experienced by working-class or first-generation college students (Aries & Seider, 2005, 2007; Hurst, 2010; Jensen, 2004; Lehmann, 2009; London, 1992; Reay, Crozier, & Clayton, 2009). When these students attend college, their speech, dress, interests, tastes, and cultural knowledge change; in other words, they acquire some of the cultural capital associated with higher social class groups. The higher-ranking the college, and the higher the socioeconomic status of its students, the more cultural capital there is to be acquired. Aries and Seider (2005, 2007) compared the experiences of low-income students at a highly-selective liberal arts college to those at a state college. The low-income students at the highly-selective, private institution were more exposed to middle- and upper-class people and, partly in order to better fit in, adopted more middle- and upper-class behaviors and aspirations than did low-income students at the state college.

When low-SES origin students go to college, especially high-ranking colleges, they have the opportunity to acquire social and cultural capital that they had not acquired from their families. However, evidence from the literature suggests that although low-SES origin students' levels of social and cultural capital may rise, they do not match those of high-SES origin students. Higher education does not make up for the lower capital held by their families and consequently, low-SES origin college graduates enter the labor market at a disadvantage. For example, the women who took the "party pathway" in Armstrong and Hamilton's (2013) study were exposed to similar social experiences in college—some were even in the same sororities—but they began and ended college with varying levels of social capital. In the labor market, the social capital that was most helpful was family social capital, and no amount of collegiate socializing could provide that.

An important reason why the capital of low-SES students does not rise to meet that of high-SES students is because capital builds upon capital. This phenomenon has been described in several studies. A comparison of the extracurricular participation of upper-middle and working-class students revealed that upper-middle class students participate in more activities and that they gain more social and cultural capital from their participation (Stuber, 2009). Working-class students are less likely to participate because they have less time and money to do so. Moreover, they are less likely to believe extracurricular participation will matter much, instead having faith in the importance of grades and work ethic on the labor market. Upper-middle class students are more likely to pursue such capital building activities as student government, study abroad, and Greek Life. They are culturally disposed to want to participate, and when they do, they have the social skills to succeed and build more capital. In this way, the distribution of extracurricular

participation in college reproduces capital inequalities between high- and low-SES origin students.

The study about students at Oxford and Science Po (Tholen et al., 2013) found that although attendance at these institutions opens doors to elite social networks, not all students will walk through those doors or succeed if they do. The building of privileged social networks requires economic, social, and cultural capital. Students needed to know how to be proactive in networking and to have the social skills to impress recruiters (social and cultural capital). They also needed the financial resources to afford to do an internship (economic capital). Similarly, working-class students at a Canadian research university expressed that their lack of economic capital and the need to work limited their ability to gain experience and social contacts in their desired career fields (Lehmann, 2009).

We are starting to see from these examples see how graduates' social, cultural, economic, and human capital are interrelated: the possession of one form of capital helps one acquire more of another. In reference to the partying, very affluent, low-achieving "socialites," Armstrong and Hamilton (2013) aptly summarize these women's advantage: "These women came out on top of hierarchically organized peer cultures as they had the time, money, and know-how to perfect gender- and class-specific interactional skills, appearances, and cultural tastes. They used these positions to extend their social networks with similarly affluent people" (p. 217). Other partying women, from comfortable but relatively less-privileged middle-class and upper-middle class families, did not develop the same social standing, social networks, or cultural refinement.

An alternative trajectory to partying is the professional pathway, but this pathway is academically challenging and the students who succeeded on it were from privileged families. They had strong academic backgrounds and parents who could advise them, both academically

and socially, and fully support them financially. In other words, success on the professional pathway, which led to graduate school and professional employment, required human, economic, and cultural capital in the individual and in the family (Armstrong & Hamilton, 2013).

An issue related to that of capital building upon capital is that of social segregation according to class. One must be exposed to social and cultural capital in order to acquire it, but it can be difficult for low-SES students to form close relationships with high-SES students because their cultural dispositions are different. Furthermore, low-income students cannot afford the social activities of high-income students, such as dining at high-priced establishments (Aries & Seider, 2005). In some cases, students from working-class backgrounds deliberately resist cultural assimilation into the middle class and restrict social relationships with middle-class students (Hurst, 2010).

Stuber (2009), Tholen et al. (2013), and Armstrong and Hamilton's (2013) writings, among others', demonstrate that the more social, cultural, economic, and human capital one brings to college, the easier it is to acquire more. They also demonstrate the difficulty of "catching up" to students with the highest levels of capital. If low-SES students do not catch up, they will not be playing on a level field with high-SES students as they search for employment. A college may be able to help low-SES students catch up by providing them with enough resources and services, even if it is not high-ranking.

### *Financial resources and expenditure*

An institution's financial resources and expenditure have an influence on the earnings of its graduates. In one study, earnings were positively predicted not by average institutional SAT score but by tuition, and higher-tuition institutions may provide students with more or better resources (Dale & Krueger, 2002). Long (2008) also found a positive relationship between

tuition and earnings. An earlier study found that institutional expenditure per full-time student predicted earnings among WWII veterans, and that the return to expenditure was greater at public institutions (Wachtel, 1976), which may indicate that greater expenditure is more helpful if students do not have the advantage of institutional prestige.

The manner in which colleges can grow their students' capital, and therefore their earnings prospects, is by expending their resources for the direct benefit of their students. The amount of institutional expenditure per student, and the areas to which this expenditure is proportioned, varies greatly between institutions (Toutkoushian & Smart, 2001). Low-SES students attend lower-ranking colleges, on average, and lower-ranking colleges have on average fewer financial resources. The institutions with the highest endowments consist of the highest-ranking, most-selective, and prestigious institutions in the country (The Chronicle of Higher Education, 2014). This places low-SES students at a disadvantage, because the amount of resources that colleges spend on academic and student services may influence earnings through its effect on student growth. Specifically, institutional spending on services for students may increase the amount of human, social, and cultural capital that students gain at college.

Greater institutional expenditure per student is positively related to self-reported student gains in interpersonal skills and learning (Toutkoushian & Smart, 2001). It may be the case that the more support that colleges provide, the more academic and social integration students experience. Academic and social engagement are important; they are known to improve student persistence (Braxton, 2000; Braxton, Hirschy, & McClendon, 2004; Kuh, Kinzie, Schuh, & Whitt, 2005). A sense that one belongs leads to a higher-quality college experience and academic performance (Ostrove & Long, 2007). More importantly, social engagement is related to job skills (Hu & Wolniak, 2010), as is academic engagement (Pascarella & Terenzini, 2005).

Academic and social integration have been shown to be related to post-college graduation socioeconomic status (Smart & Pascarella, 1986).

After examining why a public Midwestern research university did not place most of its working- and middle-class women on a path to upward social class mobility, and placed some of its upper-middle and upper-class students on a path to downward mobility, Armstrong and Hamilton (2013) conclude that student outcomes are strongly influenced by the strength of the fit between a students' resources and the pathways provided by the university. In order to be upwardly mobile, the less-privileged students needed more financial support, academic guidance, and academic structure than they received. In fact, the working-class students received the structure that they needed to succeed at lower-ranking, regional public colleges, to which some transferred. This example suggests that it is not merely the amount of institutional expenditure per student, but also how it is spent, that influences student outcomes. Generous institutional expenditure per student has the potential to narrow the capital gap between high- and low-SES students, but it may not, or it may not do so sufficiently to equalize labor market outcomes.

### Collegiate qualifications

The final mechanism that mediates the relationship between class of origin and post-graduation earnings is the qualifications with which one leaves college. Specifically, I am referring to major and grade point average.

Social class of origin is related to one's academic performance. For example, first-generation college students have slightly lower first-year and total grade point averages than other students whose parents have bachelor's degrees or higher (overall GPA of 2.6 compared to 2.9) (Chen, 2005). This may lead to lower salaries for first-generation students, because a higher

grade point average predicts higher earnings after graduation (Loury & Garman, 1995; Thomas, 2000, 2003).

The major one chooses is likewise related to the social class of one's parents. First-generation college students are less likely to choose majors in science, mathematics, humanities, arts, and social studies, and more likely to choose vocational programs of study. Some reasons for this include the weaker academic preparation of first-generation college students and their perception that some of the less-popular majors, such as those in the humanities, lead to low earnings (Chen, 2005).

However, some of the majors that are less common among low-SES students are associated with relatively higher salaries, while some vocational majors are associated with lower earnings. Education majors are associated with lower salaries than any other major category of study, including the humanities. The vocationally-oriented business major is associated with relatively higher earnings, however, as are STEM majors (Hilmer & Hilmer, 2012; Thomas, 2000, 2003). Interestingly, while STEM majors are associated with higher earnings, there is evidence that these fields are less meritocratic than others. In a comparative study of the effect of family income on earnings between different majors, the authors found that that the size of the positive effect of family income on earnings is strongest among science and math/computer science/engineering majors. By contrast, the size of the positive effect of academic attainment on earnings is greatest among business, science, and education majors (Wolniak, Seifert, Reed, & Pascarella, 2008).

In summary, the theoretical framework presents four overarching mechanisms by which the social class in which they grew up influences the earnings of college graduates. These mechanisms are social capital, cultural capital, institutional characteristics, and collegiate

qualifications. One is inescapably dependent on one's family for one's social and cultural capital, and since low-SES families have less of this capital, low-SES students are disadvantaged on the labor market. They may receive a boost if they attend an elite college or a college that has high institutional expenditure on student services. Elite colleges also provide a boost by signaling desirable traits to employers. However, while low-SES students may gain some social and cultural capital at college—and more at an elite college or one that offers good services—it is unlikely that they can catch up to their high-SES peers. The final mechanism that links class of origin to earnings consists of the student collegiate qualifications of grade point average and major, and in this realm, too, low-SES students are sometimes at a disadvantage.

This theoretical framework shines light on the multiple processes at work in the relationships—between class of origin, education, and earnings—that are addressed by the research questions. I use the framework to develop my hypotheses.

**Analytic Framework**

I present here a summary of my hypotheses, followed by a more thorough discussion of the relationships that I expect to find. The hypotheses that correspond to the first and second group of research questions emerge from the theoretical framework and the literature on which the framework is built. The hypotheses that correspond to the third research question emerge primarily from evidence from the literature, but they are also supported by the theoretical framework.

1. *What is the post-graduation earnings gap between high-SES origin and low-SES origin college graduates?* Hypothesis One: Low-SES origin graduates have lower earnings than high-SES origin graduates. I do not have an expectation of how large this gap is.

a. *How does the earnings gap differ according to institutional ranking?* Hypothesis 1.a: I expect that the higher ranking the institution, the smaller the earnings gap between high and low-SES origin graduates.

b. *Among low-SES origin graduates, is a degree from a high-ranking institution associated with higher earnings than a degree from a low-ranking institution?* Hypothesis 1.b: Yes. The higher ranking the institution, the greater the earnings premium provided to low-SES students.

2. *What student or college characteristics help to explain the post-graduation earnings gap between high-SES origin and low-SES origin students?* Hypothesis Two: Student characteristics that I expect to play a role are the collegiate qualifications of grade point average and major. Institutional characteristics are rank and expenditure on academic services, instruction, and student services.

    a. *If some low-SES origin graduates have higher earnings than others, what factors explain this phenomenon? Can it be explained by different student or college characteristics?* Hypothesis 2.a: Some low-SES origin graduates experience greater earnings than others due to their own characteristics and the characteristics of the colleges from which they earn a degree. Students with certain majors and a high grade point average—which can indicate high ability and discipline—may achieve greater earnings. I expect that graduates of high-ranking colleges have higher earnings. No matter the rank, graduates of colleges with greater financial resources who spend those resources on academic and student services and instruction may produce better outcomes for low-SES students.

b. *If a degree from an elite college is associated with higher earnings among low-SES origin graduates, what characteristics of elite colleges promote higher earnings*? Hypothesis 2.b: Elite colleges may lead to greater earnings for low-SES origin students than lower-ranking colleges because elite colleges have greater resources to spend on their students. They may use their resources to provide superior academic services, instruction, and student services. Alternatively, unobserved effects of the rank itself, such as the signaling of high student ability to employers, may lead to higher-paying employment.

3. *Did the post-graduation earnings gap, or the factors that influence it, change over time?* Hypothesis Three: The gap and its influences have changed over time. I expect that both the high/low-SES and low-SES elite college/low-SES non-elite college earnings gaps changed over time. I also expect that the influences on the high/low-SES earnings gap changed over time.

First, I hypothesize that high-SES college graduates have higher earnings than low-SES college graduates. Low-SES graduates benefit more from college, but only in the sense that the earnings premium they receive from a degree from an elite institution, relative to a degree from a low-ranking institution, is greater (Zhang, 2005). Among college graduates, a higher parental income is associated with slightly higher earnings (Thomas, 2003; Zhang, 2005). Among graduates of elite colleges, those whose parents are in the top income quartile out-earn all other graduates (Bowen et al., 2005). In accordance with my theoretical framework, I expect this post-graduation earnings gap because high-SES origin graduates have more social capital and cultural capital. Low-SES students may gain some social and cultural capital during college, but it is unlikely that they can catch up to their high-SES peers. In addition, the colleges that high-SES

students attend are different from those that low-SES students attend, and the grade point average and major with which they leave college are different.

I expect to find that even if the post-graduation earnings gap exists among graduates of colleges of all ranks, it may be smaller among graduates of elite colleges. Evidence suggests that students from low-socioeconomic backgrounds, who are less likely to go to college, benefit more from college, financially-speaking, than students from high-socioeconomic backgrounds (Brand & Xie, 2010). More importantly, previous evidence suggests that low-SES students benefit more than high-SES students from attending a more selective college (Brand & Halaby, 2006; Dale & Krueger, 2002; Pascarella & Terenzini, 2005; Zhang, 2005).

In my theoretical framework, I outline how higher-ranking colleges may be assisting their graduates: because they signal high ability to employers and because they provide more social, cultural, and human capital than lower-ranking colleges. Low-SES students would benefit greatly from these provisions, and the gap in capital between themselves and high-SES students may become smaller at high-ranking than at low-ranking colleges. It is for this reason that I hypothesize that higher-ranking colleges have smaller earnings gaps between high and low-SES graduates. Concurrently, I expect that the higher-ranking the institution, the greater the earnings premium provided to low-SES graduates, relative to attending a low-ranking institution.

Regarding the influences on earnings, I hypothesize that both student characteristics and institutional characteristics can help to explain the high/low SES earnings gap. They may also explain the earnings gap among college graduates from low socioeconomic backgrounds. Relevant student characteristics I predict are grade point average and major. The evidence suggests that earnings are influenced by both college grade point average (Loury & Garman,

1995; Pascarella & Terenzini, 2005; Thomas, 2000, 2003) and major (Hilmer & Hilmer, 2012; Hu & Wolniak, 2010; Pascarella & Terenzini, 2005; Thomas, 2000, 2003).

Institutional characteristics that help explain the earnings gaps are institutional rank and expenditure on instruction, academic services, and student services. High-SES students are more likely to attend high-ranking colleges, where low-SES students are underrepresented (Bowen et al., 2005). Higher college selectivity is associated with greater earnings (Behrman et al., 1996; Black & Smith, 2004; Brewer et al., 1999; Long, 2008, 2010; Monks, 2000; Mueller, 1988; Solmon & Wachtel, 1975; Thomas, 2000, 2003; Trusheim & Crouse, 1981; Zhang, 2005). This phenomenon could be due to a signaling effect, or it could be because high-ranking colleges develop more capital in their students. High-ranking colleges may have more resources to spend on their students. Greater resources and expenditure on students should improve graduates' outcomes no matter the institutional rank, however. Institutional expenditure on instruction, academic services, and student services can increase students' social and academic engagement, which can increase their acquisition of capital.

My third research question concerns change over time in the relationship between class of origin and post-graduation earnings. I hypothesize that both the post-graduation earnings gap between high- and low-SES graduates and the gap between low-SES elite college graduates and low-SES non-elite college graduates changed over time. I speculate that any change may be related to the fact that the 2007 to 2008 graduates faced a more-competitive labor market upon graduation relative to the 1992 to 1993 graduates[1]. One reason for a more-competitive labor market is an increase in the number of bachelor's degree holders relative to the number of degree-level jobs (Acemoglu & Autor, 2011; Beaudry, Green, & Sand, 2014), and another is the

[1] The 2008 recession is not a part of Hypothesis Three because its role in the relationship between class of origin and earnings cannot be tested with these data.

2007 to 2008 recession. Previous research has indicated that the state of the economy affects college graduates' earnings prospects: a high national unemployment rate at graduation is related to lower earnings immediately after and even fifteen years after graduation (Kahn, 2010).

My theoretical framework suggests that among both cohorts, I will find that high-SES graduates have greater earnings than low-SES graduates, for such reasons as the possession of greater capital and the characteristics of the institutions from which they graduate. I expect that in a more-competitive job market, high-SES students may have an even greater advantage in finding employment and high-paying employment. I also expect that low-SES students at elite colleges would have an easier time finding employment than low-SES students at non-elite colleges. The literature supports the notion that there is variation in the influence of the recession on earnings: A Canadian study found that male graduates who are predicted to have low earnings[2] due to low college quality or ability do not recover as well, in terms of earnings or employer quality, from entering the labor market during a recession as compared to men who are predicted to have high earnings (Oreopoulos, von Wachter, & Heisz, 2012).

The 2008 recession officially began in December 2007 and ended in June 2009. The national unemployment rate was just 5 percent in December 2007, but it grew to 9.5 percent in June 2009, eventually reaching its peak of 10 percent in October 2009. The unemployment rate varied significantly between industries and states. Especially harmful for recent college graduates was the fact that while employment decreased 5 percent overall during the recession, the number of job openings decreased 44 percent (U.S. Bureau of Labor Statistics, 2012). This decrease in job openings indicates a severe drop in hiring, which likely affected college

[2] Earnings in this case were predicted according to college attended, major, and years of study, accounting for Canadian province of study and cohort year. These traits are meant to capture college quality and ability, according to the authors.

graduates by decreasing the probability of finding employment. During the 2008 recession, the unemployment rate for young college graduates increased (The Pew Charitable Trusts' Economic Mobility Project, 2013a).

The U.S economy also experienced recession around the time that the 1992-1993 Baccalaureate and Beyond graduates entered the job market. As a result of the recession that lasted from July 1990 to March 1991, the unemployment rate rose from 5.5 percent to a peak of 7.8 percent in June 1992. Unemployment did not reach pre-recession levels until December 1994 (Borbely, 2010). The 1990-1991 recession was milder than that of 2007 to 2009, and unemployment was less severe. As a result of the 1990-1991 recession, unemployment increased about 2 percent. By contrast, unemployment increased five percent as a consequence of the 2007-2009 downturn (Borbely, 2010). Unemployment was still heightened when the 1992-1993 Baccalaureate and Beyond graduating cohort was beginning to enter the job market, but as the 2007-2008 graduates entered the job market, unemployment was on the rise. If the high/low-SES earnings gap or the low-SES elite college/low-SES non-elite college earnings gaps are related to the competitiveness of the job market, then these gaps may be smaller among the 1992-1993 graduates than among the 2007-2008 graduates. These shifting dynamics have not previously been explored, and the results of my analyses, whether or not they support my hypotheses, make an original contribution to the field.

**Contribution and Significance of Study**

The data used in this project are expansive. The student level data consist of multiple cohorts, which allows me to explore the patterns by which the relationship between a degree and earnings changed over time. My analytic approach, involving not only the commonly used

multiple regression model but also propensity score matching and hierarchical linear modeling, is unusually complex among studies regarding the same subject matter.

Zhang (2005) found a large premium to attending a high-quality college for low-SES students, and Bowen et al. (2005) found that among graduates from the 1976 entering cohort at 11 selective institutions, those from the highest income quartile were earning more in 1995 than the other graduates from their cohort. This study is influenced by these works. However, this study expands on previous work such as Bowen et al.'s by exploring the class-based gap in earnings among graduates of similarly-ranked colleges using relatively larger, more recent, and nationally-representative datasets. One is not likely to expect that graduates of similar colleges, in terms of rank and expenditure on student resources, have distinctly different earnings based on their parents' socioeconomic status but, based on previous evidence and my theoretical framework, I expect this to be the case. This study is the first to use student and institutional college characteristics to explain both the high/low SES earnings gap and the low-SES elite/low-SES non-elite college earnings gap.

The relationships explored in this study are important because they have policy implications for what the federal government, states, and colleges can do to improve upward mobility for low-SES students. The finding that elite colleges are better at helping low-SES students get ahead recommends national, state, and institutional policies to increase access to elite institutions. With more originality, the finding that even among elite college graduates, those from high-SES backgrounds are at an earnings advantage leads me to recommend that elite colleges institute policies and practices such as targeted career advising in order to level the playing field, as best as possible, between their low- and high-SES students.

Giving colleges tools to create a more level playing field in the labor market among students from all backgrounds is imperative at a time when many students, especially those from low-income families, graduate with high debt loads. I find some evidence that colleges can reduce the class-based inequalities among their graduates by expending more resources in certain areas, encouraging their low-SES students to consider particular majors, or giving them the support they need to earn high grade point averages. Such results suggest that even non-elite colleges can take these steps to help their low-SES students enter the labor market on a more level playing field with low-SES students at elite colleges.

The originality of the study will become more apparent throughout the literature review, in which I expound previous work concerning the relationships between one's family's socioeconomic status, college rank, and earnings.

## Chapter 2: Literature Review

In Chapter Two, I examine previous work and theory that relate to the earnings of college graduates. First, I discuss evidence for the economic premium to higher education. Next, I explore an acknowledged source of variation in college graduates' earnings: college rank. I then enter into a discussion of another source of variation, which is of focal interest in this paper but is rarely studied: the social class in which one grew up. In the latter sections, I discuss additional factors that contribute to variation in earnings among graduates: the state of the economy, student characteristics, and institutional characteristics. I conclude with a reiteration of the original contributions made by this study.

### Economic Return to Higher Education

The average economic return to higher education is the context in which I explore variation in the economic return to higher education based on class of origin and institutional type. Individuals with a college degree have much higher earnings than those without a degree, on average. Bachelor's degree holders have incomes almost twice as large as those of non-college graduates (Williams & Swail, 2005). In 2011, the median earnings of full-time workers with only a bachelor's degree were $56,500, much greater than the $35,400 median earnings of workers with only a high school diploma (Baum, Ma, et al., 2013). Pascarella and Terenzini's (2005) review of the literature suggests a bachelor's degree earnings benefit of 37 percent for men and 39 percent for women. Even those with a two-year degree earn more than non-college graduates. Income has grown for college graduates, but stagnated for non-graduates (Haskins, Holzer, & Lerman, 2009).

There is considerable concern regarding the costs of higher education and debt taken on by students and their families. Is the economic return greater than the cost? The answer is yes, on average. After a review of the literature, Hout (2012) concludes that a college education will pay for itself several times over. Zhang's (2005) cost-benefit analysis with a nationally-representative dataset of 1992-1993 college graduates demonstrates that the financial benefits of college exceed the cost by a large amount over the course of a working life. The median student who enrolls at age 18, borrows the full cost of tuition and fees, and earns a bachelor's degree in four years will have compensated for both her debt and lost wages by age 36 (Baum, Ma, et al., 2013). There is large variation in earnings among college graduates, and some graduates cannot manage their debt load, but in general, college graduates earn enough to pay back the amount borrowed and are financially better-off than non-college graduates. Non-college graduates are much more likely to be at the bottom of the earnings distribution than those with a degree (Baum, Kurose, & Ma, 2013).

One reason that the return to a degree outweighs the cost is that earnings growth is greater for graduates than for non-graduates (Baum, Kurose, et al., 2013). This is indicated by the growing gap in earnings between graduates and non-graduates as they age. Those with only a bachelor's degree earn 54 percent or $15,200 more than those without a degree when they are 25 to 29 years old, but the gap grows to 86 percent or $32,000 more among 45 to 49-year-olds (Baum, Ma, et al., 2013). Higher education is also related to the probability of employment. Bachelor's degree holders have greater odds of being employed and of finding employment when unemployed (Williams & Swail, 2005).

Degree-holders receive numerous other employment-related advantages. They receive better health care, longer vacations, and superior work conditions (Williams & Swail, 2005). The

greater the level of education, the greater the employment benefits. In 2011, among full-time employees, 73 percent of those with advanced degrees, 65 percent of those with four-year degrees, and 52 percent of high school graduates could receive employer pension plans. Similarly, 73 percent of those with advanced degrees, 69 percent of those with bachelor's degrees, and 55 percent high school graduates could receive health insurance from their employers. College graduates report a higher level of satisfaction with their work (Baum, Ma, et al., 2013).

The returns to higher education are vast in nature; they extend beyond the employment realm and beyond the individual. Higher education produces positive outcomes for college graduates' communities and the nation (Hout, 2012). College graduates enjoy a greater quality of life. They live longer, in greater health. They vote more, volunteer more, pay higher taxes, and purchase more goods and services. They are less likely to be incarcerated or receive government welfare support (Williams & Swail, 2005).

College graduates have greater linguistic, mathematical, and subject-specific skills. Their critical thinking skills are superior, and they experience more lifelong learning. Furthermore, higher education changes one's character. An extensive review of the literature indicates evidence for psychosocial changes, such as a decline in dogmatism and ethnocentrism; value and attitude shifts, such as greater racial understanding and support for gender equity; and different moral development, especially a shift from moral reasoning based on social authority to moral reasoning based on universal moral principles. The returns to higher education extend to later generations; the children of college graduates have higher academic achievement, academic attainment, job status, and earnings (Pascarella & Terenzini, 2005).

A postsecondary degree is clearly associated with numerous benefits, including greater physical health and intellectual growth. A degree is also associated with higher earnings, on average, but there is evidence that the amount of economic benefit varies according to the type of institution from which one earned a degree.

**Variation in the Economic Return to a Degree by Institutional Type**

This section introduces literature concerning the relationship between college type and post-graduation earnings, which is critical to the framing of this study. Zhang (2005) explores the relationship between post-graduation outcomes and college quality, as measured by institutional position in Barron's Profiles of American Colleges. The nationally-representative data present five-year post-graduation outcomes for students who earned bachelor's degrees in academic year 1992-1993. College ranking is strongly related to earnings. Graduates from middle-quality public and private colleges earn 10 percent more than graduates of low-quality public colleges. Graduates from high-quality public and private colleges earn 20 percent more than graduates of low-quality public colleges. The premium to attending a high-quality college was supported using different measures of college quality: Carnegie Classification, average SAT score, and tuition and fees. Zhang's comparison of the earnings premiums of college quality one and five years after graduation indicates that wage gaps increase over time because high-quality college graduates' earnings increase at a higher rate.

Zhang (2005) presents evidence that attendance at a high-quality college is particularly helpful in high-paying career fields. Using quantile regression, he shows that college quality has a larger effect on earnings at the top of the income distribution than at the bottom. "When going to college becomes a relatively universal phenomenon, it cannot serve as a mechanism to

differentiate the most capable and wealthy students from others. Attending an elite college, then, becomes such a differentiating apparatus," Zhang explains (p. 88). A prestigious college on a resume may be critical to gaining access to the more remunerative career tracks, and to getting to the top inside those tracks.

Graduate school attendance is an indirect source of the economic advantages promoted by high-quality colleges. Students from high-quality colleges are more likely to enroll in graduate school within five years of graduation, more likely to obtain an advanced degree, and more likely to attend a high-quality college for their graduate program (Zhang, 2005). Students who earned bachelor's degrees from high-quality institutions are less likely to attend comprehensive colleges for graduate school and more likely to attend research universities. Regarding doctoral programs in particular, it is bachelor's graduates of high-quality public colleges, relative to low-quality public colleges, who are more likely to attend (Zhang, 2005).

Zhang's work is particularly extensive, but other scholars have examined the relationship between college selectivity or quality and economic outcomes. Most studies have found a moderate but positive effect. Solmon and Wachtel (1975) conducted one of the earliest analyses on this topic. They found that among WWII Air Force veterans, leading research institutions and large doctoral granting institutions are associated with above-average earnings in 1969, while small doctoral granting institutions, comprehensive colleges with a limited selection of programs and other liberal arts colleges are associated with below-average earnings. Wachtel (1976) shows that among the same group of veterans, institutional expenditures per full-time student—another measure of college quality—predicts earnings in 1969. Returns to expenditure per student are greater at universities than colleges and at public institutions than at private institutions.

Predicting 1972 earnings for adult men, Trusheim and Crouse (1981) report that average institutional SAT/ACT score is a highly significant predictor of earnings, even when controlling for intelligence and motivation. Among men with similar backgrounds, qualifications, and occupational status, a one standard deviation increase in college selectivity is associated with an earnings premium of $1,872. Mueller's (1988) analysis of 1979-1980 follow-up data of 1971 college freshmen reveals small effects: average institutional SAT score explains just .21 percent of variation in men's income and .4 percent of variation in women's income. On the contrary, Behrman, Rosenzweig, and Taubman's (1996) work representing identical and fraternal twins born between 1936 and 1955 in Minnesota reveals effects of different measures of college quality: 1994 wages were higher for individuals who attended colleges that are private, smaller, grant Ph.D.s, and provide higher salaries to senior faculty.

Brewer, Eide, and Ehrenberg (1999) consider the effects of institutional ranking according to Barron's Profiles of American Colleges for a nationally-representative sample of the high school class of 1972. They find an earnings premium for the highest-ranking and middle-ranking private colleges relative to the lowest-ranking public colleges, the magnitude of which grows from the 1970s to the 1980s. Monks (2000) also uses Barron's Profiles as a measure of institutional selectivity and reports that for a nationally-representative set of respondents between the ages of 28 to 36, 1993 wages were related to selectivity. Compared to graduates from competitive institutions, those from non- or less-competitive colleges earned 5 percent less, those from very competitive institutions earned 8 percent more, and those from highly or the most competitive colleges earned 15 percent more. Monks also notes a 4.5 percent earnings premium for private colleges and a 14 percent earnings premium for graduate degree granting research institutions relative to liberal arts colleges.

Thomas's (2000) analyses of a nationally-representative dataset of 1992-1993 college graduates show that a 100 point increase in average institutional SAT score is associated with a one percent earnings premium about one year after graduation. Private institutions are associated with a four percent earnings premium, relative to public institutions, but this premium is outweighed by a 57 percent greater debt-to-earnings ratio. In a later analysis of the five-year post-graduation outcomes of the same set of graduates, Thomas (2003) finds a greater earnings premium to college selectivity. Relative to low- and mid-selectivity public and private institutions, mid-selectivity private institutions are associated with a 9 percent and high-selectivity private institutions with a 12 percent earnings premium, which suggests that the greater debt associated with private colleges may be worth it if the college is highly-selective. Liberal arts colleges were associated with 10 percent lower earnings.

Black and Smith (2004) use three measures of college quality: faculty salary, average SAT score, and freshman retention rate and show that among a nationally-representative sample of people in their 30s, men who had attended high-quality colleges instead of low-quality colleges enjoyed a wage premium of about 11 percent in 1998. The wage premium for women was 7.5 percent. Long (2008) also uses multiple measures of college quality—average SAT score, tuition, average full professor's salary, and faculty/student ratio—and demonstrates that early post-graduation wage outcomes are predicted by college quality, though not with all statistical models. In a following analysis, Long (2010) similarly uses a college quality index that includes such factors as average SAT/ACT score and proportion of applicants who are rejected. He concludes that college quality not only predicts wages, but that this effect increases over time.

A few studies have found no statistically significant relationship between college selectivity or quality and economic outcomes. Loury and Garman (1995) show that average institutional SAT score does not predict earnings for White men who graduated from high school in 1972 and attended a four-year college for a minimum of one year; however, selectivity does predict the earnings of Black men. Dale and Krueger (2002) explore the results of multiple statistical approaches with data representing the 1976 first-year cohort of the College and Beyond Survey who worked full-time in 1995. When controlling for selection, average institutional SAT score is not related to earnings. Brand and Halaby's (2006) analyses, using matching to control for selection, also find no association between attendance at an elite college—as indicated by 1969 Barron's ranking—and 1974 or 1992 wages for men who graduated from Wisconsin high schools in 1957.

Several scholars have demonstrated that college type is related not only to earnings, but also to other desirable outcomes, such as the probability of graduating. After a review of the literature, Pascarella and Terenzini (2005) write that the between-college effect on economic outcomes is larger than the effect on developmental outcomes. Nevertheless, they discuss evidence that college selectivity influences "aesthetic, cultural, and intellectual values; political and social liberalism; and secularism," but not "learning, cognitive and intellectual development, the majority of psychosocial change, the development of principled moral reasoning, or shifts in attitudes and values" (p. 593). The literature also supports an effect of college selectivity on academic aspirations and the likelihood of graduating and enrolling in graduate school.

To cite specific studies, Brand and Halaby (2006) found no effect on wages, but did find that elite college attendance predicts occupational status and degree attainment. Long's (2008) analyses indicate a positive effect of college selectivity and a college quality index on bachelor's

degree attainment. Based on subsequent analyses, Long (2010) concludes that the effect of college quality on the likelihood of bachelor's degree attainment increased in the 1980s and 1990s. He also notes that greater college quality is associated with delayed marriage and childbearing, and that the size of these effects increased over time. Smith's (2013) observations are more recent and concern twins who graduated from high school in 2004, 2006, or 2007. A 100-point increase in average institutional SAT score is associated with an approximately 5 percent increase in the probability of graduating.

In summary, several researchers have found that bachelor's degrees from postsecondary institutions of higher quality, selectivity, or rank—depending on the measure used by the researcher—are associated not only with greater earnings but also greater probability of graduation and graduate school enrollment. But there is another important source of variation in earnings among college graduates that must be discussed. Earnings among graduates vary not only by institutional type, but also by the social class in which graduates were raised.

**Variation in the Economic Return to a Degree by Social Class**

Would-be first-generation college students and those from working-class, lower-class, or low-income backgrounds are less likely to enroll in college, enroll in a four-year college, and enroll in a highly-selective institution. Low-income students are overrepresented in two-year and for-profit institutions and underrepresented in four-year nonprofit institutions (Baum, Ma, et al., 2013; Thomas & Bell, 2008). They are less likely to enroll in the most selective college to which they could be accepted. Among 2004 high school graduates who could have been accepted to very selective colleges, 53 percent of lower-SES and 40 percent of upper-SES students actually enrolled in less-selective or two-year institutions. This phenomenon, known as "undermatching,"

is associated with a lower probability of graduation (Baum, Ma, et al., 2013). On average, low-income college students are less likely to graduate. The disparity is stark. Among students who enrolled in colleges in 2003-2004, just 26 percent of low-income (below $30, 489) but 58 percent of high-income (above $88,516) students had graduated with bachelor's degrees by 2009 (Baum, Ma, et al., 2013). Low-income students have a lower likelihood of college attendance and graduation even when taking into account level of academic preparation (Haskins et al., 2009).

While they are underrepresented, low-income and first-generation students do attend elite colleges. In Bowen, Kurzweil, and Tobin's (2005) sample of the 1995 entering cohort at 19 of the nation's most selective colleges, about 11.7 percent of applicants and 10.8 percent of matriculates were low-income; and 6.5 percent of applicants and 6.2 percent of matriculates were first-generation college students. Although they are less likely to enroll and to graduate, students from low-income families actually gain more from a college degree than students from high-income families (Brand & Xie, 2010; Pascarella & Terenzini, 2005). This is not to say that graduates from low-income families earn more than graduates from high-income families. Rather, I am referring to evidence that the financial return of being a college graduate relative to that of not being a graduate is greater for students from low-income families than for students from high-income families.

Recent research explores a phenomenon called negative selection, in which those who would gain more from higher education are less likely to participate or to earn a degree (Hout, 2012). Brand and Xie (2010) found that the positive effect of college completion on wages is larger for those with a low propensity to go to college. For example, a man with low ability whose parents did not finish high school benefits 20 percent more from college completion

relative to someone with high ability whose parents went to college (because typically those with a low propensity to go to college earn so little).

A review of the literature summarizes that college selectivity has a larger effect on earnings for students from low socioeconomic backgrounds or with low academic ability (Pascarella & Terenzini, 2005). A few studies' analyses have shown that students from low-income backgrounds benefit more from greater college selectivity than do other students. While Dale and Krueger (2002) found no relationship between college selectivity—as measured by average SAT score—and earnings about 20 years after enrollment, they did find an effect for low-income students: a 200-point greater average institutional SAT score is associated with an 8 percent greater income for students whose family income is in the bottom income decile. They also found a greater positive relationship between college tuition and earnings for low-income students. Similarly, Brand and Halaby (2006) found that elite college attendance is related to greater degree attainment and occupational status, and that these gains would have been greater for students who did not attend an elite college than for those who did.

Zhang (2005) reports the five-year post-graduation earnings premiums of attending a high-quality private college relative to a low-quality public college among 1992-1993 college graduates. Returns to college quality vary according to two measures of social class: family income and mother's education. The earnings premiums to attending a high-quality college are 12, 43, and 13 percent for students from the bottom, middle, and top thirds of the family income distribution; and 16, 32, and 2 percent for students whose mothers have less than a bachelor's degree, a bachelor's degree, and an advanced degree. Graduates with low and middle levels of parental income or education gain more from attending a high-quality private college, relative to a low-quality public college, than do graduates with high levels of parental income or education.

Bowen, Kurzweil, and Tobin (2005) show that an important barrier to admission at a selective college for low-SES students is inadequate academic preparation. However, for those who do qualify and apply, the experience can be highly remunerative. In their analysis of the 1995 entering cohort at 19 selective colleges and universities, the authors found that the general rule about a lower graduation rate among low-income students did not apply. In fact, academically qualified low-income applicants had a very similar probability as high-income applicants of being admitted, matriculating, and graduating. They also had similar academic performance and earnings.

When students from low-SES backgrounds graduate from selective colleges and universities, they gain an earnings advantage over many other groups. 15 years after earning a degree, low-SES students in the 1976 entering cohort were not only earning more than low-SES students who did not attend college, but more than college graduates in the same age range and even more than high-ability graduates from high-income families who did not attend selective colleges (Bowen et al., 2005).

Yet, while low-income students benefit greatly from attendance at a selective college, they do not catch up to their most advantaged peers (Bowen et al., 2005). Among the 1976 entering cohort at 11 selective institutions, the average 1994-1995 earnings were about 67,000 for students whose parents were in the bottom income quartile, 75 and 74,000 for students from the second and third quartiles, and 86,000 for students from the top income quartile. After controlling for pertinent factors such as SAT score and institution attended, Bowen et al. conclude that graduates from the middle quartiles are not advantaged over graduates from the bottom quartile, but that graduates from the top income quartile earn more than graduates from any other quartile. One contributing factor is that students from the top income quartile are more

likely to obtain advanced degrees than students from the lower three quartiles (Bowen et al., 2005).

There are several reasons why low-SES-origin students' economic outcomes may be poorer than those of high-SES-origin students. While Bowen et al. (2005) found little disadvantage to being low-SES among students who qualified for and applied to selective colleges, other authors' analyses have revealed less positive outcomes. Zhang (2005) found that family income and especially mother's education are related to the probability of graduating from a high-quality (highly-selective) institution. Thomas (2003) shows a moderate relationship between family income and return to college education. Among 1992-1993 college graduates, a $10,000 increase in family income was associated with .3 percent greater earnings in 1997. The variation in debt was more severe: a $10,000 increase in family income was associated with a 4.1 percent decrease in graduates' debt-to-earnings ratio. The debt-to-earnings ratio of first-generation college students was 20.41 percent higher compared to other graduates'. Zhang also reports a small influence of family income on the 1997 earnings of 1992-1993 college graduates. A $10,000 increase in family income is associated with .55 percent higher earnings (which is only $170 dollars at the mean level of earnings). First-generation status was not found to have a statistically significant relationship with earnings.

The odds of upward mobility for a person born into a low social class increase dramatically if such a person earns a college degree (Acs & Zimmerman, 2008; The Pew Charitable Trusts' Economic Mobility Project, 2013b). Social class mobility in the United States, both relative and absolute, remained fairly stable from 1984 to 2004. Data from the Panel Study of Income Dynamics indicates that about half of the individuals who started in the bottom income quintile during this period achieved upward mobility, and those with more than a high

school education were 30 percent more likely to achieve this (Acs & Zimmerman, 2008). Similarly, the same dataset indicates that among those raised in the bottom income quintile, 86 percent of college graduates but only 55 percent of non-college graduates moved into a higher quintile (The Pew Charitable Trusts' Economic Mobility Project, 2013b). Higher education is related not only to a greater likelihood of any improvement in economic circumstances, but also of becoming "rich." Among those whose parents' income was in the bottom quintile from 1967-1971, 10 percent of four-year college graduates but just 3 percent of non-graduates made it into the highest quintile by 2000 to 2008. Among those born into the top quintile, a college degree greatly improves the odds of remaining there (51 percent for four-year graduates compared to 25 percent of non-graduates) (Baum, Ma, et al., 2013).

If a child born into a low-income family earns a four-year degree, they are more likely to be upwardly mobile than their peers who do not earn a degree (Acs & Zimmerman, 2008; The Pew Charitable Trusts' Economic Mobility Project, 2013b). If they obtain a degree from a high-ranking college, they will earn more than their peers who obtain a degree from a low-ranking college (Bowen et al., 2005; Brand & Halaby, 2006; Dale & Krueger, 2002; Zhang, 2005). However, they may still earn less than their fellow graduates from highly-selective, four-year colleges who were born into high-income families (Bowen et al., 2005). Thus far, I have discussed how institutional rank and parents' socioeconomic status are important influences on the return to a four-year degree, but there are additional influences to be considered. My second research question asks whether the earnings gap between high-SES and low-SES graduates can be explained by student or collegiate characteristics. I will also explore change over time in the earnings gap. In the next section, I will explicate other conditions that one must take into account

when predicting the variation in earnings among college graduates: the state of the economy, student characteristics, and institutional characteristics.

## Other Influences on the Economic Return to a Degree

### State of the economy

The return to a degree and to college rank changes over time. Brewer et al. (1999) found that the return to attending a high-ranking private college, relative to a low-ranking public college, was higher for students who graduated in the 1980s than for those who graduated in the 1970s. One contributing factor to the change in the return to a college degree, to which was paid a great deal of attention a few years ago, is the state of the national economy. A high unemployment rate has been associated lower salaries and a lower likelihood of employment for college graduates (Baum, Ma, et al., 2013; Kahn, 2010; Oreopoulos et al., 2012; The Pew Charitable Trusts' Economic Mobility Project, 2013a). I expect that during a recession, graduates from low-income backgrounds may find it even more difficult than usual to compete for jobs with graduates from high-income backgrounds.

Kahn (2010) examines the long-term economic impact of the early 1980s recession on college graduates. Using data representing white males who earned bachelor's degrees between 1979 and 1989, she analyzes graduates' labor market outcomes up to 17 years following graduation. Students who graduated during the recession experienced an initial wage loss of 6 to 7 percent for every one percent increase in the national unemployment rate. This wage loss persisted and was at 2.5 percent 15 years post-graduation. A higher national unemployment rate at graduation was also associated with lower occupational prestige attainment and a greater likelihood of obtaining a graduate degree. A study featuring Canadian men found heterogeneity

in earnings recovery after graduating during a recession (Oreopoulos et al., 2012). The authors found that on average, recession-graduates catch up to the earnings of non-recession-graduates in 10 years. However, among men who are predicted to have low earnings, those who graduate during a recession never catch up to those who do not graduate during a recession.

Evidence from the recent 2008 recession suggests that while there was a negative impact on college graduates, they fared better than non-graduates. The degree of financial advantage provided by a degree may have decreased (Baum, Ma, et al., 2013). Although there is a general upward trend in size of the gap in median earnings between college and high school graduates, the size of the gap decreased between 2008 and 2011 from 74 to 69 percent for men and 79 to 70 percent for women (Baum, Ma, et al., 2013). Still, from 2007 to 2009, college graduates maintained a lower unemployment rate and higher personal and family incomes (Hout, 2012). Current Population Survey data including 21 to 24-year-old college graduates show an adverse economic impact during the recession: the employment rate among four-year graduates declined by 7 percent and wages declined by 5 percent (The Pew Charitable Trusts' Economic Mobility Project, 2013a). However, among high school graduates, the employment rate decreased by 16 percent and wages by 10 percent (The Pew Charitable Trusts' Economic Mobility Project, 2013a).

The state of the economy affects graduates' labor market outcomes and is taken into consideration in my interpretation of change over time in the relationship between a degree and earnings. However, students' individual characteristics and those of the institutions they attended are also an important source of variation in earnings.

### Student characteristics

Researchers have found that post-graduation earnings are related to a number of college students' characteristics, including standardized test scores, grade point average, major, values, race, and gender. In one national sample, college graduates' earnings are positively related to their scores on the Armed Forces Qualifications Test, a measure of academic ability and preparation (Monks, 2000). In a sample of low-income, minority college graduates, SAT/ACT scores were related to post-graduation earnings (Hu & Wolniak, 2010). Students' postsecondary academic performance may also be related to earnings. Loury and Garman (1995) report that a one-point increase in GPA is associated with 9.5 percent greater earnings among White men and 25 percent greater earnings among Black men who graduated from high school in 1972. Among 1992-1993 college graduates, GPA has been found to predict earnings both one year (Thomas, 2000) and five years after graduation (Thomas, 2003). Five years after graduation, a one-point higher GPA is associated with six percent higher earnings. Studies have shown GPA to be related not only to earnings, but also job status, the probability of being employed full-time, and being employed in a position appropriate for someone with a bachelor's degree (Pascarella & Terenzini, 2005).

Studies have shown that students who major in higher-paying fields will have higher salaries, on average. Among 1992-1993 college graduates, education majors have the lowest earnings, while health and engineering majors have the highest one year after graduation. Humanities majors have the greatest debt-to-earnings ratios (Thomas, 2000). Five years later, among the same cohort, debt-to-earnings ratios were no longer related to major, after controlling for labor market conditions, with the exception that business majors had lower debt-to-earnings ratios than education majors. Education majors still had relatively low earnings, and students

who studied business, engineering, health, math, or other sciences earned more (Thomas, 2003). Another examination of the same cohort ten years after graduation reveals that education majors still have the lowest salaries while business, engineering, and even humanities majors earn more (Hilmer & Hilmer, 2012). Similarly, a study on high-achieving, low-income minority college graduates found that STEM majors earned more than other majors one year after graduation (Hu & Wolniak, 2010). The impact on earnings is sizable. Generally, researchers have found an earnings gap of 25 to 35 percent between the highest- and lowest-paying majors (Pascarella & Terenzini, 2005).

Students' values and the desires that motivate them will influence their earnings directly and indirectly, through their choices, such as choice of college, major, and career. Hilmer and Hilmer (2012) examine the relationship between values, choices, and earnings. Students for whom it is important to be financially well-off and/or to be considered an authority in their field earn higher salaries ten years after graduating from college than their peers to whom these qualities are not important. One reason for this is that these students' values lead them to make different decisions than students with dissimilar values. For example, students for whom being financially well-off is important are more likely to attend top-quality public colleges and to major in higher-paying fields such as business or engineering. Students who have different priorities may make decisions that sacrifice high incomes. For example, those for whom it is important to live near parents and relatives are less likely to attend top-quality private colleges and more likely to major in education.

The focal characteristic of this paper is social class, but other demographic characteristics, particularly race and gender, can also influence the relationship between higher education and earnings. For example, Thomas (2000) found that women who graduated with a

four-year degree in the 1990s have both lower earnings and a greater debt-to-earnings ratio than men about one year after earning a degree. He found no race-based differences. Hu and Wolniak (2010) report that among high-achieving, low-income minority college graduates, men earn more than women one year after graduation. Zhang (2005) found a race-based difference: the earnings premium to a degree from a high-quality college, rather than a low-quality college, is greater for non-white than for white students.

### Institutional characteristics

Post-graduation earnings may be influenced by such institutional characteristics as financial resources, expenditure on student-related services, and employer perception of the institution and its students. Institutions with greater financial resources may provide superior opportunities for learning and professional development. There is evidence that the cost of tuition is related to later earnings. Dale and Krueger (2002) found that while average institutional SAT score did not predict the 1995 earnings of the 1976 entering cohort, their earnings were positively predicted by tuition. They suggest that this phenomenon may be due to the fact that higher-tuition colleges may provide a greater number or quality of resources.

An institution with greater resources may be able to expend them to the benefit of student development, college outcomes, and post-graduation outcomes. A strong base of research has addressed the relationship between social and academic engagement in college and student persistence to the second year or to graduation (Braxton, 2000; Braxton et al., 2004; Kuh et al., 2005). Few studies have addressed the relationship between social and academic engagement in college and post-graduation outcomes. Still, the relationship is an important one: “A significant relationship between student engagement during college and subsequent earnings would provide

a policy rationale for promoting the kinds of educational programs and academic structures that facilitate purposeful involvement among students," argue Hu and Wolniak (2010). They examined this relationship among the 2001 entering cohort of Gates Millenium Scholars, who are high-achieving, low-income minority students. Social engagement was positively related to earnings about one year after graduation, but academic engagement was not.

Other studies have found extracurricular participation to be related to students' perception of their job skills, such as leadership and public speaking, and the likelihood of finding employment, because extracurricular participation is valued by employers. Extracurricular activity may influence earnings as well, but the research findings are inconsistent. Regarding academic engagement, cooperative learning (e.g., in group projects), service learning, academic effort in one's program, and interaction with faculty have been shown to be related to increased job skills. Interaction with faculty can also influence students' choice of career (Pascarella & Terenzini, 2005).

Other potentially powerful influences on earnings, particularly in terms of access to high-income positions, are employers' perceptions of institutional quality and the quality of graduates from institutions. Rivera (2011) conducted interviews with recruiters for high-paying positions at elite investment banks, law firms, and management consulting firms. Recruiters' perceptions of and beliefs about institutions and their students are extremely important in recruitment. The employers actively recruit from only about five core target schools, which at the undergraduate level typically include institutions such as Harvard, Princeton, and Yale. Graduates from these institutions are desired not because they are believed to have the specific skills required for a position, but because they are believed to highly-able, socially polished, and on the path to becoming part of the corporate or political elite (potentially a useful connection for the

organization). Extracurricular participation in time-consuming activities (such as varsity sports) that are associated with the white upper-middle-class (such as rowing) are also preferred, because they indicate to recruiters that a candidate is an interesting person with strong time-management skills.

Rivera points out that because recruitment for some of the most elite, high-paying career tracks is restricted to so few institutions, "commonly used measures of educational prestige that do not separate super-elite schools from those that are merely "selective" may not adequately capture the full relationship of institutional status to occupational and socio-economic attainment" (p. 81).

**Summary and Significance**

In the literature review, I have discussed many influences on the relationship between a college degree and earnings. Evidence suggests that college graduates earn more if their parents are high-SES. They also earn more if they graduated from a high-ranking institution, but among graduates of high-ranking institutions, those with high-SES parents earn the most. Graduates' personal characteristics may also play a role: earnings are related to grade point average, major, standardized test scores, and personal values. Earnings are also related to the financial resources and expenditure of the institution where one earned a degree. Furthermore, the relationship between a degree and earnings may vary over time, due in part to the state of the economy.

In this paper, I calculate the earnings gap between high-SES and low-SES graduates. I also calculate the earnings gap between low-SES students who graduated from high-ranking colleges and low-SES students who graduated from low-ranking colleges. Then, I explore how these gaps can be explained by student and institutional characteristics. Finally, I examine

change in the earnings gaps over two cohorts, the latter of which entered the labor market around the time of the 2008 recession. This project makes original contributions along multiple dimensions: its subject matter, its data, and its analytical approach.

Previous scholars have explored the relationship between family SES and earnings, or college rank and earnings, but the scope of this project extends beyond that of previous work. Zhang (2005), for example, explored the difference in the earnings premium to attending a higher-quality college between students from different socioeconomic groups and found a greater premium for low-SES students. This study similarly examines that phenomenon, but it goes further to answer the question of whether low-SES elite-college graduates still earn less than high-SES elite-college graduates. Bowen et al. (2005) examined variation in the 1995 earnings of the 1976 entering cohort at eleven "selective" institutions, but this study employs a larger, more recent sample of graduates from institutions of all rank categories. This study also employs a more-selective "super-elite" institutional rank category than Bowen et al.'s eleven "selective" institutions.

This project is a complex exploration of the gap in earnings between high and low-socioeconomic status graduates, including that which exists among graduates of colleges with a similar rank. In addition, I determine if student or college characteristics can help explain why low-SES students have lower earnings than high-SES students, and why low-SES students who graduate from high-ranking colleges earn more than low-SES students who graduate from low-ranking colleges. This project is the first to explore these relationships. These relationships are important because they have implications for what colleges can do to help low-SES students get ahead.

While the scope of the subject matter is unique, the data also provide a degree of originality. Compared to those used in other studies about the relationship between postsecondary education and earnings, they are relatively more recent and longitudinal in that they span ten years from the time of graduation. Other researchers who used the Baccalaureate and Beyond data, such as Zhang (2005) and Thomas (2003), predicted earnings five years post-graduation. I am able to look ten years post-graduation. Another benefit of the student-level data are their multi-cohort design. The Baccalaureate and Beyond Longitudinal Study's multiple cohorts allow me to examine change over time in the relationship between college and earnings.

The third dimension of originality stems from the study's analytic design, which involves a rare combination of methodologies. Traditionally, analyses in studies concerning the relationship between postsecondary education and earnings are performed with multiple regression models. My use of propensity score matching and hierarchical linear modeling places my project among a minority of papers that are relatively recent, such as those by Black and Smith (2004), who use propensity score matching to match students on their propensity to attend a high-quality college, and by Thomas (2000, 2003), who uses hierarchical linear modeling in his study of the relationship between college selectivity and earnings. The next chapter provides a thorough discussion of the methodology used in previous work, followed by the original research design.

# Chapter 3: Methodology

Chapter Three opens with an account of the datasets to be used in my analyses and a description of the sample represented by the data. I outline the data collection procedure that was used to acquire the student-level data. The source of institutional level data, including my measure of college rank, is also explained. This is followed by the operationalization of the variables and a detailed description of my analytic models. For context, I note the methodological approaches used by other researchers throughout the text.

## Data and Sample

Scholars have employed several methodological approaches to the analysis of the relationship between college selectivity and earnings. Studies vary according to their datasets, measures of college quality or selectivity, and statistical approaches. In order to distinguish this study from similar work by others and to justify my dataset selections, I summarize the data that were used in related studies before returning to a description of the data used in this study.

The populations represented in study samples have grown from the earliest to the more recent studies. Solmon and Wachtel (1975) and Wachtel (1976) use data representing only men who had served in the Air Force during the Second World War. Trusheim & Crouse's (1981) sample, from the Panel Study of Income Dynamics, also consists only of men. Mueller's (1988) data represent both men and women and come from the American Council on Education and surveys developed by the Higher Education Research Institute at UCLA, while others have relied on the selective colleges found in the College and Beyond dataset (Bowen et al., 2005; Dale &

Krueger, 2002). A few researchers have taken advantage of data representing sets of twins (Behrman et al., 1996; Smith, 2013).

Beginning in the 1990s and continuing into the 2000s, researchers have preferred large, longitudinal, nationally-representative datasets. Such datasets include the National Longitudinal Study of the High School Class of 1972 (Brewer et al., 1999; Dale & Krueger, 2002; Long, 2010; Loury & Garman, 1995), High School and Beyond (Brewer et al., 1999; Long, 2010; Loury & Garman, 1995), the National Longitudinal Survey of Youth of 1979 (Black & Smith, 2004; Black & Smith, 2006; Monks, 2000), and the National Education Longitudinal Study of 1988 (Long, 2008, 2010). More recent data can be found in the Baccalaureate and Beyond database, whose first cohort graduated from college in 1992-1993 (Thomas, 2000, 2003; Zhang, 2005). Institutional information has been retrieved from the Integrated Postsecondary Education Data System (IPEDS) (Black & Smith, 2004; Black & Smith, 2006; Smith, 2013; Thomas, 2000, 2003; Zhang, 2005), the College Board's Annual Survey of Colleges (Thomas, 2000, 2003), and the U.S. News and World Report's Directory of Colleges and Universities (Black & Smith, 2004; Black & Smith, 2006).

I pull data from five datasets in order to form the working datasets for analysis. These datasets are two iterations of the Barron's Admissions Competitiveness Index, two cohorts of the Baccalaureate and Beyond Longitudinal Study (B&B), and the Integrated Postsecondary Education Data System (IPEDS). All three data systems—the Barron's Index, the Baccalaureate and Beyond, and IPEDS—are sponsored by the National Center for Education Statistics.

### Baccalaureate and Beyond Longitudinal Study

The student-level data come from two cohorts of the Baccalaureate and Beyond Longitudinal Study (B&B Study). The cohorts graduated in 1992-1993 and 2007-2008[3]. The B&B Study includes only college graduates, and surveys participants from graduation onward about their experiences with employment, finances, education, and family. The B&B data were collected from participant interviews, college transcripts, institutional records, government databases, and admissions test producers. They are appropriate for this study because they are relatively more recent than other large, nationally-representative options and consist of three cohorts (of which I examine two), which allows me to explore change over time.

#### *1993-2003 Sample*

The 1992-1993 graduates were followed until 2003. They were interviewed in 1993, 1994, 1997, and 2003. Students were initially identified and interviewed in 1993 as part of the National Postsecondary Student Aid Study (NPSAS:93). The NPSAS is focused on the financing of higher education and participants' financial circumstances.

In order to build the NPSAS:93 sample, first institutions were selected, and then students were selected from within those institutions. Eligible institutions offered a program of postsecondary education that required at least 3 months or 300 contact hours, and were located in the United States or Puerto Rico. Researchers first created geographic primary sampling units. Institutions were classified into one of 22 strata defined by institutional type. Institutions from each stratum were selected within each primary sampling unit, for a total of 1,390 institutions (Wine, Cominole, Wheeless, Dudley, & Franklin, 2005).

[3] The 1999-2000 Baccalaureate and Beyond graduating cohort was initially included in this study, but it was later excluded upon discovery of a higher rate of missingness in the IPEDS institutional data from the late 1990s, which results in a problematically small sample size.

Students were eligible for the NPSAS if they were enrolled in a postsecondary program at a NPSAS institution, and eligible for the B&B if they had earned or were eligible to earn a bachelor's degree between July 1, 1992, and June 30, 1993. Students were selected with stratified systematic sampling. They were sampled from within five strata that were based on program and level of study. 16,320 of the NPSAS sample were initially deemed eligible for the B&B. 12,480 were retained for the first follow-up in 1994 (based on eligibility) and 11,190 for the second follow-up in 1997. The final sample size in 2003 was 10,440 (Wine et al., 2005).

***1993-2003 Data collection***

For the first follow-up, sample members were sent an invitational letter and informational leaflet in the summer of 1994. Telephone interviews were conducted from June to October, and field interviews were conducted from October to December. 20 percent of sample members initially declined participation. In this circumstance, first refusal conversion specialists worked to attain cooperation, then field interviewers attempted an in-person interview. 74 percent of initial refusals completed the interview (Wine et al., 2005).

In 2003, participants were interviewed over the phone, in-person, or with a self-administered interview online. Online interviews took an average of 37 minutes, while telephone and in-person interviews an average of 35 minutes. The 2003 interview collected information about participants' activities since 1997 in the areas of education, finances, employment, family, and civic participation. Participants could use the self-administered interview starting in February of 2003. Those who had not completed this interview were contacted by telephone, and three months later field interviewers began to trace and interview nonrespondents. The overall unweighted response rate was 86 percent. In addition, the amount of missing data is reasonable.

Out of 650 interview items, just 20 have more than 10 percent missing values (Wine et al., 2005).

Almost 10 percent of the sample initially declined to participate, but 49 percent of them completed the interview. Refusal conversion specialists took over telephone conversations after initial refusal with the intention of gaining participation. These participants were offered nonresponse incentives, as were members of the sample who were not reached by telephone or who began but did not complete the self-administered interview. 55 percent of these sample members completed the interview. At the beginning of data collection, participants were offered a $20 cash incentive to complete the self-administered interview within three weeks. 47 percent of those who self-administered the interview did so within this period (Wine et al., 2005).

***2008-2009 Sample***

As with earlier cohorts, students were sampled from a group that had been selected from within institutions that had been selected for the National Postsecondary Student Aid Study. Eligible postsecondary institutions were those that could receive Title IV aid in the 2007 to 2008 academic year, the criteria for which included offering at least one program that lasted 3 or more months or 300 or more hours. 1,730 eligible institutions were selected from within 46 strata that were based on institutional characteristics that included control and highest degree offered. Students were sampled into the NPSAS from within 20 strata that were based on such traits as program of study. From among these, they were eligible for the Baccalaureate and Beyond if they had received or would be eligible to receive a bachelor's degree between July 1, 2007 and June 30, 2008. 17,170 students were selected for the B&B. They remained eligible if they ultimately did receive the degree by June 30, 2009 (Janson, Siegel, & Bennett, 2013).

***2008-2009 Data collection***

Survey data were collected online, by telephone, and in-person between July 13, 2009 and March 12, 2010. Data collection commenced when sample members were sent an informative packet that included a $5 cash incentive and access to the web interview. Participants received additional cash incentive of $30 to $50 for completing the interview by an early deadline. They were contacted by telephone to prompt interview participation, and a set of telephone interviewers were trained in refusal conversion. Field interviewers were sent to locate and interview nonrespondents. This phase also made use of newer technologies to locate sample members and encourage interview completion, including text messaging, Facebook, and YouTube. Interviews lasted 27.7 minutes, on average. The unweighted response rate was 88 percent, or 15,090 interviews completed. Just 36 out of 1,358 items had greater than 5 percent of data missing (Janson et al., 2013).

**IPEDS**

The institution-level data are sourced from the Integrated Postsecondary Education Data System, a very large dataset of postsecondary institutional information. A new dataset is released every year. Every postsecondary institution that participates in a federal financial aid program must participate, as dictated by Title IV of the Higher Education Act of 1965. There are currently more than 7,500 institutions participating (National Center for Education Statistics (a)). The surveys collect information about institutional characteristics, degree completion, enrollment, student financial aid, graduation rates, institutional finances, and employees (National Center for Education Statistics (b)). I use the IPEDS data to create my indicators of expenditure on academic services, expenditure on instruction, and expenditure on student services. In order to reflect expenditure across the years that students spent at the college from which they graduated,

I calculate the five-year average of expenditure per student in each category[4]. For each B&B cohort, the five-year average is calculated using expenditure and enrollment information from the graduating academic year and the four preceding academic years. I indicate expenditure per student by dividing, for each academic year, expenditure by total institutional Fall enrollment. For-profit institutions are excluded due to limitations of the data.[5]

The IPEDS data are publicly available for download from the website of the NCES, but the data used in this study were provided by Ozan Jacquette[6]. They had been manipulated by Jacquette before they were given to me and are of superior quality to what can be downloaded from the website. The most important manipulation involves the parent-child structure of the original, publicly-available IPEDS data. A portion of the organizational units are "children," meaning that they are campuses (e.g., "branch campuses") belonging to a larger multi-campus unit (e.g., Pennsylvania State University). Children's financial information is often reported with the parent (e.g., the main campus, such as Penn State – University Park), which holds the Title IV Program Participation Agreement with the federal government. In these cases, the parent reports financial figures representative of multiple campuses, rather than the parent campus itself or any of the children themselves. Consequently, financial information for the individual parent or child institutions is not available. Child campus's enrollment data preceding 2004 may also have been reported with parent campuses (Jacquette & Parra, 2014).

As a solution to parent-child reporting, Jacquette collapsed the data at the parent level (among other structural improvements)[7]. What this means for this study is that for each parent

[4] Average time to degree is 4.15 years for the 92/93 graduate sample used in Model Sets One through Three, 4.16 years for the 92/93 graduate sample used in Model Set Four, and 4.04 years for the 07/08 graduates.

[5] In the past, IPEDS reporting requirements varied according to sector (Jacquette & Parra, 2014), and information about expenditure on academic and student services is unavailable for for-profit institutions.

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[7] For a detailed exposition of the IPEDS data structure and the difficulties it presents for analyses, see Jacquette & Parra, 2014.

and child, for enrollment and financial expenditure, the number reported is the sum of enrollment or expenditure across the parent institution and all children[8]. For each parent campus and its children, expenditure per student is calculated by dividing total expenditure across all campuses by total enrollment across all campuses. An alternative response to the parent-child issue would involve dropping child institutions who do not report their own data or parent institutions who report data for multiple institutions. However, this would result in a smaller sample size and reduced external validity/generalizability of the estimates.

Another problem presented by the original IPEDS data are changes in federal accounting standards over time. As a consequence, the variables representing total expenditure on academic services, student services, and instruction are not reporting the same information across survey years. Jacquette resolved this issue in the data he provided to me by re-calculating total expenditure in each category such that the information contained in the variables is consistent across all survey years used in this study.

### Barron's Admissions Competitiveness Index: Measure of college quality and selectivity

The authors of studies concerning the relationship between college rank and return to a degree may refer to college "quality", college "selectivity", or college "type". Although they use different terms, these researchers are often referring to the same institutional characteristic(s). Researchers typically represent college "quality" with one or a few commonly used indicators of institutional selectivity or rank. For example, Zhang's (2005) primary indicator of college "quality" is institutional classification according to Barron's *Profiles of American Colleges*,

[8] An exception was made when all institutions in a parent-child group reported their own data in each year, in which case the number reported remains that of the individual institution.

though he also experiments with institutional Carnegie Classification, average SAT score, and tuition and fees. Zhang finds that no matter which measure is used, college quality is positively related to earnings, though the effect size varies (e.g., using average SAT scores produces smaller estimates than Barron's rankings).

The Barron's Admissions Competitiveness Index has been a periodically used measure of quality/selectivity/rank, as for example by Brewer et al. (1999), Behrman et al. (1996), Monks (2000), Brand and Halaby (2006), and Long (2010). Another frequently used indicator is average institutional SAT (and sometimes ACT) score, as for example by Trusheim and Crouse (1981), Mueller (1988), Loury and Garman (1995), Dale and Krueger (2002), Thomas (2000, 2003), and Smith (2013). Other indicators of college quality include expenditure per student (Wachtel, 1976), average faculty salary, freshman retention rate (Black & Smith, 2004), faculty-student ratio, applicant rejection rate (Black & Smith, 2006), and number of professors per student (Long, 2008).

For my own indicator of college rank, I use the Barron's Admissions Competitiveness Index. This index is appropriate because it has been used by numerous researchers. In addition, the Barron's index is more inclusive than alternative indicators because it ranks four-year colleges based on multiple characteristics related to institutional selectivity. Institutional competitiveness is rated based on admitted students' standardized test scores, GPA required for admission, class rank required for admission, and undergraduate acceptance rate (Schmitt, 2009).

I use the index's 1992 and 2008 iterations. The 1992 data are matched with the 1992-1993 B&B cohort and the 2008 data are matched with the 2007-2008 B&B cohort. These data are at the student level, matched to each participant, and representative of the rank of the college where participants earned their bachelor's degrees. Students who graduated from institutions in

the Barron's "special" category are not included. The "special" category consists of colleges offering programs to working adults and those to which admissions is based not on academics but on skill or interest in such areas as art or music (Schmitt, 2009).

### Working datasets

Data from the B&B study, IPEDS, and the Barron's Index were merged in order to form two working datasets at the student level. The first dataset is used in Chapter Four to answer Research Questions One and Two: 1) *What is the post-graduation earnings gap between high-SES origin and low-SES origin college graduates?,* and 2) *What student or college characteristics help to explain the post-graduation earnings gap between high-SES origin and low-SES origin students?* The second dataset is used in Chapter Five to answer research question three: 3) *Did the post-graduation earnings gap, or the factors that influence it, change over time?*

#### *Dataset One: Research Questions One and Two*

Dataset One is used to address variation in the 2003 earnings of the 1992-1993 graduating cohort (research questions one and two). In order to form Dataset One, the 1992-1993 graduates from the Baccalaureate and Beyond were merged with their graduating institution's characteristics from IPEDS using a shared institutional identifier. These characteristics are average expenditure on academic services, student services, and instruction from 1989 to 1993. Then, the 1992-1993 graduates were merged with their graduating institution's rank from the 1992 Barron's Index, also using a shared institutional identifier.

#### *Dataset Two: Research Question Three*

Dataset Two is used to compare variation in one-year post-graduation earnings between the 1992-1993 graduates and the 2007-2008 graduates (research question three). In order to form this dataset, each B&B sample—92/93 and 07/08—was merged first with IPEDS and then the Barron's Index. Using IPEDS, the 92/93 cohort was matched with their degree-granting institution's average expenditure on academic services, student services, and instruction from 1989-1993. The 07/08 cohort was matched with the average expenditures at their degree-granting institutions from 2004 to 2008. The 92/93 B&B cohort was also matched with their institution's 1992 rank using the Barron's Index, while the 07/08 cohort was matched with their institution's 2008 rank. Finally, the two datasets (one for each of the two B&B cohorts) were appended to one another to form a single dataset[9]. I created a cohort identifier dummy in order to distinguish the two during analyses.

To summarize, I created two working datasets, which consist of three samples. Dataset One consists of 1992-1993 graduates for whom I have earnings information from 2003. Dataset Two consists of 92/93 graduates for whom I have 1994 earnings information and the 07/08 graduates.

## Research Design

### Operationalization of variables

In this section, I outline the operationalization of my variables. The same variables are used in both datasets (described in the previous section), and the same limitations are imposed on all three samples. The differences are the sample to which the variables apply and the year they

[9] Further details regarding limitations imposed on the sample are given in the next section, "Research Design." Details regarding sample size and other sample characteristics are provided in the "Descriptive Statistics" sections of Chapter Four and Chapter Five.

represent. For example, parents' socioeconomic status is constructed the same way for both 92/93 and 07/08 graduates (using parents' income and education), but the parents are different people. Unless otherwise noted, the variables are taken from the Baccalaureate and Beyond Longitudinal Study 92/93 and 07/08 cohort datasets.

***Dependent variable***

*Earnings*: Depending on the sample, logged hourly wages in 2003, 1994, or 2009. Hourly wages are calculated by dividing annualized earnings by 52 weeks and then by hours worked in a week. Unemployed persons are assigned an hourly wage of 0, but because one cannot take the natural log of 0, all respondents' hourly wages are increased by one. This re-scaling does not influence the estimates on the independent variables or their statistical significance because hourly wages are logged. Hourly wages are a more appropriate measure of earnings than annualized salary because the samples include both full- and part-time workers (to maximize sample size), whose earnings should be compared on an hourly basis.

***Independent variables***

*Socioeconomic status*: I create a measure of a participants' family's socioeconomic status by combining parents' income and parents' highest education level. Parents' income is their adjusted gross income as reported on participants' student aid application or Pell file. Father's and mother's education are categorical variables whose categories range from less than a high school graduate to advanced degree holder. In order to create the family SES indicators, I standardize parents' income, father's education, and mother's education, add them together, and then standardize the new variable. The standardized variable represents a family's socioeconomic position in the socioeconomic distribution of the sample. I divide the standardized SES measure into five socioeconomic quintiles. I also create a binary indicator of

elite socioeconomic status that has a value of one for participants who have both a mother and father who have at least a bachelor's degree, and whose family income is in at least the top ten percent of the income distribution of the B&B sample.

The literature supports this construction of the socioeconomic indicators. In traditional sociological theory, social classes are defined not in terms of income or education per se, but rather in terms of power and access to resources. In the Marxist tradition, classes are defined in terms of ownership of the means of production. Therefore, the basic social classes are capitalists (who own means of production), workers (who work for the capitalists and do not own means of production), and petty bourgeoisie (who own means of production but do not hire workers) (Wright, 2000). In the Weberian sociological tradition, classes are defined in terms of the resources one has and how well one's resources allow one to gain more resources (Weber, 1978; Wright, 2000). When identifying distinctions between classes, Bourdieu (1977, 1986) considered not only economic capital, but also social and cultural capital and how these relate to the acquisition of economic capital.

Contemporary sociologists define social classes, or socioeconomic status, in a variety of ways. Erik Wright has presented a class typology based on occupational class, which is inspired by the Marxist tradition (Wright, 2000). Family income is a common indicator of socioeconomic status in social science research, as is educational attainment (Diemer, Mistry, Wadsworth, López, & Reimers, 2013). Jennie Brand and Yu Xie (2010) use parents' educational attainment as an indicator of family background in order to identify those with a low propensity to go to college. Scott Thomas has considered the influence of parents' education and occupational status (2000) and income (2003) on the return to a degree.

Scholars working in the economic tradition have also used indicators of parents' income or education to show the relationship between parents' socioeconomic status and the return to their children's education. Zhang (2005) shows that return to college quality relates negatively to parents' income and mother's level of education. Dale and Krueger (2002) and Bowen et al. (2005) note the influence of parents' income on the return to greater college selectivity.

Although traditional sociological class typologies consider occupational position (e.g., Weber 1978), I do not include parents' occupational category in my socioeconomic indicators. There is no sensible manner by which to combine occupational category with the variables for income and education level, which have been used in more recent work that is similar to mine (e.g., Brand & Xie 2010; Thomas 2003). The socioeconomic indicators in this study differ from the examples in the previous paragraphs because they are a combination of income and education and are therefore a more inclusive socioeconomic indicator. They incorporate socioeconomic contradictions. Income is correlated with education level, but there may be exceptions. In this study, if a respondent's parents' have a low income but a high level of education, then their score on the standardized socioeconomic variable, which is a combination of income and education, is lower than the score of someone whose parents have high levels of both income and education. In the construction of the standardized variable, neither income nor education is given more weight.

*College rank*: Using data from the Barron's Admissions Competitiveness Index, I create five dummy variables that represent five categories of collegiate rank. The Barron's Index categorizes colleges into the following groups: most competitive, highly competitive, very competitive, competitive, less competitive, noncompetitive, and special. Colleges must meet certain standards in order to be included in each rank category. In 2008, the institutions in

Barron's "most competitive" category admitted less than 33 percent of applicants, who had a median ACT score of at least 29 and SAT score of at least 655. They were in the top 10 to 20 percent of their high school class and had a grade average of at least B+. By contrast, the institutions in Barron's "less competitive" category admitted 85 percent of applicants, whose median ACT score was below 21 and median SAT score below 500. Students were typically in the top 65 percent of their high school class, and had a C grade average (Schmitt, 2009).

The construction of the five categories of college rank used in this study is based on the construction of the Barron's Index and on the work of other scholars. Brewer et al. (1999) and Zhang (2005) construct their categories of college rank based on both institutional selectivity and control. Both works group two Barron's categories together and separate private and public institutions in order to create six categories: elite private, elite public, middle private, middle public, bottom private, and bottom public. Also, both studies use bottom-ranking public institutions as the point of comparison. Monks (2000) leaves the Barron's categories as they are, does not distinguish by control, and uses the "competitive" category as the point of comparison. Brand and Halaby (2006) construct an elite category that consists of Barron's "most competitive" and "highly competitive" institutions, and compare the elites to all others.

The construction of the college rank dummy variables used in this study is similar to that of previous work, yet original. I retain the majority of Barron's categories as they are and group only the bottom two. I do not distinguish between private and public institutions. The five categories in this study are constructed as follows: super-elite (most competitive), elite (highly competitive), moderately-selective (very competitive), less-selective (competitive), and least-selective (less competitive and noncompetitive). One advantage of this construction is that it

separates the effect of only the most selective institutions—which I call "super-elite"—from all the rest.

*Institutional characteristics*: From IPEDS, five-year average expenditure on academic services (per student), expenditure on instruction (per student), and expenditure on student services (per student). Each of these is be logged.

*Student characteristics*: The student characteristics are college major (dummy variables) and total undergraduate grade point average (interval level of measurement).

The aforementioned variables are the primary independent variables of interest, but there are several other factors that I must take into account when predicting earnings.

*State of the economy*: State dummy variables representing the state in which the participants reside account for between-state variation in economies.

*Demographics*: Gender and race/ethnicity can influence earnings, and these are included as dummy variables.[10] The gender dummy represents females, and the race/ethnicity dummy variable merges often overrepresented categories (white and Asian) and relates them to underrepresented categories (all others). In order to account for participants whose work is influenced by children (particularly women), I include a ratio-level variable representing the number of dependent children under age 18.

*Other: The* participants graduated in different months within one year, which I account for with a series of dummy variables representing the specific month in which they graduated.

[10] Race is coded into two categories, one of which includes students who are white or Asian, and the other includes all other categories. The reason for this coding is primarily because 83 percent of the 92/93 B&B cohort is white, and the small sample sizes within the other race categories meant that creating balanced treatment and control groups when propensity score matching proved difficult. The categories are also designed to distinguish between typically over- and under-represented racial categories.

The specific month in which individuals enter the job market may influence employment outcomes due to such factors as economic change and employer hiring cycles. I also account for age at which participants earned the degree, which helps to account for previous work experience and is arguably also an indicator of values, motivation, or discipline. One could make the case that individuals who earn bachelor's degrees at a younger age place more value on higher earnings, that they are more motivated to be high-achieving in their academic or career lives, that they are more disciplined or have a stronger work ethic (college is hard work), or that they do not have any number of other traits that might negatively influence both academic attainment and earnings (e.g., psychological illnesses, struggles with drug addiction, etc.).

Finally, I create an admissions test score variable using a student's SAT score, if available, or ACT score if they did not report an SAT score. The variable is standardized and represents participants' ability as their position in the distribution of participant scores on either the SAT or ACT.

The samples exclude respondents who are out of the labor force (e.g., homemakers), but includes respondents who are unemployed (involuntarily) or employed full-time or part-time. The samples are also restricted to those for whom the degree earned during the B&B study is the first bachelor's degree. All graduates included in the samples were financially dependent on their parents as undergraduates.[11] Graduate school is treated as an intermediary outcome—that is to say—a mechanism by which college rank and parents' socioeconomic status influence earnings.

[11] Parents' financial information is not available for participants who were financially independent as undergraduates.

For this reason, respondents who are enrolled in graduate school or who have earned a graduate degree at the time of the follow-up survey are included in the samples[12].

So that the samples may reflect the processes outlined in the theoretical framework, respondents who transferred more than 60 credits to the institution from which they graduated are excluded. Students who transferred more than 60 credits may have spent less than two years at the institution in order to earn enough credits to graduate. Outcomes of participants who spent less than two years at their graduating institution may reflect not only the resources provided by that institution, but also the resources (or lack of them) provided by previous institutions. It is for this reason that they cannot be included in the samples.

Survey sample weights are included for each cohort so that the sample represents the population targeted by the National Postsecondary Student Aid Study, from which the Baccalaureate and Beyond respondents were drawn. Primary sampling unit and stratum variables provide the Taylor Series correction of the standard errors. [13]

**Analytic Design**

In this section, I review the analytic methods used by other researchers before outlining my own approach. The early studies employ regression techniques to regress log earnings on measures of college quality or selectivity (Solmon & Wachtel, 1975; Trusheim & Crouse, 1981; Wachtel, 1976), as do many of the later studies (Behrman et al., 1996; Brand & Halaby, 2006;

[12] Another motivation to include those with graduate degrees is a larger sample size. I did explore model specifications in which I statistically controlled for advanced degrees when estimating the 2003 earnings of the 92/93 graduates, and found that accounting for advanced degrees made little difference to the results.

[13] Sample weights are not used to calculate propensity scores in Model Set Three, nor for regression on the matched sample in Model Set Three, due to the limited capabilities of the Stata software. Variance estimation primary sampling units and strata are not defined in matching or hierarchical regression models, also due to Stata's limitations. However, in the hierarchical linear models, the standard errors of the estimates are multiplied by the square root of the design effect in order to calculate the correct standard errors (de Leeuw, Hox, & Dillman, 2008).

Brewer et al., 1999; Dale & Krueger, 2002; Long, 2008, 2010; Loury & Garman, 1995; Monks, 2000; Smith, 2013; Zhang, 2005). The regression techniques include Ordinary Least Squares (OLS), Weighted Least Squares (WLS), Generalized Least Squares (GLS), logit, and probit regression. Typically, these studies attempt to prevent omitted variable bias by controlling for factors that may influence both college attended and post-graduation earnings, such as parents' education level.

Dale and Krueger (2002) take an innovative approach to dealing with selection problems inherent to the study of the relationship between college quality and earnings. They know that unobserved student characteristics may both increase the likelihood of admission to elite colleges and increase earnings. In this case, OLS regression estimates will overestimate the return to attending an elite college, because part of the estimated effect of college selectivity will actually be the effect of unobserved student characteristics. Dale and Krueger want to control for student characteristics that are observed by admissions committees but unobserved in the data. In order to do this, they compare students who were accepted and rejected by the same colleges. This strategy assumes that even among students who are accepted to more selective schools, some will choose to attend less selective institutions, which will allow for comparison with students who, in the eyes of admissions committees, have similar qualifications but chose to attend more selective institutions.

Some relatively recent studies use hierarchical linear modeling techniques (Brand & Xie, 2010; Thomas, 2000, 2003; Zhang, 2005). Thomas (2003) argues that, given the multilevel nature of the data, which includes both institutional- and student- level variables, hierarchical linear modeling provides unbiased standard errors.

Other strategies that have been applied to modeling this relationship include structural equation modeling (Mueller, 1988), variance component models (Behrman et al., 1996), generalized method of moments (GMM) estimators (Black & Smith, 2006), instrumental variables (Black & Smith, 2006; Long, 2008), factor analysis (Black & Smith, 2006), fixed effects (Smith, 2013), the Heckman selection correction (Zhang, 2005) and matching methods (Black & Smith, 2004; Brand & Halaby, 2006; Brand & Xie, 2010). Black & Smith (2004) use propensity score matching and match students on their predicted probability of attending a high-quality university, relying on the fact that some students with a high propensity to attend a high-quality institution do not do so and can serve as counterfactuals.

I employ three statistical approaches: Ordinary Least Squares regression (OLS), Hierarchical Linear Modeling (HLM), and Propensity Score Matching (PSM). Similarly to Black and Smith (2004), I use propensity score matching in order to match respondents on their propensity to attend a high-ranking institution. Like Thomas (2000, 2003), I want to account for the multilevel nature of the data, and hierarchical linear modeling allows me to account for clustering of earnings outcomes within colleges. I include OLS regression because it is common in studies that predict earnings after college graduation, and it is a straightforward approach. The OLS estimates serve as a base with which to compare my PSM and HLM estimates.

My analyses are separated into four sets of models, each of which is designed to address different research questions. Model Set One answers research question one, Model Set Two answers questions 1.a and 2, Model Set Three answers questions 1.b, 2.a, and 2.b, and Model Set Four answers research question 3. Ordinary Least Squares estimates are calculated for each of the four sets of models. Propensity score matching is conducted for Model Set Three, and

hierarchical linear models are calculated for Model Set One, Two, and Three. In this section, I lay out my basic model design before returning to a deeper discussion of OLS, PSM, and HLM.

**Model Set One: Influence of class on earnings**

Model Set One is designed to address primarily research question one: What is the post-graduation earnings gap between high-SES origin and low-SES origin college graduates?

Model Set One also addresses research question two: What student or college characteristics help to explain the post-graduation earnings gap between high-SES origin and low-SES origin students?

Model Set One may be expressed as:

$$\ln(y_i) = \beta_0 + \beta_1 S_i + \beta_2 R_i + \beta_3 I_i + \beta_4 Q_i + \beta_5 E_i + \beta_6 D_i + \beta_7 O_i + \mu_i$$

Log hourly earnings in 2003 ($\ln(y_i)$) are predicted as a linear function of a series of vectors whose contents are as follows:

- $S_i$ (Socioeconomic status). Parents' socioeconomic status, based on income and education.
- $R_i$ (College Rank). A set of binary/dummy variables representing college rank.
- $I_i$ (Institutional resources). Logged expenditure on academic services, instruction, and student services (per student).
- $Q_i$ (Collegiate qualifications). College major and total undergraduate grade point average.
- $E_i$ (Economy). State of residence.
- $D_i$ (Demographic). Gender, race/ethnicity, and number of children.
- $O_i$ (Other). Month earned degree, age earned degree, and admissions test score.

Model Set One consists of two sub-sets of models: in the first, socioeconomic status is indicated with the socioeconomic quintiles, and in the second SES is indicated with the elite status dummy. Each sub-set is estimated using both OLS regression and HLM, and each consists of a series of model configurations that progressively add covariates. The first configuration includes only socioeconomic status, the second adds the basic controls in vectors Economy, Demographic, and Other, the third adds the variables in vector College Qualifications, the fourth adds Institutional Resources, and the fifth adds College Rank. The series of model configurations is designed to demonstrate the influence of institutional and individual characteristics in explaining the class-based earnings gap.

**Model Set Two: Influence of class within institutional types**

Model Set Two addresses research question 1.a: How does the earnings gap differ according to institutional ranking? Model Set Two also addresses research question two: What student or college characteristics help to explain the post-graduation earnings gap between high-SES origin and low-SES origin students?

The second set of models may be expressed as:

$$\ln(y_i) = \beta_0 + \beta_1 S_i + \beta_2 I_i + \beta_3 Q_i + \beta_4 E_i + \beta_5 D_i + \beta_6 O_i + \mu_i \quad if\ R_i = R$$

The contents of the vectors are as described above.

As in Model Set One, socioeconomic status is indicated with the socioeconomic quintiles in one sub-set of models and with the elite status indicator in another sub-set. Each sub-set is estimated with both OLS regression and HLM. Model Set Two differs from Model Set One in that, in each sub-set, the relationship between socioeconomic status and earnings is calculated within each of the five college rank categories.

**Model Set Three: Influence of collegiate rank within socioeconomic groups**

The third set of models addresses research question 1.b: Among low-SES origin graduates, is a degree from a high-ranking institution associated with higher earnings than a degree from a low-ranking institution?

Model Set Three also addresses research questions 2.a and 2.b: (2.a) If some low-SES origin graduates have higher earnings than others, what factors explain this phenomenon? Can it be explained by different student or college characteristics? and (2.b) If a degree from an elite college is associated with higher earnings among low-SES origin graduates, what characteristics of elite colleges promote higher earnings?

The third set of models may be expressed as:

$$\ln(y_i) = \beta_0 + \beta_1 R_i + \beta_2 I_i + \beta_3 Q_i + \beta_4 E_i + \beta_5 D_i + \beta_6 O_i + \mu_i \quad if\ S_i = S$$

The contents of the vectors are as described above. In Model Set Three, socioeconomic status is represented only with the socioeconomic quintiles, not with the elite SES dummy. Model Set Three consists of four sub-sets of models. In the first two sub-sets, the relationship between college rank and earnings is estimated within each socioeconomic quintile. The first sub-set consists of OLS and HLM estimates using the weighted sample, and the second consists of OLS and PSM estimates using the non-weighted sample[14]. The third (weighted sample) and fourth (non-weighted sample) sub-sets highlight the bottom socioeconomic quintile with an extra series of model configurations that demonstrate the influence of individual characteristics and institutional expenditure on the relationship between rank and earnings among graduates of low socioeconomic origin. The first configuration includes only the variables in vector College Rank,

[14] Sample weights are not used to calculate propensity scores in Model Set Three, nor for regression on the matched sample in Model Set Three, due to the limited capabilities of the Stata software.

the second adds the basic controls in vectors Economy, Demographic, and Other, the third adds Collegiate Qualifications, and the fourth adds Institutional Resources.

**Model Set Four: Change over time**

Model Set Four addresses research question three: Did the post-graduation earnings gap, or the factors that influence it, change over time?

Model Set Four consists of the same model configurations displayed above for model sets one through three, with the exception that they are not carried out with the same sample. Model configurations one and two, therefore, address the post-graduation earnings gap between high- and low-SES origin respondents, while Model Configuration Three addresses the gap between low-SES respondents who graduate from elite colleges and low-SES respondents who graduate from non-elite colleges. In model configurations one and two, parents' socioeconomic status is represented with both socioeconomic quintiles and an indicator of elite socioeconomic status.

Each set of analyses is performed with two cohorts of students from the Baccalaureate and Beyond Longitudinal Study: the 1992-1993 graduates, for whom the dependent variable is 1994 log hourly earnings; and the 2007-2008 graduates, for whom the dependent variable is 2009 log hourly earnings. The 1992-1993 graduates are the same cohort used in model sets one through three. The difference in this case is that it is their 1994 hourly earnings that are being examined, rather than their 2003 hourly earnings. These analyses are carried out with Ordinary Least Squares regression.

### Ordinary Least Squares Regression

I begin my analyses with Ordinary Least Squares regression (OLS). Each of the models in sets one through four, described above, are run with OLS regression. OLS is a form of linear regression in which the estimates are calculated so that they minimize the sum of squared residuals. Under the assumptions of the Gauss-Markov Theorem, an OLS estimate is the best linear unbiased estimator (BLUE). It is unbiased and has the smallest variance among unbiased estimators. The Gauss-Markov assumptions state that the relationship between the independent and dependent variable is linear, that the sample is random, that there is no perfect collinearity among any independent variables, that the error has an expected value of zero among any values of the independent variables, and that the errors are homoscedastic (Wooldridge, 2009).

The OLS estimates serve as a base with which to compare the estimates that results from more complex methodologies. I also use propensity score matching (PSM) and hierarchical linear modeling (HLM). Large discrepancies between OLS and PSM or HLM estimates would suggest that PSM or HLM reduced bias in the coefficients or standard errors, respectively. No discrepancy would indicate that there may be little statistical advantage to using PSM or HLM. However, the OLS results can also serve as valid estimates in their own right. Zhang (2005) estimated OLS and HLM models and received similar estimates. After noting the controversy over the advantages of HLM, he highlights only the OLS results.

### Propensity score matching

Propensity score matching is used to estimate the equations in Model Set Three with an aim to produce less-biased coefficients, and the results are compared to the Ordinary Least Squares estimates.

### *The problem of selection bias*

The purpose of propensity score matching, in this study, is to addresses the problem of selection bias that is presented by the regression of earnings on postsecondary education**.** Students who earn degrees are systematically (non-randomly) different from students who do not, and students who earn degrees from high-ranking colleges are different from students who earn degrees from low-ranking colleges. Their parents, on average, are of a higher social class (Baum, Ma, et al., 2013; Bowen et al., 2005). Students who attend high-ranking colleges may be better academically prepared or more able, hard-working, disciplined, persistent, motivated, interested, or supported. They may have superior social connections related to high-paying careers and more upper-middle-class cultural capital. They may experience more family pressure to be high-achieving and to enter high-paying fields.

Any of these characteristics may influence both the rank of the college one attends and one's earnings after graduation. For this reason, an estimate of the effect of elite college attendance on earnings is likely to be upwardly biased. One cannot know to what extent the biased estimate reflects the effect of a degree from an elite college, or the effect of student characteristics such as ability or motivation.

One implication of the differences between elite college graduates and non-elite college graduates is that, even if elite college graduates did not attend elite colleges, they would still have higher earnings than the students who really did attend non-elite colleges. Hypothetically, if all of these graduates, no matter which colleges they actually attended, had attended low-ranking colleges, those who would have otherwise attended an elite college would have higher earnings (due to differences in any of the characteristics listed above). If one wanted to obtain an accurate

estimate of the effect of an elite college degree, one would need a sample of graduates who are identical in all ways, except that some attended elite colleges, and some did not.

It is helpful to consider an ideal situation: a true experiment. One may consider elite college attendees the Treatment group and non-elite college attendees the Control group. The treatment is graduation from a high-ranking college. If one were to conduct a randomized experiment with the goal of isolating the effect of treatment on earnings, one would randomly assign students to high- and low-ranking colleges and compare post-graduation earnings. If students were randomly assigned to colleges, the characteristics of students in the Treatment and Control groups would be the same, on average. The Treatment and Control groups would be equally able, hard-working, and motivated.

In such a randomized experiment, one could make the assumptions that $E(Y_1|W=1) = E(Y_1|W=0)$ and $E(Y_0|W=0) = E(Y_0|W=1)$, where Y represents the outcome of receiving treatment (or not), and W represents whether or not one actually received treatment (or not) (Guo & Fraser, 2010). These expressions refer to the potential outcome framework, which recognizes that all participants have values of both $Y_0$ (outcome in the absence of treatment) and $Y_1$ (outcome after treatment), whether they actually received treatment or not (Imbens, 2004; Rubin, 1974, 1977). In a randomized experiment, the outcome after non-treatment—attending a low-ranking college—would be the same for both Treatment and Control groups. Hypothetically, if the Treatment group did not attend an elite college, its earnings would be the same as those of the Control group. If this assumption is true, the estimate of the effect of an elite college degree on earnings is unbiased.

In the true college-going population, students are not randomly assigned to colleges, and student characteristics differ systematically between Treatment and Control groups. Due to

selection bias, $E(Y_0|W=0) \neq E(Y_0|W=1)$ (Guo & Fraser, 2010). The Treatment and Control groups are "unbalanced". The lack of balance may manifest in two ways: First, the averages of variables are not the same between groups, and second, the distributions of variables are not the same between groups (Gelman & Hill, 2007).

Another manifestation of dissimilar Treatment and Control groups is that there may not be much overlap in the values of relevant characteristics. For example, there may few elite college graduates who have the same SAT scores as low-ranking college graduates. As a consequence, there would be Treatment group members without Control group counterfactuals who have the same SAT score against whom to compare outcomes (Gelman & Hill, 2007). However, statistical techniques can be used to create a sample in which the Treatment and Control groups are balanced, and there is a high degree of overlap. One such technique is propensity score matching.

### *Matching*

Matching techniques are used by researchers to match students in the Treatment group to their counterparts in the Control group who have similar characteristics. A comparison of outcomes between matched students should produce a less-biased estimate of the treatment effect. One could match students according to one particular confounding variable, or to many confounding variables, but this would be difficult. Another option is to match students according to a "propensity score" (Gelman & Hill, 2007).

The term "propensity score" was first used in print by Rosenbaum and Rubin (Guo & Fraser, 2010; 1983). A propensity score is an estimate of the probability that an individual will receive a treatment. This estimate is calculated based on any of an individual's relevant, confounding characteristics. Individuals in the Treatment group are matched to others in the

Control group who have the same or a similar propensity score (probability of receiving treatment). After matching, the Treatment and Control groups should have very similar average characteristics and distributions of characteristics; the groups should be more balanced, and there should be more overlap. Individuals with the same propensity scores have the same distribution of each covariate (Gelman & Hill, 2007).

Researchers choose among a few approaches to matching. Matching without replacement involves matching one member of the Treatment group to one member of the Control group. However, it may be that there are not nearly as many Control group members as there are Treatment group members who have high propensity scores for receiving treatment (or vice versa). Therefore, a researcher may choose to match with replacement, whereby a Control group member can serve as a match for multiple Treatment group members. Alternatively, if either the Treatment or Control group is much larger than the other, one could subclassify the sample into groups based on their propensity scores and perform analyses with each subclass. Then, one could report estimates for each subclass or average estimates across subclasses with weights that account for subclass size (Gelman & Hill, 2007).

Propensity score matching is intended to eliminate the problem of selection bias and can, theoretically, produce unbiased estimates of the effect of receiving the treatment (Rosenbaum & Rubin, 1983). However, it is important to point out that the procedure can correct only selection bias that is based on observed variables, that is, characteristics that are measured by the survey data (Guo & Fraser, 2010). The assumption that researchers make, that there are no unobserved variables that are related to treatment status and outcome, is referred to as the ignorability assumption, selection on observables, or unconfoundedness (Brand & Xie, 2010). This is a limitation of the method. If I do not have a measure of motivation or grit, for example, these

unobserved traits may cause omitted variable bias in the estimates (that is, there may still be some selection bias). Heckman, Ichimura, and Todd (1997) show that propensity score matching reduces, but probably will not completely eliminate, selection bias, due to its inability to account for selection on unobservables. In addition, they point out that selection bias is not the only type of potential bias. The quality of the data are important. Treatment and Control groups should be administered the same surveys and experience similar environments. For example, when predicting earnings, in order to avoid bias, it is important that Treatment and Control group members are operating in the same labor markets.

Propensity score matching can account only for selection bias due to observed covariates, which is also true for Ordinary Least Squares regression. However, matching prior to regression is still preferable to Ordinary Least Squares regression without matching. Black and Smith (2004) present two advantages of matching on propensity scores. First, consider the aforementioned problem that there may be few non-elite college attendees who have the same traits—such as test scores or propensities for treatment—as elite college attendees and who can serve as counterfactuals. PSM cannot eliminate this problem, but it forces its recognition. One cannot ignore this phenomenon when matching. A linear regression would ignore the problem by comparing people with dissimilar probabilities of treatment. When matching, one cannot include cases for whom there are no counterfactuals, or who have no probability of receiving the treatment. Estimates following matching may be more realistic than OLS estimates. The second problem stems from the possibility that the relationship between college rank and earnings may not be linear. "By constructing an observation-specific counterfactual for each treated observation, matching methods avoid bias due to misspecification of the functional form in a linear model," explain Black and Smith (2004, p. 101).

Black and Smith's (2004) work also exemplifies one of the difficulties with PSM. The method relies on what has been referred to as the common support assumption or common support condition. This condition states that for each X—each value of a variable being matched on—there must be people who received treatment and people who did not. Black and Smith aim to estimate the relationship between college quality and earnings after matching students on their propensity to attend a high-quality college, but their sample contains few students at low-quality colleges with a high propensity to attend a high-quality college. Therefore, the number of counterfactuals for students with a high propensity to attend high-quality colleges and who actually do so is small, and the estimates after matching have larger standard errors than the estimates after OLS. Heckman, Ichimura, Smith, and Todd (1998) point out a related limitation: matching techniques can identify the effect of treatment for only those participants for whom there are counterfactuals. If there are no people at low-quality colleges with a very high-probability of attending a high-quality college, one cannot estimate the effect of treatment for people with a high probability of attending a high-quality college.

***Models: Matching and regression on matched sample***

I estimate propensity scores using a logistic regression of the probability of receiving treatment on a set of endogenous covariates. Early model specifications used either the super-elite or the elite college rank category as the treatment. However, due to the small numbers of low-SES students who attend these colleges, post-matching regression of earnings on either of these treatments, within the lowest socioeconomic quintile, is not feasible. Therefore, the treatment is a bachelor's degree from an "elite college," which includes the super-elite and elite colleges. This treatment variable maximizes the number of bottom-quintile students at elite colleges by combining the super-elite and elite categories.

The probability of treatment is predicted with the logistic regression:

$$\Pr(T_i = 1|X) = \beta_0 + \beta_1 s_i + \beta_2 a_i + \beta_3 m_i + \beta_4 j_i + \beta_5 D_i + \mu_i$$

- $s_i$ (Socioeconomic status). Parents' income and education.
- $a_i$ (Admissions test score). SAT or ACT score percentile.
- $m_i$ (Time to college). Months between high school graduation and college entry.
- $j_i$ (Considered jobs). Considered job placement rate when making college choice.
- $D_i$ (Demographic). Gender, race/ethnicity, number of children.

The predictor variables consist, for the most part, of some of those that are also used to predict earnings. The new variable that we see here is months between high school graduation and college entry. These variables have been selected to predict the probability of attending a highly-selective college because they represent factors that influence college attendance patterns. These factors also influence earnings, which means that they are endogenous covariates upon which participants should be matched.

Parents' socioeconomic status is an important predictor of the type of college one attends (Baum, Ma, et al., 2013; Thomas & Bell, 2008) and of post-graduation earnings (Bowen et al., 2005; Thomas, 2003). Adequate academic preparation, which includes the taking of the SAT or ACT, is a major barrier to four-year college enrollment for low-income and first-generation college students (Bowen et al., 2005; Cabrera & La Nasa, 2000). SAT and ACT scores are also related to graduates' earnings (Hu & Wolniak, 2010). An indicator of whether or not participants considered their college's job placement rate when deciding to attend is included because the consideration of job placement rates might lead one to prefer higher-ranking institutions. In addition, I believe that the consideration of job placement indicates a high value placed on economic outcome, and placing a high value on being financially well-off is associated with both

a higher likelihood of attending a high-quality public college and with higher earnings (Hilmer & Hilmer, 2012).

Time to college entry is included for a similar reason as the consideration of job placement rate: it is a measure of values. Furthermore, delayed college entry is associated with attendance at a lower-ranking institution. Likewise, so is parenthood: students who delay college entry, even for a short time, are more likely to have children (Horn, Cataldi, & Sikora, 2005). Finally, gender (Aud et al., 2013) and race/ethnicity (Bowen et al., 2005; Espenshade & Radford, 2009) are used to predict the probability of treatment because they are related to college enrollment patterns. Gender is also related to earnings (Hu & Wolniak, 2010; Thomas, 2000), as is race/ethnicity (Zhang, 2005).

After estimation of the propensity scores, I take several approaches to matching and compare outcomes (Guo & Fraser, 2010). I forego nearest neighbor matching without calipers, given that this procedure allows for large differences in propensity scores. Instead, I designate an acceptable maximum difference in propensity scores—a caliper—and match cases within that restriction. The caliper is a quarter of the standard deviation of the distribution of propensity scores. I engage in nearest neighbor matching within calipers. Matching specifications that were initially implemented were matching 1-1 without replacement, 1-1 with replacement, 1-multiple with replacement, and the nonparametric method of Mahalanobis Metric Matching (Rubin, 1976, 1979, 1980) within a caliper defined by the propensity scores (Rosenbaum & Rubin, 1985). The Mahalanobis method preceded propensity score matching and matches Treatment and Control group members on the Mahalanobis distance between them according to the set of matching variables. A treated respondent is matched to the nontreated respondent with the smallest distance until all treated respondents have been matched (Guo & Fraser, 2010). After some early

efforts, I decided not to proceed with matching on the Mahalanobis distance. With this study's data, the Mahalanobis method produces a matched sample with too few observations when the caliper is used, or a poorly-balanced sample when the caliper is not used.

Among the propensity score matching specifications, I chose 1-100 matching with replacement in order to maximize the size of the matched sample. One Treatment observation can be matched with up to 100 Control observations. 2,290 Control observations are matched to 490 Treatment observations for a total matched sample size of 2,780[15]. Matching one Treatment observation to multiple Control observations can result in a less-balanced sample than 1-1 matching because this approach potentially allows for observations with dissimilar propensity scores to be matched. However, 1-multiple matching produces a larger sample size than the alternative. Maximizing the sample size is important in this study, particularly due to the dearth of low-SES students at elite colleges. I also use matching with replacement, which can produce a smaller sample size than matching without replacement because a single Control observation can be used as a match multiple times. However, the benefit of matching with replacement is a better balance between Treatment and Control groups because the most similar Control observations among all can be chosen as a match, rather than the most similar of those remaining.

I take several measures to ensure as best a balance between Treatment and Control observations as possible. A common support restriction is enforced by dropping Treatment observations whose propensity score is outside of the range of propensity scores in the Control Group. Any Control observations whose propensity scores are an exact match for a Treatment observation are matched to that Treatment observation. The caliper restriction also helps to

[15] Sample sizes in this discussion of propensity score matching have been rounded to the tenth place, in accordance with NCES guidelines regarding reporting of non-weighted sample sizes (National Center for Education Statistics's Statistical Standards Program).

ensure a well-balanced sample. 97 percent of Control observations are matched to only one treatment observation, and the maximum number of Treatment observations to which a single Control observation is matched is 9.

I conducted several tests to check the balance between the Treatment and Control groups. T-tests indicate a difference in the means of the covariates. However, Ho, Imai, King, and Stuart argue (2007) that one should not rely on hypothesis tests such as t-tests to check for balance. One flaw of hypothesis tests is that they cannot tell us if a small amount of imbalance is unacceptable. A small degree of imbalance on a variable with a large effect on the dependent variable can result in large bias or inefficiency. Another flaw is that hypothesis test results are influenced not just by balance, but also by such factors as number of observations and ratio of treatment to control units, which means that one can improve test results by, for example, removing observations. One can appear to have improved balance while possibly having worsened it. Ho et al. recommend comparing, for each variable, means (where more than .25 SD difference is unacceptable), standard deviations, histograms, and quantile-quantile plots (QQ plots) between treatment and control groups after matching. QQ plots allow for comparison of variable distributions.

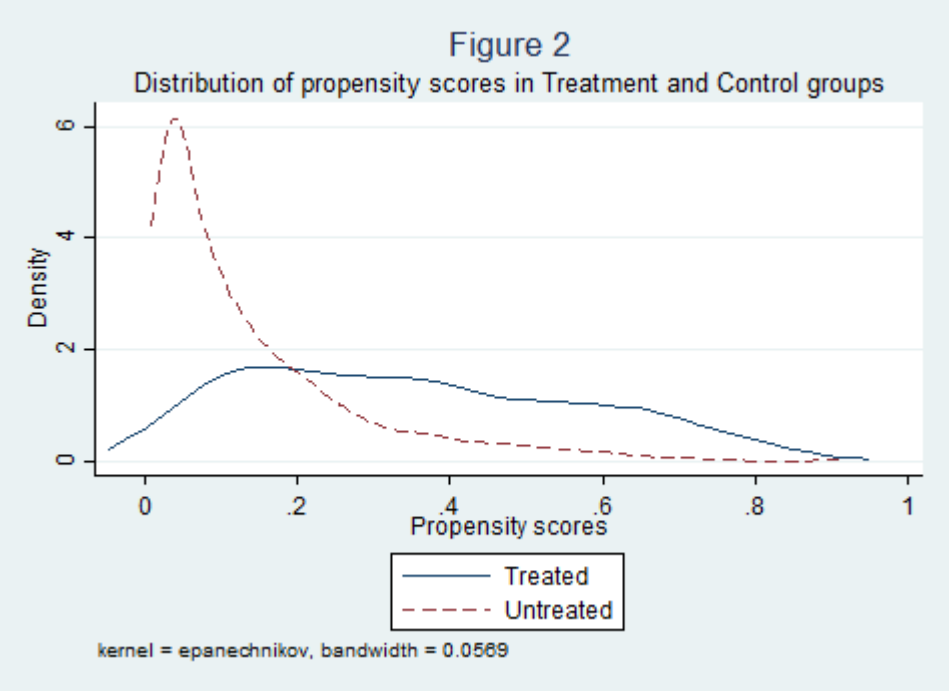



Figure 2 is a kernel density graph illustrating the distribution of propensity scores in the Treatment and Control groups. As expected, the Control group has a greater density of low propensity scores—that is, a greater number of members with a low propensity to attend an elite college. However, there are enough Control group members with a high propensity to attend an elite college to provide a wide region of common support. In Figure 3, we see that all Control observations fall into the region of common support. However, some Treatment observations lack common support Control observations with which to be matched at high values of the propensity score, those greater than .8. Only five treatment observations fall outside of the region of common support, and they are not used in the matched sample.

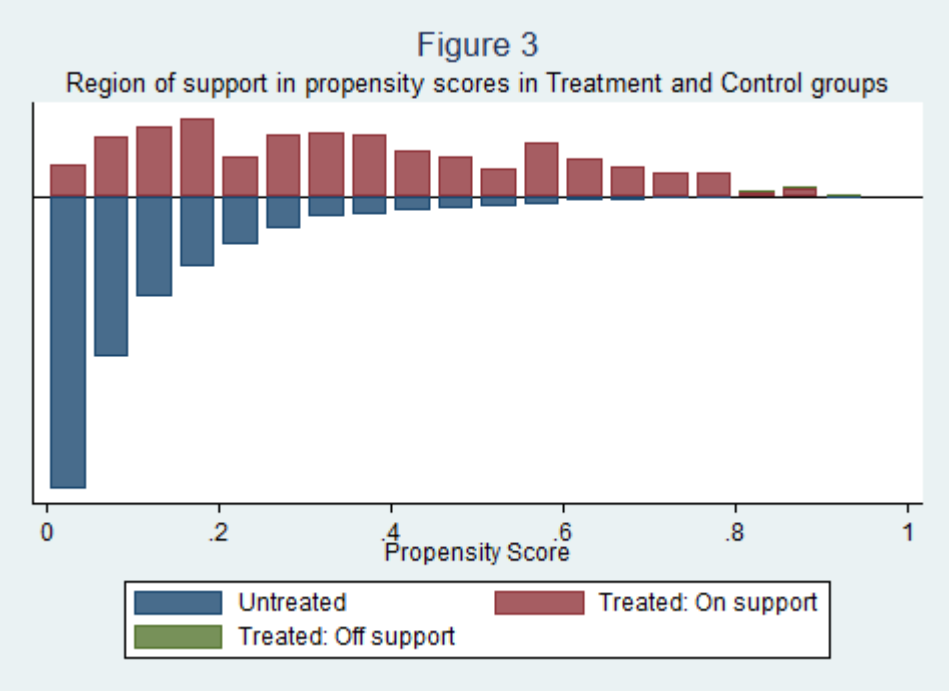



Table 1 presents the balance of variable means and distributions between the Treatment and Control groups in the matched and unmatched samples. I check the balance on every variable that was used to calculate the propensity to attend an elite college. The t-test for the difference in means between the Treatment and Control groups is not statistically significant for any variable, including the dependent variable. The difference in mean hourly earnings between the Treatment and Control group is reduced from $3.66 to $2.73 in the matched sample. $2.73 per hour is the average effect of treatment on the treated, and it is not statistically significant in the matched sample. However, we shall see in the results from Model Set Three that the effect of treatment on earnings is statistically significant for one socioeconomic group in particular.

Table 1. *Characteristics of Unmatched and Matched Samples*

| Variable | Unmatched / Matched | Mean: Treated | Mean: Control | % bias | % reduction in bias | t-test: t | t-test: p>t | Variance Ratio |
|---|---|---|---|---|---|---|---|---|
| Parents' income 1993 | U | 87041.00 | 62787.00 | 37.50 | | 8.97 | 0.00 | |
| | M | 85329.00 | 83747.00 | 2.40 | 93.50 | 0.29 | 0.77 | 0.50 |
| Dad no HS | U | 0.02 | 0.04 | -10.30 | | -1.92 | 0.06 | |
| | M | 0.02 | 0.04 | -10.40 | -0.90 | -1.62 | 0.11 | 0.61 |
| Dad HS grad | U | 0.14 | 0.30 | -38.60 | | -7.22 | 0.00 | |
| | M | 0.14 | 0.14 | 0.50 | 98.60 | 0.10 | 0.92 | 0.60 |
| Dad <2yrs PSE | U | 0.06 | 0.09 | -11.60 | | -2.22 | 0.03 | |
| | M | 0.06 | 0.07 | -1.80 | 84.90 | -0.30 | 0.77 | 0.70 |
| Dad >2yrs PSE | U | 0.05 | 0.07 | -10.60 | | -2.03 | 0.04 | |
| | M | 0.05 | 0.04 | 0.80 | 92.40 | 0.14 | 0.89 | 0.66 |
| Dad BA degree | U | 0.30 | 0.26 | 9.00 | | 1.86 | 0.06 | |
| | M | 0.30 | 0.30 | -1.60 | 82.50 | -0.24 | 0.81 | 0.93 |
| Dad advanced degree | U | 0.43 | 0.24 | 40.90 | | 8.71 | 0.00 | |
| | M | 0.43 | 0.41 | 5.50 | 86.50 | 0.81 | 0.42 | 0.77 |
| Mom no HS | U | 0.01 | 0.04 | -16.20 | | -2.85 | 0.00 | |
| | M | 0.01 | 0.02 | -1.90 | 88.50 | -0.39 | 0.70 | 0.40 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Mom HS grad | U | 0.19 | 0.36 | -37.50 | | -7.17 | 0.00 | |
| | M | 0.20 | 0.21 | -3.10 | 91.70 | -0.53 | 0.60 | 0.69 |
| Mom <2yrs PSE | U | 0.10 | 0.11 | -4.50 | | -0.90 | 0.37 | |
| | M | 0.10 | 0.11 | -5.20 | -14.70 | -0.81 | 0.42 | 0.88 |
| Mom >2yrs PSE | U | 0.09 | 0.10 | -1.30 | | -0.26 | 0.79 | |
| | M | 0.10 | 0.10 | -1.70 | -29.00 | -0.26 | 0.79 | 0.96 |
| Mom BA degree | U | 0.33 | 0.25 | 18.00 | | 3.75 | 0.00 | |
| | M | 0.34 | 0.33 | 1.20 | 93.60 | 0.17 | 0.86 | 0.86 |
| Mom advanced degree | U | 0.27 | 0.14 | 31.50 | | 6.95 | 0.00 | |
| | M | 0.26 | 0.23 | 8.00 | 74.50 | 1.16 | 0.25 | 0.65 |
| Test score, SD from mean | U | 0.94 | -0.10 | 118.50 | | 23.18 | 0.00 | |
| | M | 0.93 | 0.90 | 2.70 | 97.70 | 0.47 | 0.64 | 0.90 |
| Months between HS & college | U | 3.04 | 3.17 | -6.00 | | -1.03 | 0.30 | |
| | M | 3.04 | 3.05 | -0.50 | 91.50 | -0.13 | 0.90 | 0.90 |
| Considered college's job placement rate | U | 0.42 | 0.34 | 16.10 | | 3.31 | 0.00 | |
| | M | 0.41 | 0.42 | -0.60 | 96.50 | -0.09 | 0.93 | 0.93 |
| Female | U | 0.45 | 0.53 | -17.90 | | -3.63 | 0.00 | |
| | M | 0.45 | 0.48 | -5.90 | 67.30 | -0.92 | 0.36 | 0.99 |
| American Indian, Black, Hispanic, or Other | U | 0.11 | 0.09 | 8.80 | | 1.86 | 0.06 | |

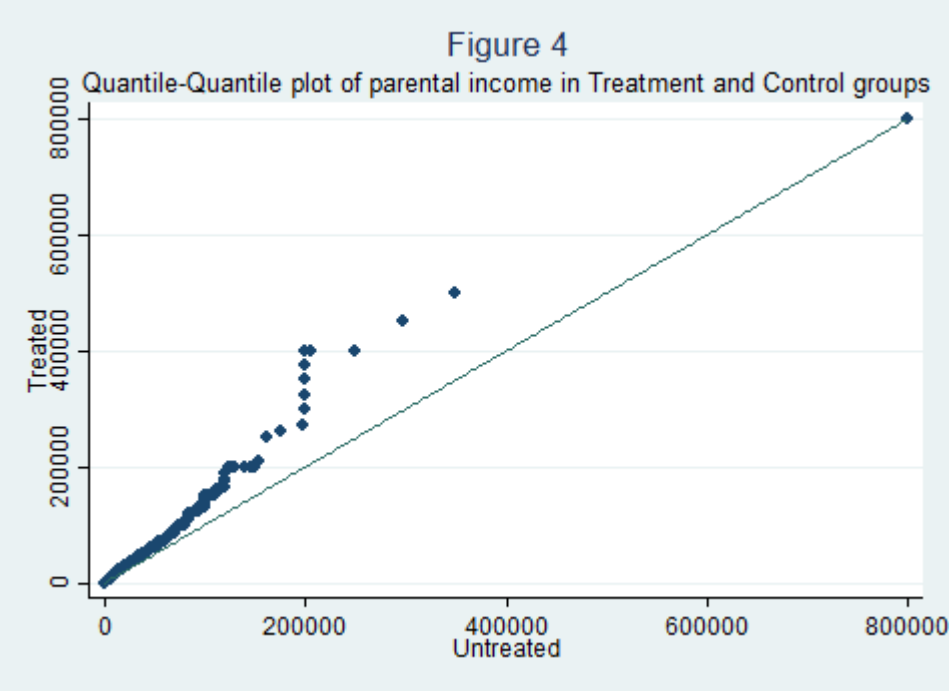
| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | M | 0.11 | 0.14 | -11.20 | -27.50 | -1.60 | 0.11 | 0.82 |
| Mean Bias | U | 24.20 | | | | | | |
| | M | 3.60 | | | | | | |
| Median Bias | U | 16.10 | | | | | | |
| | M | 2.20 | | | | | | |
| Pseudo R2 | U | 0.23 | | | | | | |
| | M | 0.01 | | | | | | |
| LR chi2 | U | 613.58 | | | | | | |
| | M | 6.41 | | | | | | |
| p>chi2 | U | 0.00 | | | | | | |
| | M | 0.98 | | | | | | |

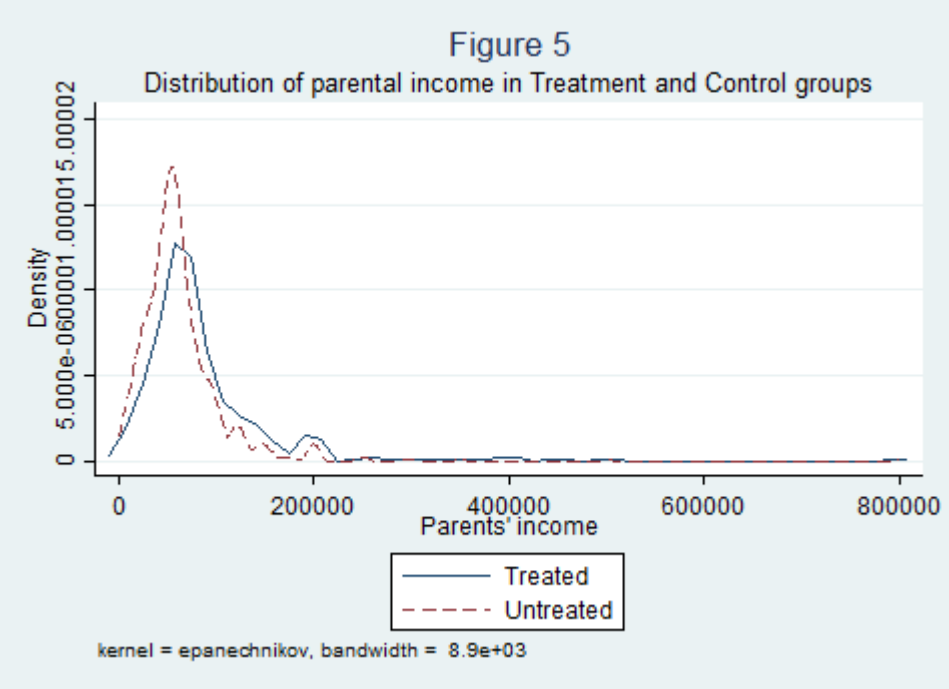
| Variable | Sample | Treated | Controls | Difference | S.E. | T-stat |
|---|---|---|---|---|---|---|
| Hourly earnings | Unmatched | 31.19 | 27.53 | 3.66 | 1.69 | 2.16 |
| | ATT | 31.21 | 28.48 | 2.73 | 2.06 | 1.32 |

*Note.* The upper section displays, for each variable used to calculate the propensity to attend an elite college, a comparison of the means and variances in the Treatment and Control groups, in the unmatched and matched samples. For each variable, the table shows the standardized percentage bias, the reduction in standardized percentage bias, the t-test for the equality of means between Treatment and Control groups, and the ratio of the variances in the Treatment and Control groups.

The middle section displays the mean bias, median bias, Pseudo R2, and p-value from the likelihood-ratio test of the joint insignificance of the predictors.

The lower section displays the mean hourly earnings in the Treatment and Control groups in the unmatched and matched samples, with the t-test for the equality of means. The difference in hourly earnings between the Treatment and Control groups in the matched sample is the effect of treatment on the treated (ATT).




Comparisons of the distribution of values in the continuous matching variables between Treatment and Control groups are illustrated by the QQ plots and Kernel Density graphs in

Figures Four through Nine. The matching variables that present difficulty in achieving good balance between Treatment and Control groups are family income and parental education. Although a similarity in means was achieved by matching for family income and the parental education dummy variables (see Table 1), the distributions are dissimilar in some cases. In Figure 4, we see that Treatment observations have higher values of parental income than Control observations. Figure 5 shows that the Treatment group's distribution skews somewhat more toward the higher income rank. Although the distributions appear similar in Figure 5, the Treatment group has about twice as much variance in family income than the Control group, and the ratio of the variances is .50 (Table 1). For some levels of mother's and father's education, the ratio of variances is high, but for some at the higher and lower ends of the spectrum, the ratios are somewhat low.

Figure 6

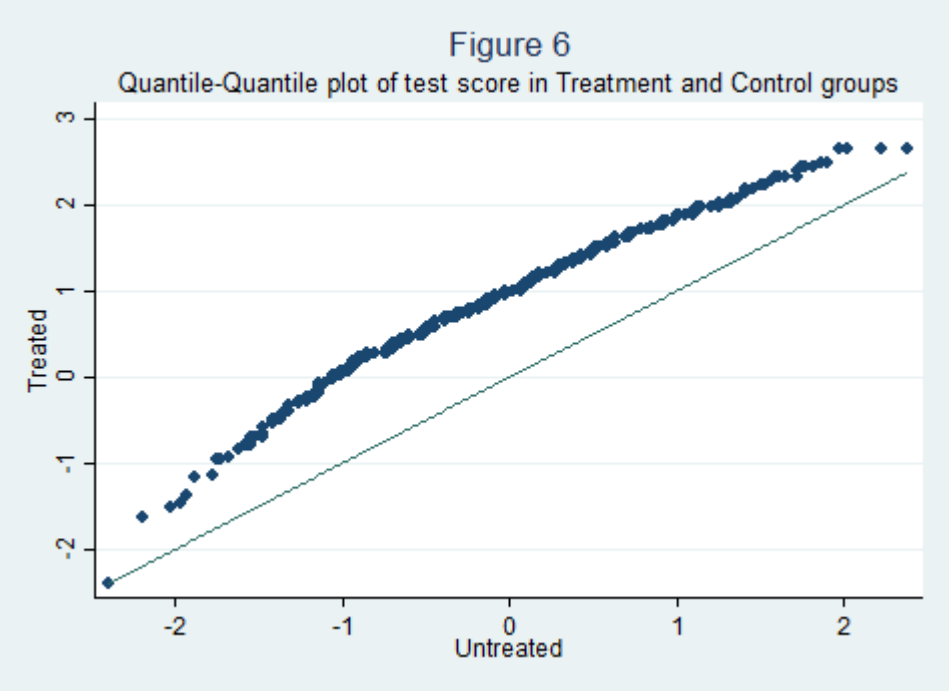


Figure 7

Distribution of test score in Treatment and Control groups

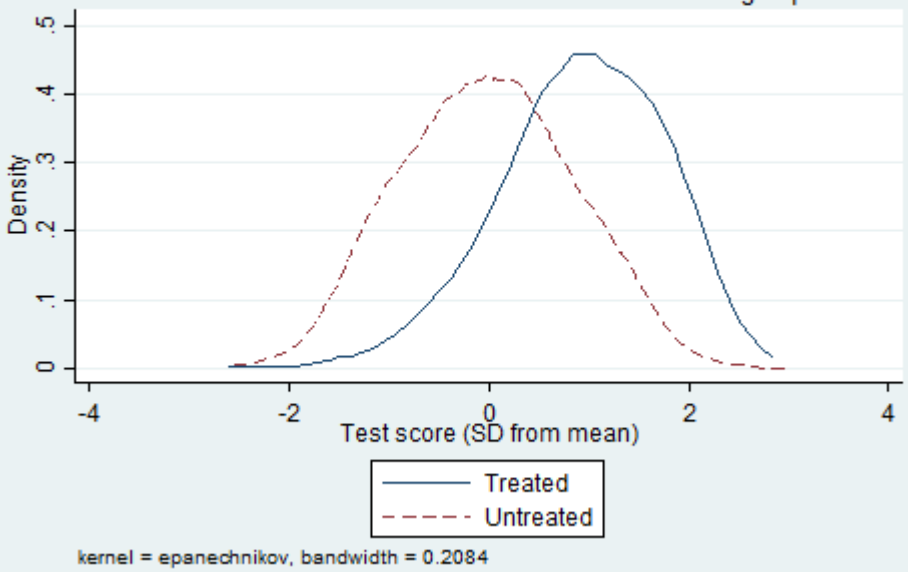
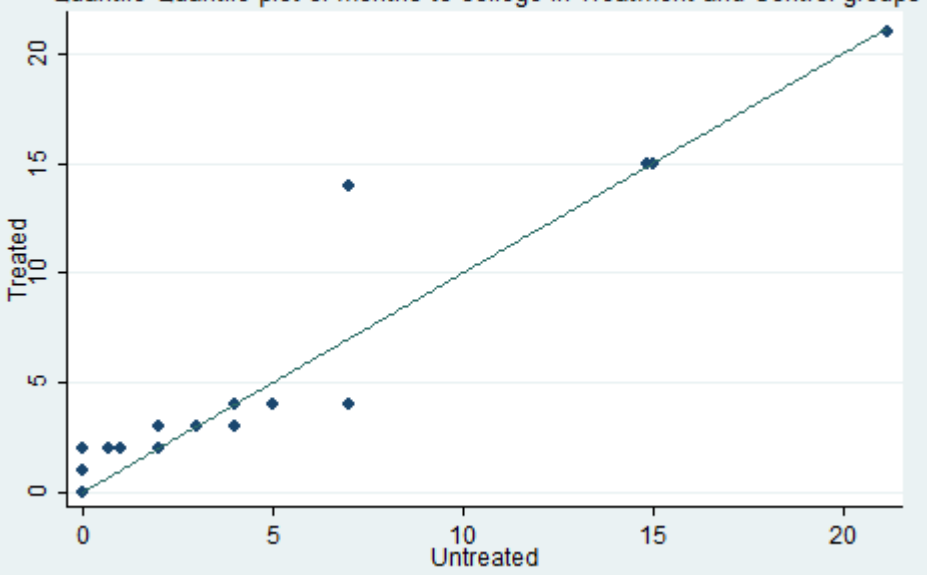
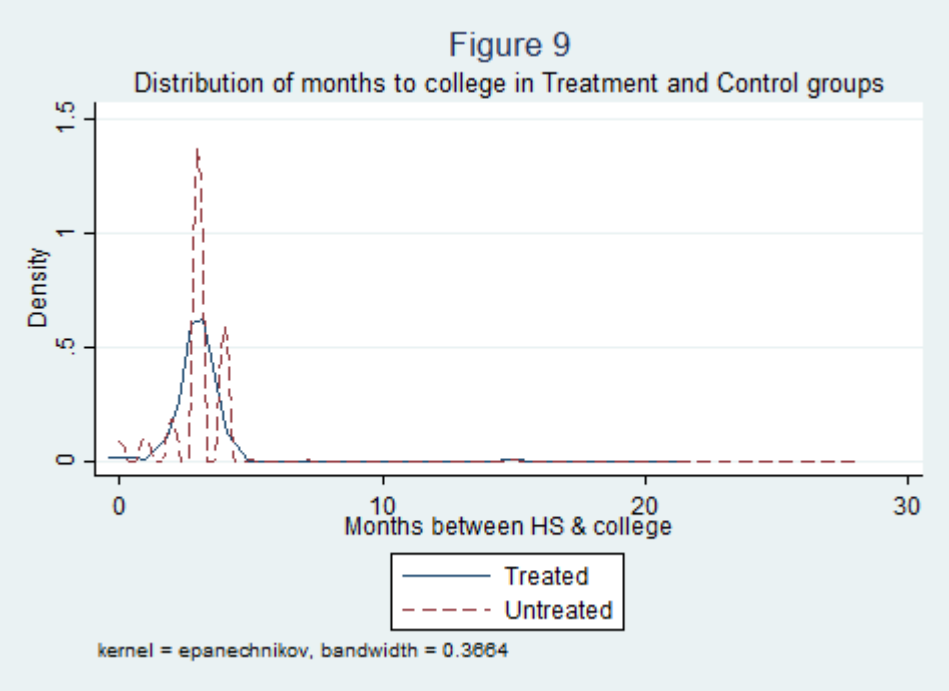



Figure 8

Quantile-Quantile plot of months to college in Treatment and Control groups






For the other matching variables, good balance in both means and distributions was achieved. Figure 6, the QQ plot for standardized test score, and Figure 7, the kernel density graph, both indicate that the Treatment group does have higher test scores. However, the difference in means is not statistically significant, and ratio of the variances is .90, which indicates a similar distribution. Figures 8 and 9 suggest somewhat different distributions in the number of months between high school and college entry. However, the difference in means is not statistically significant, and the ratio of variances is .90. The variance ratios for considered job placement rate, gender, and race are similarly high.

The matched sample is used to estimate the models in Model Set Three, as was laid out earlier:

$$\ln(y_i) = \beta_0 + \beta_1 R_i + \beta_2 I_i + \beta_3 Q_i + \beta_4 E_i + \beta_5 D_i + \beta_6 O_i + \mu_i \quad if\ S_i = S$$

- $y_i$ 2003 log hourly earnings.

- $S_i$ (Socioeconomic status). Parents' socioeconomic status, based on income and education.
- $R_i$ (College Rank). A set of binary/dummy variables representing college rank.
- $I_i$ (Institutional resources). Logged expenditure on academic services, instruction, and student services (per student).
- $Q_i$ (Collegiate qualifications). College major and total undergraduate grade point average.
- $E_i$ (Economy). State of residence.
- $D_i$ (Demographic). Gender, race/ethnicity, and number of children.
- $O_i$ (Other). Month earned degree, age earned degree, and admissions test score.

Because the matched sample cannot be weighted by Stata, I calculate new OLS estimates using a non-weighted sample and the super-elite/elite treatment variable. Because they refer to the same non-weighted sample, these OLS estimates are comparable to the estimates produced by the matched sample.

### Multilevel modeling

Hierarchical linear models are used to estimate the equations in Model Set One, Two, and Three, with the goal of producing estimates whose standard errors are less biased than those produced by OLS regression.

#### *The problem of clustering*

A researcher employing Ordinary Least Squares regression to regress earnings on various predictors relies on certain assumptions to claim that the standard errors are unbiased and that the significance of the coefficients is accurate. One of these assumptions is independence of errors.

$$\mathrm{cov}(e_i, e_j) = 0$$

When this assumption holds, errors between participants and within groups of participants are uncorrelated. This assumption likely does not hold in my sample.

Colleges are unique. Each institution has its own history, culture, and traditions. Institutions vary according to academic structures, residential structures, social environments, and extracurricular environments. They offer differing degrees of resources to their students. Some are more prestigious than others, and receive more attention from employers. Geographical location may influence graduates' post-graduation employment opportunities. These differences exist even among institutions of the same type (e.g., private/public, research/liberal arts), size, and rank. Students within particular colleges share experiences that are unlike those of students at other colleges. There is reason to believe that each college has a unique impact on its students. Also, students may be drawn to or selected by particular institutions because of certain traits that they share. Due to these phenomena, it is likely that student outcomes are "clustered" or "nested" within colleges. There is "dependence" among individual students within the same colleges (Raudenbush & Bryk, 2002; Snijders & Bosker, 2012). Let us consider graduates of the same college a "cluster" of graduates. Earnings within each cluster of graduates of the same college may be similar to one another.

If earnings are clustered among graduates of the same college, the independence of errors assumption is violated. Errors/observations are not independent because graduates of the same colleges are more similar to one another than they are to graduates of other colleges. As a result, the standard errors of the estimates are biased (Garson, 2013; Raudenbush & Bryk, 2002). The direction of the bias is typically downward. Because the estimated variance will be smaller than it really is, students will appear to be more similar than they really are. The risk of a Type 1 error

(a false positive) is increased. This means that a covariate may appear to be a statistically significant predictor of the outcome when it is not.

***Hierarchical Linear Modeling***

The intercept in a regression model represents the value of $y$, the dependent variable, when each $x$, or independent variable, has a value of 0. The $\beta_{1\ldots k}$ , the slope coefficients, represent the amount of change in $y$ for a one-unit change in $x$. Consider an OLS regression:

$$y = \beta_0 + \beta_1 x_i + e_i$$

$$e_i \sim N(0, \sigma_e^2)$$

Let us say that $y$ represents earnings, and that $x_i$ is a measure of social class. The intercept, $\beta_0$, and slope, $\beta_1$, are assumed to be (and are treated as being) the same for all cases (e.g., students or colleges). They are treated as "fixed" coefficients. A fixed intercept means that earnings among students with parents' social class of 0 are assumed to be the same for all colleges. A fixed slope means that, as one moves up the class ladder, the relationship between class and earnings is assumed to be the same for graduates of all colleges.

Now, consider a hierarchical linear model (Garson, 2013; Gelman & Hill, 2007; Raudenbush & Bryk, 2002; Snijders & Bosker, 2012):

$$y_{ij} = \beta_{0j} + \beta_{1j} x_{ij} + e_{ij}$$

$$e_{ij} \sim N(0, \sigma_e^2)$$

Using multilevel models, researchers may allow the intercepts or slope coefficients to vary across level-two units (in this study, colleges). They may be treated as "random" coefficients. Let us say that in this example, the intercept and slope are permitted to vary across level-two units. Maintaining the earlier example, this means that the effect of social class on

earnings is allowed to vary between colleges. Each college has its own regression line. If each college can have its own value of the intercept and slope, the intercept and slope will each have a mean and variance. They will have residuals that are approximately normally distributed with a mean of 0 and a variance. In this example, the level-two equations for the intercept and slope are:

$$\beta_{0j} = \gamma_{00} + u_{0j}$$

$$\beta_{1j} = \gamma_{10} + u_{1j}$$

$$\begin{bmatrix} u_{0j} \\ u_{1j} \end{bmatrix} \sim N\left(\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} \tau_{00} & \\ \tau_{10} & \tau_{11} \end{bmatrix}\right)$$

The hierarchical linear model has residuals, representing unexplained variability in the dependent variable at two levels: the individual level and the group level.

I begin my hierarchical analyses by predicting a random intercept model or "null model" (Garson, 2013).

$$y_{ij} = \beta_{0j} + e_{ij}$$

$$\beta_{0j} = \gamma_{00} + u_{0j}$$

$$e_i \sim N(0, \sigma_e^2)$$

$$u_{0j} \sim N(0, \tau_{00})$$

"$y$" represents graduates' hourly earnings[16]. Using this model, I examine the amount of variability that exists in earnings at level one with the value of the individual level residual and at level two with the variance of the intercept. The individual-level (level-one) variance in hourly earnings is high: The average amount by which an individual's earnings differ from mean earnings is by 1,072.81. The intercept variance, 121.84, is statistically significant. A statistically

[16] Earnings are not logged in the null model in order to improve interpretability.

significant intercept variance indicates that colleges vary in terms of graduates' earnings. $121.84 represents the average amount by which a college's graduates' hourly earnings differ from the average.

Next, I calculate the intraclass correlation coefficient (ICC), which represents the proportion of observed variance in the dependent variable that is between level-two units (Snijders & Bosker, 2012). The ICC also represents the correlation between two randomly selected cases (i.e., students) within a randomly selected cluster (i.e., a college). The ICC would be 0 if the grouping variable is not informative, and 1 if all students in the same college had the same outcomes (Gelman & Hill, 2007). Any ICC above 0 indicates that the independence of errors assumption has been violated (Garson, 2013).

The ICC is calculated as follows:

$$\text{ICC}=\frac{\widehat{\tau_{00}}}{\widehat{\tau_{00}+\sigma_e^2}}$$

The intraclass correlation coefficient is .10, which indicates that there is correlation of graduates' earnings within colleges and variability in graduates' earnings between colleges. These results demonstrate that the use of multilevel modeling would be prudent and that at least the intercept should be treated as random. The equations in Model Sets One, Two, and Three are estimated using hierarchical linear models in which the intercept is treated as random.

***Model Set One: Influence of class on earnings***

$$\ln(y_{ij}) = \beta_{0j} + \beta_{1j}S_{ij} + \beta_{2j}R_{ij} + \beta_{3j}Q_{ij} + \beta_{4j}E_{ij} + \beta_{5j}D_{ij} + \beta_{6j}O_{ij} + e_{ij}$$

$$\beta_{0j} = \gamma_{00} + \gamma_{01}I_j + u_{0j}$$

$$\beta_{1j} = \gamma_{10}$$

$$\beta_{2j} = \gamma_{20}$$

$$\beta_{3j} = \gamma_{30}$$

$$\beta_{4j} = \gamma_{40}$$

$$\beta_{5j} = \gamma_{50}$$

$$\beta_{6j} = \gamma_{60}$$

$$e_{ij} \sim N(0, \sigma_e^2)$$

$$[u_{0j}] \sim N\ ([0], [\tau_{00}])$$

- $y_i$ 2003 log hourly earnings.
- $S_i$ (Socioeconomic status). Parents' socioeconomic status, based on income and education.
- $R_i$ (College Rank). A set of binary/dummy variables representing college rank.
- $I_i$ (Institutional resources). Logged expenditure on academic services, instruction, and student services (per student).
- $Q_i$ (Collegiate qualifications).College major and total undergraduate grade point average.
- $E_i$ (Economy). State of residence.
- $D_i$ (Demographic). Gender, race/ethnicity, and number of children.
- $O_i$ (Other). Month earned degree, age earned degree, and admissions test score.

***Model Set Two: Influence of class within institutional types***

$$\ln(y_{ij}) = \beta_{0j} + \beta_{1j}S_{ij} + \beta_{2j}Q_{ij} + \beta_{3j}E_{ij} + \beta_{4j}D_{ij} + \beta_{5j}O_{ij} + e_{ij} \quad \textit{if } R_{ij} = R$$

$$\beta_{0j} = \gamma_{00} + \gamma_{01}I_j + u_{0j}$$

$$\beta_{1j} = \gamma_{10}$$

$$\beta_{2j} = \gamma_{20}$$

$$\beta_{3j} = \gamma_{30}$$

$$\beta_{4j} = \gamma_{40}$$

$$\beta_{5j} = \gamma_{50}$$

$$e_{ij} \sim N(0, \sigma_e^2)$$

$$[u_{0j}] \sim N\ ([0], [\tau_{00}])$$

***Model Set Three: Influence of collegiate rank within socioeconomic groups***

$$\ln(y_{ij}) = \beta_{0j} + \beta_{1j}R_{ij} + \beta_{2j}Q_{ij} + \beta_{3j}E_{ij} + \beta_{4j}D_{ij} + \beta_{5j}O_{ij} + e_{ij} \quad \textit{if } S_{ij} = S$$

$$\beta_{0j} = \gamma_{00} + \gamma_{01}I_j + u_{0j}$$

$$\beta_{1j} = \gamma_{10}$$

$$\beta_{2j} = \gamma_{20}$$

$$\beta_{3j} = \gamma_{30}$$

$$\beta_{4j} = \gamma_{40}$$

$$\beta_{5j} = \gamma_{50}$$

$$e_{ij} \sim N(0, \sigma_e^2)$$

$$[u_{0j}] \sim N\ ([0], [\tau_{00}])$$

In this chapter, I have outlined my methodological approach. I merge data from the Baccalaureate and Beyond Longitudinal Study (B&B), Integrated Postsecondary Education System (IPEDS), and Barron's Admissions Competitiveness Index in order to form two working

datasets with which to conduct the analyses in Model Sets One through Four. In Model Sets One through Three, I use OLS, HLM, and PSM specifications in order to address variation in the 2003 earnings of 1992-1993 college graduates. These findings are presented in Chapter Four. In Model Set Four, I examine changes in the one-year post-graduation earnings gaps between the 92/93 and 07/08 graduates. I discuss the findings regarding these changes in the post-graduation earnings gaps in Chapter Five.

## Chapter 4: The Influences on Earnings Ten Years after Graduation

In this chapter, I answer research questions one and two, which address class- and college rank-based gaps in the 2003 hourly earnings of 1992-1993 college graduates: 1) What is the post-graduation earnings gap between high-SES origin and low-SES origin college graduates?, and 2) What student or college characteristics help to explain the post-graduation earnings gap between high-SES origin and low-SES origin students? The chapter opens with a detailed description of the characteristics of the sample. Next follows a presentation of the results from Model Sets One, Two, and Three. I show that the majority of my hypotheses about the earnings premium associated with high parental socioeconomic status and high college rank are supported. The chapter concludes with a discussion of the implications of the findings.

### Descriptive Statistics

Table 2 describes the characteristics of the sample used in Model Sets One, Two, and Three[17]. Table 3 illustrates these characteristics according to college rank, while Table 4 sorts respondents according to their socioeconomic quintile. The respondents in this sample earned their bachelor's degrees from 1992 to 1993 and in 2003 are either unemployed or employed full- or part-time. The sample size is greatly reduced from the original Baccalaureate & Beyond 92/93 cohort sample size of around 11,000 due to the restrictions imposed on the sample. Approximately half of the original B&B sample did not follow what is considered the traditional

[17] This is not the same sample of 92/93 graduates used in Model Set Four to predict 1994 earnings (Chapter Five). The samples are different because they have been limited according to whether or not respondents were out of the labor force in different years (in 1994 for the sample used in Model Set Four and 2003 for the sample used in Model Sets One, Two, and Three).

college path among the privileged: they were not financially dependent on their parents, nor did they enter one college and remain there until they earned their Bachelor's degree.

Consequently, the sample restriction to respondents who transferred fewer than 61 credits to their B&B graduating institution reduces the sample size by 2,030, and approximately 3,040 observations are lost when limiting the sample to financial dependents. 250 more respondents are dropped because they had a previous Bachelor's degree, and 470 because they were out of the labor force in 2003. The loss of observations due to missing values brings the analytic sample size to approximately 3,000[18].

In Table 2, one sees that about 20 percent of the sample hails from each socioeconomic quintile. 9 percent qualifies as part of the elite socioeconomic group. Just five percent of the entire sample graduated from a super-elite college, but 10 percent from an elite college, 25 percent from a moderately-selective college, 44 percent from a less-selective college, and 16 percent from one of the least-selective colleges.

In Table 3, it is clear that the socioeconomic composition of the student sample varies according to institutional rank. At super-elite institutions, 42 percent of the sample hailed from the top socioeconomic quintile, but just four percent from the bottom quintile. By contrast, at the least-selective institutions, only 17 percent of students came from the top quintile, but 30 percent from the bottom socioeconomic quintile.

Table 4 illustrates that less-selective colleges were most popular among each socioeconomic quintile. Rank of college attended is related to socioeconomic status in the expected pattern. Among respondents whose parents were in the bottom socioeconomic quintile,

[18] While 3,000 may seem like a large sample size, some of the sub-sample sizes are small (e.g., low-SES students at super-elite colleges). For more detail, see the Limitations section in Chapter 6: Conclusion.

24 percent attended a least-selective college, but just one percent a super-elite college. By contrast, among respondents whose parents were in the top socioeconomic quintile, 12 percent attended a least-selective college and 10 percent a super-elite college.

Table 2. *Means for Earnings and Predictors*

| | All Graduates Mean/SE |
|---|---|
| Hourly Earnings 2003 | 28.87 (0.92) |
| First (bottom) SES quintile | 0.19 (0.01) |
| Second SES quintile | 0.21 (0.01) |
| Third SES quintile | 0.21 (0.01) |
| Fourth SES quintile | 0.19 (0.01) |
| Fifth (top) SES quintile | 0.21 (0.01) |
| Elite SES | 0.09 (0.01) |
| Least-selective college | 0.15 (0.02) |
| Less-selective college | 0.44 (0.03) |
| Moderately-selective college | 0.25 (0.02) |
| Elite college | 0.10 (0.02) |
| Super-elite college | 0.05 (0.02) |
| Academic expenditure per student | 1800.61 (85.62) |
| Instructional expenditure per student | 7346.08 (218.76) |
| Student services | 1138.04 |

| | |
|---|---|
| expenditure per student | |
| | (55.98) |
| GPA | 3.04 |
| | (0.02) |
| Age at degree | 22.02 |
| | (0.02) |
| Test score, SD from mean | 0.02 |
| | (0.04) |
| Months between HS & college | 3.11 |
| | (0.04) |
| Considered college's job placement rate | 0.35 |
| | (0.02) |
| Female | 0.49 |
| | (0.02) |
| # of children 2003 | 0.74 |
| | (0.03) |
| White or Asian | 0.91 |
| | (0.01) |
| American Indian, Black, Hispanic, or Other | 0.09 |
| | (0.01) |
| Observations | 3191 |

*Note*. Weighted means and standard errors. Binary variables representing major, state of residence, and month of graduation have been excluded for length.

Table 3. *Means for Earnings and Predictors, by College Rank*

| | Least-Selective Mean/SE | Less-Selective Mean/SE | Moderately-Selective Mean/SE | Elite Mean/SE | Super-Elite Mean/SE |
|---|---|---|---|---|---|
| Hourly Earnings 2003 | 24.95 | 29.46 | 28.78 | 29.56 | 34.93 |
| | (1.24) | (1.86) | (0.72) | (1.19) | (5.46) |
| First (bottom) SES quintile | 0.30 | 0.21 | 0.13 | 0.11 | 0.04 |
| | (0.04) | (0.02) | (0.02) | (0.02) | (0.02) |
| Second SES quintile | 0.21 | 0.25 | 0.18 | 0.13 | 0.07 |
| | (0.03) | (0.02) | (0.02) | (0.04) | (0.03) |
| Third SES quintile | 0.19 | 0.20 | 0.24 | 0.18 | 0.19 |
| | (0.03) | (0.02) | (0.02) | (0.03) | (0.05) |
| Fourth SES quintile | 0.14 | 0.18 | 0.20 | 0.25 | 0.28 |
| | (0.02) | (0.02) | (0.02) | (0.03) | (0.06) |
| Fifth (top) SES quintile | 0.17 | 0.16 | 0.24 | 0.33 | 0.42 |
| | (0.03) | (0.02) | (0.02) | (0.05) | (0.04) |
| Elite SES | 0.05 | 0.07 | 0.11 | 0.14 | 0.19 |
| | (0.01) | (0.01) | (0.01) | (0.03) | (0.05) |
| Academic expenditure per student | 1012.30 | 1381.77 | 1972.05 | 2880.45 | 5067.54 |
| | (55.32) | (50.54) | (71.29) | (308.51) | (723.09) |
| Instructional expenditure per student | 4782.24 | 5856.85 | 7965.00 | 11586.43 | 17310.47 |
| | (204.06) | (144.68) | (225.44) | (1012.57) | (1059.66) |
| Student services expenditure per student | 923.26 | 908.78 | 1181.19 | 1546.53 | 2880.26 |

| | | | | | |
|---|---|---|---|---|---|
| | (49.21) | (42.75) | (66.92) | (210.34) | (457.01) |
| GPA | 2.96 | 3.02 | 3.10 | 3.08 | 3.08 |
| | (0.05) | (0.02) | (0.02) | (0.05) | (0.15) |
| Age at degree | 22.24 | 22.11 | 21.90 | 21.76 | 21.63 |
| | (0.06) | (0.03) | (0.03) | (0.06) | (0.07) |
| Test score, SD from mean | -0.62 | -0.18 | 0.26 | 0.64 | 1.36 |
| | (0.08) | (0.04) | (0.04) | (0.12) | (0.07) |
| Months between HS & college | 3.20 | 3.11 | 3.13 | 2.96 | 3.10 |
| | (0.12) | (0.05) | (0.11) | (0.08) | (0.14) |
| Considered college's job placement rate | 0.30 | 0.34 | 0.35 | 0.42 | 0.45 |
| | (0.04) | (0.02) | (0.03) | (0.05) | (0.04) |
| Female | 0.54 | 0.50 | 0.51 | 0.40 | 0.39 |
| | (0.04) | (0.02) | (0.03) | (0.04) | (0.04) |
| # of children 2003 | 1.03 | 0.76 | 0.68 | 0.50 | 0.41 |
| | (0.08) | (0.05) | (0.04) | (0.06) | (0.09) |
| White or Asian | 0.83 | 0.93 | 0.92 | 0.91 | 0.91 |
| | (0.04) | (0.01) | (0.01) | (0.02) | (0.02) |
| American Indian, Black, Hispanic, or Other | 0.17 | 0.07 | 0.08 | 0.09 | 0.09 |
| | (0.04) | (0.01) | (0.01) | (0.02) | (0.02) |
| Observations | 2534 | 2870 | 2819 | 1826 | 1493 |

*Note*. Weighted means and standard errors. Binary variables representing major, state of residence, and month of graduation have been excluded for length. Number of observations for each column represents the total number of observations that Stata takes into account when calculating the correct weighted standard errors (from "subpop" option of "svy" command).

Table 4. *Means for Earnings and Predictors, by SES*

| | Bottom Quintile Mean/SE | Second Quintile Mean/SE | Third Quintile Mean/SE | Fourth Quintile Mean/SE | Top Quintile Mean/SE | Elite SES Mean/SE |
|---|---|---|---|---|---|---|
| Hourly Earnings 2003 | 26.44 | 27.46 | 27.25 | 32.99 | 30.28 | 33.86 |
| | (1.02) | (1.49) | (0.82) | (3.91) | (1.59) | (3.11) |
| Least-selective college | 0.24 | 0.16 | 0.14 | 0.11 | 0.12 | 0.08 |
| | (0.03) | (0.02) | (0.02) | (0.02) | (0.03) | (0.02) |
| Less-selective college | 0.51 | 0.53 | 0.43 | 0.42 | 0.34 | 0.36 |
| | (0.03) | (0.04) | (0.04) | (0.04) | (0.04) | (0.05) |
| Moderately-selective college | 0.18 | 0.23 | 0.30 | 0.27 | 0.29 | 0.31 |
| | (0.02) | (0.02) | (0.03) | (0.03) | (0.03) | (0.04) |
| Elite college | 0.06 | 0.07 | 0.09 | 0.13 | 0.16 | 0.15 |
| | (0.02) | (0.02) | (0.02) | (0.03) | (0.04) | (0.04) |
| Super-elite college | 0.01 | 0.02 | 0.04 | 0.07 | 0.10 | 0.10 |
| | (0.01) | (0.01) | (0.02) | (0.02) | (0.03) | (0.04) |
| Academic expenditure per student | 1441.10 | 1531.11 | 1762.22 | 1986.39 | 2257.82 | 2376.51 |
| | (57.84) | (62.43) | (103.56) | (114.09) | (175.79) | (288.01) |
| Instructional expenditure per student | 6185.92 | 6480.54 | 7392.59 | 8007.61 | 8591.51 | 8962.83 |
| | (194.54) | (202.04) | (322.30) | (307.53) | (392.24) | (549.37) |
| Student services expenditure per student | 992.76 | 1015.75 | 1082.30 | 1178.32 | 1407.75 | 1505.04 |
| | (34.38) | (43.85) | (65.78) | (69.04) | (115.28) | (181.90) |
| GPA | 2.98 | 3.04 | 2.99 | 3.09 | 3.10 | 3.06 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | (0.03) | (0.03) | (0.03) | (0.03) | (0.04) | (0.05) |
| Age at degree | 22.18 | 22.03 | 22.04 | 21.97 | 21.89 | 21.86 |
| | (0.05) | (0.04) | (0.04) | (0.04) | (0.05) | (0.06) |
| Test score, SD from mean | -0.35 | -0.13 | 0.02 | 0.16 | 0.37 | 0.42 |
| | (0.06) | (0.05) | (0.07) | (0.07) | (0.07) | (0.09) |
| Months between HS & college | 3.34 | 3.09 | 3.06 | 3.03 | 3.07 | 3.32 |
| | (0.16) | (0.07) | (0.05) | (0.07) | (0.10) | (0.20) |
| Considered college's job placement rate | 0.35 | 0.37 | 0.34 | 0.34 | 0.34 | 0.31 |
| | (0.03) | (0.03) | (0.03) | (0.03) | (0.03) | (0.04) |
| Female | 0.51 | 0.46 | 0.50 | 0.51 | 0.49 | 0.49 |
| | (0.03) | (0.03) | (0.03) | (0.03) | (0.03) | (0.04) |
| # of children 2003 | 0.82 | 0.80 | 0.77 | 0.66 | 0.67 | 0.67 |
| | (0.06) | (0.06) | (0.05) | (0.05) | (0.05) | (0.06) |
| White or Asian | 0.85 | 0.89 | 0.92 | 0.95 | 0.95 | 0.94 |
| | (0.02) | (0.02) | (0.02) | (0.01) | (0.02) | (0.02) |
| American Indian, Black, Hispanic, or Other | 0.15 | 0.11 | 0.08 | 0.05 | 0.05 | 0.06 |
| | (0.02) | (0.02) | (0.02) | (0.01) | (0.02) | (0.02) |
| Observations | 3237 | 3292 | 3245 | 3227 | 3206 | 2912 |

*Note*. Weighted means and standard errors. Binary variables representing major, state of residence, and month of graduation have been excluded for length. Number of observations for each column represents the total number of observations that Stata takes into account when calculating the correct weighted standard errors (from "subpop" option of "svy" command).

Rank of college is associated not just with the socioeconomic characteristics of the student body, but also with expenditure on academic services, student services, and instruction, as is strikingly illustrated in Table 3. Among the least-selective institutions, the average yearly expenditure on student services was just 1012.30 per student, compared to a much larger 5067.54 per student at super-elite colleges. The difference in student services expenditure is 923.26 at the least-selective compared to 2880.26 at the super-elite institutions. Instructional expenditure presents the largest discrepancy, 4782.24 at the least-selective relative to 17310.47 at the super-elite institutions. The super-elite colleges in particular spend notably more than any other category, and the difference in spending between the super-elites and any other rank is greater than the difference between any other two rank categories. Super-elite colleges' spending is in fact farther from the average than least-selective colleges' spending: average academic expenditure per student among all colleges was 1800.61, student services expenditure 1138.04, and instructional expenditure 7346.08 (see Table 2).

In my analyses, I will examine if expenditure helps to explain the relationship between SES and earnings, and the descriptive tables suggest that there may be a relationship. Hourly earnings are greater among graduates of higher-ranking colleges, where expenditure is greater. Ten years after graduation, mean hourly earnings are $34.93 among graduates of super-elite colleges and $24.95 among graduates of the least-selective colleges (Table 3). There is also an earnings discrepancy between the highest and lowest socioeconomic quintiles, though it is smaller than the discrepancy between the highest and lowest ranking colleges: $30.28 per hour among respondents from the highest quintile, and $26.44 among respondents from the bottom quintile (Table 4). The fact that the earnings gap related to college rank appears to be larger than

that related to socioeconomic category suggests that college rank does influence earnings, above and beyond the influence of class of origin, at the zero-order level.

**Findings**

In this section, I present the results from Model Sets One through Three, which address research questions one and two:

1. What is the post-graduation earnings gap between high-SES origin and low-SES origin college graduates?
    a. How does the earnings gap differ according to institutional ranking?
    b. Among low-SES origin graduates, is a degree from a high-ranking institution associated with higher earnings than a degree from a low-ranking institution?
2. What student or college characteristics help to explain the post-graduation earnings gap between high-SES origin and low-SES origin students?
    a. If some low-SES origin graduates have higher earnings than others, what factors explain this phenomenon? Can it be explained by different student or college characteristics?
    b. If a degree from an elite college is associated with higher earnings among low-SES origin graduates, what characteristics of elite colleges promote higher earnings?

These results are displayed in Tables 5 through 12. Model Set One demonstrates that there is a gap in earnings between graduates whose parents have high socioeconomic status and graduates whose parents have low socioeconomic status, and that this gap may be explained by GPA, major, institutional expenditure, and institutional rank. However, Model Set Two shows

that the earnings premium associated with high socioeconomic origin among graduates of least-selective, moderately-selective, and elite colleges cannot be explained by the individual and institutional characteristics measured in this study. In Model Set Three, we see that low-SES graduates have higher earnings if they have a degree from an elite college, which also cannot be explained by GPA, major, and institutional expenditure.

**Research Question One**

Model Set One was designed to address in a straightforward manner the first research question: *What is the post-graduation earnings gap between high-SES origin and low-SES origin college graduates?* The findings from Model Set One, presented in Tables 5 and 6, support Hypothesis One, in which I predicted that low-SES graduates have lower earnings than high-SES graduates. The results indicate that there is indeed a post-graduation earnings gap between high-SES origin and low-SES origin students. More specifically, there is earnings gap between respondents from the most privileged backgrounds and everyone else. Elite socioeconomic background is associated with 13 to 16 percent greater earnings, depending on the model configuration, relative to any other background (Table 6).

Table 5. *Model Set One: OLS & HLM Effect of SES Quintile on Earnings*

| | (1) SES only | (2) +Basic Controls | (3) +GPA & Major | (4) +Institutional Expenditure | (5) +Rank |
|---|---|---|---|---|---|
| **OLS** | | | | | |
| Second SES quintile | 0.04 | 0.02 | 0.00 | 0.00 | -0.01 |
| | (0.08) | (0.07) | (0.06) | (0.06) | (0.06) |
| Third SES quintile | 0.01 | -0.02 | -0.03 | -0.03 | -0.04 |
| | (0.07) | (0.07) | (0.06) | (0.06) | (0.06) |
| Fourth SES quintile | 0.09 | 0.08 | 0.08 | 0.08 | 0.08 |
| | (0.08) | (0.08) | (0.07) | (0.07) | (0.07) |
| Fifth (top) SES quintile | 0.09 | 0.03 | 0.04 | 0.04 | 0.04 |
| | (0.08) | (0.09) | (0.07) | (0.07) | (0.07) |
| Observations | 4815 | 4815 | 4815 | 4815 | 4815 |
| **HLM** | | | | | |
| Second SES quintile | 0.03 | 0.04 | 0.02 | 0.02 | 0.02 |
| | (0.11) | (0.10) | (0.09) | (0.09) | (0.09) |
| Third SES quintile | -0.01 | -0.05 | -0.05 | -0.05 | -0.05 |
| | (0.12) | (0.10) | (0.09) | (0.09) | (0.09) |
| Fourth SES quintile | 0.11 | 0.11 | 0.10 | 0.10 | 0.10 |
| | (0.12) | (0.11) | (0.10) | (0.10) | (0.10) |
| Fifth (top) SES quintile | 0.10 | 0.05 | 0.04 | 0.04 | 0.04 |
| | (0.13) | (0.12) | (0.10) | (0.10) | (0.10) |
| Observations | 2502 | 2502 | 2502 | 2502 | 2502 |

*Note*. Weighted samples. Number of observations in the OLS specification are much larger than in the HLM specification because they reflect the total number of observations that Stata takes into account when calculating the correct weighted standard errors (from "subpop" option of "svy" command).

The lowest SES quintile has been excluded in order to serve as the comparison group. The following predictor variables were included the models: In Model Two: State of residence, gender, race, number of children, month earned degree, age earned degree, and standardized test score; In Model Three: The aforementioned plus GPA and major; In Model Four: The aforementioned plus expenditure on academic services, expenditure on student services, and expenditure on instruction; In Model Five: The aforementioned plus college rank dummies. Full set of estimates available upon request.

Standard errors in parentheses
$^{+}$ $p < 0.10$, $^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

Table 6. *Model Set One: OLS & HLM Effect of Elite SES on Earnings*

| | (1) SES only | (2) +Basic Controls | (3) +GPA & Major | (4) +Institutional Expenditure | (5) +Rank |
|---|---|---|---|---|---|
| **OLS** | | | | | |
| Elite SES | 0.14* | 0.10 | 0.12* | 0.13* | 0.13* |
| | (0.06) | (0.06) | (0.06) | (0.06) | (0.06) |
| Observations | 4815 | 4815 | 4815 | 4815 | 4815 |
| **HLM** | | | | | |
| Elite SES | 0.16+ | 0.13 | 0.13 | 0.13 | 0.13 |
| | (0.09) | (0.09) | (0.09) | (0.09) | (0.09) |
| Observations | 2502 | 2502 | 2502 | 2502 | 2502 |

*Note*. Weighted samples. Number of observations in the OLS specification are much larger than in the HLM specification because they reflect the total number of observations that Stata takes into account when calculating the correct weighted standard errors (from "subpop" option of "svy" command).

The following predictor variables were included the models: In Model Two: State of residence, gender, race, number of children, month earned degree, age earned degree, and standardized test score; In Model Three: The aforementioned plus GPA and major; In Model Four: The aforementioned plus expenditure on academic services, expenditure on student services, and expenditure on instruction; In Model Five: The aforementioned plus college rank dummies. Full set of estimates available upon request.

Standard errors in parentheses
$^{+}$ $p < 0.10$, $^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

Table 5 lists the OLS & HLM estimates of 2003 hourly earnings regressed on the SES quintiles. In the OLS specifications, none of the quintiles are associated with greater earnings, relative to the bottom quintile. Table 6 illustrates the OLS and HLM estimates of the relationship between elite socioeconomic status and hourly earnings. OLS regressions show that respondents whose parents have elite socioeconomic status have at least 12 percent higher earnings than everyone else, even when accounting for all relevant observed characteristics.

The hierarchical linear models present a similar relationship between the socioeconomic quintiles and earnings to the OLS models. None of the top four socioeconomic quintiles have

greater earnings than the bottom quintile (Table 5). However, the elite socioeconomic group is demonstrated to be privileged above all others (Table 6). Respondents of elite socioeconomic origin have 16 percent higher earnings, relative to all others, before accounting for other factors.

**Research Question 1.a**

Model Set Two addresses research question 1.a: *How does the earnings gap differ according to institutional ranking?* The results support Hypothesis 1.a, that high-ranking institutions have a smaller class-based, post-graduation earnings gap among their graduates than low-ranking institutions. Tables 7 and 8 demonstrate that the earnings gap differs not only according to college rank, but also according to whether one uses an OLS or HLM specification. The consistent finding among the OLS and HLM model specifications is that if one attends one of the least-selective colleges in the nation, an elite socioeconomic background is associated with higher earnings ten years after graduation. The results presented here apply even taking into account the student and institutional characteristics of GPA, major, and expenditure.

Table 7 presents the OLS and HLM estimates of earnings regressed on the socioeconomic quintiles, within each of the five college rank categories. As in the results from Model Set One, the socioeconomic quintiles lack predictive power. It is only in the OLS specification and among graduates of moderately-selective colleges that high-SES respondents—from the fourth socioeconomic quintile—have 19 percent higher hourly earnings in 2003 than respondents from the bottom quintile.

Table 7. *Model Set Two: OLS & HLM Effect of SES Quintile on Earnings, by Rank*

| | (1) Super-Elite | (2) Elite | (3) Moderately-Selective | (4) Less-Selective | (5) Least-Selective |
|---|---|---|---|---|---|
| **OLS** | | | | | |
| Second SES quintile | -0.62 | -0.10 | 0.10 | -0.04 | -0.06 |
| | (0.98) | (0.15) | (0.11) | (0.08) | (0.08) |
| Third SES quintile | -0.08 | -0.13 | 0.13 | -0.10 | -0.15 |
| | (0.75) | (0.17) | (0.11) | (0.07) | (0.14) |
| Fourth SES quintile | 0.01 | 0.21 | 0.19$^{+}$ | 0.01 | -0.23 |
| | (0.86) | (0.19) | (0.10) | (0.10) | (0.15) |
| Fifth (top) SES quintile | -0.29 | 0.13 | 0.15 | -0.12 | -0.04 |
| | (0.85) | (0.13) | (0.10) | (0.09) | (0.13) |
| Observations | 1494 | 1827 | 2819 | 2870 | 2535 |
| **HLM** | | | | | |
| Second SES quintile | -0.10 | -0.07 | 0.03 | -0.04 | -0.06 |
| | (1.50) | (0.27) | (0.15) | (0.11) | (0.12) |
| Third SES quintile | 0.02 | -0.01 | 0.05 | -0.09 | -0.39$^{*}$ |
| | (1.17) | (0.22) | (0.17) | (0.12) | (0.17) |
| Fourth SES quintile | 0.13 | 0.29 | 0.17 | 0.02 | -0.17 |
| | (1.36) | (0.27) | (0.16) | (0.14) | (0.19) |
| Fifth (top) SES quintile | -0.09 | 0.27 | 0.14 | -0.12 | -0.18 |
| | (1.33) | (0.18) | (0.19) | (0.12) | (0.19) |
| Observations | 139 | 246 | 688 | 1047 | 382 |

*Note*. Weighted samples.

Number of observations in the OLS specification are much larger than in the HLM specification because they reflect the total number of observations that Stata takes into account when calculating the correct weighted standard errors (from "subpop" option of "svy" command).

The lowest SES quintile has been excluded in order to serve as the comparison group. The following predictor variables were included each of the models: State of residence, gender, race, number of children, month earned degree, age earned degree, standardized test score, GPA, major, expenditure on academic services, expenditure on student services, and expenditure on instruction. Full set of estimates available upon request.

Standard errors in parentheses
$^{+}$ $p < 0.10$, $^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

Table 8. *Model Set Two: OLS & HLM Effect of Elite SES on Earnings, by Rank*

| | (1) Super-Elite | (2) Elite | (3) Moderately-Selective | (4) Less-Selective | (5) Least-Selective |
|---|---|---|---|---|---|
| **OLS** | | | | | |
| Elite SES | -0.41 | 0.16 | 0.16* | -0.05 | 0.54** |
| | (0.31) | (0.11) | (0.08) | (0.12) | (0.17) |
| Observations | 1494 | 1827 | 2819 | 2870 | 2535 |
| **HLM** | | | | | |
| Elite SES | -0.42 | 0.32+ | 0.05 | 0.01 | 0.38* |
| | (0.49) | (0.17) | (0.08) | (0.16) | (0.15) |
| Observations | 139 | 246 | 692 | 1047 | 382 |

*Note*. Weighted samples.

Number of observations in the OLS specification are much larger than in the HLM specification because they reflect the total number of observations that Stata takes into account when calculating the correct weighted standard errors (from "subpop" option of "svy" command).

The following predictor variables were included each of the models: State of residence, gender, race, number of children, month earned degree, age earned degree, standardized test score, GPA, major, expenditure on academic services, expenditure on student services, and expenditure on instruction. Full set of estimates available upon request.

Standard errors in parentheses
+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

In Table 8, we see that respondents of elite socioeconomic origin also have greater earnings—by 16 percent—compared to all others among graduates of moderately-selective colleges (OLS). The earnings advantage associated with a privileged background is even greater among graduates of the least-selective colleges: those from an elite socioeconomic background have 54 percent higher earnings ten years after graduation.

The hierarchical linear models also show evidence of the advantage of a privileged background. In Table 8, an elite socioeconomic background is associated with 38 percent greater hourly earnings among respondents of the least-selective colleges. An elite socioeconomic

background is also associated with 32 percent greater earnings among graduates of elite colleges. In Table 7, we see a surprising result: among graduates of the least-selective colleges, the third SES quintile has lower earnings than the bottom quintile. In Chapter Five, in which I present the results from Model Set Four, I show that just one year after this cohort graduated, there are more instances in which a higher socioeconomic status is associated with lower earnings, within some college rank categories.

**Research Question 1.b**

The results from the third set of models address research question 1.b: *Among low-SES origin graduates, is a degree from a high-ranking institution associated with higher earnings than a degree from a low-ranking institution?* The findings, displayed in Tables 9 through 12, support Hypothesis 1.b, which states that, among low-SES origin graduates, high-ranking institutions are associated with greater earnings than low-ranking institutions. The findings also suggest that among all respondents, low-SES origin graduates benefit most from a degree from a high-ranking college, because it is only among graduates from the bottom SES quintile that higher college rank is associated with higher earnings. The relationships presented in this section apply to graduates with similar majors and grade point averages, and who attended colleges with similar expenditure on academic services, student services, and instruction.

OLS estimates indicate that bottom-SES quintile students who graduate from an elite college have 49 percent higher hourly earnings than their bottom-quintile peers who graduate from a least-selective college (Table 9). Graduation from a less-selective college is associated with 21 percent higher earnings than graduation from a least-selective college for these low-SES students. However, the HLM estimates show that the earnings advantage provided to the bottom

SES quintile by elite or less-selective colleges is not robust to accounting for clustering of outcome within colleges: degrees from an elite or less-selective college are not statistically significant in the HLM specification. Instead, the results show a 142 percent earnings advantage to a degree from a super-elite college for bottom-quintile respondents.

Table 9. *Model Set Three: OLS & HLM Effect of College Rank on Earnings, by SES Quintile*

| | (1) Bottom Quintile | (2) Second Quintile | (3) Third Quintile | (4) Fourth Quintile | (5) Top Quintile |
|---|---|---|---|---|---|
| **OLS** | | | | | |
| Super elite college | 0.51 | -0.42 | 0.24 | 0.31 | -0.01 |
| | (0.63) | (0.53) | (0.32) | (0.30) | (0.24) |
| Elite college | 0.49* | -0.04 | -0.15 | 0.28 | 0.12 |
| | (0.20) | (0.18) | (0.33) | (0.23) | (0.13) |
| Moderately selective college | 0.02 | 0.05 | 0.20 | 0.22 | 0.10 |
| | (0.13) | (0.11) | (0.16) | (0.18) | (0.11) |
| Less selective college | 0.21* | 0.00 | 0.10 | 0.24 | 0.01 |
| | (0.09) | (0.10) | (0.14) | (0.16) | (0.11) |
| Observations | 3237 | 3291 | 3246 | 3229 | 3207 |
| **HLM** | | | | | |
| Super elite college | 1.42+ | -0.48 | 0.10 | -0.04 | -0.47 |
| | (0.86) | (0.78) | (0.58) | (0.54) | (0.58) |
| Elite college | 0.11 | -0.07 | -0.17 | 0.15 | 0.03 |
| | (0.49) | (0.36) | (0.42) | (0.40) | (0.38) |
| Moderately selective college | -0.08 | -0.03 | 0.06 | 0.15 | -0.10 |
| | (0.31) | (0.24) | (0.25) | (0.31) | (0.32) |
| Less selective college | 0.24 | 0.07 | -0.03 | 0.05 | -0.08 |
| | (0.20) | (0.17) | (0.21) | (0.27) | (0.28) |
| Observations | 475 | 519 | 508 | 490 | 510 |

*Note*. Weighted samples.

Number of observations in the OLS specification are much larger than in the HLM specification because they reflect the total number of observations that Stata takes into account when calculating the correct weighted standard errors (from "subpop" option of "svy" command).

The least-selective college rank category has been excluded in order to serve as the comparison group. The following predictor variables were included each of the models: State of residence, gender, race, number of children, month earned degree, age earned degree, standardized test score, GPA, major, expenditure on academic services, expenditure on student services, and expenditure on instruction. Full set of estimates available upon request.

Standard errors in parentheses
+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 10. *Model Set Three: OLS & PSM Effect of College Rank on Earnings, by SES Quintile*

| | (1) Bottom Quintile | (2) Second Quintile | (3) Third Quintile | (4) Fourth Quintile | (5) Top Quintile |
|---|---|---|---|---|---|
| **OLS** | | | | | |
| Super-elite or elite college | 0.32* | -0.07 | -0.12 | 0.07 | -0.05 |
| | (0.15) | (0.15) | (0.14) | (0.11) | (0.13) |
| Observations | 480 | 520 | 510 | 490 | 510 |
| **PSM** | | | | | |
| Super-elite or elite college | 0.27* | -0.24+ | -0.23* | -0.01 | -0.09 |
| | (0.11) | (0.12) | (0.12) | (0.08) | (0.12) |
| Observations | 420 | 490 | 490 | 480 | 500 |

*Note*. Non-weighted samples used for OLS and PSM specifications. Sample sizes have been rounded to the tenth place, in accordance with NCES guidelines regarding reporting of non-weighted sample sizes.

The following predictor variables were included each of the models: State of residence, gender, race, number of children, month earned degree, age earned degree, standardized test score, GPA, major, expenditure on academic services, expenditure on student services, and expenditure on instruction. Full set of estimates available upon request.

Standard errors in parentheses
+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The propensity score matching results also show that college rank is important to earnings for graduates from the bottom SES quintile. Table 10 presents the relationship between earnings and a degree from an elite college in a sample of respondents who have been matched on their propensity to attend an elite college (in the PSM models, "elite college" includes colleges in the super-elite and elite categories)[19][20]. Respondents from the bottom quintile have 27

[19] As explained in Chapter Three: Methodology, due to small numbers of low-SES students at elite institutions, the super-elite and elite college attendees were grouped together for PSM to improve the quality of PSM results.

[20] Sample sizes in Tables 10 and 12 have been rounded to the tenth place, in accordance with NCES guidelines regarding reporting of non-weighted sample sizes (National Center for Education Statistics's Statistical Standards Program).

percent higher earnings if they attended an elite college, relative to any other type of college. In order to provide a sample whose estimates are comparable with the PSM results, I used a similarly non-weighted, but non-matched sample to calculate OLS estimates of earnings on elite college attendance [21] (Table 10).

The OLS and PSM results are consistent for the bottom quintile: OLS results show 32 percent higher earnings associated with an elite college degree. The OLS and PSM results differ regarding the second and third socioeconomic quintiles. In these quintiles, among respondents with a similar propensity to attend an elite college, elite college attendance is associated with lower earnings than non-elite college attendance.

**Research Question Two**

Both Model Set One and Model Set Two research question two: *What student or college characteristics help to explain the post-graduation earnings gap between high-SES origin and low-SES origin students?* With Hypothesis Two, I expected to find that GPA, major, institutional expenditure, and institutional rank explain the class-based earnings gap. The findings from Model Set One provide partial support for Hypothesis Two among graduates of all types of colleges. However, Model Set Two indicates that these characteristics do not explain the class-based earnings gap among graduates of least-selective, moderately-selective, and elite colleges.

In Model Set One, in models three through five in Table 6, the elite SES indicator is statistically significant in the OLS specifications but not in the hierarchical linear models, which suggests that unobserved characteristics of individual colleges are influencing earnings. The

[21] Due to limitations of the Stata software, no weights were used to produce PSM estimates. See Chapter Three: Methodology for more information. The non-weighted OLS specifications were also calculated using the combined super-elite/elite college rank variable.

hierarchical linear models take into account the clustering of earnings outcomes within individual colleges, which may be influenced by differences in the student experience between colleges. The discrepancy between the OLS and the HLM estimates suggests that characteristics of the particular college one attends, other than expenditure and rank, influence earnings ten years after graduation and help to explain the relationship between socioeconomic status of origin and earnings. These unobserved characteristics may include such traits as peers and quality of career counseling.

The observed student and institutional traits also have explanatory power. The OLS estimates in Table 6 suggest that respondents of elite socioeconomic origin have higher post-graduation earnings even among those with similar values of the observed student and institutional characteristics. However, once one accounts for the violation of the independence of errors assumption by using HLM, individual and institutional characteristics explain the class-based earnings discrepancy. Before accounting for other individual and institutional characteristics, elite socioeconomic status of origin is associated with higher earnings even when accounting for clustering of earnings within colleges using HLM. But unlike the OLS estimates, among respondents with similar grade point averages and majors, those from an elite background do not have higher hourly earnings. Nor is there a class-based earnings gap among respondents who went to colleges with similar expenditure on academic services, student services, and instruction, and with similar rank.

Model Set Two also addresses research question two, but from a different perspective than did Model Set One: While GPA, major, and institutional expenditure do appear to help account for the class-based earnings gap in Model Set One, Table 8 shows us that the earnings premium associated with elite socioeconomic status among graduates of elite (HLM),

moderately-selective (OLS), and least-selective (OLS & HLM) colleges cannot be accounted for by GPA, major, and institutional expenditure[22].

**Research Questions 2.a and 2.b**

The estimates provided by Model Set Three provide answers to research questions 2.a and 2.b: (2.a) *If some low-SES origin graduates have higher earnings than others, what factors explain this phenomenon? Can it be explained by different student or college characteristics?*, and (2.b) *If a degree from an elite college is associated with higher earnings among low-SES origin graduates, what characteristics of elite colleges promote higher earnings?* Four model specifications, presented in Tables 11 and 12, address these questions. In Hypothesis 2.a, I stated that some low-SES graduates have higher earnings than others because of their GPA, major, institution's expenditure, and institution's rank. The findings do not lend much support to this hypothesis. Hypothesis 2.b is more supported than Hypothesis 2.a, but also not fully. Hypothesis 2.b stated that elite colleges' expenditure and additional unobserved characteristics lead their low-SES graduates to have higher earnings than low-SES graduates of lower-ranking colleges.

Table 11 compares the OLS and HLM estimates of earnings regressed on rank for only the bottom socioeconomic quintile in the weighted sample, with progressively more variables taken into account. The OLS estimates indicate that a degree from an elite college is associated with 49 percent higher earnings—relative to a degree from a least-selective college—even when taking into account the respondents' GPA and major and their colleges' expenditure on academic

[22] The HLM estimates for earnings regressed on elite socioeconomic status, within the college rank categories, without any control variables (for comparison purposes), are available upon request. In this specification, elite socioeconomic status is associated with higher earnings among graduates of least-selective colleges (as it is with the control variables) and less-selective colleges (it is not with control variables).

services, student services, and instruction. In fact, the more variables that are taken into account, the higher the earnings premium associated with elite college rank. The HLM estimates similarly show only an earnings advantage to a degree from a super-elite college when all factors are accounted for.

Table 11. *Model Set Three: OLS & HLM Effect of Individual and Institutional Characteristics on Earnings, Bottom Quintile*

| | (1) Rank Only | (2) +Basic Controls | (3) +GPA & Major | (4) +Institutional Expenditure |
|---|---|---|---|---|
| **OLS** | | | | |
| Super-elite college | -0.06 | 0.09 | 0.26 | 0.51 |
| | (0.60) | (0.68) | (0.62) | (0.63) |
| Elite college | 0.18$^{+}$ | 0.26 | 0.31$^{*}$ | 0.49$^{*}$ |
| | (0.10) | (0.17) | (0.15) | (0.20) |
| Moderately-selective college | -0.07 | -0.14 | -0.08 | 0.02 |
| | (0.10) | (0.11) | (0.11) | (0.14) |
| Less-selective college | 0.05 | 0.13 | 0.17$^{+}$ | 0.21$^{*}$ |
| | (0.13) | (0.08) | (0.09) | (0.10) |
| Observations | 3378 | 3378 | 3378 | 3378 |
| **HLM** | | | | |
| Super-elite college | 0.25 | 0.76 | 1.19 | 1.42$^{+}$ |
| | (0.69) | (0.80) | (0.75) | (0.86) |
| Elite college | 0.12 | -0.14 | -0.00 | 0.11 |
| | (0.13) | (0.38) | (0.36) | (0.49) |
| Moderately-selective college | -0.01 | -0.29 | -0.14 | -0.08 |
| | (0.18) | (0.26) | (0.28) | (0.31) |
| Less-selective college | 0.11 | 0.18 | 0.23 | 0.24$^{+}$ |
| | (0.10) | (0.19) | (0.19) | (0.20) |
| Observations | 475 | 475 | 475 | 475 |

*Note*. Weighted samples. Samples include only respondents from the bottom socioeconomic quintile. Number of observations in the OLS specification are much larger than in the HLM specification because they reflect the total number of observations that Stata takes into account when calculating the correct weighted standard errors (from "subpop" option of "svy" command).

The least-selective college rank category has been excluded in order to serve as the comparison group. The following predictor variables were included the models: In Model Two: State of residence, gender, race, number of children, month earned degree, age earned degree, and standardized test score; In Model Three: The aforementioned plus GPA and major; In Model Four: The aforementioned plus expenditure on academic services, expenditure on student services, and expenditure on instruction. Full set of estimates available upon request.

Standard errors in parentheses
$^{+}$ $p < 0.10$, $^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

Table 12. *Model Set Three: OLS & PSM Effect of Individual and Institutional Characteristics on Earnings, Bottom Quintile*

| | (1) Rank Only | (2) +Basic Controls | (3) +GPA & Major | (4) +Institutional Expenditure |
|---|---|---|---|---|
| **OLS** | | | | |
| Super-elite or elite college | 0.14 | 0.15 | 0.20 | 0.32* |
| | (0.13) | (0.14) | (0.14) | (0.15) |
| Observations | 480 | 480 | 480 | 480 |
| **PSM** | | | | |
| Super-elite or elite college | 0.13* | 0.12 | 0.13 | 0.27* |
| | (0.06) | (0.09) | (0.09) | (0.11) |
| Observations | 420 | 420 | 420 | 420 |

*Note*. Samples include only respondents from the bottom socioeconomic quintile and are non-weighted for the OLS and PSM specifications. Sample sizes have been rounded to the tenth place, in accordance with NCES guidelines regarding reporting of non-weighted sample sizes.

The following predictor variables were included the models: In Model Two: State of residence, gender, race, number of children, month earned degree, age earned degree, and standardized test score; In Model Three: The aforementioned plus GPA and major; In Model Four: The aforementioned plus expenditure on academic services, expenditure on student services, and expenditure on instruction. Full set of estimates available upon request.

Standard errors in parentheses
$^{+}$ $p < 0.10$, $^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

Table 12 compares the non-weighted sample OLS & PSM estimates from regressing earnings on a degree from an elite college. The OLS estimates show that in the non-matched sample, there is an earnings advantage only among respondents with similar characteristics, including test score, GPA, major, and institutional expenditure. In the sample in which individuals were matched on their propensity to attend an elite college, an elite college degree is associated with higher earnings when no other factors are taken into account, when basic factors such as state of residence, gender, and test score are taken into account, and when institutional expenditure is taken into account.

The consistent theme running through the results presented in Tables 11 and 12 is that accounting for the student characteristics of GPA and major, or the institutional characteristics of expenditure, does not explain away the earnings boost provided to bottom SES quintile respondents by elite colleges. In fact, college rank is more often a statistically significant predictor of earnings when individual and institutional characteristics are taken into account, than when they are not.

In answer to research question 2.a, low-SES origin graduates who attend elite colleges have higher earnings than those who do not. This phenomenon cannot be explained away by taking into account such factors as test score, GPA, major, or institutional expenditure in the areas of academic services, student services, or instruction. Regarding research question 2.b, it is not the greater expenditure of elite colleges in the areas of academic services, student services, or instruction that is responsible for the earnings advantage with which they are associated. Nor are the grade point averages or majors of students at these institutions responsible for the earnings boost.

**Discussion**

As with the presentation of the estimates, the discussion is organized according to the order of the research questions. The answers to the research questions are summarized in question order, accompanied by an explication of their implications.

In the first research question, I ask whether there is a post-graduation earnings gap between high- and low-SES origin graduates. Hypothesis One proclaims that low-SES origin graduates have lower earnings than high-SES origin graduates. Indeed, the results from Model Set One show that yes, graduates from higher socioeconomic origins do have higher earnings

than other graduates. This phenomenon is only apparent, however, when comparing the graduates with the most socioeconomically privileged parents to all others. Even the estimates with the HLM and design-adjusted standard errors indicate that the elite group has about 16 percent higher earnings, before controlling for demographic characteristics, GPA, major, and institutional characteristics.

With research sub-question 1.a, I questioned how the earnings gap would differ according to institutional rank, and correctly hypothesized that high-ranking institutions would have a smaller SES-based earnings gap among their graduates than low-ranking institutions. Model Set Two demonstrates that the SES-based post-graduation earnings gap does vary according to institutional rank. The earnings premium associated with elite socioeconomic origin is larger among graduates of the least-selective colleges than among graduates of higher-ranking colleges, but the earnings gap among moderately-selective and elite colleges is notable as well: a 16 percent difference between the elites and all others among graduates of moderately-selective colleges in the OLS specification, and a 32 percent difference among graduates of elite colleges in the HLM specification. The earnings premium to being of elite socioeconomic origin at least-selective colleges—the consistent result among the OLS and HLM specifications—has several implications. The first is that least-selective colleges do not "level the playing field" among their students as well as higher-ranking colleges when it comes to earnings opportunities following graduation. The least-selective colleges are not serving their lower-SES students as well as their higher-SES students. However, there may be a more gentle interpretation.

Unlike the elite-SES indicator, the highest socioeconomic quintile is not associated with higher earnings at least-selective colleges. One interpretation of this result is that graduates of the most privileged socioeconomic origins have class-related qualities that other students do not

have, which are unrelated to the colleges they attend and lead them to have higher earnings following graduation (Aries & Seider, 2007; Armstrong & Hamilton, 2013; Bourdieu, 1977; Rivera, 2011; Tholen et al., 2013).

These are resources—such as cultural and social capital (Bourdieu, 1977, 1986)—that are difficult for colleges to provide to their students. These are also resources that may be especially helpful if one graduates from a college where the typical post-graduation career tracks are not associated with relatively high earnings. In other words, elite-origin graduates of the least-selective colleges have higher earnings not because the colleges serve them better than they serve low-SES students, but due to class-related advantages that they would have no matter which college they attend.

The aforementioned is a likely interpretation among least-selective colleges, which serve a larger proportion of low-SES origin students than higher-ranking colleges. However, the SES-based earnings gap among graduates of higher-ranking colleges may have an additional explanation. Moderately-selective and elite colleges serve a higher proportion of high-SES students than least-selective colleges, and a lower proportion of low-SES students (see Table 3). Therefore, they may be structured to better serve high-SES students, a phenomenon vividly described by Armstrong and Hamilton (2013). The earnings premium associated with elite socioeconomic origins at moderately-selective and elite colleges may be due not only to class-related qualities such as greater capital, but how those qualities interact with systems designed to reward the students who possess them (Bourdieu, 1977, 1986). Least-selective colleges' structures may also reward high-SES students' capital, of course, but the effect is likely stronger at high-ranking colleges, which serve a greater proportion of high-SES origin students, because they are structured to serve that demographic.

High-ranking colleges may be structured to serve a high-SES demographic, but they may also provide better opportunities than low-ranking colleges for low-SES students to gain capital and to enter high-paying careers. Research question 1.b asks whether high-ranking institutions are associated with higher earnings among low-SES origin students than low-ranking institutions. The evidence from my findings indicates that Hypothesis 1.b, that the higher ranking the institution, the greater the earnings premium provided to low-SES students, is supported. Model Set Two provides some indirect evidence in support of the hypothesis. Elite socioeconomic origins are not associated with higher earnings in most of the higher rank categories (the categories above least-selective), and when they are, the earnings premium is smaller than it is among graduates of the least-selective colleges. This implies that higher-ranking colleges may be better than the least-selective colleges at leveling the playing field between high- and low-SES origin graduates, and between students of elite origin and everyone else.

Model Set Three provides more direct evidence in support of Hypothesis 1.b. The estimates indicate that a degree from an elite college is associated with higher earnings than a degree from a non-elite college. Interestingly, the findings suggest that an elite college degree is associated with higher earnings only for graduates from the bottom socioeconomic quintile. Not only do low-SES origin students have a lot to gain from elite college attendance, they also have more to gain than students from more privileged backgrounds.

The answers to the second set of research questions provide more evidence for the economic gain that low-SES students receive from an elite college degree. The second research question asks what student or college characteristics explain the class-based post-graduation earnings gap. The sub-questions address the reasons for the earnings gap among low-SES origin

graduates and for the earnings premium associated with elite colleges. I expected to find that the earnings gap is predicted by GPA, major, institutional expenditure, and institutional rank. Hypothesis Two is somewhat supported. The results from Model Set One suggest that individual and institutional characteristics do help explain the class-based earnings gap among all graduates. However, these characteristics do not explain the class-based earnings gap among graduates of least-selective, moderately-selective, and elite colleges (Model Set Two).

In addition, Model Set Three shows that neither individual nor institutional characteristics can account for the rank-based earnings gap among graduates from the bottom socioeconomic quintile. In the OLS, HLM, and PSM specifications, a degree from an elite college is associated with higher earnings for the bottom SES quintile even among individuals with a similar GPA and major, and whose colleges had similar expenditure on academic services, student services, and instruction. Hypothesis 2.a, which stated that some low-SES origin graduates have higher earnings than others due to these personal and institutional characteristics and rank, is thus mostly false. Hypothesis 2.b, which stated that the expenditure and other unobserved characteristics of elite colleges lead to higher earnings for low-SES origin students, is half supported.

The findings show that, while low-SES origin graduates of elite colleges earn less than their privileged peers, they earn more than they would have had they graduated from a lower-ranking college. The earnings premium is not due to the grade point averages or majors of the low-SES students at elite colleges, nor due to the higher expenditure on academic services, student services, or instruction by elite colleges. And yet, the findings imply that elite colleges do something that promotes upward mobility for low-SES students that lower-ranking colleges do

not do. If not superior academic performance, more lucrative majors, or more expenditure on services, then what?

The literature and my theoretical framework provide some clues. Elite institutions provide access to lucrative career paths because elite employers recruit at these institutions, partly because they perceive the students to be highly-able (Rivera, 2011; Tholen et al., 2013). Furthermore, elite institutions may provide low-SES students with greater social, cultural, and human capital in a manner not captured by the observed expenditure variables, as is evidenced in the literature (Aries & Seider, 2005, 2007; Braxton & Nordvall, 1985; Gerber & Cheung, 2008; Hurst, 2010; Jensen, 2004; Lehmann, 2009; London, 1992; Reay et al., 2009). Exposure to this capital may come from classroom experiences, student programming, or peer interaction.

While the findings suggest that elite institutions provide low-SES students with more capital than lower-ranking institutions, the findings also suggest that this provision is limited. The higher earnings of elite-SES origin respondents, even among graduates of elite colleges, indicate that even if low-SES students gain some capital at college, they do not catch up to their high-SES peers. This has been indicated in other literature, which describes how capital builds upon capital (Aries & Seider, 2005; Armstrong & Hamilton, 2013; Hurst, 2010; Lehmann, 2009; Stuber, 2009; Tholen et al., 2013). Consequentially, the capital discrepancy with which students enter college makes it more difficult for low-SES students than high-SES students to successfully take advantage of the high-earning career opportunities (Lehmann, 2009; Tholen et al., 2013).

**Conclusion**

In this chapter, I have shown that the return to a Bachelor's degree does vary according to one's parents' socioeconomic status and the rank of the college from which one graduates. This

variation cannot be accounted for with the obvious relevant individual and institutional variables. Elite-SES origin graduates earn more than all others. While individual and institutional characteristics explain some of this discrepancy among the full sample, I have reported evidence that among graduates of least-selective, moderately-selective, and elite colleges, elite socioeconomic origin is associated with higher earnings even when accounting for these factors. At the same time, the findings reveal that low-SES students in particular receive an earnings premium from attending an elite college, though the reasons remain unknown.

Because the specific factors associated with elite college attendance that help low-SES students get ahead remain unclear, it is impossible to be sure which steps colleges should take to level the playing field between low- and high-SES students on the labor market. Helping low-SES origin students earn a high grade point average and choose a lucrative major, and providing them with high-quality academic, student, and instructional resources are actions that surely do make a difference. However, the findings presented in this chapter indicate that these resources are not enough, and that colleges must take deliberate action if they want to close the class-based earnings discrepancy among their graduates. Low-ranking colleges must work hard if they want their low-SES students to have similar earnings outcomes as low-SES students at elite colleges. Unobserved qualities of elite colleges are leading their low-SES graduates toward earnings higher than those of low-SES graduates of low-ranking colleges. The literature and my theoretical framework hint that some of these qualities relate to the social and cultural capital that low-SES students gain at elite colleges. Another important influence is likely the career opportunities unique to elite colleges.

The findings, interpreted through the lens of my theoretical framework, suggest that when low-SES students attend an elite college, they are gaining capital and career opportunities that

they would not at a lower-ranking institution. They earn more than they would have if they had not attended an elite college, but they are not catching up to their peers from the most privileged backgrounds. The most privileged graduates of elite, moderately-selective, and the least-selective colleges out-earn all others. Many forces, some visible and others very difficult to discern, some enacted by colleges and some only loosely related, are likely at play. It may be impossible for colleges to provide their least-privileged students with all of the capital possessed by their most-privileged students, thereby closing the post-graduation earnings gap. That should not stop them, however, from doing their best to improve the equity of their structures as best as possible. Colleges should implement programs to increase the social and cultural capital of their low-SES students and help them compete more effectively with high-SES students on the job market. As we will see in Chapter Five, such programs are no less important for more recent cohorts than they would have been for the 1992-1993 graduates. Indeed, the influence of class of origin on immediate post-graduation earnings appears to have increased between 1994 and 2009.

## Chapter 5: Change over Time in the Influences on Earnings

Chapter Five presents the estimates from Model Set Four, which address research question 3: Did the post-graduation earnings gap, or the factors that influence it, change over time? In the first section, I describe the characteristics of the 1992-1993 and 2007-2008 Baccalaureate and Beyond graduating cohorts. The findings are then presented in clusters according to model configuration, followed by a discussion of their implications. Model Set Four demonstrates that there has been change over time in the relationships between class of origin, college rank, and earnings. Just one year after graduation, the earnings premium associated with high class of origin was non-existent among the 1992-1993 graduates, but notable among the 2007-2008 graduates. I use the theoretical framework and other literature to explain both the change between the cohorts and the change in the 92/93 cohort that occurred between 1994 and 2003. The findings support the first part of Hypothesis 3, that the high/low-SES and low-SES elite college/low-SES non-elite college earnings gaps changed over time. They do not support the second part of the hypothesis, that the influences on the high/low-SES earnings gap changed over time.

### Descriptive Statistics for the 92/93 and 07/08 Cohorts

The characteristics of the full sample from each cohort are illustrated in Tables 13 through 18. For both cohorts, the imposition of the necessary restrictions reduces the number of observations from the original sample size considerably. The size of the 92/93 sample is reduced from 11,000 to 5,000 after 2,030 observations are dropped because they transferred more than 60 credits to their degree-granting institution; then about 3,040 because they were not financially

dependent on their parents as undergraduates; 250 because they had a previous Bachelor's degree; and 600 because they were out of the labor force in 1994[23]. The sample size of 5,000 is further reduced in the analyses when observations are dropped due to having missing values.

The 07/08 cohort's sample size of about 17,000 is reduced by approximately 4,090 after dropping respondents who transferred more than 60 credits to their degree-granting institution; another 5,310 after dropping respondents who were financially independent as undergraduates; 240 after dropping respondents who had previously earned a bachelor's degree; and 810 after dropping respondents who were out of the labor force in 2009. The sample size of around 6,000 is further reduced during the analyses due to missing values in the data.

Table 13 illustrates the means and standard errors of the dependent and independent variables for the 92/93 graduate sample. Table 14 breaks down these statistics according to college rank, and Table 15 according to parents' socioeconomic status. In Table 13, we see that approximately twenty percent of the sample hails from each socioeconomic quintile, and 9 percent have parents with elite socioeconomic status[24]. The largest proportion of respondents—45 percent—attended a college in the "less-selective" rank category. 16 percent attended a least-selective college, 26 percent a moderately-selective college, 9 percent an elite college, and 4 percent a super-elite college.

[23] The 92/93 sample used in this chapter's analyses is different from the sample used in the previous chapter. This sample is defined by respondents who were in the labor force in 1994, while the previous chapter's sample is defined by respondents who were in the labor force in 2003.

[24] A graduate is considered to be of elite socioeconomic origin if both parents have at least a bachelor's degree and an income in the top ten percent of the income distribution of the sample.

Table 13. *92/93 Cohort: Means for Earnings and Predictors*

| | All Graduates Mean/SE |
|---|---|
| Hourly Earnings 1994 | 10.76 |
| | (0.24) |
| First (bottom) SES quintile | 0.19 |
| | (0.01) |
| Second SES quintile | 0.21 |
| | (0.01) |
| Third SES quintile | 0.20 |
| | (0.01) |
| Fourth SES quintile | 0.20 |
| | (0.01) |
| Fifth (top) SES quintile | 0.20 |
| | (0.01) |
| Elite SES | 0.09 |
| | (0.01) |
| Least-selective college | 0.16 |
| | (0.02) |
| Less-selective college | 0.45 |
| | (0.03) |
| Moderately-selective college | 0.26 |
| | (0.03) |
| Elite college | 0.09 |
| | (0.02) |
| Super-elite college | 0.04 |
| | (0.01) |
| Academic expenditure per student | 1691.60 |
| | (61.84) |
| Instructional expenditure per student | 6993.91 |
| | (200.16) |
| Student services | 1101.08 |

| | |
|---|---|
| expenditure per student | |
| | (42.31) |
| GPA | 3.00 |
| | (0.02) |
| Age at degree | 22.02 |
| | (0.02) |
| Test score, SD from mean | 0.01 |
| | (0.04) |
| Female | 0.55 |
| | (0.01) |
| # of children 1993 | 0.00 |
| | (0.00) |
| White or Asian | 0.91 |
| | (0.01) |
| American Indian, Black, Hispanic, or Other | 0.09 |
| | (0.01) |
| Observations | 2379 |

*Note*. Weighted means and standard errors. Binary variables representing major, state of residence, and month of graduation have been excluded for length. Though the cohort is the same, this is not the same sample as was used in Chapter Four.

Table 14. *92/93 Cohort: Means for Earnings and Predictors, by College Rank*

| | Least Selective | Less Selective | Moderately Selective | Elite | Super Elite |
|---|---|---|---|---|---|
| | Mean/SE | Mean/SE | Mean/SE | Mean/SE | Mean/SE |
| Hourly Earnings 1994 | 9.83 | 10.80 | 10.74 | 10.51 | 15.21 |
| | (0.35) | (0.37) | (0.35) | (0.32) | (3.29) |
| First (bottom) SES quintile | 0.27 | 0.21 | 0.15 | 0.11 | 0.03 |
| | (0.03) | (0.02) | (0.02) | (0.02) | (0.02) |
| Second SES quintile | 0.20 | 0.27 | 0.17 | 0.15 | 0.08 |
| | (0.03) | (0.02) | (0.02) | (0.04) | (0.03) |
| Third SES quintile | 0.21 | 0.19 | 0.24 | 0.16 | 0.15 |
| | (0.03) | (0.02) | (0.02) | (0.02) | (0.04) |
| Fourth SES quintile | 0.13 | 0.19 | 0.22 | 0.23 | 0.34 |
| | (0.02) | (0.02) | (0.02) | (0.04) | (0.05) |
| Fifth (top) SES quintile | 0.19 | 0.15 | 0.22 | 0.35 | 0.39 |
| | (0.03) | (0.02) | (0.02) | (0.05) | (0.06) |
| Elite SES | 0.05 | 0.07 | 0.10 | 0.19 | 0.14 |
| | (0.01) | (0.01) | (0.01) | (0.05) | (0.04) |
| Academic expenditure per student | 1021.12 | 1362.76 | 1909.65 | 2672.93 | 4694.78 |
| | (59.42) | (58.75) | (99.51) | (383.55) | (572.04) |
| Instructional expenditure per student | 4895.01 | 5824.47 | 7672.03 | 10582.16 | 16837.21 |
| | (226.27) | (210.85) | (314.64) | (1208.70) | (1534.93) |
| Student services expenditure per student | 940.32 | 911.23 | 1215.72 | 1400.96 | 2600.61 |

| | | | | | |
|---|---|---|---|---|---|
| | (55.45) | (43.15) | (91.77) | (225.66) | (467.18) |
| GPA | 2.94 | 2.99 | 3.05 | 3.03 | 3.02 |
| | (0.04) | (0.02) | (0.02) | (0.04) | (0.15) |
| Age at degree | 22.22 | 22.10 | 21.92 | 21.78 | 21.59 |
| | (0.06) | (0.03) | (0.03) | (0.06) | (0.10) |
| Test score, SD from mean | -0.61 | -0.14 | 0.26 | 0.57 | 1.38 |
| | (0.07) | (0.04) | (0.05) | (0.09) | (0.11) |
| Female | 0.59 | 0.54 | 0.58 | 0.47 | 0.44 |
| | (0.03) | (0.02) | (0.03) | (0.03) | (0.08) |
| # of children 1993 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | (.) | (0.00) | (.) | (.) | (.) |
| White or Asian | 0.84 | 0.94 | 0.92 | 0.90 | 0.89 |
| | (0.04) | (0.01) | (0.01) | (0.02) | (0.04) |
| American Indian, Black, Hispanic, or Other | 0.16 | 0.06 | 0.08 | 0.10 | 0.11 |
| | (0.04) | (0.01) | (0.01) | (0.02) | (0.04) |
| Observations | 4030 | 3503 | 3857 | 3457 | 2020 |

*Note*. Weighted means and standard errors. Binary variables representing major, state of residence, and month of graduation have been excluded for length. Number of observations for each column represents the total number of observations that Stata takes into account when calculating the correct weighted standard errors (from "subpop" option of "svy" command). Though the cohort is the same, this is not the same sample as was used in Chapter Four.

Table 15. *92/93 Cohort: Means for Earnings and Predictors, by SES*

| | Bottom Quintile Mean/SE | Second Quintile Mean/SE | Third Quintile Mean/SE | Fourth Quintile Mean/SE | Top Quintile Mean/SE | Elite SES Mean/SE |
|---|---|---|---|---|---|---|
| Hourly Earnings 1994 | 11.17 | 10.46 | 10.66 | 11.12 | 10.43 | 10.41 |
| | (0.79) | (0.31) | (0.43) | (0.74) | (0.28) | (0.40) |
| Least-selective college | 0.23 | 0.15 | 0.17 | 0.11 | 0.15 | 0.09 |
| | (0.04) | (0.02) | (0.03) | (0.02) | (0.03) | (0.03) |
| Less-selective college | 0.50 | 0.56 | 0.42 | 0.44 | 0.34 | 0.36 |
| | (0.04) | (0.04) | (0.04) | (0.05) | (0.05) | (0.06) |
| Moderately-selective college | 0.21 | 0.21 | 0.31 | 0.29 | 0.28 | 0.29 |
| | (0.04) | (0.03) | (0.04) | (0.04) | (0.04) | (0.05) |
| Elite college | 0.06 | 0.07 | 0.07 | 0.11 | 0.16 | 0.20 |
| | (0.02) | (0.02) | (0.02) | (0.03) | (0.05) | (0.07) |
| Super-elite college | 0.01 | 0.01 | 0.03 | 0.06 | 0.07 | 0.06 |
| | (0.00) | (0.01) | (0.01) | (0.02) | (0.02) | (0.02) |
| Academic expenditure per student | 1424.65 | 1501.44 | 1627.57 | 1962.01 | 1939.95 | 1980.58 |
| | (62.82) | (60.10) | (77.22) | (120.74) | (107.03) | (125.58) |
| Instructional expenditure per student | 6057.29 | 6386.39 | 6873.35 | 7851.10 | 7787.36 | 8015.35 |
| | (209.18) | (209.38) | (247.72) | (340.82) | (347.08) | (392.53) |
| Student services expenditure per student | 1015.93 | 1006.86 | 1072.82 | 1185.37 | 1225.43 | 1211.66 |
| | (43.02) | (44.52) | (53.69) | (78.10) | (73.70) | (92.94) |
| GPA | 2.96 | 3.02 | 2.95 | 3.03 | 3.05 | 2.99 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | (0.03) | (0.02) | (0.03) | (0.03) | (0.03) | (0.04) |
| Age at degree | 22.15 | 22.07 | 22.06 | 22.01 | 21.83 | 21.76 |
| | (0.05) | (0.04) | (0.04) | (0.04) | (0.05) | (0.07) |
| Test score, SD from mean | -0.31 | -0.14 | -0.03 | 0.17 | 0.33 | 0.31 |
| | (0.07) | (0.05) | (0.06) | (0.07) | (0.06) | (0.08) |
| Female | 0.59 | 0.50 | 0.54 | 0.56 | 0.56 | 0.55 |
| | (0.03) | (0.02) | (0.03) | (0.03) | (0.03) | (0.04) |
| # of children 1993 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | (.) | (.) | (.) | (0.00) | (.) | (.) |
| White or Asian | 0.83 | 0.88 | 0.94 | 0.96 | 0.94 | 0.94 |
| | (0.03) | (0.02) | (0.01) | (0.01) | (0.02) | (0.02) |
| American Indian, Black, Hispanic, or Other | 0.17 | 0.12 | 0.06 | 0.04 | 0.06 | 0.06 |
| | (0.03) | (0.02) | (0.01) | (0.01) | (0.02) | (0.02) |
| Observations | 3374 | 3401 | 3384 | 3381 | 3351 | 3302 |

*Note*. Weighted means and standard errors. Binary variables representing major, state of residence, and month of graduation have been excluded for length. Number of observations for each column represents the total number of observations that Stata takes into account when calculating the correct weighted standard errors (from "subpop" option of "svy" command). Though the cohort is the same, this is not the same sample as was used in Chapter Four.

A similar pattern presents itself within each socioeconomic group: the most popular college type was a less-selective college for students from the bottom and top quintile alike. However, a greater proportion of bottom than top-quintile students attended a least- or less-selective college, while a greater proportion of top-quintile students attended moderately-selective, elite, and super-elite colleges.

The demographic characteristics of the student populations within each college rank category further underscore the pattern of social class stratification within higher education. At the least-selective colleges, relative to super-elite colleges, greater proportions of the student body (as represented by this sample) were from the bottom, second from bottom, or third socioeconomic quintiles. At the super-elite colleges, relative to the least-selective colleges, greater proportions of the student body were from the fourth and fifth (top) socioeconomic quintiles. For example, 39 percent of respondents who attended super-elite colleges were from the highest socioeconomic quintile, while only 19 percent of respondents who attended one of the least-selective colleges were from the highest socioeconomic quintile.

The high-ranking institutions spent more on academic services, student services, and instruction than the low-ranking institutions during the time that the 1992-1993 graduating cohort attended. Because they attended higher-ranking institutions, on average, than low-SES origin graduates, the high-SES origin graduates attended institutions that had greater expenditure on these resources and services. The difference in expenditure per student between the super-elite colleges and all other types, but particularly the least-selective colleges, is striking. Across all institutions attended by the respondents, average academic expenditure per student was $1,691.60, average instructional expenditure per student was $6,993.91, and average student services expenditure per student was $1,101.08. However, while the least-selective colleges

spent below-average amounts in these areas, expenditure per student at the super-elite colleges was far above average: $4,694.78 on academic services, $16,837.21 on instruction, and $2,600.61 on student services.

Approximately one year after earning their bachelor's degrees, the 1992-1993 graduates' mean hourly earnings were $10.76. The cohort's earnings varied according to college rank and parents' socioeconomic status. Interestingly, mean earnings among graduates of most types of colleges were about $10 per hour, but mean earnings among graduates of super-elite colleges were $15. The difference in earnings among graduates from different socioeconomic backgrounds was much smaller than the difference among graduates from different college types. In fact, the pattern is counterintuitive: The bottom quintile had slightly higher earnings than the other socioeconomic groups (e.g, $11.17 compared to the top quintile's $10.43).

One possible explanation is graduate school: Perhaps the more-talented graduates from the higher socioeconomic groups enrolled in graduate school right after earnings their bachelor's degrees, leaving the less-talented high-SES graduates to compete on the labor market with the low-SES graduates. I explored this possibility by removing respondents who were enrolled in graduate school in 1994 from the sample and examining the same descriptive statistics. Without graduate students in the sample, the mean hourly earnings are a touch higher for all socioeconomic groups. However, the mean earnings of the bottom socioeconomic quintile remain slightly higher than the mean earnings of the top socioeconomic quintile ($11.54 relative to $10.60 for the top quintile). Graduate school enrollment, therefore, does not explain why students from the top socioeconomic quintile do not have higher earnings than students from the bottom socioeconomic quintile one year after graduation among the 1992-1993 graduates.

The descriptive characteristics of the 2007-2008 graduating cohort show patterns similar to those of the 1992-1993 cohort, with some notable differences. Table 16 displays the characteristics for the entire sample, Table 17 breaks them down according to college rank, and Table 18 breaks them down according to parents' socioeconomic status.

In Table 16, one sees that, similarly to the 92/93 cohort, 9 percent of the sample comes from an elite socioeconomic background. However, the socioeconomic quintiles are not equally represented. This phenomenon is due to a higher rate of missing values in the institutional variables of rank and expenditure in the lower socioeconomic quintiles. Table 16 displays the characteristics of the sample once observations with missing values in the dependent or independent variables have been removed, which is the sample that is used during regression. Almost 8 percent of observations in the bottom quintile are missing college rank information, compared with 3 percent of observations in the top quintile. As a result, the distribution of respondents across college rank categories is affected and differs from that of the 92/93 sample. For example, relative to the 92/93 sample, a smaller proportion of respondents attended a least-selective college, and a greater proportion a super-elite college. If many of the missing low-SES respondents attended a least-selective college, then the proportion of respondents in the analytic sample (in which observations with missing values have been dropped) who attended a least-selective college is lower than it would be without the missingness, and the proportion who attended a super-elite college is higher than it would be.

Table 16. *07/08 Cohort: Means for Earnings and Predictors*

| | All Graduates Mean/SE |
|---|---|
| Hourly Earnings 2009 | 15.83 |
| | (0.28) |
| First (bottom) SES quintile | 0.13 |
| | (0.01) |
| Second SES quintile | 0.18 |
| | (0.01) |
| Third SES quintile | 0.19 |
| | (0.01) |
| Fourth SES quintile | 0.22 |
| | (0.01) |
| Fifth (top) SES quintile | 0.28 |
| | (0.01) |
| Elite SES | 0.09 |
| | (0.01) |
| Least-selective college | 0.08 |
| | (0.01) |
| Less-selective college | 0.38 |
| | (0.03) |
| Moderately-selective college | 0.29 |
| | (0.03) |
| Elite college | 0.15 |
| | (0.02) |
| Super-elite college | 0.10 |
| | (0.02) |
| Academic expenditure per student | 2651.79 |
| | (236.04) |
| Instructional expenditure per student | 10172.44 |
| | (507.17) |
| Student services | 1958.93 |

| | |
|---|---|
| expenditure per student | |
| | (96.43) |
| GPA | 3.25 |
| | (0.01) |
| Age at degree | 22.04 |
| | (0.02) |
| Test score, SD from mean | 0.00 |
| | (0.04) |
| Female | 0.59 |
| | (0.01) |
| # of children | 0.00 |
| | (.) |
| White or Asian | 0.84 |
| | (0.01) |
| American Indian, Hawaiian/Pacific Islander, Black, Hispanic, Multiple, Other | 0.16 |
| | (0.01) |
| Observations | 6193 |

*Note*. Weighted means and standard errors. Binary variables representing major, state of residence, and month of graduation have been excluded for length.

Table 17. *07/08 Cohort: Means for Earnings and Predictors, by College Rank*

| | Least Selective | Less Selective | Moderately Selective | Elite | Super Elite |
|---|---|---|---|---|---|
| | Mean/SE | Mean/SE | Mean/SE | Mean/SE | Mean/SE |
| Hourly Earnings 2009 | 13.75 | 15.52 | 15.84 | 16.20 | 17.98 |
| | (0.59) | (0.53) | (0.33) | (0.75) | (0.82) |
| First (bottom) SES quintile | 0.19 | 0.17 | 0.11 | 0.11 | 0.05 |
| | (0.02) | (0.01) | (0.01) | (0.01) | (0.02) |
| Second SES quintile | 0.29 | 0.21 | 0.15 | 0.12 | 0.11 |
| | (0.03) | (0.02) | (0.01) | (0.02) | (0.02) |
| Third SES quintile | 0.16 | 0.22 | 0.20 | 0.18 | 0.10 |
| | (0.03) | (0.01) | (0.01) | (0.02) | (0.02) |
| Fourth SES quintile | 0.22 | 0.22 | 0.24 | 0.23 | 0.15 |
| | (0.03) | (0.02) | (0.01) | (0.02) | (0.03) |
| Fifth (top) SES quintile | 0.14 | 0.18 | 0.29 | 0.37 | 0.59 |
| | (0.03) | (0.01) | (0.02) | (0.03) | (0.04) |
| Elite SES | 0.03 | 0.05 | 0.09 | 0.13 | 0.25 |
| | (0.01) | (0.01) | (0.01) | (0.02) | (0.03) |
| Academic expenditure per student | 1267.17 | 1547.67 | 2131.43 | 3222.03 | 8495.63 |
| | (59.82) | (49.85) | (117.49) | (187.34) | (1831.26) |
| Instructional expenditure per student | 5120.97 | 6421.23 | 8609.04 | 12140.91 | 29645.54 |
| | (168.51) | (140.09) | (406.99) | (743.17) | (3281.99) |
| Student services expenditure per student | 1270.03 | 1578.26 | 1648.59 | 2211.15 | 4431.05 |

| | | | | | |
|---|---|---|---|---|---|
| | (75.97) | (59.61) | (95.79) | (175.82) | (854.83) |
| GPA | 3.25 | 3.22 | 3.20 | 3.32 | 3.41 |
| | (0.04) | (0.01) | (0.04) | (0.03) | (0.03) |
| Age at degree | 22.27 | 22.11 | 22.03 | 21.96 | 21.73 |
| | (0.05) | (0.03) | (0.03) | (0.04) | (0.04) |
| Test score, SD from mean | -0.60 | -0.43 | 0.08 | 0.49 | 1.13 |
| | (0.07) | (0.03) | (0.04) | (0.07) | (0.11) |
| Female | 0.68 | 0.62 | 0.58 | 0.52 | 0.54 |
| | (0.03) | (0.01) | (0.02) | (0.03) | (0.03) |
| # of children | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | (.) | (.) | (.) | (.) | (.) |
| White | 0.75 | 0.76 | 0.83 | 0.79 | 0.70 |
| | (0.05) | (0.02) | (0.02) | (0.03) | (0.04) |
| White or Asian | 0.78 | 0.79 | 0.89 | 0.88 | 0.82 |
| | (0.04) | (0.02) | (0.02) | (0.02) | (0.04) |
| American Indian, Hawaiian/Pacific Islander, Black, Hispanic, Multiple, Other | 0.22 | 0.21 | 0.11 | 0.12 | 0.18 |
| | (0.04) | (0.02) | (0.02) | (0.02) | (0.04) |
| Observations | 1285 | 4517 | 3251 | 1820 | 951 |

*Note*. Weighted means and standard errors. Binary variables representing major, state of residence, and month of graduation have been excluded for length. Number of observations for each column represents the total number of observations that Stata takes into account when calculating the correct weighted standard errors (from "subpop" option of "svy" command).

Table 18. *07/08 Cohort: Means for Earnings and Predictors, by SES*

| | Bottom Quintile Mean/SE | Second Quintile Mean/SE | Third Quintile Mean/SE | Fourth Quintile Mean/SE | Top Quintile Mean/SE | Elite SES Mean/SE |
|---|---|---|---|---|---|---|
| Hourly Earnings 2009 | 15.24 | 15.76 | 15.13 | 15.61 | 16.81 | 18.65 |
| | (0.62) | (0.84) | (0.41) | (0.53) | (0.54) | (1.01) |
| Least-selective college | 0.11 | 0.13 | 0.06 | 0.07 | 0.04 | 0.03 |
| | (0.02) | (0.02) | (0.01) | (0.01) | (0.01) | (0.01) |
| Less-selective college | 0.48 | 0.46 | 0.43 | 0.38 | 0.24 | 0.20 |
| | (0.04) | (0.03) | (0.03) | (0.03) | (0.03) | (0.03) |
| Moderately-selective college | 0.25 | 0.25 | 0.31 | 0.32 | 0.31 | 0.29 |
| | (0.03) | (0.03) | (0.03) | (0.03) | (0.04) | (0.04) |
| Elite college | 0.12 | 0.10 | 0.14 | 0.16 | 0.20 | 0.22 |
| | (0.02) | (0.02) | (0.02) | (0.03) | (0.03) | (0.04) |
| Super-elite college | 0.04 | 0.06 | 0.05 | 0.07 | 0.21 | 0.27 |
| | (0.02) | (0.01) | (0.01) | (0.01) | (0.03) | (0.05) |
| Academic expenditure per student | 2163.93 | 2084.18 | 2171.76 | 2392.81 | 3776.15 | 4055.91 |
| | (210.14) | (100.65) | (94.61) | (145.67) | (553.34) | (529.56) |
| Instructional expenditure per student | 8227.34 | 8707.86 | 8460.27 | 9446.30 | 13772.20 | 14914.26 |
| | (467.25) | (432.26) | (246.94) | (435.87) | (1209.99) | (1410.05) |
| Student services expenditure per student | 1731.72 | 1779.02 | 1788.26 | 1757.56 | 2457.26 | 2776.31 |
| | (76.51) | (78.93) | (56.83) | (75.71) | (240.17) | (259.06) |
| GPA | 3.21 | 3.18 | 3.25 | 3.28 | 3.29 | 3.30 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | (0.03) | (0.02) | (0.02) | (0.03) | (0.02) | (0.04) |
| Age at degree | 22.10 | 22.15 | 22.06 | 22.01 | 21.94 | 21.94 |
| | (0.04) | (0.04) | (0.03) | (0.03) | (0.03) | (0.05) |
| Test score, SD from mean | -0.53 | -0.28 | -0.14 | 0.09 | 0.47 | 0.55 |
| | (0.05) | (0.05) | (0.05) | (0.05) | (0.05) | (0.07) |
| Female | 0.65 | 0.64 | 0.59 | 0.57 | 0.55 | 0.52 |
| | (0.02) | (0.02) | (0.02) | (0.02) | (0.02) | (0.03) |
| # of children | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | (.) | (.) | (.) | (.) | (.) | (.) |
| White | 0.58 | 0.73 | 0.78 | 0.83 | 0.87 | 0.89 |
| | (0.03) | (0.02) | (0.02) | (0.02) | (0.01) | (0.02) |
| White or Asian | 0.69 | 0.77 | 0.82 | 0.88 | 0.92 | 0.92 |
| | (0.03) | (0.02) | (0.02) | (0.01) | (0.01) | (0.02) |
| American Indian, Hawaiian/Pacific Islander, Black, Hispanic, Multiple, Other | 0.31 | 0.23 | 0.18 | 0.12 | 0.08 | 0.08 |
| | (0.03) | (0.02) | (0.02) | (0.01) | (0.01) | (0.02) |
| Observations | 5925 | 6029 | 6033 | 5908 | 5725 | 4305 |

*Note*. Weighted means and standard errors. Number of observations for each column represents the total number of observations that Stata takes into account when calculating the correct weighted standard errors (from "subpop" option of "svy" command).

The most popular type of college among the respondents was a "less-selective" college, and, as with the 92/93 cohort, the socioeconomic stratification of postsecondary education is evident in Tables 17 and 18. The least-selective colleges had a higher proportion of respondents from the bottom than from the top socioeconomic quintile, while the super-elite colleges had a much higher proportion of respondents from the top than from the bottom quintile.

Compared to the 92/93 sample, there is evidence of increased institutional privilege for students from the highest socioeconomic background[25]. In the 92/93 sample, the proportion of super-elite college graduates from the top socioeconomic quintile was 39 percent and the proportion from the elite socioeconomic category was 14 percent. By contrast, in the 07/08 sample these proportions are 59 percent and 25 percent, respectively. In addition, among top-quintile respondents in the 92/93 sample, only seven percent graduated from a super-elite and 16 percent from an elite institution. However, in the 07/08 sample, these proportions are 21 percent and 20 percent. Among the lower socioeconomic quintiles, the respondents seem similarly proportioned across colleges between the 92/93 and 07/08 cohorts.

Another notable likeness between the 92/93 and 07/08 samples is the difference in institutional expenditure according to college rank, particularly the difference between the super-elite colleges and all others. While expenditure at the least-selective institutions is below average, expenditure at the super-elite colleges is far above average. Among the least-selective colleges, five-year average expenditure per student on academic services was $1,267.17, compared to $8,495.63 at the super-elite colleges. The least-selective/super-elite discrepancy is

[25] The greater proportion of top-SES quintile students in elite colleges in the 07/08 sample, relative to the 92/93 sample, may be inflated due to the higher rate of missingness among low-SES respondents, who attend lower-ranking colleges, on average.

$5,120.97 compared to $29,645.54 for expenditure on instruction and $1,270.03 compared to $4,431.05 for expenditure on student services.

Mean hourly earnings approximately one year after earning a bachelor's degree are $15.83. As with the 92/93 sample, earnings do vary according to rank of college attended and parents' social class, though the pattern of variation differs between the cohorts. Unlike the 92/93 sample, graduates with a high socioeconomic background earn more than graduates with a low socioeconomic background. When separated into their own category, graduates of elite socioeconomic origin earn more than even graduates from the top quintile ($18.65 per hour compared to $16.81 in the top quintile and $15.24 in the bottom quintile). In both cohorts, graduates of high-ranking colleges earn more than graduates of low-ranking colleges, though in the 92/93 cohort there was a large increase between graduates of elite and super-elite colleges, which does not exist among the 07/08 graduates. Average earnings among graduates of super-elite colleges are $17.98, while earnings among graduates of the least-selective colleges are $13.75.

**Findings: Research Question Three**

The findings presented here address research question three: Did the post-graduation earnings gap, or the factors that influence it, change over time? Hypothesis Three, which stated that both the high- vs. low-SES earnings gap and the low-SES elite college vs. low-SES non-elite college earnings gaps changed over time, is supported. The findings demonstrate that yes, the class-based post-graduation earnings gap did change over time, as did the rank-based earnings gap among low-SES graduates. The findings do not demonstrate that the factors that influence the class-based earnings gap have changed over time, simply because the gap does not exist

among the 1992-1993 graduates just one year after graduation. Therefore, the second part of Hypothesis Three, in which I predicted that the influences on the high vs. low-SES earnings gap changed over time, is not supported.

The results are presented in order of the model configurations, which mirror Model Set One, Two, and Three in Chapter Four (i.e., Model Set Four's Model Configuration One mirrors Model Set One). In Model Configuration One, we see that class of origin is positively associated with earnings one year following graduation among the 07/08 cohort, but not among the 92/93 cohort. In Model Configuration Two, we see that within college rank categories, higher socioeconomic origin is sometimes associated with higher earnings in both cohorts but, counterintuitively, sometimes also associated with lower earnings, though this phenomenon occurs more frequently in the 92/93 cohort. Model Configuration Three demonstrates the positive association between rank and earnings within socioeconomic groups for both cohorts, though in somewhat differing patterns.

**Model Set Four: Model Configuration One**

The results from Model Configuration One do differ between the 1992-1993 cohort and the 2007-2008 cohort. A statistically significant relationship between social class of origin and earnings soon after graduation is evident in the later cohort, but not in the first. Tables 19 and 20 display the estimates for the relationship between parents' socioeconomic status and hourly earnings one year after earning a bachelor's degree among both cohorts. Table 19 illustrates that, among the 92/93 cohort, none of the socioeconomic quintiles are associated with higher earnings, relative to the earnings of the bottom quintile. Similarly, in Table 20 we see that elite

socioeconomic origins are not associated with higher earnings than non-elite origins among the 92/93 graduates.

The estimates for the 2007-2008 graduates are more interesting. Graduates whose parents are in the top socioeconomic quintile have 10 percent higher earnings than graduates whose parents are in the bottom quintile, before accounting for any other factors. However, once one accounts for even such basic controls as gender and test score, having parents in the top SES quintile is no longer associated with higher earnings.

Table 19. *Model Set Four, Configuration One: OLS Effect of SES Quintile on Earnings, 92/93 & 07/08 Cohorts*

| | (1) SES only | (2) +Basic Controls | (3) +GPA & Major | (4) +Institutional Expenditure | (5) +Rank |
|---|---|---|---|---|---|
| **92/93 Cohort** | | | | | |
| Second SES quintile | -0.00 | -0.03 | -0.04 | -0.04 | -0.04 |
| | (0.05) | (0.05) | (0.05) | (0.05) | (0.05) |
| Third SES quintile | -0.04 | -0.07 | -0.07 | -0.07 | -0.07 |
| | (0.06) | (0.05) | (0.05) | (0.05) | (0.05) |
| Fourth SES quintile | 0.03 | -0.02 | 0.01 | 0.01 | 0.01 |
| | (0.06) | (0.05) | (0.05) | (0.05) | (0.05) |
| Fifth (top) SES quintile | 0.01 | -0.04 | -0.03 | -0.02 | -0.02 |
| | (0.06) | (0.06) | (0.06) | (0.06) | (0.06) |
| Observations | 4685 | 4685 | 4685 | 4685 | 4685 |
| **07/08 Cohort** | | | | | |
| Second SES quintile | 0.03 | -0.00 | -0.00 | -0.00 | -0.00 |
| | (0.06) | (0.06) | (0.06) | (0.06) | (0.06) |
| Third SES quintile | 0.00 | -0.04 | -0.03 | -0.03 | -0.04 |
| | (0.06) | (0.06) | (0.05) | (0.05) | (0.05) |
| Fourth SES quintile | 0.03 | -0.03 | -0.03 | -0.03 | -0.03 |
| | (0.06) | (0.06) | (0.06) | (0.06) | (0.06) |
| Fifth (top) SES quintile | $0.10^{+}$ | 0.01 | 0.04 | 0.03 | 0.03 |
| | (0.06) | (0.06) | (0.06) | (0.06) | (0.06) |
| Observations | 6438 | 6438 | 6438 | 6438 | 6438 |

*Note*. Weighted samples.

The lowest SES quintile has been excluded in order to serve as the comparison group. The following predictor variables were included the models: In Model Two: State of residence, gender, race, number of children, month earned degree, age earned degree, and standardized test score; In Model Three: The aforementioned plus GPA and major; In Model Four: The aforementioned plus expenditure on academic services, expenditure on student services, and expenditure on instruction; In Model Five: The aforementioned plus college rank dummies. Full set of estimates available upon request.

Standard errors in parentheses
$^{+}$ $p < 0.10$, $^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

Table 20. *Model Set Four, Configuration One: OLS Effect of Elite SES on Earnings, 92/93 & 07/08 Cohorts*

| | (1) SES only | (2) +Basic Controls | (3) +GPA & Major | (4) +Institutional Expenditure | (5) +Rank |
|---|---|---|---|---|---|
| **92/93 Cohort** | | | | | |
| Elite SES | -0.01 | -0.04 | -0.01 | -0.01 | -0.01 |
| | (0.06) | (0.07) | (0.07) | (0.07) | (0.07) |
| Observations | 4685 | 4685 | 4685 | 4685 | 4685 |
| **07/08 Cohort** | | | | | |
| Elite SES | 0.17** | 0.13* | 0.13* | 0.13* | 0.13* |
| | (0.06) | (0.06) | (0.06) | (0.06) | (0.06) |
| Observations | 6438 | 6438 | 6438 | 6438 | 6438 |

*Note*. Weighted samples.

The following predictor variables were included the models: In Model Two: State of residence, gender, race, number of children, month earned degree, age earned degree, and standardized test score; In Model Three: The aforementioned plus GPA and major; In Model Four: The aforementioned plus expenditure on academic services, expenditure on student services, and expenditure on instruction; In Model Five: The aforementioned plus college rank dummies. Full set of estimates available upon request.

Standard errors in parentheses
$^{+}$ $p < 0.10$, $^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

The elite socioeconomic status indicator has more predictive power. In Table 20, we see that respondents with parents of elite socioeconomic status have 13 percent higher earnings than all others, even after accounting for both individual characteristics (i.e., GPA and major) and institutional characteristics (i.e., expenditure and rank).[26] College rank itself is also associated with higher earnings in both Tables 19 and 20 for the 07/08 cohort[27]: a degree from a moderately-selective or less-selective college is associated with 15 percent higher hourly

[26] Elite socioeconomic origins are not associated with higher earnings when accounting for only the basic control variables and/or GPA and major. This suggests that the basic demographic controls (e.g., state and test score), GPA, and major may play a role in explaining the relationship between class and earnings, when not accounting for institutional factors.

[27] Estimates on the college rank indicators are not displayed in the tables for brevity. The estimates are available upon request.

earnings, relative to a degree from a least-selective college. This is not the case in the 92/93 sample.

Because there is no statistically significant difference in earnings between respondents of different socioeconomic origins in the first cohort, one can say nothing about the factors that influence a nonexistent difference in earnings. Therefore, the findings do not show that the factors that influence the earnings gap have changed over time.

**Model Set Four: Model Configuration Two**

In Model Configuration Two, both cohorts produce results that are counterintuitive. Among graduates of both high-ranking and low-ranking colleges, a higher class of origin is often associated not with higher earnings but with lower earnings.

Table 21 displays the relationship between the SES quintiles and earnings within each college rank category for both cohorts. In the 92/93 sample, we see several negative coefficients for the higher SES indicators. Among graduates of super-elite institutions, those from the fifth (top), third, and second socioeconomic quintiles are estimated to have 33, 50, and 53 percent *lower* earnings than graduates from the bottom quintile. Among graduates of elite institutions, those from the fourth and third quintiles also have 35 and 59 percent *lower* earnings, respectively. Table 22 illustrates a similar phenomenon for 92/93 graduates of elite origin. Those graduating from super-elite institutions have 45 percent *lower* earnings than non-elite origin graduates. However, elite-origin graduates of elite and moderately-selective institutions have 19 and 11 percent *higher* earnings, respectively, than non-elite origin grads.

Table 21. *Model Set Four, Configuration Two: OLS Effect of SES Quintile on Earnings, by Rank, 92/93 & 07/08 Cohorts*

| | (1) Super-Elite | (2) Elite | (3) Moderately-Selective | (4) Less-Selective | (5) Least-Selective |
|---|---|---|---|---|---|
| **92/93 Cohort** | | | | | |
| Second SES quintile | -0.53$^{+}$ | -0.12 | -0.13 | -0.05 | 0.03 |
| | (0.30) | (0.11) | (0.10) | (0.07) | (0.11) |
| Third SES quintile | -0.50$^{***}$ | -0.59$^{**}$ | 0.02 | -0.02 | -0.12 |
| | (0.13) | (0.23) | (0.10) | (0.06) | (0.14) |
| Fourth SES quintile | -0.11 | -0.35$^{*}$ | 0.09 | -0.04 | 0.01 |
| | (0.13) | (0.13) | (0.07) | (0.07) | (0.13) |
| Fifth (top) SES quintile | -0.33$^{*}$ | -0.12 | 0.09 | -0.11 | -0.10 |
| | (0.17) | (0.09) | (0.08) | (0.09) | (0.11) |
| Observations | 2017 | 3452 | 3851 | 3499 | 4028 |
| **07/08 Cohort** | | | | | |
| Second SES quintile | 0.28 | 0.02 | 0.10 | -0.08 | 0.30$^{+}$ |
| | (0.51) | (0.16) | (0.10) | (0.08) | (0.15) |
| Third SES quintile | 0.90$^{+}$ | -0.26$^{+}$ | 0.09 | -0.13$^{*}$ | 0.14 |
| | (0.49) | (0.14) | (0.09) | (0.07) | (0.26) |
| Fourth SES quintile | 0.83$^{+}$ | 0.04 | 0.13 | -0.25$^{***}$ | 0.19 |
| | (0.48) | (0.15) | (0.10) | (0.07) | (0.14) |
| Fifth (top) SES quintile | 0.72 | 0.01 | 0.10 | -0.10 | 0.28 |
| | (0.48) | (0.13) | (0.11) | (0.07) | (0.21) |
| Observations | 951 | 1820 | 3251 | 4517 | 1273 |

*Note*. Weighted samples.

Number of observations for each column represents the total number of observations that Stata takes into account when calculating the correct weighted standard errors (from "subpop" option of "svy" command).

The lowest SES quintile has been excluded in order to serve as the comparison group. The following predictor variables were included each of the models: State of residence, gender, race, number of children, month earned degree, age earned degree, standardized test score, GPA, major, expenditure on academic services, expenditure on student services, and expenditure on instruction. Full set of estimates available upon request.

Standard errors in parentheses
$^{+}$ $p < 0.10$, $^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

Table 22. *Model Set Four, Configuration Two: OLS Effect of Elite SES on Earnings, by Rank, 92/93 & 07/08 Cohorts*

| | (1) Super-Elite | (2) Elite | (3) Moderately-Selective | (4) Less-Selective | (5) Least-Selective |
|---|---|---|---|---|---|
| **92/93 Cohort** | | | | | |
| Elite SES | -0.45$^{+}$ | 0.19$^{+}$ | 0.11$^{+}$ | -0.11 | 0.07 |
| | (0.25) | (0.11) | (0.07) | (0.11) | (0.17) |
| Observations | 2017 | 3452 | 3851 | 3499 | 4028 |
| **07/08 Cohort** | | | | | |
| Elite SES | 0.22 | 0.32$^{**}$ | -0.04 | 0.03 | 0.68$^{*}$ |
| | (0.20) | (0.12) | (0.07) | (0.10) | (0.33) |
| Observations | 951 | 1820 | 3251 | 4517 | 1273 |

*Note*. Weighted samples.

Number of observations for each column represents the total number of observations that Stata takes into account when calculating the correct weighted standard errors (from "subpop" option of "svy" command).

The following predictor variables were included each of the models: State of residence, gender, race, number of children, month earned degree, age earned degree, standardized test score, GPA, major, expenditure on academic services, expenditure on student services, and expenditure on instruction. Full set of estimates available upon request.

Standard errors in parentheses
$^{+}$ $p < 0.10$, $^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

Some of the within-college-rank estimates of the effect of class of origin on post-graduation earnings for the 2007-2008 graduates also run in the unexpected direction. Among graduates of less-selective colleges, respondents from the fourth and third quintiles have 25 and 13 percent lower hourly earnings than respondents from the bottom quintile (Table 21). Similarly, among graduates of elite colleges, respondents from the third quintile have 26 percent lower earnings than respondents from the bottom quintile. In other college rank categories, however, the coefficients run in the expected direction. Among respondents who graduated from

the least-selective college, those from the second quintile have 30 percent greater earnings than those from the bottom quintile. Among graduates of super-elite colleges, those from the fourth and third quintiles have 83 and 90 percent greater earnings than those from the bottom quintile.

In Table 22, we see that the estimates associated with elite socioeconomic origins among the 2007-2008 graduates run in the expected direction. Having parents with elite socioeconomic status is associated with 32 percent greater earnings among graduates of elite colleges and 68 percent greater earnings among graduates of the least-selective colleges.

**Model Set Four: Model Configuration Three**

The results from Model Configuration Three are not as counterintuitive as those produced by Model Configuration Two. For both cohorts, higher institutional rank is associated with higher earnings. The estimates are displayed in Table 23.

In the 92/93 sample, a higher-ranking institution is associated with higher earnings among graduates from the bottom socioeconomic quintile. Relative to a bachelor's degree from a least-selective college, a degree from a less-selective college is associated with 24 percent higher earnings and a degree from an elite college is associated with 33 percent higher earnings.

In the 07/08 sample, higher-ranking institutions are associated with higher earnings among graduates from the bottom and third socioeconomic quintiles. A degree from a less-selective college is associated with 44 percent higher earnings than a degree from a least-selective college among respondents whose parents are in the lowest SES quintile. Among graduates whose parents are in the third quintile, a less-selective college is associated with 36 percent higher earnings, a moderately-selective college with 39 percent higher earnings, and a super-elite college with 68 percent higher earnings than a least-selective college.

Table 23. *Model Set Four, Configuration Three: OLS Effect of College Rank on Earnings, by SES Quintile, 92/93 & 07/08 Cohorts*

| | (1) Bottom Quintile | (2) Second Quintile | (3) Third Quintile | (4) Fourth Quintile | (5) Top Quintile |
|---|---|---|---|---|---|
| **92/93 Cohort** | | | | | |
| Super-elite college | 0.22 | 0.27 | -0.05 | 0.27 | 0.01 |
| | (0.21) | (0.21) | (0.22) | (0.19) | (0.18) |
| Elite college | 0.33* | 0.09 | -0.35 | -0.11 | 0.19 |
| | (0.13) | (0.16) | (0.22) | (0.13) | (0.12) |
| Moderately-selective college | 0.07 | -0.15 | 0.02 | -0.01 | 0.18 |
| | (0.11) | (0.13) | (0.13) | (0.11) | (0.11) |
| Less-selective college | 0.24* | -0.05 | 0.10 | -0.08 | -0.00 |
| | (0.10) | (0.09) | (0.10) | (0.11) | (0.12) |
| Observations | 3371 | 3401 | 3383 | 3376 | 3340 |
| **07/08 Cohort** | | | | | |
| Super-elite college | 0.27 | -0.39 | 0.68* | 0.10 | -0.05 |
| | (0.41) | (0.32) | (0.28) | (0.22) | (0.23) |
| Elite college | 0.35 | -0.03 | 0.22 | 0.02 | -0.01 |
| | (0.28) | (0.19) | (0.24) | (0.16) | (0.17) |
| Moderately-selective college | 0.25 | -0.02 | 0.39* | 0.05 | -0.01 |
| | (0.18) | (0.14) | (0.19) | (0.13) | (0.15) |
| Less-selective college | 0.44** | 0.03 | 0.36+ | -0.10 | -0.01 |
| | (0.15) | (0.13) | (0.20) | (0.13) | (0.15) |
| Observations | 5903 | 6006 | 6033 | 5908 | 5725 |

*Note*. Weighted samples.
Number of observations for each column represents the total number of observations that Stata takes into account when calculating the correct weighted standard errors (from "subpop" option of "svy" command).

The least-selective college rank category has been excluded in order to serve as the comparison group. The following predictor variables were included each of the models: State of residence, gender, race, number of children, month earned degree, age earned degree, standardized test score, GPA, major, expenditure on academic services, expenditure on student services, and expenditure on instruction. Full set of estimates available upon request.

Standard errors in parentheses
+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

## Discussion

The discussion is divided into two sections. In the first, I compare this chapter's and the previous chapter's findings concerning the 92/93 cohort in order to examine some notable differences in the influences on earnings one year and ten years after graduation. I propose that the influence of class of origin on earnings is more apparent ten years after graduation due to lingering effects of graduating during a time of heightened unemployment and the later influence of such individual resources as social and cultural capital. In the second section, I discuss the change in the role of class of origin on earnings between the 92/93 and 07/08 cohorts. Class of origin may have been more important to immediate post-graduation earnings in 2009 than in 1994 due to a labor market that was more competitive due to both heightened unemployment and a greater proportion of degree-holders relative to the number of degree-level positions.

### The 92/93 graduating cohort: 1994 earnings vs. 2003 earnings

After examining the estimates for the 1994 earnings of the 92/93 graduates, it became evident that there are some important differences from the estimates for the cohort's 2003 earnings[28]. The influence of college rank, within the socioeconomic quintiles, is similar one and ten years after graduation. Parents' socioeconomic status, however, is more predictive of their earnings ten years after graduation than one year after graduation.

In this chapter's Model Configuration One, which is equivalent to Chapter Four's Model Set One, neither the socioeconomic quintiles nor the elite SES indicator are associated with earnings one year after graduation. Similarly, in Chapter Four, the quintiles are not associated

[28] I am comparing the estimates in this chapter, Chapter Five, which were obtained using OLS regression, with only the OLS estimates from Chapter Four.

with ten-year post-graduation earnings when including any control variables. However, ten years after graduation, elite socioeconomic origin is associated with higher earnings, even after accounting for relevant individual and institutional characteristics.

This chapter's Model Configuration Two is comparable to Chapter Four's Model Set Two. A comparison of the predictors of earnings one year after graduation in Tables 5 and 6 and ten years after graduation in Tables 19 and 20 shows that, while a higher class of origin is actually associated with lower earnings one year after graduation, a higher class of origin is associated with greater earnings ten years after graduation. Elite SES is associated with higher earnings in 1994 among graduates of elite and moderately-selective colleges (Table 22), but the statistical significance is weaker than that of the elite SES indicator when estimating 2003 earnings (Table 8), in which the elite SES indicator is associated with higher earnings among graduates of moderately-selective and least-selective colleges.

The lack of or in two instances statistically weak (significant at ten percent level) positive association between higher parental SES and post-graduation earnings in 1994 is counterintuitive, but these results mirror the descriptive characteristics of the sample, which were enumerated earlier in the chapter. In 1994, neither respondents from the top quintile nor the more-select elite socioeconomic category have higher hourly earnings than graduates from the bottom quintile (Table 15). In 2003, the top quintile is out-earning the bottom quintile by four dollars per hour, and the elite group even more so (Table 4).

The literature does not provide an explanation for the lack of difference in earnings according to parents' socioeconomic status soon after graduation[29]. The literature and my

[29] A possible explanation involving graduate school was debunked earlier in the chapter.

theoretical framework do, however, help us to understand why the impact of class of origin is more evident ten years after graduation. The 92/93 cohort graduated at a time when the effects of the 1990 to 1991 recession remained: In May 1993, national unemployment was at 7.1 percent (U.S. Bureau of Labor Statistics). A Canadian study found that graduating during a recession is associated with lower earnings, partly because it is associated with lower employer quality[30] (Oreopoulos et al., 2012). Graduates who were predicted to have high wages based on college attended, program of study, and years of study (and therefore considered highly-skilled or highly-able by the authors) recovered within four years, largely by switching to higher-quality employers. Graduates who were predicted to have low wages, however, never fully recovered, largely because the quality of their employers did not improve sufficiently. This study suggests that, while all graduates may be affected by a recession, graduates from less-privileged backgrounds may not recover as well as more-privileged graduates. If this is the case, earnings differences based on class of origin will be more apparent ten years than one year after graduation. Oreopoulos et al.'s (2012) findings also suggest that graduating at a time of enhanced unemployment could increase the size of a cohort's social class-based earnings gap ten years after graduation.

My theoretical framework also provides mechanisms to help us make sense of why the class-based earnings gap is not apparent until ten years after graduation among the 92/93 graduates. In the framework, social capital, cultural capital, institutional characteristics, and individual collegiate qualifications (i.e., GPA and major) are the mechanisms through which social class of origin influences earnings. Social capital (Bourdieu, 1986; Portes, 1998) should,

[30] In the study referenced, employer quality is measured with size, total payroll, and median wage.

according to my framework, influence one's employment outcomes immediately after graduation, but that is no reason to forget its continued influence as one advances (or does not advance) in one's career. Social capital may help someone to obtain a high-earning position even years after graduation. Perhaps high-SES students, when they first enter the labor market, first attempt to obtain desirable employment "on their own." Later, if they do not succeed, familial social connections are called upon to help. Perhaps, as graduates age and gain more financial obligations, they decide that they should do whatever than can, including making use of their connections, to obtain a higher-paying position.

As with social capital, cultural capital (Bourdieu, 1977, 1986; Swartz, 1997) may not only help one obtain a first position, but also influence the progression of one's career. Perhaps one of the reasons that the 92/93 sample does not show a class-based difference in immediate post-graduation earnings—at least not in the expected direction—is that, upon first entry to the labor market, students are competing with their peers from similar colleges. In other words, due to employer recruitment practices, students at similar colleges have similar opportunities because they are operating in the same labor market. They have access to a similar set of employers. However, once out of college and part of the larger labor market, one's career progression is more influenced by cultural capital. Perhaps cultural capital is more important to promotion to high-ranking and high-paying positions than it is for obtaining an entry-level position. For example, the "right" cultural disposition may result in a candidate being perceived as "leadership material."

According to my theoretical framework, the institutional characteristics of rank and expenditure mediate the relationship between class of origin and earnings. If candidates from colleges of similar rank are operating in the same or similar labor markets upon graduation, they

may have similar positions with similar wages available to them, which may reduce the influence of class of origin immediately after earning a bachelor's degree, especially within college rank categories. It is possible that rank has a greater impact on earnings in the later years following graduation, when graduates are operating in larger labor markets and competing with graduates of all types of colleges. If that is the case, then rank's mediating effect between high-SES origin and earnings should be more apparent ten years following graduation by accounting for the class-based earnings gap in the estimates. The findings are unclear on this point. They indicate that rank itself matters both one and ten years following graduation, but only among the lowest-SES graduates (Tables 9, 10, and 23). Also, rank does not explain away the earnings premium to having parents with elite socioeconomic status even ten years following graduation (Tables 6 and 8). Therefore, an increasingly important influence of rank may not play an important role in explaining the growing importance of class of origin in the years following graduation.

Similarly, the findings do not indicate that expenditure makes a large difference in the relationship between parents' SES and earnings for the 92/93 graduates, either one or ten years after graduating (e.g., Tables 6 and 20). The fourth mechanism, the qualifications of GPA and major, also do not appear to make much of a difference in the sense that the earnings gap (when it appears) is present whether one accounts for these factors or not. However, if they do make a difference, there is reason to believe that their influence could build over time. The developmental advantages that one gains from greater institutional resources could aid one's career development, and a high GPA and remunerative major could increase access to high-paying positions through the years. While entry-level pay may be similar across many fields, certain majors may be associated with career fields in which there is more opportunity for advancement or higher pay in post-entry-level positions.

One may think that high-SES origin graduates have higher earnings ten years after graduation because they are more likely to have advanced degrees, a phenomenon that would not be as apparent just one year after a cohort graduates. In Zhang's (2005) study of the same Baccalaureate and Beyond cohort, he argues that graduates of "high-quality" colleges have higher incomes because they are more likely to earn advanced degrees. However, this is not the same as arguing that high-SES origin graduates have higher earnings because they are more likely to earn advanced degrees. Furthermore, early in this project I explored model specifications in which I included a variable to control for advanced degrees when estimating 2003 earnings, and found that accounting for advanced degrees made little difference to the results (i.e., advanced degrees did not account for the higher earnings associated with high class of origin).

**One year after graduation: 92/93 cohort vs. 07/08 cohort**

In the 92/93 cohort, the contrast between the 1994 and 2003 results indicates that the positive influence of high class of origin on earnings becomes apparent more than one year after graduation. However, in the 07/08 sample, a positive relationship between class of origin and earnings is apparent just one year after earning a degree. We now come to research question and Hypothesis Three. Hypothesis Three, in which I predicted that both the high- vs. low-SES origin earnings gap and the low-SES elite college vs. low-SES non-elite college earnings gaps would change over time, is supported. I also predicted that the influences on the high- vs. low-SES origin earnings gap would change over time, which is false in that there was no evidence of such changes.

There exists a radical difference between the cohorts with regard to the influence of class of origin on earnings. A comparison of the two cohort's estimates in Model Configuration One indicates that the immediate, post-graduation, class-based gap in earnings between graduates of high and low socioeconomic origins has increased over time. The results from Model Configuration Two suggests that in some cases, the relationship between class of origin and earnings has even changed direction from favoring students of lower socioeconomic origin to favoring students of higher socioeconomic origin.

The comparison between the cohorts indicates that having parents with a high socioeconomic status, or perhaps the resources associated with having such parents, was more important to "getting ahead" in regards to income in 2009 than it was 15 years earlier. Shifting national economic and demographic conditions may provide some explanation, although one cannot know from these data whether the explanations that I provide here are correct. The explanations given here are speculative. Two economic and demographic changes that I believe to be important in explaining the increasing earnings boost related to high parental SES are the start of the economic recession and the increase in the proportion of the population that has a bachelor's degree.

The 07/08 cohort graduated between July 1, 2007, and June 30, 2008 and were surveyed from July 2009 to March 2010 (Janson et al., 2013). The recession began in December 2007 and ended in June 2009 (U.S. Bureau of Labor Statistics, 2012). Although the cohort graduated at the start of the recession, when unemployment was relatively low, this study examines their earnings in 2009, around the peak of national unemployment.

Only 16 percent of the cohort had graduated in December 2007. The majority of the cohort, 68 percent, graduated in May 2008, after the recession had begun and unemployment had

reached 5.4 percent. Unemployment continued to rise rapidly and by the time the participants were surveyed about their employment starting in July 2009, unemployment had reached 9.5 percent. The unemployment rate would continue to hover around 9 percent until October 2011, when it began to decrease by about one percent per year until the time of this writing in December 2014 (U.S. Bureau of Labor Statistics). In a New York Times article published about two months before the majority of the 07/08 cohort graduated, college career staff assert that employer hiring had decreased, that students were receiving fewer job offers, and that hiring was expected to be even lower the next year (Murphy, May 31, 2008). The number of job openings decreased 44 percent during the 2008 recession (U.S. Bureau of Labor Statistics, 2012), while the unemployment rate of young college graduates increased (The Pew Charitable Trusts' Economic Mobility Project, 2013a). When the majority of the cohort graduated in 2008, the unemployment rate of college graduates ages 21 to 24 was an average of 5.9 percent, but increased rapidly to 9.1 percent in 2009[31] (Heidi Shierholz, Alyssa Davis, & Kimball, May 1, 2014).

The 92/93 Baccalaureate and Beyond cohort faced a similar unemployment rate among young college graduates as that faced by the 07/08 cohort upon graduation (6.1 percent in 1993 relative to 5.9 percent in 2008 (Heidi Shierholz et al., May 1, 2014). However, in 1993, the unemployment rate was decreasing, and by the time the B&B study measured the 92/93 cohort's earnings in spring 1994, unemployment was lower than when the 07/08 cohort's earnings were measured in 2009. Sixty percent of the 92/93 cohort, which graduated in the period between July 1, 1992 and June 30, 1993 (Wine et al., 2005), earned their degrees in May 1993. The effects of

[31] Average age at graduation for 07/08 cohort sample was 22.

the 1990-1991 recession (Borbely, 2010) lingered and national unemployment was at 7.1 percent at the time (U.S. Bureau of Labor Statistics). A pessimistic New York Times piece published in June 1993 describes college graduates struggling to find positions and taking positions that previously would have been held by high school graduates (Celis, June 6, 1993). However, by April 1994, the time at which we estimate the cohort's earnings in this study, national unemployment had fallen to 6.4 percent and would continue to fall until 2001 (U.S. Bureau of Labor Statistics). Youth unemployment also improved: the unemployment rate for college graduates ages 21 to 24 was 6.1 percent in 1993 but fell to 5.3 percent in 1994[32] (Heidi Shierholz et al., May 1, 2014).

In summary, unemployment was falling as the 92/93 cohort entered the labor market and increasing as the 07/08 cohort entered the labor market. While previous research (Kahn, 2010) has found a negative relationship between unemployment rate and earnings that is present immediately after graduation, I propose that the direction of the change in unemployment rate (increasing or decreasing) at the time of graduation is also important. Because of decreasing unemployment around 1993-1994, it is possible that, despite facing a higher unemployment rate at the time of their graduation, the 92/93 cohort faced a less-competitive labor market than the 07/08 cohort. Employers were increasing the size of their workforce, and may have favored young workers due to lower salary expectations. By contrast, in 2008, employers who were reducing the size of their workforce would not have been hiring.

In an economic climate with reduced hiring, the resources associated with a high-SES background may increase one's competitiveness for the few positions that are available. In the

[32] Average age at graduation for 92/93 cohort sample was 22.

2008 New York Times article (Murphy, May 31, 2008), Harvard economist Lawrence Katz asserts that "a poor economy magnifies the differences between student groups" and that graduates "…from spectacular schools with spectacular grades will continue to do well, while those in the middle and lower end will have a much harder time finding jobs and will be offered much lower salaries."

Social capital (Bourdieu, 1986; Portes, 1998) can help one find positions or employers who are open to creating positions. For example, family members' social connections can help one acquire appropriate employment (Armstrong & Hamilton, 2013). Cultural capital (Bourdieu, 1977, 1986; Swartz, 1997) may help candidates to know where to look for employment opportunities, and can also help them to impress employers during job fairs and interviews (Armstrong & Hamilton, 2013; Garnett et al., 2008; Rivera, 2011; Tholen et al., 2013).

Major (Hilmer & Hilmer, 2012; Thomas, 2000, 2003), GPA (Chen, 2005; Loury & Garman, 1995; Thomas, 2000, 2003), institutional rank (e.g., Black & Smith, 2006; Zhang, 2005), and institutional expenditure (Toutkoushian & Smart, 2001; Wachtel, 1976) may play a role in helping high-SES origin graduates obtain employment. In this study's sample, institutional characteristics appear to play a smaller role than major and GPA because in Table 22, we see that they do not account for the earnings gap between elite and non-elite origin graduates.

In model configurations one and two among the 07/08 cohort, we see not only a gap in earnings between those from the bottom SES quintile and those from higher quintiles, but also a gap in earnings between graduates of elite socioeconomic origin and all others, which does not appear in Model Configuration One for the 92/93 cohort. The earnings premium associated with elite socioeconomic origins in particular supports the theory that social and cultural capital may

be helping graduates of higher socioeconomic origins obtain competitive positions, because it is the elite group that should have the most capital and therefore the greatest advantage on the labor market. Further evidence comes from the fact that in 2009, the elite SES group has 68 percent higher hourly earnings compared to all others among graduates of the least-selective colleges who, because of their institution's rank, may be at a disadvantage on the labor market. Model Configuration One does indeed indicate an earnings disadvantage associated with least-selective colleges: graduates of least-selective colleges earn 15 percent less than graduates of less-selective and moderately-selective colleges after accounting for other relevant factors, including class of origin[33].

In addition to the explanation just provided, one can speculate about alternative explanations for the difference in importance of parental socioeconomic status between the 92/93 and 07/08 cohorts. Earlier, I suggested that the 92/93 graduates faced a less-competitive job market upon graduation than the 07/08 cohort because unemployment was decreasing, rather than increasing. I also proposed that a high socioeconomic background would be more helpful in a competitive labor market. However, it is possible that the 92/93 graduates faced a more-competitive job market than the 07/08 graduates because national unemployment was higher when they entered the labor market. It is also possible that in a very difficult labor market, the resources associated with high class of origin do not provide the advantage they otherwise would. If these possibilities were true, it may be that high SES was not as advantageous for the 92/93 cohort as for the 07/08 cohort because the labor market was such that even high parental SES did not help much. The advantage of elite socioeconomic origin is more apparent in the

[33] For brevity, the estimates on the college rank indicators are not displayed in the tables representing Model Configuration One. Estimates available upon request.

07/08 cohort, then, because the labor market was (not yet) as competitive as it was in the early 1990s.

Beyond differing economic conditions, demographic changes may also have played a role in the increasing value of high parental socioeconomic status. As the proportion of the population with a bachelor's degree increases[34], and the proportion of jobs that are college-level fails to keep up, the number of competitors for college-level employment increases (Acemoglu & Autor, 2011). This, paired with a competitive labor market due to an economic recession, may result in a labor market in which high-SES origin graduates are better able to distinguish themselves as desirable candidates. In a 1992 New York Times article, economists predicted that if college enrollment outpaced the growth of professional jobs, distinguishing characteristics among college graduates would become increasingly important: "As college degrees increasingly become the norm, the type of school, grades and major are bound to matter more" (Nasar, August 7, 1992). Indeed, the proportion of people between 25 and 29 years old with a bachelor's degree rose from 24.7 percent in 1995 to 30.8 percent in 2008 (National Center for Education Statistics, 2013).

In a 2009 commentary, economist Richard Rothstein argues that college graduates' struggles to find employment appropriate to their level of education is due not to the graduates' lack of skill, but rather to too little bachelor's level-employment relative to the number of college graduates: "The Bureau of Labor Statistics has consistently projected that the number of college

[34] Contrary to what one might expect, given the rise in college attendance and completion, the value of a bachelor's degree relative to a high school diploma has increased, rather than decreased, since the 1980s. This is partly due to the fact that real wages for workers without a degree have declined, while real wages for workers with a degree have increased (Acemoglu & Autor, 2011).

graduates in the U.S. labor market will continue to match (or exceed) the number of job openings requiring college education" (Rothstein, July 21, 2009).

The economic literature supports Rothstein's assertion. Acemoglu and Autor (2011) explicate economic and demographic patterns that help us understand the difference between the 92/93 and 07/08 cohorts in the importance of parental socioeconomic status. Since the 1980s, the share of employment in middle-level (e.g., sales, production) occupations has decreased, while the share of employment in both high- (e.g., professional, managerial) and low- skill (e.g., service) occupations has increased. At the same time, college-attainment rates have increased for men and women. However, the share of employment that is high-level does not incorporate all of the college-educated. Consequently, in the last few decades, the proportion of college-educated men and women in low-skill occupations has increased, while the proportion in high-level occupations has decreased.

Beaudry, Green, and Sand (2014) illustrate the effect of high- vs. low-skill job polarization on the employment of college graduates. They track the proportion of newly college-educated workers employed in what they call cognitive-task occupations, "essentially management, professional, and some technical occupations" (p. 381). The proportion of college graduates obtaining cognitive employment soon after graduation increased for cohorts graduating between 1992 and 2000, then began to decline through 2010. Furthermore, the proportion of workers who later moved into cognitive-task employment in the years after graduation also decreased in the post-2000 cohorts.

Thus far in the discussion, I have neglected to discuss one aspect of Hypothesis Three: I predicted that the gap in earnings among low-SES origin graduates that is based on college rank would change over time, and I was correct. The college rank-based gap in earnings among

graduates of low socioeconomic origin is apparent in both the 92/93 and 07/08 cohorts: a degree from a less-selective college is associated with higher earnings than a degree from a least-selective college. However, there was some change. In the first cohort, bottom-quintile respondents receive an earnings premium from a degree from an elite college, which is not the case in the 07/08 cohort. Instead, in 2009, respondents from the third socioeconomic quintile receive an earnings premium to attending a moderately- or less-selective college, relative to a least-selective college. The loss of an earnings premium to attending an elite college for the lowest-SES origin graduates mirrors the finding that high socioeconomic origins became more important over time. The environment has become harsher for low-SES graduates: not only are they at a disadvantage relative to their high-SES peers, even a degree from an elite college is not as helpful as it used to be.

**Conclusion**

At the end of Chapter Four, I argued that colleges should increase their low-SES origin students' social and cultural capital so that these students would be more competitive with high-SES students on the labor market. This argument was based on an analysis of the 2003 earnings of the 1992-1993 graduates. This chapter's analyses of the one-year post-graduation earnings of both the 92/93 and 07/08 graduates suggests that this argument became even more important in the intervening years. Class-based gaps in earnings were apparent ten years after the 92/93 cohort graduated, but not immediately after. The appearance of class-based earnings gaps immediately after graduation among the 07/08 graduates suggests that the influence of class in creating disparities among the earnings of college graduates has grown. It also suggests that the ten-year post-graduation class-based earnings gaps may be even larger among the 07/08 than

among the 92/93 graduates. As we saw with the 92/93 cohort, the class-based earnings gap can increase over time, for—I have asserted—such reasons as lingering consequences of graduating during a time of heightened unemployment for low-SES graduates (Oreopoulos et al., 2012) and the later effects of class-based discrepancies in social and cultural capital.

One cannot know with these data whether the predictive power of parents' socioeconomic status on post-graduation earnings has increased, decreased, or remained the same for cohorts that graduated after 2008. Either an increase or decrease is plausible, based on economic and demographic conditions. I have proposed that class of origin was more influential among the 07/08 graduates than among the 92/93 graduates because the former faced a more competitive labor market upon graduation for two reasons: the effects of the recession on unemployment and hiring, and an increase in the proportion of college graduates relative to degree-level employment. The national unemployment rate was 9 percent when the earnings of the 07/08 graduates were measured in 2009, but it began to decrease in 2011 and had dropped to 5.6 percent as of this writing in December 2014 (U.S. Bureau of Labor Statistics). If hiring became less competitive, the advantage to a high class of origin may have decreased. However, increased hiring would not have changed the fact that there are more college-educated workers than there are degree-level positions (Acemoglu & Autor, 2011; Beaudry et al., 2014), a situation that, if recent economic and demographic trends continue, will only worsen in the near future. If high-SES graduates are more likely than low-SES graduates to obtain degree-level positions, and if low-SES graduates are more likely to obtain positions that do not require a bachelor's degree, then the class-based earnings gap will likely persist.

Given their greater social and cultural capital, and their greater propensity to attend high-ranking colleges, high-SES graduates would likely be at an earnings advantage even if there

were more degree-level jobs than degree-holders. Degree-level jobs are not created equal, and high-SES graduates have resources that increase their likelihood of entering the more-remunerative career tracks. As such, the recommendation that I made at the end of Chapter Four still stands: colleges can implement programs and practices to help their low-SES students be more competitive with high-SES students, and they should make the effort to do so.

# Chapter 6: Conclusion

This study expands on previous research in an area that has been of interest to both researchers and laypeople for some time. As the cost of attaining a bachelor's degree rises, scholars and prospective students take an increasing interest in the economic return to the degree (Martin & Lehren, May 12, 2012; Stainburn, August 2, 2013; Stewart, September 13, 2013; Vedder, April 09, 2012). The analyses have examined the variation in the return to a degree that is due to parents' socioeconomic status and explained that variation with measures of college rank, other institutional characteristics, and individual student characteristics. This study is the first to examine class-based variation in earnings among graduates of similarly-ranked colleges. Although others have argued that a bachelor's degree is financially "worth it," on average, (Baum, Ma, et al., 2013; Hout, 2012; Zhang, 2005), I have shown that a degree is not worth the same amount for all types of graduates, from any type of college.

My research design was compartmentalized into four sets of analytic models, each of which was designed to test specific hypotheses and answer specific research questions. Ordinary Least Squares regression—a common approach when estimating graduates' earnings—was used for all of the models. However, in Chapter Four, I went a step further in my efforts to reduce selection bias in the coefficients by matching individuals on their propensity to attend high-ranking colleges. In addition, I correct for a violation of the independent of errors assumption—a cause of bias in the standard errors—by accounting for clustering in the data with hierarchical linear models.

The Baccalaureate and Beyond dataset has allowed me to look both one year and ten years post-graduation with two relatively recent cohorts and to examine change between them.

The analyses presented in Chapter Four showed variation in ten-year post-graduation earnings among 1992-1993 four-year college graduates. A degree is worth more for graduates from elite socioeconomic backgrounds. For students from low-SES backgrounds, an elite college degree is worth more than a non-elite college degree, but still less than an elite college degree is for students from high-SES backgrounds. In Chapter Five, I showed that there was no apparent class-based earnings discrepancy among the 92/93 cohort immediately after graduation, and speculated as to why the class-based earnings discrepancies that had been discussed in Chapter Four later appeared. Chapter Five also revealed that the one-year post-graduation earnings premium associated with an elite socioeconomic background increased between 1994 and 2009.

In this concluding chapter, I begin by acknowledging the study's limitations. I review the research questions and hypotheses, then discuss the relationship between higher education and social stratification as reflected in the study's findings. Finally, I close with a conversation regarding the study's implications for colleges.

**Limitations**

The most important limitation of the analyses in this project is that, in order to claim unbiasedness, I would have to rely on the assumption of selection on observables, which means that I would have to assume that I have the data to be able to statistically control for all variables that influence both earnings and the probability of receiving the "treatment". I do not claim that I have been able to account for all such factors and acknowledge that my estimates are likely biased. The estimates reflect not only the influence of the observed predictors, but also the influence of the unobserved ones. I cannot control for all confounding factors, particularly

human traits that are difficult to measure, such as confidence, persistence, ambition, work-ethic, etc.

For example, I found that low-SES graduates of elite colleges earn more than low-SES graduates of non-elite colleges. I must consider that this result is due partly to the greater confidence and ambition of low-SES students who attend elite colleges. I addressed such confounding factors as best as possible in Chapter Four's Model Set Three by creating the matched sample with which to estimate the effect of a degree from an elite college. As another example, there are unobserved, difficult-to-measure characteristics that high-SES students are more likely to have, such as social connections that can help them obtain high-paying jobs. My estimates indicate that high-SES graduates of elite colleges have higher earnings than low-SES graduates of elite colleges, but I cannot know how much of this gap in earnings is due to such unobserved variables. This is an example of a case in which the unobserved variable—social capital—is actually a mechanism by which class of origin influences earnings and therefore, if the earnings estimate of high-SES graduates is higher only because of this variable (and other such intermediary variables that are the result of parents' SES), the estimate is not biased.

A second limitation stems from the nature of the data that I have available to me. Pascarella and Terenzini (2005) note that researchers who are comparing student outcomes between colleges should pay more attention to classroom and extracurricular experiences in order to assess the influence of different campus environments, which would include interaction with faculty and peers. Similarly, I would like to have indicators of the degree to which participants took advantage of the academic and social resources available to them at their institutions. Instead, I have measures of institutional expenditure on academic and student services, which do not specify how these funds are used, nor the resources that are actually

available to students, and certainly not how they are used by students. In some model configurations, the expenditure variables appear to help explain the gap in earnings between high- and low-SES graduates. However, I cannot make specific claims, but merely suggest that this might be because low-SES students who attend institutions that spend more on student services receive superior student services, which assists them in such a way that they are advantaged in their careers. The specific recommendations that I have made for institutions are not based on the data because the variables do not get at the processes at work "behind the scenes."

Another limitation is caused by the Stata software, which does not allow users to employ survey weights when performing propensity score matching, the consequence of which is that in Chapter Four, the sample used in the PSM models and non-weighted OLS models is not the same sample as is used in the weighted OLS and HLM models. The estimates from the weighted and non-weighted samples are not comparable. The weighted sample is nationally-representative, but the generalizability of the non-weighted sample is smaller (though presumably still wide, given the B&B sampling method).

Due to limitations of the IPEDS reporting structure (Jacquette & Parra, 2014), expenditure and enrollment are collapsed to the parent level, which means that for each parent and child institution, the expenditure per student reported is the sum of expenditure across the parent institution and all children divided by the sum of enrollment across the parent and all children. The internal validity of the study is slightly reduced because the expenditure reported for each institution is not always the accurate number for that individual institution if the institution is part of system with parent and child institutions.

The social class-based distribution of students among four-year colleges produced analytic difficulties. I wanted to know more about gaps in earnings among graduates of the most elite colleges in the country, but relatively few of the respondents attended the colleges classified as "super-elite" in this study. Even worse was the small proportion of low-SES origin students who attended super-elite or elite colleges. These sample characteristics may have contributed to the lack of statistical significance in some model specifications and limited the model specifications that would produce valid estimates. For example, early in the project I created a low-SES origin indicator whose estimates would be compared to those produced by the elite-SES origin indicator. A respondent was classified as having low-SES origin if the parents were in the bottom ten percent of the income distribution and neither had a four-year degree. There were about 220 low-SES respondents among the 92/93 cohort sample used in Chapter Four, but only three graduated from a super-elite college, and only ten from an elite college. Consequently, I have not presented the estimates from any model specifications that involve the low-SES indicator.

The bottom-SES quintile, although it includes many more respondents than the low-SES indicator did—about 790 in the 92/93 sample used in Chapter Four—also presents a problem of sample size. Only about 10 respondents of these 790 graduated from a super-elite college, and 40 from an elite college. These numbers may have led to the lack of statistical significance in some of the estimates on the socioeconomic quintile indicators in Model Set Two, in which each of the upper quintiles is compared to the lowest. They may also explain the high coefficient associated with super-elite colleges for bottom-quintile respondents in the HLM specification in Model Set Three (Chapter Four, Table 11).

**Questions and Hypotheses**

Research questions one through three addressed the variation in the 2003 hourly earnings among the 1992-1993 graduating cohort. Question one opened the study with the basic question: *What is the post-graduation earnings gap between high-SES origin and low-SES origin college graduates?* With Hypothesis One, I expected to find that high-SES origin graduates out-earn low-SES origin graduates. The findings from Model Set One support the hypothesis: graduates of elite socioeconomic origin earn 13 to 16 percent more than other graduates.

With research question 1.a, I then asked *how the earnings gap addressed in question one differs according to institutional rank.* I correctly hypothesized that higher-ranking institutions have smaller class-based earnings gaps among their graduates. Elite socioeconomic origin is associated with a greater earnings premium among graduates of the least-selective colleges than among graduates of moderately-selective (OLS specification) and elite colleges (HLM specification).

Addressing the benefits of high college rank rather than high class of origin, research question 1.b asked *whether high-ranking institutions are associated with higher earnings for low-SES origin graduates, relative to their low-SES peers who graduated from lower-ranking institutions.* Hypothesis 1.b predicted, correctly, that higher-ranking institutions provide a greater earnings premium than lower-ranking institutions for students from a low socioeconomic background.

With research question two, I delved into the reasons for the class-based gap in earnings: *What student or college characteristics help to explain the post-graduation earnings gap between high-SES origin and low-SES origin students?* Hypothesis Two stated that GPA, major, institutional expenditure, and institutional rank would explain this gap. Hypothesis Two is

somewhat supported among the cohort in general but not among graduates of all types of colleges. In Model Set One, these individual and institutional characteristics do appear to reduce (OLS specification) or completely account for (HLM specification) the gap in earnings between graduates of elite socioeconomic origin and everyone else. However, in Model Set Two, in which we look within the college rank categories, GPA, major, and institutional expenditure do not account for the earnings premium associated with an elite socioeconomic background among graduates of least-selective, moderately-selective, and elite colleges.

I explored the reasons for the variation in earnings among low-SES origin graduates in particular with research questions 2.a: *If some low-SES origin graduates have higher earnings than others, what factors explain this phenomenon? Can it be explained by different student or college characteristics?* and 2.b: *If a degree from an elite college is associated with higher earnings among low-SES origin graduates, what characteristics of elite colleges promote higher earnings?* Hypothesis 2.a posited that some low-SES origin graduates out-earn others due to their GPA, major, institution's expenditure, and institution's rank. In Chapter Four's Model Set Three, we saw that low-SES graduates do receive an earnings premium if their degree is from an elite institution. However, this premium is not explained by the elite college graduates' GPA or major, not is it explained by elite institutions' greater expenditure on academic services, student services, or instruction. Hypothesis 2.b, which predicted that both expenditure and other unobserved characteristics of elite colleges lead to higher earnings for their low-SES origin graduates, is therefore half supported in that the findings support—or at least do not provide evidence contrary to—the hypothesis that there are characteristics of elite colleges that help their low-SES students get ahead that are unobserved in these data.

Research question three was set apart from the others. The question explored change over time in the predictive power of parents' socioeconomic status by comparing the class-based variation in earnings between the 92/93 cohort and the 07/08 cohort just one year after graduation. Question three was answered in Chapter Five: *Did the post-graduation earnings gap, or the factors that influence it, change over time?* I hypothesized that two earnings gaps would change over time: the gap between high- and low-SES origin graduates, and the gap between low-SES origin graduates of elite colleges and low-SES origin graduates of non-elite colleges. The results support these predictions. Notably, elite socioeconomic origins are associated with higher earnings soon after graduation among the 2007-2008 graduates, but not among the 1992-1993 graduates. I also hypothesized, however, that the variables that influence the high- vs. low-SES origin earnings gap would change over time. The results do not support this hypothesis because there was no one-year post-graduation earnings gap among the 1992-1993 graduates, and therefore no influences on this gap that could have changed with the later cohort.

**Higher Education and Social Stratification**

The findings of this study indicate that among their bachelor's degree recipients, non-profit, four-year colleges reproduce, to some degree, the socioeconomic hierarchy of the students' parents. In my theoretical framework, institutional characteristics play a mediating role between parents' socioeconomic status and post-graduation earnings, and my findings support the existence of such a mechanism. Even if actions and structures of the colleges themselves are not responsible for actively reproducing socioeconomic hierarchies (though the literature suggests that they do; e.g., Armstrong & Hamilton, 2013), the best one can conclude from this study is that four-year colleges are not breaking up the socioeconomic hierarchy such that the

earnings and education level of their graduates' parents are unrelated to their graduates' own earnings.

The findings from Chapter Five suggest that colleges' role in facilitating the reproduction of the socioeconomic hierarchy actually increased between 1994 and 2009. Inequality in labor market outcomes based on class of origin is a phenomenon that will likely persist in the near future. The immediate post-graduation earnings gap may have been exacerbated in 2009 due to the period of high unemployment that followed the 2007-2009 recession. Nevertheless, as long as high-SES origin graduates have more social and cultural capital, and as long as these resources act as mechanisms of social reproduction because they are rewarded in education and employment, high-SES origin graduates will have higher post-graduation earnings, on average. The current demographic and economic realities that our nation faces merely exacerbate the effect of these traditional mechanisms of social reproduction. Competition for high-paying employment was tougher for the 2007-2008 graduates than for the 1992-1993 graduates; a lower proportion of college graduates were working in high-skill occupations and a higher proportion in low-skill occupations (Acemoglu & Autor, 2011; Beaudry et al., 2014).

One obvious conclusion that can be drawn from the study's findings, particularly the finding that elite colleges are associated with higher earnings among low-SES origin graduates, is that one should increase the proportion of students at elite colleges who are from low-SES backgrounds and increase the proportion of low-SES origin high school graduates who enroll in elite colleges. The underrepresentation of low-SES students at many four-year colleges is a popular concern in the literature (Baum, Ma, et al., 2013; Bowen et al., 2005; Brand & Xie, 2010; Haskins et al., 2009; Thomas & Bell, 2008), and I agree, of course, that it is an important one. I do recommend that the federal government, states, and colleges implement and improve

policies and practices that increase access to high-ranking colleges where low-SES students are underrepresented. The federally-funded Upward Bound program, which helps low-income and would-be first-generation college students prepare for college, is one example of such a program (U.S. Department of Education). Independent, non-profit organizations such as the College Advising Corps (College Advising Corps), which helps underrepresented students apply to college, and QuestBridge (QuestBridge), which helps low-income students apply to "leading" colleges, can also play a role in improving enrollment rates of low-SES students at high-ranking colleges. Colleges should partner with the College Advising Corps to encourage their graduates to be advisors, and with QuestBridge to accept applications from low-income students through the program.

Improving the representation of low-SES students at elite colleges in particular is important because of the particular benefits that these colleges provide for students. Among my participants from the bottom SES quintile who were matched on their propensity to have a degree from an elite college, a degree from an elite college is associated with 27 percent greater earnings ten years after graduation, relative to a degree from a least-selective college. Low-SES students have less social and cultural capital from their families than high-SES students (Bourdieu, 1977), so it is critical that they gain as much capital as possible through their colleges in order to be competitive on the labor market. Elite colleges provide more opportunities than lower-ranking colleges to gain social and cultural capital that will help low-SES students maximize their earning potential.

One important example of social capital provided by the highest-ranking colleges is access to elite career networks, which includes elite employers, employees of elite employers who are alumni of the same or similar high-ranking institutions, and faculty and peers who have

helpful career connections (Rivera, 2011; Tholen et al., 2013). Peers at elite colleges will be of higher class background, on average, than peers at non-elite colleges, and they will have more cultural capital to share with low-SES students (Aries & Seider, 2005, 2007). Low-SES students can use their new cultural capital to seek out and impress elite employers at, for example, recruitment events (Armstrong & Hamilton, 2013; Rivera, 2011; Tholen et al., 2013). Elite institutions are also the most financially affluent (The Chronicle of Higher Education, 2014), which allows for programs and practices that increase students' social and cultural capital (Hu & Wolniak, 2010; Pascarella & Terenzini, 2005; Toutkoushian & Smart, 2001).

Elite colleges are not the only institutions that are beneficial to low-SES students. My findings suggest that less-selective institutions, relative to least-selective, are also associated with greater earnings. The greater the rank of the institution, the more social and cultural capital students have the opportunity to gain. For example, the higher-ranking the institution, the more cultural capital is to be found among one's peers (Aries & Seider, 2005, 2007). Lower-ranking institutions also have employer recruitment, alumni, and faculty and peers with job connections. However, the lower-ranking the institution, the less likely it is that these networks lead to prestigious, high-paying positions with such employers as Wall Street investment banks and management consulting firms, in part because it is less likely that elite employers will recruit at non-elite institutions. It is also less likely that non-elite college alumni work for elite employers (Rivera, 2011).

There are limits to the benefits of attending a higher-ranking rather than a lower-ranking college. Although low-SES students who attend elite colleges experience relative upward social mobility, there is an earnings gap even among graduates of elite colleges. The theoretical framework suggests that this gap can be attributed partly to the phenomenon of capital building

upon capital. Elite institutions may offer opportunities to gain capital or to use one's capital for personal gain, but low-SES students who have little capital are less able to take advantage of these opportunities. For example, extracurricular participation offers opportunities to gain capital, but one has to have the desire to participate, which may be related to awareness of the benefits of participating (cultural capital) (Stuber, 2009). Certain activities that are associated with the upper- or upper-middle class, such as squash and rowing, are more impressive than others to recruiters for elite employers (Rivera, 2011), but low-SES students are less likely to have been socialized to participate in such activities or to know how they might help them in the labor market. One can gain capital from high-SES peers, but one may not be able to or have the desire to form friendships with high-SES students (social and cultural capital) (Aries & Seider, 2005; Hurst, 2010).

A degree is a form of institutionalized cultural capital (Bourdieu, 1977, 1986) that students have the opportunity to gain at college, but if one does not have a good relationship with knowledgeable, well-educated parents who can provide helpful guidance (social and cultural capital), one may not perform well academically (Armstrong & Hamilton, 2013). A strong academic portfolio includes not only high grades, but also such qualities as professional internship and study abroad experiences, which are aided not only by familial social and cultural capital but also economic capital (Armstrong & Hamilton, 2013; Lehmann, 2009; Stuber, 2009; Tholen et al., 2013).

Related to academic performance is the issue of fit between students and institutional structures. If there is good fit—for example, the university provides the appropriate amount of academic and career guidance for a student with a particular amount of knowledge about higher education and its relationship with the labor market (cultural capital)—then the student will be

successful. If not—if there is not guidance appropriate for low-SES students with low cultural capital provided by the institution because it serves a relatively affluent population that does not need it—then the low-SES student may not graduate at all, or graduate with a useful (for that student) major or GPA. Among Armstrong and Hamilton's (2013) participants at a large, selective (but not elite), state flagship research institution, were a few students of working-class origin, with little cultural capital, who were more academically successful after transferring to more-affordable regional state colleges with structured programs in fields such as nursing designed for students like them. Academically successful, in this case, does not refer to being on an elite career path, but on a path to upward socioeconomic mobility. Armstrong and Hamilton propose that working-class students may do well at either regional state colleges that place students on "mobility pathways" or at elite colleges with excellent student resources and guidance that place students on "professional pathways."

This concluding chapter would be disappointing, however, if the primary recommendation that I made was to increase access to elite colleges for low-SES students. Such a solution would only impact a small proportion of low-SES college graduates. Furthermore, if the only change made was an increased proportion of students at elite colleges from low-SES backgrounds, those low-SES students who were admitted may earn more than they otherwise would have, but high-SES students would still earn more among graduates of those colleges. The findings have shown that high-SES students out-earn low-SES students among graduates of both high- and low-ranking colleges.

My recommendation, therefore, is that all four-year colleges should make an effort to provide excellent career and graduate school counseling for all of their students. These efforts could decrease the size of both the high/low-SES earnings gap and the earnings gap among low-

SES students who graduate from colleges of different rank. Because low-SES students may benefit the most from enhanced advising, special effort should be made to attract their attention toward these resources. The findings from the 92/93 cohort do indicate that greater expenditure on academic services, student services, and instruction do not account for the earnings premium that low-SES graduates receive from a degree from an elite college. This does not mean, however, that these resources do not or cannot make a difference. The earnings premium associated with elite colleges remains when controlling for expenditure because there are other, unobserved (in these data) benefits to attending an elite college, such as greater recruitment by elite employers (Rivera, 2011; Tholen et al., 2013) and exposure to greater social and cultural capital among one's peer group (Aries & Seider, 2005, 2007). In addition, analyses of the 2003 earnings of the 92/93 cohort do indicate that GPA, major, and institutional expenditure make a difference in the post-graduation earnings gap among all graduates, though not within all of the college rank categories.

These findings have implications for the type of counseling that colleges could implement to help their low-SES graduates be as upwardly mobile as they would like to be. For example, students could benefit from a holistic type of advising that combines academic advising and career counseling. This advising should begin during student orientation and should including discussion of GPA, major, and career options. Students who are underrepresented in certain career tracks should be encouraged to consider them and provided with detailed information about the qualifications that such careers require. For example, low-SES origin graduates may be underrepresented in such career tracks such as elite finance or management consulting, not only because recruitment for these positions often occurs at the highest ranking colleges in the country, but also because recruiters are more likely to select high-cultural capital

students (Rivera, 2011). Lower-ranking colleges could try encouraging elite employers to recruit at their institutions for high-paying positions, and any college could encourage recruiters not to give too much weight to such factors as participation in extracurricular activity associated with the higher social classes (e.g., rowing, squash).

It is important to make an effort to target low-SES students for high-quality advising. As I explained in Chapter Two's literature review and in Chapter Four, low-SES students enter college with less capital than high-SES students, and capital builds upon capital (Aries & Seider, 2005; Armstrong & Hamilton, 2013; Hurst, 2010; Lehmann, 2009; Stuber, 2009; Tholen et al., 2013). For these reasons, low-SES students are less able to take advantage of opportunities to enter elite career tracks (Lehmann, 2009; Tholen et al., 2013) and could benefit greatly from extra help. It may be difficult to target students based specifically on information regarding their socioeconomic background, but there are indirect approaches based on structures that colleges already have in place. One could target students in programs for at-risk students, with low standardized test scores, who graduated from high schools serving a low-income population, or who are enrolled in remedial coursework.

Even if greater numerical expenditure itself on student resources, academic resources, or instruction would not make much of a difference (which I do not believe would be the case at lower-expenditure institutions), or if institutions do not have more resources to expend, such circumstances do not rule out the possibility of effective change. One cannot know from these data exactly how the institutions were distributing their expenditures. For example, I do not know how much went to the career center, or what the career center was doing with those funds. Such details matter. Effective change does not require greater expenditure; colleges can

reallocate the resources that they are already expending, or institute difference practices among the faculty, staff, and centers to whom the resources are going.

To be fair to colleges, I do believe that it would be unrealistic to demand that colleges should completely "level the playing field" by creating equal opportunity in the labor market among students from different socioeconomic backgrounds. So many mechanisms external to the colleges themselves are at work that it would be too much to ask. As I discussed in Chapter Four, a cohort enters college with discrepancies in social and cultural capital between the high- and low-SES origin students, and it may be impossible for colleges to find a way around low-SES students' lower capital or provide them with the same capital. Even my own recommendation of excellent career and graduate school counseling would be unlikely to eliminate earnings gaps based on class of origin. Excellent advising would also be unlikely to eliminate earnings gaps based on college rank because of greater exposure to social and cultural capital at elite colleges due to a higher saturation of high-SES origin students (Aries & Seider, 2005, 2007) and recruitment interest from elite employers (Rivera, 2011; Tholen et al., 2013). The impact of such counseling may be greatest immediately after graduation. After ten years have passed, the discrepancies in social and cultural capital that are based on class of origin will have had more time to work, and the earnings gap will increase. I examined this phenomenon in Chapter Five, when I compared the 1994 earnings gaps to the 2003 earnings gaps among the 92/93 cohort.

Despite this seemingly pessimistic outlook, I also argued at the end of Chapter Four that although the provision of completely equal opportunity by colleges may not be realistic, there remains value in doing what one can. When it comes to leveling students' capital or opportunity to gain capital, practice may never make perfect, but it can make progress. Future studies should evaluate programs and practices that are designed to improve students' post-graduation

outcomes, particularly low-SES students' outcomes. I recommend a qualitative study that follows students from the time of entry at a four-year college for at least five years. The proposed study may be similar to the work portrayed in *Paying for the Party* (Armstrong & Hamilton, 2013), with some important differences. The proposed study should directly evaluate programs and practices whose purpose it is to impact post-graduation career outcomes. An example of practices that should be subject to evaluation are the activities of colleges' career centers. The proposed study could also examine the impact of interaction with peers, interaction with faculty and staff, classroom experiences, and extracurricular activities on post-graduation outcomes.

Another interesting dimension that could be added to a longitudinal, qualitative study of college students is interviews or surveys of students' post-graduation employers, or employers to whom they applied or with whom they interviewed but were not successful. The goal of these interviews should be to ascertain the motivations behind employers' decision to hire or not to hire a candidate. This may be similar to the work done by Rivera (2011), except that, in a qualitative study that begins following the participants when they are still students, employers' perceptions of a participants' desirable traits can be linked to both the participants' college experiences and their socioeconomic background. A qualitative study such as the one that I have proposed has the potential to reveal important relationships between socioeconomic background, programs and practices of four-year colleges, and post-graduation career outcomes. A reduction in the earnings disparities that are based on college graduates' class of origin would bring the higher education system closer to being the meritocratic system that many believe it to be.

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