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**The Postsecondary Resource Trinity Model:
Exploring the Interaction between Socioeconomic, Academic, and
Institutional Resources in Students' College-to-Career Pathways**

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**The Postsecondary Resource Trinity Model:
Exploring the Interaction between Socioeconomic, Academic, and
Institutional Resources in Students' College-to-Career Pathways**

by

Matthew Shankar Giani, BA; MA

Dissertation

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**The Postsecondary Resource Trinity Model:
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Abstract: It is frequently stated that higher education is our nation's greatest vehicle for social mobility. But despite the dramatic expansion of the postsecondary system since the 1940s, social mobility rates have remained stagnant and significant socioeconomic disparities in college attainment have persisted. Three explanations of this phenomenon appear most prominently in the literature. The first is that low-SES students are significantly less likely to be academically prepared for college. The second is that, even when college-ready, low-SES students are more likely to attend less selective or lower quality postsecondary institutions, decreasing their odds of attainment. The third is that socioeconomic background may exert an independent effect on the likelihood of postsecondary success, independent of background ability and institutional quality. Although each explanation is supported empirically, thus far limited attempts have been made to determine how these three factors interact across educational transitions.

The purpose of this study is to estimate the relative impact of SES across transitions in students' college-to-career pathways and explore how socioeconomic disparities in rates of student outcomes vary by student ability, institutional selectivity,

and the combination of the two. Sequential logit modeling, a methodological staple in research on the effects of socioeconomic background on educational progression, is used to estimate the relative effect of SES on seven postsecondary transitions, from college application through graduate school attainment. The labor market outcomes of college graduates are also analyzed to determine whether family upbringing continues to influence students even after completing college. For both the postsecondary and labor market analyses, separate models are fit for different ability groups and institutional selectivity levels to investigate how these factors impact the magnitude of socioeconomic disparities in transitions.

The results of this study suggest the need for a new conceptualization of this phenomenon, which is termed the Postsecondary Resource Trinity model. This model highlights the complex interaction between socioeconomic, academic, and institutional resources and suggests the need for a re-examination of the traditional perspective that the impact of SES declines steadily for all students as they progress through postsecondary. Implications of the model for policy, practice, and future research are discussed.

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CHAPTER 1: PROBLEM STATEMENT

The concept of intergenerational social mobility, whereby individuals elevate their socioeconomic standing in relation to the socioeconomic status attained by their parents, is inextricably linked to American ideology and has been described as “the bedrock upon which the American story has been anchored” (Sawhill & Morton, 2007, p. 1). Awarding social positions based on talent, capacity, and work ethic rather than based on heredity or ascribed characteristics was one of the features that even foreign observers believed distinguished the young American republic from the aristocratic European social systems from which many American colonists emigrated (de Tocqueville, 1945). The goal of promoting social mobility was also one of the primary catalysts of governmentally funded education and the expansion of educational opportunity in the United States. For example, Thomas Jefferson’s proposal of a community supported system of public education in Virginia in the late 1700s, one of the first proposals for state-funded public schools, was designed to ensure that the most capable citizens would have the educational opportunity to become leaders of their community “without regard to wealth, birth or other accidental condition or circumstance” (Jefferson, 1778, p. 1). It is this belief that status attainment should be unrelated to socioeconomic origin which serves as the ethical foundation of what James Truslow Adams described as the *American dream*:

...that dream of a land in which life should be better and richer and fuller for every man, with opportunity for each according to his ability or achievement...It

is not a dream of motor cars and high wages merely, but a dream of a social order in which each man and each woman shall be able to attain to the fullest stature of which they are innately capable, and be recognized by others for what they are, regardless of the fortuitous circumstance of birth or position. (Adams, 1931, p. 415)

Although social mobility has been a central tenet of American ideology since the early days of the republic, promoting social mobility through higher education did not become a widespread policy strategy until two concurrent forces reshaped the higher education system. The first influence was the deleterious effects of the Great Depression and World War II on the American economy. As Olson (1973) described, policymakers were concerned that the return of servicemen following the war would dramatically increase unemployment rates and possibly lead to another depression. President Franklin D. Roosevelt relied on the National Resources Planning Board's prediction of as many as nine million unemployed workers during the readjustment period following the war when he asked Congress to pass legislation aimed at providing postsecondary educational benefits to returning veterans. While veterans would receive large benefits under the plan, the Armed Forces Committee on Post-War Educational Opportunities for Service Personnel, another executive agency that Roosevelt relied on for policy recommendations at this time, bluntly stated in its final report that they had "regarded any benefits which may be extended to individuals in the process as incidental" (Olson, 1973, p. 597-98). The eventual passage of the G.I. Bill in June of 1944 was thus motivated more by the need for macroeconomic stabilization and unemployment reduction rather than the desire

to provide returning veterans with opportunities for social mobility (Olson, 1973). But regardless of policymakers' intent, the G.I. Bill succeeded in initiating the dramatic transformation of postsecondary education in the United States and was important not only for expanding enrollment in colleges and universities overall but also for stimulating the "democratization" of the higher education system by "making college a viable option for men from a range of sociodemographic backgrounds, including minorities, first-generation Americans, and those from low-income households" (Bound & Turner, 2002, p. 785).

The second force that contributed to the transformation of higher education was the development and influence of human capital theory. Although the foundation of human capital theory was laid out by Adam Smith more than two centuries ago, the theory was more fully developed and began to gain widespread appeal in the 1950s (Lewis, 1954; Mincer, 1958) and the 1960s (Becker, 1962, 1964; Schultz, 1961). Around this time, certain economic anomalies caused economists to pay closer attention to the relationship between education and national growth. As Schultz (1961) noted, "It has been widely observed that increases in national output have been large compared with the increases of land, man-hours, and physical reproducible capital" (p. 1). This observation caused economists to doubt the sufficiency of previous explanations of economic growth rooted in better exploitation of the natural world and increases in physical capital and led to the notion that "investment in human capital is probably the major explanation" for the rapid economic growth witnessed by many economically advanced nations (Schultz, 1961, p. 1). Human capital thus became defined as the knowledge, skills, and talents that

are deemed to be valuable in the economic marketplace and contribute to increasing both personal earnings and overall economic output. As the G.I. Bill provided a significantly expanded pool of Americans with postsecondary degrees which allowed human capital theorists to study these relationships, it was not long before economists had amassed compelling evidence regarding the strong relationship between postsecondary education and desirable economic outcomes, such as higher earnings, higher occupational prestige, and lower rates of unemployment (Becker, 1962, 1964; Card, 1999; Griliches, 1977; McMahon, 1991; Mincer, 1974; Psacharopolous, 1980; Psacharopolous & Patrino, 2004; Schultz, 1961).

The widespread perceived success of the G.I. Bill in preventing a second depression and creating pathways to stable employment for returning veterans, combined with the growing literature base on the relationship between higher education and desirable socioeconomic outcomes, generated increased support for even broader efforts to expand access to postsecondary. The growing momentum for higher education expansion culminated in the passage of the Higher Education Act in 1965 which provided financial assistance to colleges and universities so they could expand student enrollment and allocated need-based financial aid to students from lower socioeconomic backgrounds (Astin & Oseguera, 2004).

The impact of these concurrent forces is evident in the rates of postsecondary enrollment growth during this time period. As Goldin and Katz (1999) demonstrated, in 1900 less than five percent of all eighteen to twenty-one year olds in the United States were attending a college or university, and access was generally restricted to children of

the wealthy elite. Enrollment increased over the next several decades, but by 1940 still only one out of every six youth in that same age range was enrolled in some type of postsecondary institution. However, the G.I. Bill and the Higher Education Act stimulated exponential growth in postsecondary enrollment (Olson, 1973). By 1970, approximately 60% of 18 to 21 year olds were enrolled in postsecondary, representing a four-fold increase in the postsecondary enrollment percentage compared to the 1940 rate (Goldin & Katz, 1999, p. 41).

The unprecedented expansion of postsecondary education during the post-war period and the burgeoning literature base on the relationship between postsecondary education and positive socioeconomic outcomes also stimulated a wave of social mobility research, and much of the research at this time provided an optimistic view of the extent of social mobility in America. Blau and Duncan's (1967) seminal study of the occupational structure and status attainment processes estimated a weak connection between father's socioeconomic status and the status attained by sons (mothers and daughters were often excluded from analyses of social mobility at this time due to the infrequency of women in the workforce). Becker and Tomes (1986) calculated an average correlation between father's and son's earnings of about 0.15, indicating a fairly weak relationship, in their review of a number of studies estimating the degree of mobility in the US that were conducted between 1950 and 1980. These authors concluded that "almost all the earnings advantages or disadvantages of ancestors are wiped out in three generations" (Becker & Tomes, 1986, p. S1). Gary S. Becker summarized the dominant perspective on intergenerational earnings transmission in his 1988 presidential

address to the American Economics Association when he stated that “low earnings as well as high earnings are not strongly transmitted from fathers to sons” (p. 10). Indeed, research at this time seemed to confirm the belief that the United States was a land where eventual socioeconomic attainment was not foreordained by socioeconomic origin, and higher education was believed to be one of the key vehicles for social mobility.

However, much of the research on social mobility during this period suffered from a number of serious limitations that prevented the accurate estimation of the extent of social mobility, including significant mistakes in reported income in many of the surveys most commonly used to study mobility, unrepresentative samples, and the inability of researchers to differentiate transitory fluctuations in income from underlying permanent income status (Bowles, 1972; Bowles & Gintis, 2002; Solon, 1992, 1999; Zimmerman, 1992). More recent studies, which have benefitted both from more accurate data and advanced statistical techniques, estimate that the relationship between parents’ and children’s earnings is much higher, and therefore the extent of social mobility much lower, in the US than previously believed. Solon (1992), Restuccia and Urrutia (2004), Jäntti (2009), and Sawhill and Morton (2007) all estimate an intergenerational earnings correlation of between 0.4 and 0.45. Although there are no universally accepted standards regarding the ideal extent of intergenerational transmission of socioeconomic status, these estimates would mean that the United States has one of the lowest rates of social mobility among democratic societies with advanced economies (Jantii, 2006; Sawhill & Morton, 2007, Solon, 2002). A recent study of the The Pew Charitable Trusts (2012) estimated that “only 4 percent of those raised in the bottom quintile [of family income]

make it all the way to the top [quintile] as adults, confirming that the ‘rags-to-riches’ story is more often found in Hollywood than reality” (p. 2). Additionally, research appears to indicate that our rates of social mobility have remained relatively unchanged over time despite the dramatic expansion of the higher education system (Beller & Hout, 2006).

POSTSECONDARY EXPANSION AND ATTAINMENT

Given the widespread access to and participation in postsecondary education in the United States and the consistently documented relationship between higher education and positive socioeconomic outcomes, it was initially unclear why higher education expansion would not have weakened the relatively strong association between parents’ and children’s earnings. But while postsecondary participation increased significantly beginning in the 1950s and 1960s, research has shown that enrollment growth was not met with a concomitant rise in attainment rates. Turner’s (2004) analysis shows that the percentage of high school graduates that enrolled in college as full-time students for at least some period of time increased from 51% in 1970 to 67% in 1999, but the percentage that received a bachelor’s degree only rose from 23% to 24% during the same time period. Put differently, “Completion rates fell by more than 25 percent over this interval” (Turner, 2004, p. 13). Bowen, Chingos, and McPherson’s (2009) research similarly depicts a declining college completion rate, or the percentage of students that attained at least some postsecondary which eventually earned a bachelor’s degree, between the early 1970s and early 1990s, although it appears that the completion rate has increased slightly since the mid-1990s (p. 4). Data from the National Center for Education Statistics

(NCES) likewise show that full-time postsecondary enrollment increased by 87% from 1979 to 2009 but the number of degrees conferred rose by only 74% during the same time period, another indication that attainment rates have not kept pace with enrollment growth (NCES, 2011b).

While human capital theory greatly contributed to the expansion of the postsecondary system, in some ways initial human capital research also downplayed the importance of postsecondary attainment. After the initial development of human capital theory, economists began investigating the functional form of the relationship between education and economic outcomes. The most frequent variables used in these analyses were years of schooling and years of work experience as the independent variables and earnings as the dependent variable (Mincer, 1974), and many studies eventually revealed a strong linear relationship between years of schooling and earnings when earnings underwent a log-transformation (Card, 1999). While the finding that log-earnings are linearly related to years of schooling is intuitively appealing, the assumption of such models is that years or amount of schooling is more important than earning a postsecondary credential. In other words, if earnings (or log-earnings) are linearly related with years of schooling, there is no additional boost in earnings capacity following the completion of a postsecondary degree or certificate.

To test this assumption, economists began to model discontinuities in log-earnings at years of schooling that correspond to when students receive educational credentials. Such research eventually led many economists to conclude that there are noticeable and often substantial “sheepskin effects” in education (Belman & Heywood,

1991; Hungerford & Solon, 1987; Schady, 2003), or additional boosts in earnings after receiving a postsecondary credential, and that earnings increase with the completion of each level of postsecondary credential. In other words, postsecondary certificate, associate's degree, bachelor's degree, and graduate and professional degree holders all earn more than their counterparts with no credential but the same number of years of education (Grubb, 1993; Jaeger & Page, 1996). Research has also shown that the wage premium for earning postsecondary credentials has increased over time largely due to an insufficient number of college graduates, congruent with economic theories of supply and demand (Card & Lemieux, 2000; Long, 2010).

The inability of postsecondary expansion to increase social mobility may therefore be largely explained by the disconnect between enrollment and completion, and this disconnect is most pronounced for students from disadvantaged backgrounds. Indeed, disaggregating college attainment figures by students' socioeconomic origins reveals significant and growing disparities. Mortenson's (2010) estimates of bachelor's degree attainment by family income using census data are alarming: 82.4% of students born into families in the top quartile of family income earn a bachelor's degree by age 24, while only 8.3% of students from families in the bottom quartile do so; the bachelor's degree attainment rate for dependent students who enrolled in college was 97.9% for students from the top income quartile but only 19.9% for students from the bottom income quartile; and of all bachelor's degrees awarded in 2009, 55.1% were awarded to students from the highest income quartile while only 7.3% were granted to students from the lowest quartile. Mortenson concluded that "in 2009 a student born into the top quartile of

family income is ten times more likely to earn a bachelor's degree by age 24 than is another student born into the bottom quartile of family income" (p. 2), and that this disparity has doubled since 1980. Although other researchers estimate a smaller attainment gap between high-income and low-income students (Lauff, Ingels, & Christopher, 2014; Tinto, 2006), it is evident that a sizeable gap in postsecondary attainment by socioeconomic origin remains, and has likely grown over time, even though the rates at which students from low-income backgrounds enroll in postsecondary has increased significantly.

Given the importance of postsecondary attainment rather than simply enrolling in college for the purposes of improving students' socioeconomic outcomes and promoting social mobility, researchers began to investigate the possible causes of lagging postsecondary attainment rates in the face of postsecondary expansion, particularly for students from disadvantaged socioeconomic backgrounds. Although numerous factors have been identified which likely contribute to this phenomenon, three "resources," or individual and institutional characteristics that promote postsecondary attainment, are the most salient to the current study: academic resources, institutional resources, and socioeconomic resources. The following sections will discuss each of these resources in greater detail.

ACADEMIC RESOURCES

One of the more prominent explanations of socioeconomic disparities in postsecondary attainment rates is that disadvantaged students are often less academically prepared for postsecondary than their more privileged peers (Adelman, 1999, 2006;

Cabrera & La Nasa, 2000, 2001; Kim, 2004; McPherson & Shapiro, 1998; Terenzini, Cabrera & Bernal, 2001). This argument draws from two separate but related lines of research. The first has examined the impact of students' academic preparation on their likelihood of succeeding in college, and many studies have identified strong relationships between various measures of academic preparation and postsecondary enrollment, performance, and attainment. High school grade point average (GPA) has been found to strongly impact both college GPA (Cohn, Cohn, Balch, & Bradley, 2004) and a student's likelihood of earning a degree (Geiser & Santelices, 2007). Adelman's (1999, 2006) influential studies showed that "academic resources," which he defined primarily as the quality of the high school curriculum that students completed and their performance in that curriculum, are by far the greatest contributor to college attainment. Adelman's analyses also showed that socioeconomic status (SES) had a statistically significant but modest impact on bachelor's degree attainment once pre-collegiate achievement had been controlled for. And although some research has shown that measures such as standardized assessments are poor predictors of postsecondary performance (Hoffman & Lowitzki, 2005) or are not equally predictive of college success for all student subgroups (Zwick & Sclar, 2005), the fact that such measures are widely used by institutions in admissions decisions causes them to be important determinants of college access and success regardless of their true impact on these outcomes.

The second line of research that supports the college readiness argument has investigated socioeconomic differences in students' academic preparation and ability. Two meta-analyses of this phenomenon showed a moderate to strong relationship

between various measures of socioeconomic status and academic achievement and ability across a diverse array of study contexts and methodological approaches (Sirin, 2005; White, 1982). Terenzini, Cabrera, and Bernal's (2001) analysis of data from NCES' National Educational Longitudinal Survey of 1988 (NELS:88) showed that low-income students were consistently underrepresented in the top half of all academic ability areas on NELS-administered assessments by a margin of 30 to 40 percentage points and scored approximately 25% lower than their high-income peers on ACT and SAT assessments. Cabrera and La Nasa (2001) estimated that only 15% of low-SES students obtain the academic qualifications necessary to support college enrollment prior to graduating from high school, compared to approximately 55% of high-SES students.

Although academic resources are a strong determinant of college access and completion and low-SES students on average have lower academic qualifications than their high-SES counterparts, this fact alone would not necessarily explain why completion rates have declined over time, particularly for low-SES students. However, if marginal students, or those who would not have enrolled in postsecondary during earlier time periods but do go on to postsecondary today, are less academically prepared, this phenomenon would help to explain decreases in college completion. This is precisely what Turner (2004) assessed in her study of supply- and demand-side explanations of trends in college completion. Her analyses showed that marginal students are indeed of lower academic ability than they were previously, as evidenced by the fact that the scores of 17-year-olds on the National Assessment of Educational Progress (NAEP) have declined by approximately ten percentage points since 1970. Thus, while college

participation rates have increased, students are on average less prepared for college than in previous decades, and this fact is particularly true for students from disadvantaged backgrounds.

INSTITUTIONAL RESOURCES

But while low-SES students may be less academically prepared for postsecondary on average than students from more privileged upbringings, this fact alone may be insufficient to fully explain the large and widening socioeconomic disparities in students' postsecondary outcomes. Although there are multiple explanations for why postsecondary attainment rates have not kept pace with enrollment growth in the United States, one of the most compelling is the way in which enrollment growth was coupled with institutional differentiation and increased stratification in the higher education system, often the intentional design of policymakers and state legislatures. As Karabel (1972) emphasized, much of the growth in higher education attendance, particularly during the period between the 1950s and the 1970s, was fueled by the exponential growth of enrollment at sub-baccalaureate institutions. While these institutions enrolled 153,970 students in 1948, by 1968 the two-year-or-less public college sector had grown to enroll 1,169,635 students, a ten-fold increase of more than a million students in just two decades. The number of these institutions also expanded rapidly during this time period, nearly doubling during the 1960s alone from 656 to 1,100. In California, the state with the largest and most intricate network of community colleges during the 1960s, approximately 80% of all beginning postsecondary students began at a community college (Medsker & Tillery, 1971). Indeed, the expansion of the sub-baccalaureate

system was driven largely by the push for the massification of higher education in order to provide greater opportunities for social mobility, and much of the growth of this sector of the higher education system was due to increases in the enrollment of low-income, first-generation, racial minority, and other groups of students historically underrepresented in postsecondary (Karabel, 1972; Trow, 1973).

However, the higher education system has also become increasingly stratified over time due to other factors beyond the direct intervention of government action. As Hoxby (1997) described, since the 1940s American higher education has been transformed “from a series of local autarkies to a nationally and regionally integrated market” (p. 1). In other words, colleges moved from serving primarily their local communities to drawing their student bodies from across the nation. This resulted in increased competition for access to the most elite colleges and the ability of already selective institutions to become even more selective in admissions. The increased selectivity of the elite colleges also caused their student bodies to become even more homogeneous in terms of student ability (Cook & Frank, 1993). This process naturally stimulated a virtuous cycle for selective institutions; the increasing demand for access resulted in average student ability levels to rise at these colleges, and because average student ability is also one aspect of a college’s quality this caused the quality of these institutions to increase over time as well. But while within-college heterogeneity in terms of student ability has decreased over time, the by-product of this geographical integration of the higher education market is that between-college heterogeneity has increased. Less selective institutions became increasingly unable to attract high-ability students as these

students' institutional options increased, resulting in the relative ability of the student bodies of less selective institutions to decrease over time.

This extreme heterogeneity in the distribution of student ability across institutions also mirrors the distribution of institutional resources. It is widely acknowledged that elite institutions command tremendous budgets and are able to procure sizeable endowments, while less selective institutions are often under-resourced and face extreme budgetary uncertainty. Institutions are thus able to provide students with significantly different levels of educational “value,” or the amount of educational resources provided to them in proportion to the amount they pay. Winston and Yen (1995) quantified this relationship by dividing universities into deciles based on the average subsidy they provide students and calculating the price/cost ratio, or the amount charged in tuition and fees over the per student costs the institution spends on education and related expenses. Students attending institutions in the top decile enjoy a price/cost ratio of only 20%, meaning the institution allocates approximately four times more resources for education than they charge in tuition in fees, or an 80% subsidy. In contrast, institutions in the bottom decile have a ratio of 77%, providing students with an average subsidy of less than 25% of the total cost of education. Indeed, while the advertised tuition price of elite institutions is often far higher than the price of tuition at less selective institutions, high-resource institutions are able to provide students with such large subsidies that attendance at these institutions is often less expensive than attending the least selective institutions in the country (Hoxby & Avery, 2012; Winston & Yen, 1995).

This stratification of the higher education system is important to consider when assessing trends in postsecondary enrollment and the causes of socioeconomic disparities in postsecondary outcomes. Although the postsecondary enrollment rates of low-income students have increased over time, access to the most selective institutions in the country has remained elusive. Students from the lowest SES quartile account for only three percent of the enrollment at selective institutions, while nearly three-quarters of the students attending these colleges and universities come from high-SES backgrounds (Carnevale & Rose, 2003). Some research has also found that low-SES students that do go on to postsecondary today are less likely to attend selective institutions than they were in the past (Bastedo & Jaquette, 2011).

And while the underrepresentation of disadvantaged students at selective institutions could be caused primarily by low-SES students being less prepared for college on average than their high-SES peers, as discussed in the previous section, research has also described a phenomenon known as “academic undermatch” in which students enroll in institutions where the student body has a significantly lower average level of academic ability than their own academic qualifications. Unsurprisingly, low-SES students are significantly more likely than their high-SES counterparts to undermatch, often opting for enrollment at community colleges and less selective institutions, even when they are academically qualified for access to more selective colleges (Bowen, Chingos, and McPherson, 2009; Hoxby & Avery, 2012; Roderick et al., 2008; Smith, Pender, & Howell, 2012). The result of widespread undermatching among low-SES students is that there is a much higher percentage of high-ability, low-income

students in the general population than are represented at highly selective colleges (Hill & Winston, 2010).

While disadvantaged students are significantly more likely to undermatch, there is somewhat of a disagreement in the literature regarding the effects of undermatch on persistence and attainment. One hypothesis contends that being one of the higher ability students at an institution may make it easier for students to excel in their coursework and perform at a high level relative to their peers, often called the “frog pond hypothesis” or the “big fish little pond effect” (Heil, Reisel, & Attewall, 2014). Some empirical research has indeed estimated that low-ability students that enroll in college are significantly more likely to earn a degree if they attend a less selective institution (Light & Strayer, 2000). Similarly, being significantly underqualified relative to one’s peers may result in the student struggling academically and having lower chances of graduation (Sander & Taylor, 2012; Thernstrom & Thernstrom, 1997). This is one of the primary arguments against affirmative action to the extent that it results in minority students being significantly underqualified (Sander & Taylor, 2012).

However, research has also shown that being surrounded by higher ability students, more common at selective institutions, has a positive effect on students’ likelihood of graduating, often described as “peer effects” in education (Winston, 1999). Bowen, Chingos, and McPherson’s (2009) study of undermatch also estimated that students who were undermatched decreased their likelihood of graduation by 10 to 15 percentage points. Alternatively, Alon and Tienda (2005) found that students from all racial and ethnic backgrounds increased their likelihood of attaining a bachelor’s degree

if they attended selective colleges, even if they were overmatched. Research has also estimated that more than two-thirds of the variation in institutional graduation rates can be explained by the academic qualifications of the student body alone, reinforcing the contention that more selective institutions improve students' odds of graduating (Astin & Osequera, 2005). And even if the impact of academic match on students' likelihood of graduation is somewhat ambiguous, research has shown that elite institutions provide students with greater access to high-status occupations and entry into the elite or ruling class (Karabel, 2005). In short, while socioeconomic differences in students' academic ability may explain part of the disparities in student outcomes, socioeconomic disparities in the types of institutions students enroll in, even when controlling for their academic background, may be even more influential in determining the degree to which the higher education system promotes social mobility for disadvantaged students.

SOCIOECONOMIC RESOURCES

Socioeconomic differentials in both academic ability and the selectivity of institutions in which students enroll help to explain socioeconomic disparities in students' college outcomes and why the expansion of the postsecondary system did not significantly affect social mobility rates in the United States. But socioeconomic background may also have a direct effect on student outcomes even when controlling for students' academic ability and the types of institutions they attend, and there is a substantial body of evidence indicating socioeconomic background is becoming increasingly influential in molding students' postsecondary educational opportunities.

One of the most widely cited explanations of this phenomenon is trends in the financing of higher education. As Bound & Turner (2002) noted, prior to World War II the federal government provided minimal support to students for attendance at colleges and universities. The G.I. Bill provided enormous benefits to returning veterans, including up to \$500 in tuition and educational expenses paid to the institution for up to four years and a monthly cash allowance of \$65 for unmarried veterans and \$90 for married ones. The subsidy for tuition was sufficient to cover the full costs of some of the most expensive schools, including Harvard University, and the monthly stipends were approximately half the opportunity cost of not working. The substantial educational benefits provided to veterans through the G.I. Bill are largely responsible for the overwhelming response of veterans to enroll in postsecondary institutions during the post-war period (Olson, 1973).

Although veterans greatly benefited from the educational subsidies of the G.I. Bill, prior to the 1960s the federal government provided minimal aid to non-veteran students. Lewis (1989) noted that in 1963-64, only \$114 million was allocated to students for attendance at postsecondary institutions, and the entirety of that amount was comprised of loans distributed through the National Defense Student Loan program (now Perkins Loans). However, the federal government began to greatly expand the availability of subsidies for postsecondary attendance through the Higher Education Act of 1965 and subsequent amendments in 1972, which created the Pell Grant program (Mercer, 2008). By 1970-71, the federal government provided \$1.6 billion dollars in financial aid to students, and this amount climbed to \$5.5 billion in 1978-79 and more

than \$10 billion in 1980-81 (Lewis, 1989). Thus, in the 1970s alone the federal government increased its contribution to student financial aid by a factor of approximately 6.5 in current dollars and tripled aid in constant dollars, spurring the dramatic increase in postsecondary access and enrollment (Lewis, 1989). Observers have described this era as the “Golden Age” of federal student financial aid in the United States and the period in which students’ socioeconomic background was the least consequential in regards to their access to higher education (Heller & Rogers, 2006).

But while the federal government quickly became the largest source of student financial aid during the 1970s the majority of revenue for public institutions was still provided by the states, as the federal government only provided 18% of public higher education expenditures in 1980 (Hossler, Lund, Ramin, Westfall, & Irish, 1997). Toutkoushian (2001) estimated that in 1974-75 state appropriations made up approximately 57% of net educational and general (E&G) revenue sources for public postsecondary institutions while tuition and fees, government grants and contracts, and federal appropriations totaled 33% combined. The percentage of E&G revenues from state appropriations stayed fairly constant through the first half of the 1980s, amounting to 59% of E&G revenue in 1979-80 and 58% in 1984-85 (Toutkoushian, 2001). As a consequence of states’ continued investment in higher education during the 1970s and early 1980s, college affordability increased during this period despite rapidly expanding enrollment (Mumper & Mohr, 1996).

Beginning in the mid-1980s, however, state appropriations began a steady decline, precipitated by the economic struggles of the 1970s and 1980s characterized by

slowed economic growth, high levels of unemployment, and rising inflation (Olson, 1982). The economic “stagflation” of the 1970s resulted in greater scrutiny of institutions funded by the state as tax revenues greatly contracted during this era. By 1989-90 state appropriations had declined to 54% of E&G revenues and dropped to 47% by 1994-95 (Toutkoushian, 2001). While state funding increased slightly in the early to mid 2000s, the recent economic recession which began in 2008 led to similarly steep budget cuts for higher education. Oliff, Palacios, Johnson, and Leachman (2013) estimated that states spent \$2,353, or 28%, less per student on higher education in fiscal year 2013 compared to 2008, and that every state in the country apart from North Dakota and Wyoming are spending less per student on higher education than they did prior to the recession. These authors also noted that eleven states cut per pupil expenditures by more than one-third and two states, Arizona and New Hampshire, slashed per pupil funding by half during this period.

Federal expenditures for higher education have also failed to ensure that college is affordable and accessible for all students seeking a postsecondary credential. Between 1980 and 1992, the federal share of higher education expenditures declined from 18% to 14% (Hossler et al., 1997). And while the federal government continued to increase the total dollar amount of financial aid awarded to students through the 1980s, the percentage of aid distributed as grants declined while the reliance on student loans increased. Grants comprised 76% of federal student financial aid in 1975-76, but shrank to 47% by 1980-81 and 31% by 1988-89 (Lewis, 1989).

Given the declines in both federal financial aid per student and state appropriations for higher education, students and their families have been required to bear an ever increasing share of the postsecondary costs burden. In 1974-75, net tuition and fees accounted for 13% of E&G revenues, but that percentage climbed to 18% by 1989-90 and 21% by 1994-95 (Toutkoushian, 2001). Between 1971-72 and 1999-00, tuition and fees for public two-year and public four-year institutions increased by 110% and 121%, respectively. These trends continued throughout the 2000s with the average price of attendance increasing from \$10,100 to \$15,200 for public four-year institutions, \$18,600 to \$28,200 for private non-profit four-year institutions, and \$14,200 to \$20,600 for private for-profit institutions between 1999-2000 and 2007-08 (NCES, 2011a). The Spellings Report, a critical analysis of the state of higher education in the United States commissioned by the US Department of Education, noted with concern “the seemingly inexorable increase in college costs, which have outpaced inflation for the past two decades and have made affordability an ever-growing worry for students, families, and policymakers” (US Department of Education, 2006, p. 2).

The deleterious impact of escalating tuition on college access has also been compounded by trends in family income. As Weinberg, Nelson, Roemer, and Welniak (1999) showed, from 1947 to 1997 family income grew by 122 percent, from \$20,102 to \$44,568 in constant dollars. However, much of this growth occurred prior to 1970. Median family income increased by 91% in approximately two decades between 1947 and 1969 but only grew by 16% in the nearly three decades between 1969 and 1997. While family income did increase during the latter time period, the growth in family

income is also primarily attributed to greater participation of women in the workforce. Median earnings for men working year-round, full-time actually fell by five percent between 1982 and 1997, even as real earnings for women grew by approximately 14% despite the increased supply of women in the workforce.

Declining state appropriations for higher education, insufficient federal grant aid, rapidly rising tuition, and waning family financial resources have resulted in students increasingly relying on student loans to finance the cost of their postsecondary education. Data from the National Center for Education Statistics (2011) show that in 1995-96 approximately 38% of undergraduate students attending public four-year institutions received federal student loans and the average amount of loans was \$3,800. By 2007-08, 46.2% of students received student loans and the average loan amount had increased to \$6,600. These figures are even more alarming for students attending private non-profit and private for-profit institutions. In 2007-08, approximately 59% of undergraduate students attending private non-profit institutions took out student loans with an average loan amount of \$9,100, and nearly 92% of students attending private for-profit institutions received loans for an average of \$8,100. The College Board (2012) estimated that in 2009-10 about 55% of public four-year students who graduated from their institution had accumulated student loan debt at an average of \$22,000 per student, while two-thirds of those graduating from private non-profit institutions held debt at an average of \$28,100. The reliance on loans is particularly problematic for low-SES students as research has shown these students to be more loan-averse than their socioeconomically

advantaged peers and to be influenced by the availability of grants, but not loans, in the college choice process (Terenzini, Cabrera, & Bernal, 2001).

Although it is difficult to estimate the impact of these various financial trends on social mobility rates in the United States, it is increasingly evident that higher education is becoming less accessible for students with modest incomes. While the wave of postsecondary expansion during the 1940s to 1960s was largely propelled by a perception of higher education as a public good which accrues to society at large, the American Association of State Colleges and Universities (2012) has argued that recent trends in higher education finance constitute “an irreversible slide of U.S public higher education [from] being a collectively-funded public good to that of an individually purchased private good” (p. 1). Research has confirmed that students have grown more concerned about the costs of postsecondary attendance over time and are increasingly likely to base their postsecondary institution choice on cost rather than other factors (Astin, 1998).

And while financial factors have received a great deal of attention, a broader view of socioeconomic background reveals additional barriers that may inhibit the chances of postsecondary success for low-SES students. Specifically, research has consistently found that first-generation students, or those whose parents did not attend college, are less likely to attend postsecondary and are at significantly higher risk of dropping out of postsecondary compared to students’ whose parents had completed some level of postsecondary education, even when controlling for academic background (Choy, 2001; Engle & Tinto, 2008; Ishitani, 2003, 2006; Pascarella & Chapman, 1983). In short, even for students of similar ability levels who enroll in similar institutions, there are a variety

of reasons why one's socioeconomic background may still have a pronounced impact on one's college and career outcomes.

PURPOSE OF THE STUDY

Given the significant body of evidence demonstrating that the higher education system is not promoting social mobility for socioeconomically disadvantaged students to the maximum extent possible, the purpose of this study is to attempt to estimate and quantify the degree to which students' socioeconomic background impacts their college and career outcomes. As alluded to in the preceding sections, the process of social mobility through postsecondary educational attainment can be understood as a series of stages, including college application, acceptance, enrollment, persistence, and attainment, as well as students' participation in graduate education and their eventual career outcomes. While attempting to estimate the relative importance of SES at different stages of postsecondary is a difficult endeavor, an intuitive and widely used methodological approach for doing so was developed by Mare (1980, 1981). Rather than viewing educational attainment as a single and discrete outcome, Mare conceptualized educational attainment as the progression through a series of transition points, each of which may be influenced by SES to a different degree. He utilized a technique called sequential logit modeling (Tutz, 1991), sequential response modeling (Maddala, 1983), or the continuation ratio logit model (Agresti, 2002), in which logistic regression analysis is conducted for each stage or transition in the process and the sample for each transition is restricted to only students who successfully passed through all previous stages. By including the same socioeconomic variable(s) in each model and restricting the sample in

this fashion, the technique allows one to estimate the relative degree to which SES influences each stage in a longitudinal educational attainment process.

Mare's approach has been used by sociologists and educational researchers in diverse contexts, both in the study of K-12 (Shavit & Blossfeld, 1993) and higher education (Shavit, Arum, & Gamoran, 2007), in order to estimate the relative impact of SES across educational transitions. It has also been critiqued (Cameron & Heckman, 1998), refined (Hauser & Andrew, 2006), expanded (Breen & Jonsson, 2000; Stolzenberg, 1994), and defended (Mare, 2006) extensively given its prominence in the literature on educational stratification and social mobility. However, the overarching conclusion from this line of research has remained relatively constant since the Mare model was first developed, namely that socioeconomic background is more influential at earlier stages in the educational process but declines in significance as one moves on to later transitions (Hauser & Andrew, 2006; Mare, 1980; Shavit, Arum, & Gamoran, 2007).

While Mare's model is a useful technique for studying the relative impact of SES on different postsecondary stages, the methodological approach and the line of research it has propagated have a number of limitations. Possibly the most important criticism of this approach is the fact that it does not sufficiently account for the extreme degree of stratification within the higher education system (Breen & Jonsson, 2000). For example, as an outcome such as college enrollment is generally treated as dichotomous in logistic regression, a student who enrolls in a non-selective or open-enrollment university is often treated as experiencing the same outcome as a student who enrolls in an elite private university, despite these two enrollments being quite different qualitatively. Given the

extreme degree of stratification within the higher education system and the fact that low-income students are particularly underrepresented at the more selective institutions (Bastedo & Jaquette, 2011; Carnevale & Rose, 2003), failing to account for this stratification may result in misleading estimates of the impact of socioeconomic background on postsecondary participation and progression.

Additionally, while possible confounding variables are generally controlled for in the statistical models, research using Mare's technique has traditionally focused on deriving estimates of the average impact of SES for all students. While this approach is reasonable a priori, it is also possible that the impact of socioeconomic background on particular transitions might not be equivalent for all students. One particularly intriguing study in this regard is Hoxby and Avery's (2012) study analyzing the college application behavior of high-ability students from different economic backgrounds. The authors found that low-income, high-ability students were significantly less likely than their more privileged peers to apply to highly selective institutions. While this finding was expected given the prior literature on undermatch, the authors also found that "the subset of high-achieving, low-income students who do apply to selective institutions are just as likely to enroll and progress toward a degree at the same pace as high-income students with equivalent test scores and grades" (p. 1).

Although high-ability students from disadvantaged backgrounds that enroll in highly selective institutions constitute a small fraction of the population of low-income students in college, Hoxby and Avery (2012) appear to have identified a context in which socioeconomic background is inconsequential for one's chances of progressing through a

particularly postsecondary stage, namely college completion. However, it is not immediately evident whether it is students' academic ability, institutional selectivity, or the combined interaction of the two factors that results in students' socioeconomic background no longer influencing their likelihood of earning a degree. The study therefore raises a number of important questions about the relationship between socioeconomic background, academic ability, and institutional selectivity. For example: do socioeconomic disparities in completion exist among high-ability students that enroll in less-selective institutions; do attainment disparities exist among lower ability students that enroll in highly selective institutions, and; do socioeconomic disparities exist in earlier stages such as acceptance and enrollment when high-ability students apply to less selective institutions? In short, it is possible that socioeconomic background, academic ability, and institutional selectivity may interact in unexpected ways, yet limited research has explored these interactions.

Researchers using sequential logit modeling to study the impact of socioeconomic background on postsecondary progression have also primarily analyzed three specific stages in the process: college enrollment, the attainment of a bachelor's degree, and graduate school enrollment and/or completion. While these outcomes are no doubt important, researchers have emphasized that there are a number of intermediary steps in the process that are also important to consider (Avery & Kane, 2004; Klasik, 2012). A salient example is Klasik's (2012) recent study of the steps leading to four-year college enrollment in which the author estimated significant socioeconomic gaps in students'

postsecondary application and acceptance rates. It is therefore important to extend this technique by examining these additional stages in the process.

Finally, research in this tradition does not often analyze the final transition in students' college-to-career pathways, namely their transition into the labor market. This is somewhat unsurprising given that the transition into the labor force is not part of the "educational attainment" process and is therefore outside the scope of much of the research that has examined the relative impact of SES across educational transitions. However, for the higher education system to fully promote the social mobility of students from disadvantaged upbringings, it is important to ensure that the labor market outcomes of low-SES college graduates are roughly equivalent to the outcomes of their more privileged peers.

The purpose of this study is therefore to contribute to our understanding of higher education and social mobility and expand Mare's approach in a number of ways. The goal is to arrive at a fuller and more nuanced understanding of where socioeconomic background is most influential, in what contexts, and for which types of students. In particular, the study explores how this "trinity" of postsecondary resources, namely socioeconomic resources, academic resources, and institutional resources, interact to influence transitions rates throughout students' college-to-career pathways. The following section will briefly describe the research questions this study will investigate and the methodological approach that will be utilized to address these questions.

RESEARCH QUESTIONS AND OVERVIEW OF METHODOLOGY

Although Chapter 3 will provide a more thorough description of the methodological approach this study will utilize, this section provides a brief overview of the methodology. This study addresses four primary research questions:

- 1) To what extent does socioeconomic background influence the likelihood that students will successfully pass through each postsecondary transition?
- 2) How do academic ability and institutional selectivity moderate the impact of socioeconomic background across postsecondary stages?
- 3) To what extent does socioeconomic background impact the labor market outcomes of college graduates?
- 4) How do academic ability and institutional selectivity moderate the impact of socioeconomic background on students' transition into the labor market?

This study makes use of NCES' Educational Longitudinal Survey of 2002 (ELS:02). ELS:02 is a nationally representative survey of students that were high school sophomores in 2002, were scheduled to graduate high school in 2004, and had thus experienced up to eight years in postsecondary education and/or the workforce by the final wave of data collection in 2012. The survey provides a rich set of data on students' socioeconomic and demographic backgrounds, academic preparation during high school, and postsecondary experiences. These student-level data are also supplemented by extensive information on students' community contexts, high schools, and postsecondary institutions which they apply to and attend.

Following Mare's (1980, 1981) technique, the first two research questions are addressed using sequential logit modeling, in which separate logistic regression models are fit to each stage in the postsecondary process and the sample for each model is restricted to only students who are eligible for the given transition. In line with the literature base which has utilized this technique, the first research question is answered by including the entire cohort of students in the sample and estimating the impact of SES on each postsecondary transition. This provides a baseline understanding of the average extent to which SES impacts the likelihood that students will successfully pass through each postsecondary transition.

This approach is then expanded in order to address the second research question. The sample is first disaggregated into separate ability quartile cohorts and the same sequential logit models are fit to each ability sub-sample. This technique therefore illuminates whether the magnitude of socioeconomic disparities in transition probabilities varies by student ability level. Next, institutions are disaggregated into three tiers of institutional selectivity (selective, moderately selective, and non-selective), based on Barron's Admissions Competitive Index, and once again the logit models are fit for the different selectivity levels. This allows us to explore if socioeconomic disparities are greater at particular types of institutions. Finally, these techniques are combined and logit models are fit to each combination of student ability group and institutional selectivity level. This provides an understanding of whether disparities vary by ability level controlling for institutional selectivity and, conversely, whether gaps vary by selectivity level controlling for student ability.

Although community colleges constitute a substantial portion of the postsecondary system and are a primary gateway into higher education for many students, particularly those from low-income backgrounds, the methodological approach this study utilizes is not appropriate for the analysis of community college outcomes. For example, analyzing the impact of SES on the likelihood that students will be accepted to a community college would be unlikely to produce useful results given that the majority of community colleges practice an open-admissions policy and accept all students, regardless of academic background. Additionally, while students may earn postsecondary certificates and associate's degrees at community colleges, this study is primarily interested in baccalaureate attainment given the strong relationship between bachelor's degree receipt and socioeconomic outcomes. For these reasons the study will focus exclusively on four-year institutions.

The next two research questions will be answered by restricting the sample to only students who earned a bachelor's degrees by the study's conclusion and estimating the impact of their socioeconomic background on their labor market outcomes. Only students who completed a bachelor's as their highest degree by the study's conclusion will be included. In other words, students that went on to graduate school will be excluded from the analyses given that they had experienced an extremely short amount of time in the labor market by the study's conclusion. For the third research question, the sample will include all students with a bachelor's as their highest degree. Three labor market outcomes will be analyzed, namely unemployment, hourly wages, and annual earnings. Multilevel logistic regression will be used to estimate the impact of SES on the

likelihood that students will be unemployed, as defined in accordance with federal guidelines as students looking for work but not currently employed. Multilevel regression will then be used to examine the relationship between SES and both hourly wages and annual earnings for college graduates. These analyses will begin by only including the SES quartile variables to determine how labor market outcomes of high-achieving students are impacted by students' socioeconomic background without controlling for any other factors. Additional variables will then be added in successive blocks to determine both the degree to which controlling for other variables changes the estimated relationship between SES and labor market outcomes and the extent to which other variables influence these outcomes. This analysis will therefore highlight whether students' socioeconomic backgrounds influence their labor market outcomes even when controlling for the receipt of a bachelor's degree and a number of other variables.

Similar to the postsecondary analyses, the fourth research question will be addressed by disaggregating the sample and fitting separate models to each sub-sample. Students will first be disaggregated into separate ability groups to explore whether the magnitude of disparities varies according to ability, the institutions will be disaggregated to determine whether or not the size of disparities is equivalent across levels of institutional selectivity. However, because the number of students that earned bachelor's degrees and did not go onto graduate school is far smaller than the original sample, models of student ability by institutional selectivity combinations are not feasible.

CONTRIBUTION OF STUDY

Social mobility is one of the ideals most deeply ingrained into the American ethos, and higher education is often described as our nation's greatest vehicle for social mobility. But despite the dramatic expansion of postsecondary education over the last half-century, social mobility rates have remained relatively stagnant, inequality continues to rise, and the American Dream seems far more like a dream than an obtainable reality for many disadvantaged students. A variety of explanations have been proposed to make sense of these trends: low-SES students are less prepared for college; institutional differentiation and stratification have resulted in the diversion of low-SES students into lower-quality institutions; and the rising costs of higher education and social class factors have created substantial obstacles for socioeconomically disadvantaged students. All three of these explanations are supported by a significant body of evidence. However, thus far these three explanations have produced disparate and unconnected lines of research. Additionally, while the research discussed above investigating the relative impact of SES on students' likelihood of progressing through each stage in the college-to-career process has generated interesting insights, this research has been primarily designed to produce quantitative estimates of the impact of SES rather than to illuminate how and why SES is influential.

This study therefore attempts to contribute to both lines of research. It attempts to integrate these three explanations of social stratification in higher education by highlighting the complex interaction between the three factors. It also attempts to expand Mare's methodological approach in order to characterize how the impact of SES on each

postsecondary transition points varies according to students' academic ability and institutional selectivity. As the results of the statistical analyses will show, this phenomenon is more nuanced than it is generally perceived to be, suggesting the need for a refined model of this process. This revised conceptualization will be called the Postsecondary Resource Trinity Model and will highlight the complex interaction between three "resources" which are generally understood to promote students' college outcomes: the student's socioeconomic resources, her academic resources, and the resources of the postsecondary institution. Implications of the model and suggestions for future research will also be discussed.

In an era of fiscal restraint, budget shortfalls, and dwindling state and federal support for higher education in general and low-income college students in particular, it is more important than ever to determine the critical junctures in students' college-to-career pathways and the specific contexts in which socioeconomic background is most influential. Developing a more nuanced understanding of this phenomenon will allow us to target resources most effectively in order to mitigate the potentially deleterious effects of socioeconomic disadvantage on students' chances of postsecondary attainment. The hope is that this study contributes to our understanding of stratification and inequality in higher education and provides insights into ways in which the community of higher education policymakers, practitioners, and scholars can promote the postsecondary success and social mobility of disadvantaged students.

CHAPTER 2: REVIEW OF THE LITERATURE

The purpose of this chapter is to review the extant literature on the influence of socioeconomic origins on the various transitions in students' college-to-career pathways and to discuss the most prominent theoretical frameworks that have been put forth to explain this phenomenon. The literature review will be structured in a way which mirrors the stages in students' college-to-career pathways that will be included in the analysis (application, acceptance, choice/enrollment, persistence/transfer behavior, attainment, graduate school participation, and labor market outcomes). Each section will begin by reviewing the available data on socioeconomic disparities in the stage being discussed. After reviewing the empirical estimates, each section will also discuss the most prominent conceptualizations and theoretical frameworks which have been developed to explain socioeconomic disparities in that particular stage.

While the review will begin with the college application stage, the college-going process in fact begins long before students apply to college. Studies indicate that college planning often begins as early as elementary school (Flint, 1992), and students must pass through a number of stages even before applying to a postsecondary institutions, including completing the necessary courses during high school, taking the required standardized achievement tests, and graduating from high school (Cabrera & La Nasa, 2001; Klasik, 2012). Although these are important facets of the process and students' socioeconomic backgrounds surely influence these stages, these steps are outside the scope of the study as the intent is to focus only on the postsecondary and labor market outcomes of high school graduates.

COLLEGE APPLICATION

The first step in all students' postsecondary pathways is the college application process, but while a significant body of literature has examined the influence of SES on college choice and enrollment less research has investigated socioeconomic variations in college application behavior (Byers González & DesJardins, 2002; Hossler, Braxton, & Coopersmith, 1989; Fuller, Manski, & Wise, 1982; Paulsen, 1990; Weiler, 1994). However, the studies that have analyzed these relationships have highlighted significant disparities between different socioeconomic groups in both college application rates and the selectivity of institutions to which students apply, and researchers have proposed a variety of explanations of these disparities.

While Hurtado, Inkelas, Briggs, and Rhee's (1997) study focused primarily on the influence of race/ethnicity on the college choice process, the authors also analyzed the influence of a variety of sociodemographic characteristics on college application behavior and discovered substantial socioeconomic disparities in college application rates when they disaggregated the results by family income. They found that more than half of all students with family incomes of \$14,999 or less did not apply to any postsecondary institution, while only 25% of students from families making \$50,000 or more failed to apply to a college or university. Put differently, low-income students were twice as likely as the high-income group to not apply to any college. These same disparities were evident between income groups in terms of the percentage of students that applied to five or more schools. While approximately 17% of the highest income group applied to at least five schools, only 3.1% of low-income students did so, indicating that high-income

students were five times as likely as low-income students to apply to five or more schools. Chi-square tests revealed that these differences in college application behavior between income groups were indeed statistically significant ($p < .001$). In the authors' subsequent multiple regression analysis of college application, the parameter estimates for income groups were statistically significant and substantially larger than the estimates for the racial/ethnic categories, suggesting that family income may in fact be more influential than race/ethnicity in predicting some aspects of students' college application behavior, even when controlling for other factors.

Cabrera and La Nasa (2001) discovered similar socioeconomic disparities in application behavior, even among high-achieving students, in their analysis of students' pre-college pathways using data from NCES' National Education Longitudinal Study of 1988 (NELS:88). The authors identified the rates at which students from different SES backgrounds became "college-qualified," graduated from high school, and applied to postsecondary institutions. Out of the pool of college-qualified high school graduates, the authors noted that only 65.5% of student from the lowest-SES background applied to a four-year institution, 16% below the national rate for college-qualified students and 22% below the rate for college-qualified students from the highest-SES background. In other words, only two out of three college-qualified low-SES graduates applied to a four-year institution, compared to nearly nine out of ten high-SES graduates who were college-qualified.

The importance of the college application process is underscored by a number of studies that have investigated the relationship between college application behavior and

subsequent enrollment for high-achieving students. In an analytic report prepared for NCES, Berkner, Chavez, and Carroll (1997) investigated postsecondary access rates for 1992 high school graduates using NCES' NELS:88 longitudinal survey. These authors found statistically significant differences in the four-year college enrollment rates between income groups, even when controlling for prior achievement and only including "college-qualified" students in their analysis. However, the authors noted that the enrollment gap between college-qualified low-income and middle-income students disappeared once they controlled for whether students took college entrance examinations and applied for admission, supporting the contention that the gap in four-year college access between high-achieving students from different SES backgrounds may be significantly reduced if low-income students applied to four-year institutions with greater frequency. Cabrera and La Nasa (2001) similarly concluded that the chances of lowest-SES students enrolling in a four-year institution "improve dramatically to the point of closely resembling the national average and the rate for highest-SES students" once low-SES students complete the task of submitting an application to a four-year college or university (p. 121).

This conclusion was echoed in a recent study from Hoxby and Avery (2012) who analyzed application and enrollment behavior at selective college and universities. Hoxby and Avery showed that low-income students were underrepresented in the cohort of high-achieving students whose academic preparation likely qualified them for admission at selective colleges and universities (i.e., students who scored above the 90th percentile on the ACT/SAT and had a GPA of A-), but that students from the lowest family income

quartile still constituted 17% (with 25% being perfectly proportional) of this population of high achievers. The authors also showed that high-achieving, low-income students that do apply to selective institutions are admitted and graduate at rates roughly equivalent to students from higher-SES backgrounds. However, they estimated that the vast majority of high-achieving, low-income students do not apply to any selective college or university, despite the fact that these institutions would often cost them less than the resource-poor two-year and non-selective four-year institutions which they apply to more frequently.

Explanations of the Impact of SES on College Application

If low-income students enroll in, and possibly graduate from, colleges and universities at the same rates as their higher-income peers with equivalent academic credentials once they apply to these institutions, what can explain the significant disparities in college application behavior between various income groups? One possible explanation is that low-income students simply have lower postsecondary aspirations and expectations than their higher-income peers, even if they are high-achievers. However, research does not appear to support this contention. As Berkner, Chavez, and Carroll's (1997) analysis showed, more than 90% of high school graduates reported that they anticipated enrolling in postsecondary at some point in the future, even if they did not anticipate immediately enrolling upon graduating from high school, and the difference between socioeconomic groups was minimal when prior achievement was controlled for. Adelman (2006) also concluded that postsecondary anticipations were not significantly related to college attainment once academic ability and preparation had been controlled

for, suggesting that even the presence of socioeconomic differences in postsecondary anticipations would not explain the disparity in postsecondary application.

While socioeconomic differences in postsecondary aspirations may be insufficient to explain gaps in college application rates, researchers have proposed alternative explanations of this process. For example, Flint (1992) analyzed the influence of a variety of sociodemographic characteristics on “choice sets,” or the set of institutions a student’s family is knowledgeable of and considering applying to that students and their families create prior to beginning the application process. Flint asked parents of eighth grade students to create a list of institutions that they were currently considering encouraging their children to apply to and categorized these institutions based on the highest degree offered, institutional selectivity, and proximity to the family’s home residence. He found that higher-income parents had a longer list of institutions in their choice set, that mother and father’s highest level of education attained and family income were statistically significantly related to the highest degree offering of the institutions in their choice set as well as the averaged selectivity of the institutions, and that family income was also related to averaged proximity, indicating that students from higher-income families were more likely to be considering institutions further away from their home residence. Flint concluded that socioeconomic factors significantly influence the choice sets that students consider, which subsequently influences the number and selectivity of institutions to which they apply. Subsequent studies have confirmed that low-income students have limited college choice sets and significantly less information about postsecondary options than their higher-income peers, both of which constrain the breadth of colleges low-

income students apply to on average (Cabrera & La Nasa, 2000; Hearn, 1991; Kim & Schneider, 2005; Person & Rosenbaum, 2006).

Research has also shown that cost and convenience of steps in the application process may significantly influence both the number of schools and the selectivity of institutions to which students apply. Pallais (2013) relied on an interesting natural experiment in order to test this hypothesis. In 1997, the ACT increased the number of free score reports it allows test-takers to send to institutions from three to four, and maintained the \$6 marginal cost for each additional score sent. Pallais discovered a large increase in the fraction of ACT-takers who sent four score reports and a large decrease in the fraction that sent three between the year prior and the year after this policy change, but little change in the proportion that sent either three or four reports. In other words, eliminating the \$6 fee for sending a fourth report resulted in approximately 20% of the sample sending their scores to an additional institution. Students sent scores to both more selective and less selective institutions, broadening the selectivity range of colleges to which they sent their assessment scores.

Pallais' (2013) results are particularly interesting from the perspective of research on the college application and decision-making process which stems from rational-choice models of behavior. Pallais predicted that sending an additional score report could increase a student's expected future earnings by as much as \$6,000 by increasing the odds that a student enrolls in a more selective institution, given the relationship between institutional selectivity and future earnings. The overwhelming response of students to send an additional score report due to the elimination of a nominal \$6 is therefore

inconsistent with optimal decision-making behavior and principles of utility maximization. However, while \$6 per score may be a nominal fee for many families, low-income students may be disproportionately disinclined to send additional score reports given the fee. As Pallais noted, although sending score reports does not inevitably translate into applying to an institutions, doing so is a necessary stage of the process and does increase the likelihood that students will indeed apply to the institution to which they sent their score.

Researchers have also pointed to the importance of analyzing the contexts which students graduate from in order to better understand college application behavior. Roderick, Coca, and Nagaoka's (2012) work on Chicago Public Schools students highlighted the importance of college-going cultures at the high school level. These researchers estimated that a number of different constructions of college-going culture, including teacher perceptions of the extent to which such a culture is present in the high school, the rates at which previous years' graduates applied to college, and the rates at which previous years' graduates attended postsecondary, all influence the frequency with which current graduates apply to college.

Hoxby and Avery (2012) also attempted to explain the socioeconomic disparity in applications to selective institutions by investigating contextual factors. These authors grouped high-achieving, low-income students into two categories based on their application behavior: "achievement-typical" students and "income-typical" students. Achievement-typical students were more likely to apply to selective institutions, while income-typical students applied to non-selective universities and community colleges

with much greater frequency. The authors noted that income-typical students did not come from families or neighborhoods that were any more disadvantaged on average than the contexts from which achievement-typical students came. However, income-typical students were significantly more likely to have attended districts too small to support selective public high schools, were more likely to be relatively isolated from a critical mass of fellow high achievers, and were less likely to encounter teachers or schoolmates from previous cohorts of graduates who attended a selective institution. Contextual factors were thus found to be significant in both Roderick, Coca, and Nagaoaka's (2012) and Hoxby and Avery's (2012) studies even when controlling for student achievement, SES, and a variety of other student-level factors.

In sum, researchers have consistently documented significant socioeconomic disparities in college application rates, both in terms of the total number of institutions which students apply to and the selectivity of the institutions considered during the application process. These socioeconomic disparities are present even when controlling for academic ability and prior achievement. Multiple explanations have been developed to account for this disparity, including factors that limit low-income students' choice sets, financial and convenience barriers, and contextual factors. While no strong consensus regarding the most crucial obstacles to high-achieving, low-income students broadening their application pool has emerged from the research community, researchers agree that encouraging these students to expand their choice set and increase the number and selectivity of institutions to which they apply may be key to increasing the postsecondary access and attainment rates of these students. Some researchers even contend that the

attainment disparities between high-SES and low-SES students could be significantly ameliorated if low-SES students simply expanded their application pool (Hoxby & Turner, 2013).

COLLEGE ACCEPTANCE

Although a good deal of research has investigated the impact of socioeconomic background on college application behavior and college enrollment rates (discussed in the following section), less research has studied the impact of SES on the likelihood that college applicants will be accepted to an institution. Indeed, in some of the literature on the college choice process, application and enrollment are the only stages discussed, with little mention of the importance of institutional admissions (Terenzini, Cabrera, & Bernal, 2001). One of the potential reasons for this dearth in the literature is that institutions do not always make public the manner in which they determine admissions decisions, making it difficult to study this phenomenon, but another explanation is that much of the research on the effects of sociodemographic characteristics on admissions has focused on the impact of race given the highly-visible and often contentious nature of race-based affirmative action. Additionally, many of the studies of how institutions can or should consider class in admissions have been couched in terms of whether class-based affirmative action can maintain levels of racial diversity if race-based affirmative action is no longer politically or legally feasible (Bernal, Cabrera, & Ternezini, 2000; Gaertner & Hart, 2013; Kahlenberg, 1996). However, a limited body of research has been able to examine the extent to which SES impacts the likelihood that a student will be accepted to an institution, conditional upon application. This section will review the extant empirical

research on the role of SES in admissions decisions and discuss the dominant perspectives of this phenomenon.

One of the more prominent studies of the impact of SES on admissions decisions is Hoxby and Avery's (2012) recent work. As discussed in the previous section, their study was primarily interested in estimating the likelihood that high-ability students from different socioeconomic backgrounds would apply to highly selective institutions. Somewhat unsurprisingly, the authors found that students from disadvantaged households were significantly less likely than their higher-income peers to apply to a selective institution, even if their academic qualifications likely provided them access to such institutions. Notably, however, the authors also found that high-ability, low-income students that did apply to selective institutions were just as likely as their more privileged peers with equivalent academic backgrounds to be accepted, enroll, and even complete a degree.

Although it may be the case that socioeconomic background does not impact the admissions decisions of high-ability students that apply to highly selective institutions, it is not immediately evident whether this finding holds for the entire population of college applicants or in other postsecondary contexts. Cabrera and La Nasa's (2001) study examined socioeconomic differences in students' pathways to college for a nationally representative sample of students. The authors found that although low-SES students are significantly less likely to meet the authors' definition of "college qualified" and apply to a four-year institution, students that meet both of these criteria enroll in four-year institutions at roughly the same rate as high-SES students (80% vs. 89%). The authors

concluded that much of the socioeconomic disparities in students' college outcomes are therefore explained by background differences in academic preparedness and the rates at which students apply to college.

While both studies investigated socioeconomic differences in the enrollment outcomes of college applicants, neither study specifically analyzed college acceptance as a discrete stage. Hoxby and Avery (2012) in particular justified this decision by arguing that if “high- and low-income students are equally likely to enroll in a college, conditional on having applied to it, they must be getting treated similarly in the admissions process. Otherwise, they would enroll differentially simply because they had been admitted differentially” (p. 21). However, this premise assumes that students from different socioeconomic backgrounds will respond to admissions decisions equivalently, which may not be the case. For example, even if high- and low-income students that applied to selective institutions both enrolled at a rate of 80%, a number of different processes could have occurred. If 100% of high-income applicants were accepted but only 80% enrolled while 80% of low-income applicants were accepted and all of the accepted low-income students enrolled, it would suggest that low-income students are truly disadvantaged in the admissions process. Or the reverse could be true, with only 80% of high-income students admitted and all of them choosing to enroll while 100% of low-income students were admitted and only 80% enrolled. In short, acceptance and enrollment are two distinct stages, and the lack of socioeconomic disparities in one stage does not necessarily prove the absence of disparities in the other.

In contrast, Klasik's (2012) study overcame this conflation of acceptance and enrollment by examining them as discrete stages. Using data from ELS:02, the author found that only 47.1% of students in the lowest income group that applied to a four-year college were accepted compared to 79.8% of high-income students, a gap of more than 30 percent. Klasik also found that there were even larger socioeconomic disparities in the enrollment rates of students who were admitted to four-year colleges, reinforcing the need to analyze acceptance and enrollment as distinct stages. However, simply investigating socioeconomic gaps in the acceptance rates of four-year applicants does not provide insight into the impact of SES on the likelihood of acceptance, as a number of confounding factors rather than the direct of SES, such as differences in academic preparation, could possibly explain these disparities. Klasik therefore statistically estimated the relationship between SES and admissions decisions using logistic regression and restricting the sample to only those students that applied to a four-year college. He found that high-income students were significantly more likely to be accepted to a four-year institution, even when controlling for other demographic characteristics, academic background, college aspirations, and whether students had completed their financial aid application, among other variables. His results therefore suggest that four-year institutions may have a preference for admitting applicants from high-SES backgrounds.

However, not all studies have reached the same conclusion on the impact of SES on college admissions decisions. Sackett et al. (2012) attempted to estimate the degree to which institutions consider SES in admissions using a different technique, namely by

comparing the mean and standard deviation of a composite socioeconomic background variable for college applicants and enrollees. They hypothesized that if colleges preferentially admit students with higher SES, the mean of the SES variable would be higher and its variance significantly reduced in the group of enrollees compared to applicants. They found that the mean SES was 0.126 standard deviations higher for the group of enrolled students compared to applicants, but this difference was primarily explained by the fact that high-SES students had higher academic credentials on average than their low-SES peers. In other words, enrollees were more affluent than the pool of applicants simply because they were more academically prepared for college. Additionally, the standard deviation of the SES variable was only 3% smaller for enrollees compared to applicants, indicating that the distribution of socioeconomic background was roughly equivalent for applicants and enrollees. A much larger reduction in standard deviation between applicants and enrollees was found for academic variables, such as SAT scores and high school GPA, supporting the contention that institutions do not take socioeconomic background into account for admissions decisions nearly as much as they consider academic qualifications. The authors concluded that “these findings are contrary to what would be found if proxies for SES were the sole or primary determinant of admissions, or if schools had a per se preference for high-SES students” (p. 7). Overall, there does not appear to be a strong consensus regarding the extent to which socioeconomic background exerts an independent effect on the likelihood that college applicants will be admitted given the limited research that has examined this topic.

Explanations of the Impact of SES on College Acceptance

In some respects, there seems to be a greater amount of research on the potential mechanisms through which socioeconomic background could or should impact students' likelihood of college acceptance than there is empirical research investigating this phenomenon. Institutional practices related to the consideration of SES in admissions often get placed into one of two categories: need-blind or need-aware (Heller, 2008). In need-blind admissions, information on students' socioeconomic background should technically be excluded from the admissions considerations altogether, and financial need is only considered after an admissions decision is made and the institution is calculating the student's financial aid package. In these contexts there should be no direct impact of socioeconomic background on the likelihood of admission once factors related to admissions decisions are controlled for.

However, need-aware admissions practices could work in one of two ways, resulting in three, rather than two, different ways in which SES could impact students' likelihood of being admitted to college: institutions can be need-blind, need-supportive, or need-averse. Institutions that are need-supportive consider students' socioeconomic background in the admissions process and give preferential treatment to students that were raised in poverty, had parents that did not go to college, or overcame some other type of socioeconomic disadvantage. In contrast, institutions that are need-averse are those that give preferential treatment to students from more affluent households when making admissions decisions.

Although empirical estimates of the extent to which SES impacts students' likelihood of college acceptance are lacking, making it difficult to definitively determine the degree to which institutions consider need in admissions, there is some support for the presence of each of the three practices described above. In Heller's (2008) study for the National Association of College Admissions Counselors (NACAC), the author analyzed the results of a survey administered to all postsecondary institutions in the United States that granted baccalaureate degrees, participated in the federal government's Title IV financial aid programs, and were public or private, not-for-profit colleges and universities in the 50 states and the District of Columbia. The results of the survey indicated that 93% of public universities and 81% of private institutions practiced need-blind admissions, and only 2% of public institutions were need conscious throughout the entire admission cycle. The study also found that 32% of public universities and 18% of private colleges provided aid packages that met 100% of demonstrated financial need for every admitted student. However, the author noted that only 20% of the total population of postsecondary institutions responded to the survey, and it is therefore difficult to determine whether these results are broadly generalizable to the postsecondary system as a whole.

While the majority of institutions may practice need-blind admission, Heller (2008) also noted that the practice of need consideration has increased between 1994 (the previous time a similar NACAC survey was administered to colleges) and the time the data for the 2008 report were collected. Indeed, as Hoxby and Avery (2012) argued, "High-achieving, low-income students are considered very desirable by selective

colleges, private and public, which are eager to make their student bodies socio-economically diverse without enrolling students who are unprepared for their demanding curricula” (p. 4). Selective colleges in particular may therefore consider need in the admissions process in order to attempt to increase the SES distribution of their undergraduate bodies. Although the degree to which SES impacts the likelihood of admission at selective institutions on average is not known, one of the more public examples of this admissions practice is in the case of the University of Texas at Austin, which is currently defending its admissions policies in court via the *Fisher v. University of Texas* case. The university’s consideration of race in admissions is the primary point of contention, but the university has had to thoroughly describe and defend the entirety of its admissions procedure during the case. Although a thorough analysis of the specific methodology the university uses to admit students is outside the scope of this section, the university made known that it considers socioeconomic background as part of the “special circumstances” students experienced, and students that encountered these special circumstances are given an added boost in the admissions process. Additional institutions, such as the University of Colorado, have also made public their experimentation with providing admissions boosts to students from socioeconomically disadvantaged backgrounds (Gaertner & Hart, 2013). Thus, there is at least some direct and public evidence of institutions practicing need-supportive admissions.

However, there is equally public evidence that some institutions, even highly regarded ones, are need-averse in admissions. In October of 2013, it was revealed that George Washington University not only considers need in admissions, but admits less-

qualified applicants from more privileged backgrounds over better prepared students from socioeconomically disadvantaged households, specifically due to the increased likelihood that wealthier students would be more able to pay the full cost of attendance (Jaschik, 2013). Although this practice is not entirely uncommon, the university received a great deal of criticism due to the fact that it had traditionally described itself as practicing need-blind admissions. It is therefore somewhat unsurprising that the majority of institutional respondents to the survey of college's consideration of need in admissions that Heller (2008) analyzed would have represented that they were entirely need-blind; disadvantaging low-income students in the admissions process has the potential to be seen as unjust and damaging to an institution's reputations, so institutions may be willing to describe themselves as need-blind even if they do indeed consider financial background when determining which students to admit. Unfortunately, it is impossible to draw generalizable conclusions from a few isolated and highly public cases, so it is difficult to determine the average effect of socioeconomic background on the likelihood that applicants will be admitted to college.

COLLEGE ENROLLMENT

After applying to institutions and receiving admissions decisions, the next step in students' postsecondary pathways is deciding whether to enroll in postsecondary and, if so, which institution to enroll in. This section will first review the literature on postsecondary enrollment rates and characteristics of enrollment by socioeconomic origin to provide the overall context of enrollment disparities between SES groups. This will be followed by a discussion of the extent to which academic background moderates the

effect of socioeconomic background on students' postsecondary destinations. Research on the impact of socioeconomic background on the matriculation decisions of those accepted to college will then be discussed. Finally, this section will discuss a number of theoretical and conceptual frameworks that have been proposed to explain the relationship between students' socioeconomic upbringing and the postsecondary enrollment patterns that are evident in higher education in the United States.

As discussed in the first chapter, postsecondary enrollment has increased dramatically in the United States since the post-war period to the point where the majority of high school graduates attend postsecondary for at least some period of time. But although postsecondary enrollment rates have increased both as a proportion of the total cohort of college-age youth in the United States and for each socioeconomic subgroup, the gap in participation between socioeconomic groups has remained relatively stagnant, or possibly even grown, over time. Data from the NCES (2013) show that in 1975, the gap in enrollment between low-income and high-income students was 29% (34.7% vs. 63.7%). By 2011, the enrollment rate of low-income high school graduates had increased to 52.1%, but a concomitant increase in the enrollment of high-income students to 82.3% resulted in the gap actually widening instead of narrowing over this time period. In the first-look at data from NCES' Educational Longitudinal Study of 2002 (ELS:2002), Bozick and Lauff (2007) showed that only 52.3% of students in the sample from the lowest family income bracket had ever attended a postsecondary institution two years after graduating from high school, while more than 90% of students from the highest income bracket had done so. Disparities were likewise evident between

students based on the educational attainment of their parents, with 53.1% percent of students whose parents had a high school diploma or less attending postsecondary compared to 87.2% of students whose parents had a graduate or professional degree. Despite low-SES students increasingly participating in postsecondary, high-SES students have increased their participation at roughly the same or greater rates, maintaining or widening the socioeconomic gap in postsecondary enrollment (Ellwood & Kane, 2000).

Bozick and Lauff (2007) also highlighted how socioeconomic background significantly influences the types of postsecondary institutions that students attend. Only 20.8% of students from the lowest income bracket had attended a four-year institution two years after graduating from high school compared to nearly 70% of children from the highest income group. Out of the cohort of students that attended any postsecondary institution nearly 60% of low-income students had attended a two-year or less-than-two-year institution compared to only 23% of students from the highest income bracket. These differences in the type of institution attended were once again evident based on the educational attainment of parents. Approximately two-thirds of the students whose parents had attained a graduate or professional degree had enrolled in a four-year institution compared to only one-fifth of students whose parents had attained a high school diploma or less.

Socioeconomic disparities in postsecondary enrollment are even more alarming when enrollment is disaggregated by the selectivity of the institution. Bozick and Lauff (2007) estimated that approximately three percent of students from the lowest income bracket attended a highly selective four-year institution, compared to nearly 35% of

students from the highest income group. Low-income students were thus ten times less likely than students from the highest income backgrounds to have attended a highly selective four-year institution. Multiple studies have similarly documented the significant underrepresentation of low-income students at the most selective and prestigious institutions in the country (Astin & Oseguera, 2004; Carnevale & Rose, 2003; Hoxby & Avery, 2012), and some research supports the contention that low-SES students that do go on to college today are even less likely to attend a selective institution than similarly disadvantaged students in earlier periods (Bastedo & Jaquette, 2011). As Hearn (1992) presciently stated in the early 1990s, “Stratification based on *whether* or not one attends college certainly still exists, but stratification based on *where* one attends may be becoming increasingly significant for longer-term postsecondary outcomes” (p. 659); more than two decades later, this statement rings even truer today.

While these socioeconomic disparities in postsecondary enrollment are evident, the degree to which academic preparation and achievement ameliorate these disparities is less clear. Wyner, Bridgeland, and DiIulio (2007) analyzed the educational pathways of students who ranked in the top quartile on standardized ability assessments and compared the postsecondary participation of students whose family incomes fell below the national median to those whose incomes were in the top half of the income distribution. They estimated that more than nine out of ten high-achieving students from both income halves attended college at some point after high school (98% of higher-income students compared to 93% of lower-income students), suggesting that the socioeconomic gap in postsecondary participation may be due more to academic ability than other factors

related to socioeconomic origin. However, “low-income” is rarely defined as incomes anywhere below the national median, and splitting the sample into only two income brackets likely resulted in these authors underestimating the gap in postsecondary enrollment between high-ability students from more disparate socioeconomic backgrounds.

Ellwood and Kane (2000) reached different conclusions when they disaggregated NELS:88 data into income quartiles. Using the results of the standardized math ability assessment administered to students in the survey, these authors showed that significant gaps in postsecondary enrollment were present even when controlling for ability. While low-income students who scored in the top third on the math assessment were significantly more likely than their low-income peers who scored in the bottom third to enroll in postsecondary within twenty months after graduation (82% compared to 48%), students from the top income quartile were still significantly more likely to attend postsecondary. Approximately 96% of high-income students who scored in the top third on the math ability assessment had enrolled in postsecondary compared to 82% of low-income students, and 73% of high-income students who scored in the bottom third on the assessment attended postsecondary compared to 48% of low-income students. Similarly, high-income students were significantly more likely than low-income students to enroll in four-year institutions even when controlling for math ability. High-income students that scored in either the bottom third or middle third on the math assessment were approximately twice as likely as low-income students to enroll in a four-year college (27% to 15% for students in the bottom third of math ability and 59% to 33% for students

in the middle third). Family income was also statistically significantly related to postsecondary enrollment in various statistical analyses these authors performed.

While Ellwood and Kane (2000) concluded that family income had a statistically significant and often substantial impact on postsecondary enrollment even when controlling for academic ability, other researchers have disputed this conclusion. Carneiro and Heckman (2002) used both ordinary least squares (OLS) and instrumental variables (IV) techniques to estimate the influence of socioeconomic background on college enrollment. They utilized the Bureau of Labor Statistics' (BLS) National Longitudinal Survey of Youth of 1979 (NLSY:79), which surveyed a nationally representative sample of men and women who were between 14 and 22 during the initial survey. Students who graduated from high school and were eligible to attend postsecondary in the early 1980s were included in the analyses. Controlling for academic ability measured by the Armed Forces Qualification Test (AFQT), these authors estimated that family income had a minimal role in students' decisions to attend postsecondary and that only eight percent of the population was credit constrained, or prevented from enrolling in postsecondary due to financial factors. Academic ability was far more influential in determining whether students would attend postsecondary. The authors concluded that the socioeconomic gaps in postsecondary participation are more the result of the effect of socioeconomic status on child development and cognitive ability, which occur much earlier in the schooling process, rather than credit constraints and other socioeconomic disadvantages that influence the postsecondary enrollment process.

As Belley and Lochner (2007) pointed out, however, Carneiro and Heckman (2002) utilized data that are now more than three decades old. As discussed in Chapter 1, the 1970s was often described as the “Golden Age” for student financial aid and college actually became more affordable for students during the 1970s and 1980s due to generous financial aid and substantial state appropriations for higher education. While students and their families may have experienced minimal credit constraints during this time period, it is important to determine whether the influence of family income on postsecondary enrollment has changed over time due to dwindling state support and the increased reliance on loans rather than grants for student financial aid. Belley and Lochner (2007) investigated this possibility by utilizing Carneiro and Heckman’s (2002) methodology to analyze both the original NLSY:79 cohort as well as the more recent NLSY:97 cohort. Their findings appeared to confirm Carneiro and Heckman’s (2002) results that family income was not extremely influential in determining college enrollment for the 1979 cohort, but they discovered that the influence of income was substantially larger for the 1997 cohort. Belley and Lochner’s (2007) results thus support the contention that credit constraints for low-income families are becoming increasingly important in determining college enrollment, even for high-ability students.

While both the aforementioned studies investigated the impact of family income on college enrollment when controlling for academic ability, neither study disaggregated postsecondary enrollment by the type or selectivity of institution attended. As discussed previously, however, research has revealed significant socioeconomic disparities in students’ attendance at selective institutions. Literature in this area has helped to develop

the concept of “academic match,” or the degree to which a student’s observable academic credentials are similar to the average achievement and ability levels of other students attending the institution (Smith, Pender, Howell, & Hurwitz, 2012). While the phenomenon of overmatching has been observed, where students appear to be underqualified for the postsecondary institutions in which they enroll, the majority of studies in this vein have focused on the extent of undermatching (or overqualification).

One of the first studies to identify this phenomenon was Avery et al.’s (2006) evaluation of Harvard University’s implementation of a new financial aid initiative which increased financial aid in order to recruit students from low-income backgrounds. Harvard University had practiced need-blind admissions and provided substantial financial aid to admitted students for many years with students from families making less than \$40,000 paying \$2,300 on average, about six percent of the total cost of attendance (\$37,928), in 2003-04. However, Harvard was still struggling to increase its income diversity. The new financial aid initiative provided even greater tuition discounts to families (those making \$40,000 or less would bear no cost) and allocated resources to increase recruitment and outreach to low-income students who were academically qualified for admittance. The result was a 15% increase in applications during the implementation year, and this increase in applicants came disproportionately from students from low-income families. Many of the low-income students from this expanded pool of applicants were indeed admitted, and the first class admitted under this new financial aid policy was significantly more socioeconomically diverse than previous years. The authors concluded that many students who were qualified to attend Harvard

were discouraged from doing so because of the costs of attendance, which likely resulted in them attending less selective institutions in which they may have been undermatched.

Numerous studies have subsequently sought to estimate the extent of academic undermatch. Bowen, Chingos, and McPherson (2009) estimated that 40% of North Carolina students who were eligible to enroll in the most selective in-state colleges undermatched by enrolling elsewhere. Research on students from Chicago Public Schools (CPS) estimated an even greater percentage of students undermatching, with as many as two-thirds of CPS students that aspired to earn a bachelor's degree enrolling in an institution for which they were overqualified (Roderick et al., 2008). Even more worrisome, this same study of CPS students identified 34% of students that were substantially undermatched, often high-ability students that were attending community colleges and non-selective universities or not attending postsecondary at all. Studies using national data have likewise discovered that academic undermatch is a pervasive phenomenon across the country. Smith, Pender, and Howell's (2012) recent study using data from both NELS:88 and the Educational Longitudinal Study of 2002 (ELS:2002) estimated that approximately 41% of all college enrollees in the United States were undermatched, although the extent of undermatch had decreased by about 20% between the two cohorts.

While a number of factors have been identified which contribute to undermatch, nearly all studies that investigated this phenomenon have highlighted the importance of socioeconomic background. Bowen, Chingos, and McPherson (2009) estimated that students from the bottom quartile of family income were more than twice as likely to be

undermatched compared to students from the top quartile (59% to 27%), and students whose parents had attended no college were also twice as likely to be undermatched compared to students whose parents had attained a graduate degree (64% to 31%). Smith, Pender, and Howell (2012) similarly found that lower parental income and education levels increased the likelihood that students would undermatch, and low-income students were more likely than their higher-income peers to be substantially undermatched to the institution in which they enrolled. Thus, failing to account for the selectivity of institutions which students attend is likely to result in researchers underestimating socioeconomic disparities in postsecondary enrollment.

Explanations of the Impact of SES on College Enrollment

Overall, there is strong evidence that socioeconomically disadvantaged students are less likely to go onto postsecondary, and when they do they are more likely to attend an institution in which they are undermatched. However, one of the limitations of the literature on undermatch is that it often fails to account for socioeconomic disparities in the rates at which students apply and are admitted to colleges. As mentioned previously, in order to truly estimate the impact of socioeconomic background on the stage of enrollment and identify the causes of socioeconomic disparities at this postsecondary transition, it is important to analyze the enrollment decisions of students that were accepted to a college or university.

Research in this area has identified three primary contributors to the disparate rates at which students from different SES backgrounds matriculate. The first, unsurprisingly, is the cost of attendance. Weiler (1996) examined factors influencing the

matriculation decisions of students that were admitted to an anonymous selective private research university. He found that the net price of attendance, or the sticker price minus all financial aid the student was offered, did significantly impact the likelihood of matriculation. Nurnberg, Schapiro, and Zimmerman (2012) similarly found that students who were not awarded financial aid were less likely to matriculate, and greater net price was associated with a significant decrease in the probability of matriculation. And low-SES students are particularly sensitive to the types of aid packages they are offered. Linsenmeier, Rosen, and Rouse (2006) estimated that a change in a university's financial aid policy of replacing loans with grants for low-income students resulted in a 3% increase in the likelihood of these students matriculating, and the gain was between 8-10% for specific low-income racial subgroups. This is congruent with prior research which has described students from disadvantaged backgrounds as particularly loan-averse (Burdman, 2005). In short, a variety of studies have found that low-income students are less likely to matriculate if they feel that they are unable to bear the costs of attendance.

However, a number of non-monetary factors have also been identified which may contribute to socioeconomic disparities in matriculation rates. Arnold, Fleming, DeAnda, Castleman, and Wartman (2008) were one of the first groups of researchers to identify a phenomenon which they termed "summer melt" in which students are accepted to a college and even pay their institution's deposit but then do not enroll the following semester. This matriculation gap was identified in a study following 500 graduates from over 50 high schools that had gained national recognition for helping between 90-100% of their high school graduates, the majority of which are low-income and members of

historically underrepresented groups, earn acceptance into a college or university. While it was assumed that all of the students accepted to college who paid their required deposit would enroll the following semester, this study identified that between 20-30% of students either changed the institution they enrolled in or did not enroll at all.

This line of research identified two factors that are particularly influential in discouraging admitted low-SES students from matriculating. The first is that many disadvantaged students struggle in navigating the bureaucratic and procedural requirements of enrolling in college, such as completing financial aid applications, enrolling in classes, applying for on-campus housing, and the like. Such students may believe that they have completed all the necessary requirements for enrollment until it is too late. The second factor which this research area has identified is the influence of peers and social support systems (Tierney, Corwin, Auerbach, & Venegas, 2003; Tierney & Colyar, 2004; Tierney & Hagerdon, 2002; Tierney & Venegas, 2005, 2006). Even in high schools with strong college-going cultures like those in the study, students may become immersed in very different sociocultural contexts during the period between high school graduation and subsequent college enrollment. In the original study, many students reported that they reconsidered enrolling in college after discovering that their peers did not intend to enroll or receiving pressure from their parents and relatives to go into the workforce rather than attend postsecondary (Arnold, Fleming, DeAnda, Castleman, & Wartman, 2008). Subsequent studies have confirmed the importance of both of these factors (Castleman, Arnold, & Wartman, 2012).

Castleman and Page (2014) conducted a series of randomized controlled experiment in which students in the treatment group were assigned peer mentors over the summer and sent automated text messages reminding them of important institutional deadlines. Students that received these text messages were more than 7% more likely to enroll in college than those that did not, and the peer mentoring increased four-year college enrollment by 4.5% overall and any college enrollment by as much as 16% at some schools. The results of this study suggest that being accepted to college does not necessarily translate into enrollment, particularly for disadvantaged students, but targeted interventions can be effective in closing this matriculation gap.

Overall, research in this area is somewhat limited given that few studies of socioeconomic disparities in college enrollment have analyzed application, acceptance, and matriculation as distinct stages, which has the potential to confound the impact of SES on matriculation with the effects on the previous stages. However, the research that does exist strongly suggests that significant socioeconomic disparities exist in the likelihood that students admitted to college will indeed enroll.

PERSISTENCE AND ATTAINMENT

Much of the research on postsecondary attainment and social mobility has argued that college access and choice is the most important stage in the postsecondary process given the strong relationship between where students enroll in postsecondary and their likelihood of succeeding. However, the journey from enrollment to graduation is long and arduous for many students, and simply enrolling in a postsecondary institution, even a highly selective one, does not guarantee college attainment. As Corrigan (2003) stated,

“Public policy often emphasizes access to higher education for low-income students, but once in college these students often face the severest challenges on the path to degree attainment” (p. 25). While the previous section focused on whether students enroll in postsecondary and what colleges they choose to attend, the purpose of this section is to review the degree to which socioeconomic origin may influence how students attend postsecondary and their odds of completion. This section will discuss the degree to which socioeconomic background influences rates of persistence and attainment and review the various explanations which have been proposed regarding the impact of SES on persistence and attainment. In this study’s statistical analyses, persistence and attainment are considered to be separate stages in students’ postsecondary pathways. However, because of the interconnectedness of persistence and attainment (i.e., attainment cannot occur without persistence and persistence is less consequential without attainment), these outcomes will be discussed in tandem in the current section.

As discussed in Chapter 1, socioeconomic disparities in postsecondary attainment rates are large and growing. Mortenson (2010) used census data to estimate the degree to which students’ economic upbringing relates to their probability of earning a bachelor’s degree and how this has changed over time. He found that 82.4% of students born into families in the top quartile of family income earn a bachelor’s degree by age 24, while only 8.3% of students from families in the bottom quartile do so, suggesting that privileged students are ten times as likely to earn a degree compared to their low-income peers. Additionally, he estimated that this disparity has grown substantially over time. In his words, “In 2008 the difference was nine times. In 2007 the difference was eight times.

In 2005 the difference was seven times. And in 1980, at the end of the progressive era of public policy, the difference was five times” (p. 2). In other words, socioeconomic disparities in attainment rates have roughly doubled over the last three decades.

But simply analyzing socioeconomic gaps in postsecondary attainment confounds the impact of SES across all previous transitions with the impact of SES specifically on attainment. Mortenson (2010) therefore also analyzed the rates of bachelor’s degree completion by family income background only for students who enrolled in postsecondary at some point. He estimated that nearly 98% of students from high-income background that enrolled in college at some point earned a bachelor’s degree by age 24, while the same was true for less than 20% of low-income students. Thus, even when focusing exclusively on students that enrolled in postsecondary at some point, students from more affluent background are far more likely to persist and earn a degree compared to their less privileged counterparts.

Although Mortenson estimated substantial socioeconomic disparities in attainment and completion, the limitation of his study is that he did not follow specific cohorts over time to determine their rates of attainment, but rather derived estimates of attainment rates from Census data. A more accurate calculation is likely provided by the first look report for the third follow-up of the NCES’ ELS:02 survey (Lauff, Ingels, & Christopher, 2014), which followed a cohort of high school sophomores from 2002 to 2012 and is the data source used in the current study. Although college participation rates varied by socioeconomic background, a majority of students from all SES quartiles attended postsecondary for at least some time; more than 96% of students from the

highest SES quartile went onto postsecondary, compared to roughly 72% of low-SES students. However, only 14.5% of low-SES students had earned a bachelor's degree by the end of the study timeframe, a completion rate of only 20.2%. In contrast, nearly 61% of high-SES students had earned a bachelor's degree or higher by age 26, representing a completion rate of about 63%. Thus, even for students that went onto postsecondary, high-SES students were found to be more than three times as likely as low-SES students to earn at least a bachelor's degree.

Data from the NCES' Beginning Postsecondary Students study similarly show significant socioeconomic disparities in baccalaureate attainment among students who entered postsecondary. For the cohort of students who entered postsecondary in 1989, 41% of students from the highest SES quartile received a bachelor's degree by 1994, seven times higher than the six percent of low-SES students who attained a degree (Berkner, Cuccaro-Alamin, & McCormick, 1996; Gladieux and Swail, 2000). Even when only students who began postsecondary at a four-year institution are included, significant socioeconomic disparities are present. For the cohort entering postsecondary in 1995-96, students from high income families were twice as likely as low-income student to have attained a bachelor's degree within four years (46% to 23.5%).

Other longitudinal studies have similarly estimated not only that high-income students that go on to postsecondary are more likely to graduate than their low-income peers, but that this disparity has increased over time. Bailey and Dynarski (2011) used data from both the Census and the 1979 and 1997 National Longitudinal Surveys of Youth to estimate trends in college enrollment and completion for students from different

economic backgrounds. They found that rates of college completion for low-income youth increased by only four percentage points for cohorts born in the 1980s compared to those born in the 1960s. In contrast, the college completion rate for high-income youth increased by 18 percentage points during this time.

However, these figures obviously fail to control for any other factors that may influence postsecondary attainment. To accurately determine the influence of SES on postsecondary attainment, it is also necessary to control for other variables that may influence student's likelihood of completing their degree. Most important in this regard is the influence of academic preparedness and ability given the research showing that low-income students are far more likely to be underprepared than their high-income peers (Cabrera & La Nasa, 2001).

Rumberger (2010) used data from NELS:88 to examine the likelihood that students who graduated from high school in 1992 would have earned a bachelor's degree by 2000. Rumberger modeled this relationship using logistic regression and included data on students' high school GPA and scores on standardized assessments. He disaggregated his sample into SES quartiles with middle-SES representing the second and third quartiles, and his analyses revealed that students from the highest SES group had approximately 6.5 times the odds of completing a bachelor's degree compared to students from the lowest SES group even when controlling for grades, test scores, and college expectations. The socioeconomic disparity was even larger for particular racial subgroups, as high-SES white students had ten times the odds of completing a bachelor's degree compared to low-SES white students, and high-SES Black students had more than

twelve times the odds of completing compared to their low-SES peers. Rumberger concluded that “class still matters” in the American higher education system, and academic preparation is insufficient to promote college attainment for low-SES students (p. 253).

Cabrera, Burkum, and La Nasa (2005) analyzed data from the High School and Beyond study (HSB:80), which followed a nationally representative cohort of students who graduated high school in 1982. They found that a number of pre-collegiate characteristics, including academic preparedness, encouragement to attend postsecondary received from parents, friends, and high school professionals, and postsecondary aspirations, all increased the likelihood that students would earn a bachelor’s degree. Yet socioeconomic disparities in attainment were still evident despite controlling for these background characteristics. Students from the second quartile of SES were 11% more likely than the lowest-income students to earn a degree, and this figure was 15% for students from the third quartile and 24% for students from the highest quartile. Thus, academic preparation and other pre-college experiences were insufficient to explain the variation in attainment by socioeconomic background.

However, not all studies examining the impact of socioeconomic background on degree completion have reached the same conclusion. One of the more notable instances of this type of research comes from Adelman’s (1999, 2006) analyses of previous iterations of the NCES’ National Education Longitudinal Studies, specifically HSB:80 and NELS:88. Adelman was primarily interested in the degree to which academic preparation influences the likelihood that students would earn degrees. He advanced the

idea of academic resources, a composite of curricular rigor, class rank/GPA, and scores on ability assessments. In multivariate analyses, academic resources accounted for the overwhelming majority of the variability in baccalaureate completion among students that enrolled in college after high school. When controlling for these academic resource variables, SES was still significantly related to the likelihood that students would earn degrees but the estimated magnitude of this disparity was not large, suggesting that academic preparation is still far more influential in terms of students' rates of persistence and attainment than socioeconomic background.

Just as differences in academic preparation may explain disparate rates of attainment, the research on academic undermatch discussed previously also alludes to the fact that the types of institutions students from different SES backgrounds enroll in may explain completion gaps. Hoxby and Avery (2012) concluded from their analysis of the college-going behaviors of high-ability students that no socioeconomic disparities in college completion exist for high-ability students that enroll in highly selective institutions. But high-ability students that enroll in highly selective institutions constitute a small fraction of the overall postsecondary population, and studies which have used a broader cohort and analyzed completion rates at less selective institutions have identified significant SES disparities in completion. Bowen, Chingos, and McPherson (2009) analyzed college completion rates for students that enrolled in public flagship universities and found that 83% of high-SES students earned a degree within six years compared to only 68% of low-SES students, a difference of 15 percentage points, and the gap in four-year graduation rates was 19%. Similar disparities were identified in terms of parental

educational attainment; 83% of students that enrolled in a public flagship whose parents had a graduate degree completed a baccalaureate within six years compared to 69% of students whose parents had not enrolled in postsecondary. Overall, while socioeconomic disparities in baccalaureate attainment are clear, the magnitude of the impact of socioeconomic background on completion when controlling for academic preparation and the types of institutions students enroll in is somewhat more ambiguous.

Explanations of the Impact of SES on Persistence and Attainment

Given the importance of persistence and attainment for ensuring that postsecondary participation leads to improved socioeconomic outcomes, an extensive amount of research has investigated factors that influence student persistence and, in particular, the mechanisms whereby socioeconomic background influences persistence and attainment. Although a number of theoretical frameworks have been developed to explain postsecondary persistence, stopout, and dropout behavior, arguably the most influential has been the work of Vincent Tinto (Engle & Tinto, 2008; Tinto, 1975; Tinto, 1993; Tinto, 2006; Tinto, 2012; Tinto & Pusser, 2006) and researchers that have validated (Pascarella & Chapman, 1983; Pascarella & Terenzini, 1983) and expanded (Berger & Braxton, 1998) Tinto's theory. Tinto argued that postsecondary persistence is directly affected by the degree to which students are integrated into the fabric of their postsecondary institution. He identified two constructs, *academic integration* and *social integration*, as the most important factors that contribute to persistence and attainment. He defined academic integration as the alignment between students' academic preparation and the institution's academic demands, while social integration is the degree

to which students interact positively with their peers and faculty members and feel congruence between their values and the values of the institution. Tinto argued that lack of integration in either area can result in students leaving their institution. In other words, students may feel that their values align with those of the institution but are not academically prepared to succeed, or that they are able to meet the academic demands of their institution but do not enjoy bonds of affiliation with others that are necessary for social integration.

The importance of academic integration has been alluded to previously in the discussion of socioeconomic disparities in students' academic preparedness. However, the concept of social integration is important to consider when explaining the impact of SES on persistence and attainment, as low-SES students are significantly more likely to exhibit a number of enrollment behaviors which may impact their ability to fully engage with their institution. One of the most important is the intensity in which students enroll, as whether students attend college part-time or full-time has been identified as an important variable in the postsecondary persistence equation. Choy (2002) estimated that 39% of the total US undergraduate population was enrolled part-time in 1999, and that this percentage had increased from 28% since 1970. When students were asked if they had ever attended part-time, approximately half of all undergraduates in 1992-93 and 1999-2000 reported that they had done so. While students from all income backgrounds do attend postsecondary part-time with some frequency, Hearn (1992) showed that low-income students were significantly less likely to attend full-time than their peers even when controlling for academic characteristics and postsecondary aspirations. Predictably,

part-time enrollment has been found to reduce the likelihood that students will persist and significantly delays or prevents students from completing postsecondary (Carroll, 1989; Corrigan, 2003).

Although students may elect to enroll part-time for a variety of reasons, one of the primary determinants appears to be the degree to which students must work while they pursue postsecondary. Riggert et al. (2006) estimated that approximately 80% of all college students are employed while completing their undergraduate education, and even among students under the age of 24 at four-year colleges more than 50% are working at least part time. While the overwhelming majority of students obtain work for at least some period during their postsecondary experience, there are once again clear socioeconomic differences in the patterns of student employment. Corrigan's (2003) analysis of data from NCES' Beginning Postsecondary Student Study of 1996 (BPS:96) showed that a roughly equal percentage of students from all income backgrounds did not work during their first year of postsecondary. However, low-income students that did work were significantly more likely than their higher-income peers to be working a high number of hours. Approximately 23% of low-income dependent students and 30% of low-income independent students reported working 36 or more hours, compared to 13% of middle- and upper-income dependent students.

As few on-campus jobs allow students to work full-time, and many colleges and universities have policies prohibiting full-time employment for students, low-income students who work full-time to finance their education are significantly more likely to work off-campus. While a number of studies have described a positive impact of on-

campus employment on both academic performance and persistence, as long as the hours worked are not excessive (Astin, 1984; Ehrenberg & Sherman, 1987; Kaiser & Bergen, 1968; Merritt, 1970; Riggert et al., 2006), Astin (1993) and others have described the impact of off-campus work as uniformly negative, given that such employment often prevent students from fully engaging with their institution.

Just as students are growing more likely to attend school part-time and find employment while enrolled, students' postsecondary participation behavior is increasingly characterized by "stopout," or temporarily interrupted enrollment. In their analysis of the Beginning Postsecondary Students of 1995-96 (BPS:96) survey, Berkner, He, Cataldi, and Knepper (2002) showed that 30% of all students had not been continuously enrolled by the follow-up survey in 2000-01. The frequency of student stopout is also significantly related to the type of institutions students attend. While less than 18% of students that began postsecondary at a private, not-for-profit four-year institution temporarily interrupted their enrollment for at least one semester, 25% of students attending public four-year institutions and more than 39% of students attending two-year institutions stopped out temporarily. Unsurprisingly, students who stopout significantly increase their time-to-degree and reduce their likelihood of failing to complete their program (DesJardins, Ahlburg, & McCall, 2002; Goldrick-Rab, 2006).

Also unsurprisingly, low-income students are much more likely to temporarily exit the postsecondary system than their higher-income peers, even when controlling for academic preparation. Goldrick-Rab (2006) utilized NELS:88 to estimate the influence of social class differences on interrupted enrollment. Controlling for student performance on

the NELS standardized assessments administered to seniors, student GPA, the intensity of the high school curriculum students completed, and student expectations of completing a bachelor's degree, the author still found that students from the lowest SES quintile had three times the odds of experiencing interrupted enrollment compared to students from the highest SES quintile. Her results support the contention that stopout behavior cannot be adequately explained by academic preparation alone, but rather that socioeconomic factors play a large role in whether students will be able to maintain continuous enrollment in postsecondary.

Indeed, there are a number of financial factors that may cause low-income students to be less engaged with their institution and prevent their social integration. But financial considerations are not the only factor that may inhibit the integration, persistence, and eventual attainment of low-SES students. An interesting line of research has investigated the effects of social class on the identity formation of college students and how the college experience affects students' identity development (Aries & Seider, 2005, 2007; Granfield, 1991; Kuriloff & Reichert, 2003; Ostrove, 2003). This research has shown that students from more privileged backgrounds are more likely to have been raised with the expectation of attending postsecondary and see their college experience as a continuation of family tradition (Ostrove, 2003), while low-SES students, particularly those who are the first in their family to attend college, may feel greater conflict between their upbringing and their identification as a college student (Aries & Seider, 2005, 2007).

This is often magnified by the fact that the student populations of many postsecondary institutions, particularly selective ones, disproportionately come from more affluent backgrounds, potentially resulting in low-SES students being isolated from other students from similarly disadvantaged backgrounds (Granfield, 1991; Kuriloff & Reichert, 2003). While students from more privileged backgrounds may have an extensive amount of friends and family members who have completed college in the past or are currently enrolled, low-SES students may struggle to persist due to the complexity of navigating the institution and the lack of peer and mentor support needed to guide them through the process. Bettinger & Baker (2013) conducted a randomized controlled experiment in which students from a number of colleges, the majority of which were from disadvantaged or non-traditional backgrounds, were assigned to college coaches that communicated important information to them and helped them to develop a variety of skills required for college completion, such as time management, self-advocacy, and study skills. These researchers found that students who were randomly assigned to a coach were significantly more likely to persist during the treatment period and more likely to still be attending the institution one year after the coaching had ended compared to students in the control groups. The results suggest that while institutions that provide supports to low-SES students may significantly increase their likelihood of persistence and attainment, the lack of such supports may inhibit students from fully engaging in their institution and successfully completing their degree.

In short, while a great deal of emphasis has been placed on college access, particularly for students historically underrepresented in higher education, access is far

less impactful on students' eventual outcomes if they fail to complete their degree. The body of research which exists on SES and college persistence and attainment underscores a number of factors that may serve to inhibit low-SES students from attaining a degree, and the empirical estimates testify to the fact that socioeconomic background does significantly impact students' likelihood of completing college. However, some research also suggests that SES may be less impactful after controlling for differences in academic preparation or its effect may depend on the types of institutions students enroll in.

GRADUATE SCHOOL PARTICIPATION AND ATTAINMENT

The final stage in students' postsecondary pathways is whether or not they elect to attend graduate school after completing a bachelor's degree. While graduate education often confers significant socioeconomic benefits on students (Cappell & Pipkin, 1990; Kingston & Clawson, 1990), the relatively small number of students that go onto graduate school compared to the population which enrolls in any postsecondary institution is likely the reason why a limited amount of research has investigated the impact of socioeconomic background on graduate school participation. However, this section will review the limited number of studies that have analyzed whether and how socioeconomic background influences this postsecondary transition.

A limited number of studies have found that one's socioeconomic upbringing is related to one's likelihood of enrolling in graduate school. Researchers from NCES analyzed data from the Baccalaureate and Beyond Study, which followed a cohort of students who received their bachelor's degree in 1993 for ten years, to determine factors that were related to graduate school participation (Nevill, Chen, & Carroll, 2007).

Although they did not analyze the impact of family income background on graduate school participation, they found that parental educational attainment was strongly related to the likelihood that students would enroll in graduate school. Only one-third of college graduates whose parents had a high school diploma or less enrolled in graduate school, compared to nearly half of students whose parents had a graduate degree.

Mullen, Goyette, and Soares (2003) analyzed the same data sample (although only through 1997) and reached similar conclusions, although they also disaggregated graduate school participation by the type of program in which students enrolled and found additional nuances. Four years after graduating from college, approximately 24% of students whose parents had a high school degree or less enrolled in some graduate program compared to about 38% of students whose parents had more than a bachelor's degree. However, there was significant variability in these socioeconomic disparities based on the type of graduate program. There were no statistically significant differences between parental educational attainment subgroups in the rates at which they enrolled in MBA programs. However, college graduates whose parents had more than a bachelor's degree were three times more likely than first-generation students to enroll in a first professional degree and nearly four times as likely to enroll in a doctoral program, both of which were statistically significant differences.

While a few studies have thus estimated that SES continues to exert an influence on the rates at which students transition from baccalaureate programs to graduate school, the overwhelming conclusion from the majority of research in this area is that socioeconomic background ceases to exert a detectable influence on the graduate school

participation of college graduates. One of the first studies to reach this conclusion was Mare's (1980) seminal research, which serves as the methodological foundation of the current study, in which he used sequential logit modeling to estimate the relative impact of social background variables across educational transitions. While Mare estimated that SES significantly influenced progression rates for earlier stages in the process, he concluded that "for college graduates, the influence of social origins on their decisions to pursue further schooling is virtually nil" (p. 301). Researchers that used similar methodologies to study the effects of social background on school continuation past the baccalaureate but analyzed different datasets have generally reached the same conclusion (Ethington & Smart, 1986; Stolzenberg, 1994).

Of the studies that used alternative methodologies to study this phenomenon and identified a significant effect of SES on the progression into graduate school, the majority have found that SES plays a more indirect role in the likelihood that students will pursue graduate education. For example, both Ethington and Smart (1986) and Zhang (2005) analyzed the impact of the quality of the undergraduate institution which a student graduated from on the probability that students would enroll in graduate school. Unsurprisingly, these studies concluded that attending a higher quality or more selective undergraduate institution did increase the likelihood that students would enroll in a graduate program. To the extent that low-SES students are underrepresented at such institutions, they may have lower odds of progressing into graduate school. However, these studies also found that once undergraduate college quality is controlled for, socioeconomic background exerts little to no influence on students' likelihood of

enrolling in graduate school. Thus, the general conclusion from this field of research is that completing a bachelor's degree reduces to insignificance the effect of being raised in a disadvantaged household on student progression into graduate education.

Explanations of the Impact of SES on Graduate School Persistence and Attainment

Although the finding that socioeconomic background is unrelated to the likelihood that college graduates will transition to graduate school is a positive one, in many ways it is also unexpected and incongruent with many theories of higher education and social stratification. For example, the theories of Maximally Maintained Inequality (Raftery & Hout, 1993) and Effectively Maintained Inequality (Lucas, 2001), two highly prominent theories related to social stratification in education, both contend that as education opportunity expands, and particularly as educational participation at a given level of schooling reaches near universality, higher social classes will maintain their privileged position in society by disproportionately increasing their access to the next highest level of schooling. For example, high school completion used to be enjoyed only by a select few. As increasing number of students began completing high school, high-SES students increased their rates of access to postsecondary. And as postsecondary enrollment increased, the higher education system became increasingly stratified and high-SES students maintained, or even increased, a disproportional share of enrollment at the more selective institutions. Thus, one would predict from these theories that as baccalaureate enrollment and completion increases, students from more privileged backgrounds would begin pursuing graduate education at much higher rates than less affluent students in order to maintain their privileged social position. These theories are

therefore far less effective at explaining the relative unimportance of social background on the graduate school enrollment decisions of college graduates.

Bourdieu (1984) proposed a similar explanation which he termed social reproduction theory. As summarized by Mullen, Goyette, and Soares (2003), Bourdieu's theory implies that "an expanded system of education should become even more socially exclusive at the top. As new social groups enter higher education, socially privileged groups, whose reproduction was traditionally ensured by college degrees, increase their investments in education to stay ahead of the newcomers" (p. 144). This theory would therefore predict that socioeconomic disparities in graduate school participation should have increased over time as baccalaureate attainment became increasingly prevalent. However, once again the empirical results of this phenomenon imply the inadequacy of this theoretical explanation.

Given the inability of many prominent theories of stratification and education to explain the lack of relationship between socioeconomic background and graduate school participation, researchers have proposed different explanations of this phenomenon. For example, Stolzenberg (1994) contends that students' aspirations for graduate school are far more influenced by their undergraduate experiences rather than their family background. Students from low-SES backgrounds in particular may be completely unfamiliar with graduate school prior to graduating from high school, but a bachelor's program provides them with extensive experience with life at a university. Additionally, college may also be the time when students are likely to look beyond their family context and become increasingly influenced by their peers in terms of formulating their future

educational and career plans. Either way, the non-relationship between SES and graduate school participation for college graduates is positive indication of the efficacy of baccalaureate attainment in overcoming the effects of a disadvantaged upbringing.

SOCIOECONOMIC OUTCOMES

We have now reviewed the extant research on the impact of socioeconomic background on every stage in students' postsecondary pathways that will be addressed in this study, from college application through graduate school participation. However, for the higher education system to truly promote social mobility, it is also critical for postsecondary attainment to translate into socioeconomic benefits. The purpose of this section is therefore to review the last stage in students' college-to-career pathways, their transition into the labor market. This section will begin by reviewing research on the average socioeconomic benefits of bachelor's degrees. The relationship between sub-baccalaureate attainment and labor market outcomes will not be discussed given this study's exclusive focus on baccalaureate attainment. Although this study will not investigate the labor market outcomes of those that attained graduate education, given the fact that such students had experienced an extremely limited amount of time in the labor market by the ELS survey's conclusion, the socioeconomic benefits of graduate attainment will be briefly discussed in order to highlight the importance of this stage of educational attainment. This will be followed by a review of the research which has estimated the degree to which socioeconomic background influences the labor market outcomes of college graduates. Finally, prominent explanations of the impact of SES on this transition will also be discussed.

Bachelor's Degrees

While the bachelor's degree attainment rate for the overall US population continues to increase, the relative socioeconomic advantages conferred by a bachelor's degree also continue to rise, evidence that the rate of growth in baccalaureate attainment may not be sufficient to meet the demand. As Turner (2004) noted, in 1980 those holding a bachelor's degree earned approximately 40% more than their peers who ended their education after high school. By the early 2000s, that gap had climbed to over 65%. Amos' (2008) analysis of Census data estimated an even greater relative benefit to a bachelor's degree. In 2005, bachelor's degree holders made \$52,671 on average, compared to \$36,645 for those with an associate's degree and \$26,933 for high school graduates. Those with a bachelor's degree therefore averaged 44% more annual income than associate's degree holders and roughly twice as much as those with a high school diploma. Data from the most recent census similarly show that full-time workers who had attained a bachelor's degree earned \$57,026 in 2010 compared to \$34,197 for those with a high school degree.

Carnevale, Smith, and Strohl (2010) emphasized the growing value of a college degree by analyzing the change in the relationship between educational attainment and individuals' position in the income distribution from 1970 to 2007. In 1970, 47% of bachelor's degree holders had incomes in the middle four deciles of the income distribution, and 37% were in the top three deciles. By 2007, the share of bachelor's degree holders in the middle-class had decreased by nine percent, but the share in the top of the income distribution increased by 11%. In contrast, between 1970 and 2007 those

with a high school degree in the middle-class dropped from 60% to 45% and those in the lower-class increased from 22% to 35%. Thus, social class position appears to be increasingly tied to educational attainment in general, with bachelor's degrees being the primary gateway to the middle class and above.

Earning a bachelor's degree is also increasingly important for securing employment. Between 1976 and 2009, those with a high school diploma were more than twice as likely as those with a bachelor's degree to be unemployed, and even those with some college but no degree were approximately 65% more likely to be unemployed compared to college graduates (Elsby, Hobijn, & Sahin, 2010). These trends appear to have been exacerbated by the recent recession which began in 2008. As a report by the National Employment Law Project (2012) showed, employment losses occurred throughout the economy during the recession but were concentrated in the mid-wage professions, those often requiring more than a high school degree but less than a bachelor's degree. These mid-wage occupations constituted 60% of all employment losses during the recession but comprised only 22% of the job growth during the recovery thus far. In contrast, those occupations which require a bachelor's degree comprised 19% of the job losses during the recession but 20% of the jobs recovered, indicating that the recovery is essentially complete in this high-skill job market. While the unemployment rate for those with a bachelor's degree did increase during the recession, the increase in the unemployment rate for bachelor's degree holders was half of the increase for all other educational attainment levels. In short, the socioeconomic benefits conferred by a bachelor's degree are large and growing compared to the average earnings and

employment outcomes for those with either a high school diploma or some college but no bachelor's degree.

If the earnings gap between those with a bachelor's degree and those with lower levels of educational attainment continues to rise, what factors can explain this process? In Mincer's (1974) seminal research on education and earnings, it was assumed that the wage gap between college educated workers and high school graduates would widen as a cohort aged. In other words, attaining a bachelor's degree would increase the steepness of one's earnings trajectory compared to those with a high school diploma, resulting in a growing gap over time between those in the same age cohort with different levels of educational attainment. However, Card and Lemieux's (2000) study of age-cohort trends in the earnings gaps showed that the gap for older men is only slightly higher today than in the 1960s or 1970s while the earnings gap for young men has nearly doubled since 1975. These authors concluded that "virtually the entire rise [in the earnings gap] is attributable to changes in the relative earnings of *younger* college-educated workers" (p. 1). While Mincer's equation does not sufficiently explain this trend, Card and Lemieux contended that this phenomenon is largely explained by the slowed growth of bachelor's degree attainment rates. The supply of bachelor's degree holders for more recent generations is not meeting the growing economic demand, contributing to the rising wage differential between college and high school graduates.

Graduate and Professional School

Given the strong relationship between earning a bachelor's degree and entry into the middle-class and the fact that far more bachelor's degrees than graduate degrees are

conferred in the United States, the majority of research on attainment and earnings has focused on bachelor's degree attainment. However, increasing numbers of bachelor's degree recipients are going on to pursue graduate and professional education, and the socioeconomic benefits conferred by these degrees are naturally greater than those conferred by bachelor's degrees alone. Given that graduate and professional school constitutes the highest level of educational attainment possible in our higher education system, it is also important to discuss the relationship between graduate degree attainment and socioeconomic outcomes.

It is difficult to determine historical graduate and professional school attainment rates for the American population as the Census only recently changed the questions related to education on its surveys to inquire about educational attainment rather than years of schooling completed and to specifically ask about the completion of graduate and professional school. Prior to 1990 individuals were often grouped into a "bachelor's degree or higher" category which prevented calculations of the percentage of individuals overall, and the percentage of bachelor's degree recipients specifically, who had attained a graduate degree. However, as early as the 1990s this data began being collected, and at this time approximately 11.5 million Americans over the age of 25, or approximately seven percent of this age range, had attained a graduate or professional degree (US Census Bureau, 1990). As approximately 32 million individuals had attained at least a bachelor's degree, the percentage of bachelor's degree recipients that went on to complete a graduate degree at this time was about 35.5%. By 2010, Census data show that approximately 22.7 million individuals over the age of 25, or 11% of this population,

had attained a graduate or professional degree (US Census Bureau, 2012). While the population over 25 increased by roughly 13% during these two decades, the percentage of individuals receiving graduate or professional degrees increased by 20%, indicating that the growth in graduate attainment is outpacing population growth. However, as approximately 40 million adults had earned bachelor's degrees in 2010, the percentage of bachelor's degree recipients going on to attain a graduate degree has remained roughly constant over time, amounting to 35.9% of bachelor's degree holders in 2010 compared to 35.5% in 1990.

Unsurprisingly, the socioeconomic benefits of graduate and professional school are large, even when compared to the earnings of those with a bachelor's degree. Data from the Survey of Income and Program Participation show that the mean monthly earnings for those with a bachelor's degree were approximately \$2,100 in 1990, compared to \$2,800 for those with a master's degree, \$3,900 for doctorate recipients, and nearly \$5,000 for those with a professional degree. While a master's degree therefore conferred a 33% earnings premium, doctorate and professional degree holders earned approximately twice as much as those who ended their postsecondary education after earning a bachelor's. Although using mean earnings can provide misleading comparisons given the possibility of outliers, recent census data on median earnings still show large relative benefits. The median monthly earnings of bachelor's degree holders in 2009 was about \$4,300, compared to \$5,400 for those with a master's degree, \$6,800 for doctorates, and \$7,400 for professional degree recipients (Census, 2012). Although comparing 1990 mean earnings to 2010 median earnings makes it appear that the

earnings premium conferred by graduate degrees has decreased somewhat, the mean earnings wage premium has remained roughly constant over time.

Carnevale, Smith, and Strohl's (2010) analysis highlighted how the relationship between graduate school attainment and one's position in the socioeconomic distribution has also changed over time. In 1970, 46% of those with a graduate degree had incomes in the middle four deciles of the distribution and 41% were in the top three deciles, while only 13% were found in the bottom three deciles of the distribution. By 2007, the percentage of graduate degree holders in the middle-class had actually decreased substantially, from 46% to 30%. However, 61% of graduate degree holders were in the top three income deciles, an increase of 20%, and the percentage in the bottom three deciles had declined to nine percent. Thus, by 2007 more than 90% of individuals with a graduate degree had attained at least a middle class income, and they were twice as likely to be in the top three deciles of income as in the middle four deciles.

These socioeconomic benefits are equally evident from data on employment rates for those who have completed graduate school. The Bureau of Labor Statistics (2012) estimated that the unemployment rate for those with a high school diploma was 8.3% in 2012, compared to 7.7% for those with some college but no degree, 4.5% for bachelor's degree recipients, 3.5% for those with a master's degree, 2.5% for doctoral degree holders, and 2.1% for those with a professional degree. Individuals who attain a doctoral or professional degree are thus approximately four times less likely to find themselves out of work than those with a high school diploma or less and half as likely as bachelor's degree recipients. Attaining a graduate school education not only increases earnings for

those who secure employment, but also significantly increases the likelihood that individuals will find a job.

Variation in Earnings among College Graduates

The underlying theme of the preceding sections is straightforward: socioeconomic benefits increase with each level of schooling attained, and these relative benefits have either grown, or at least stayed constant, over time. As the purpose of this study is to investigate how socioeconomic origins influence postsecondary attainment and subsequent earnings, the following sections will review the research on the relationship between SES and attainment and the impact of socioeconomic origins on eventual earnings after controlling for educational attainment. However, the previous sections have focused primarily on the variation in socioeconomic outcomes between, rather than within, attainment levels. It is also important to review sources of variation in earnings among those with the same level of educational attainment, as these variables will need to be controlled for in the statistical models.

Numerous factors could contribute to variation in the earnings of college graduates, such as the region of the country in which they work, whether they are self-employed, and whether they work in the public or private sector. However, these factors all occur after students have completed postsecondary and entered the labor force. There are two important sources of variation in earnings that researchers have identified which occur during the postsecondary process, and these variables must be controlled for in order to accurately estimate the impact of SES on subsequent earnings controlling for

attainment. These factors are the quality of the postsecondary institution students attend and the major which they elect to pursue.

Institutional Quality and Earnings

As discussed in much of the literature on postsecondary choice and enrollment reviewed in previous sections, postsecondary access is not simply about whether one enrolls in a college or university but rather the type of institution one gains access to (Hearn, 1992). But while it is often taken for granted there exists a definite hierarchy within the postsecondary system, it is quite difficult to determine the quality of institutions in terms of the socioeconomic benefits they confer on students. Researchers have been studying the influence of various institutional characteristics on graduates' socioeconomic outcomes for a number of decades, but many of these studies, particularly the earliest work on this topic, suffer from a number of limitations and methodological errors. However, more recent research on institutional quality and socioeconomic outcomes has benefited from better samples and improved methodological techniques which have provided stronger evidence on the relationship between college quality and earnings.

One of the first studies to investigate the influence of college quality on earnings was Wales' (1973) analysis of the relationship between Gourman's academic rating of colleges and subsequent earnings using the NBER-Thorndike sample of World War II veterans. The Gourman ranking system, developed by Jack Gourman beginning in the 1960s, rated the quality of undergraduate academic programs at all universities in the country. Wales showed that undergraduate quality measured by the Gourman rankings

resulted in a significant boost in earnings for students, whether or not they earned a degree. For students who did not finish college, those who attended an institution in the lower four tiers of institutional quality earned 14% more than high school graduates with no college, while those who attended institutions in the highest quality tier earned 37% more. The earnings premium for college graduates compared to high school graduates was 29% for those who graduated from an institution in the bottom four tiers of institutional quality but 39% for graduates from the highest tier of institutions. Wales concluded that institutional quality did appear to be related to subsequent earnings, although he mentioned that he could not distinguish “the extent to which the quality variable reflects school quality as opposed to individual ability” given that the Gourman ranking was a composite index of both student ability variables and other measures of institutional quality (p. 313).

Solmon’s (1975) study also used the NBER-Thorndike sample of World War II veterans as well as the Gourman index to measure quality, to determine the relationship between college quality and earnings, but he complemented this analysis with specific measures of institutional quality. Solmon hypothesized that the effects of institutions on earnings could be broadly categorized as student quality measures, or the average academic achievement and ability levels of students attending the institution, and instructional quality measures, which he defined as consisting of variables such as faculty salaries, expenditures per student, library facilities, and research activity. His analyses provided evidence that “regardless of how quality is measured, the characteristics of one’s school significantly affect the log of subsequent earnings” (p. 551).

However, both of these studies suffered from a number of limitations. First, the NBER-Thorndike sample was a very restricted set of students (white, male, WWI veterans) which prevented the results of either study from being broadly generalizable. Second, while both studies used the Gourman ranking system to quantify institutional quality, this ranking system has been largely discredited as being “virtually without merit” given that Gourman constantly overrated large universities and underrated liberal arts colleges, the quality of specific institutions fluctuated considerably within relatively small timeframes, and Gourman never disclosed the specific formulas used to calculate quality (Webster, 1986, p. 323). Additionally, while Solmon argued that virtually all of his measures of institutional quality had a significant impact on earnings, none of his models explained more than 3% of the variance in eventual earnings. Thus, neither study provided strong evidence on the relationship between institutional quality and future earnings.

The next set of studies improved upon earlier work by using nationally representative samples of students and institutions and by focusing on specific characteristics of institutions to determine the relationship between those variables and socioeconomic outcomes. Loury and Garman (1995) used the National Longitudinal Study of the High School Class of 1972 (NLS:72) in their study and found that a 100 point increase in the median SAT of the college last attended raised the earnings of white students by 2.4% and Black students by 5%. However, median SAT was the only institutional quality variable included in their analyses, and the authors only included data on years of schooling completed rather than whether students had attained a degree. Their

failure to control for whether students completed their baccalaureate program may have biased their results in various ways, and only including median SAT as their sole measure of institutional quality likely resulted in omitted variable bias which would have overestimated the relationship between median SAT and earnings.

Estelle, Alsalam, Conaty, and To (1989) also used NLS:72 data and included a much broader range of variables to predict annual earnings. They broke these variables down into three categories: student background characteristics (family background, ability, prior achievement), student experiences at the institution (major, GPA), and institutional characteristics (private or public, expenditures per student). Their primary interest was the influence of the last category on earnings controlling for the previous two categories. The authors found that certain institutional characteristics, such as the median SAT score of students attending the institution and whether the institutional was a private college from the northeast, did have a statistically significant influence on earnings. However, taken together “the proportion of variance [in earnings] explained by these [institutional] characteristics is small and the impact on future productivity is probably smaller yet” (p. 251). They concluded that institutional characteristics were far less significant than the student experience variables included in the models, such as the GPA students maintained while in postsecondary and their choice of major.

Brewer, Eide, and Ehrenberg (1999) also used NLS:72 data, but in addition analyzed data from HS&B:80, which followed a cohort that graduated from high school in 1982 for 10 years, allowing them to investigate changes in the earnings advantages conferred by institutional quality. They defined college quality using Barron’s

Competitiveness Index. They collapsed the six Barron's categories into three groups which they defined as top, middle, and bottom quality institutions (with two of Barron's categories included in each group) and also separated public from private institutions. In their multivariate analyses, these authors predicted that students who attended the highest quality private schools in the country receive a significant boost in earnings (as high as 39% for certain cohorts) compared to those who attended the lowest quality public colleges even when controlling for students' socioeconomic background and academic achievement variables. The top public colleges were also estimated to increase earnings in some analyses, but this estimate was not consistently found to be significant. The authors concluded that attending the most selective colleges, and in particular private institutions, has a significant impact on graduates' earnings in the labor market, and that these benefits have increased over time. However, the statistical models of post-graduation earnings still explained relatively little of the variance in earnings (approximately 8%).

While much of this research provided inconclusive or weak evidence on the relationship between institutional quality and earnings, more recent research has demonstrated a stronger and more consistent relationship. Zhang (2005) controlled for a broad range of demographic, family background, academic achievement, educational attainment, and labor market experiences when estimating the influence of college characteristics on earnings. He concluded that graduates from high-quality institutions, whether public or private, enjoy nearly a 20% earnings premium over those who graduated from low-quality public colleges, and graduating from a middle-quality

institution confers a 10% earnings advantage. Hussain, McNally, and Telhaj (2009) similarly found a positive relationship between institutional quality and earnings controlling for a host of other variables. They also noted that the earnings advantage was highly non-linear in their study as the earnings premium increased significantly for graduates from the most selective institutions. Carnevale and Rose (2003) reached a similar conclusion in their review of the literature, noting that “the added earnings power of attending a highly selective college is worth the extra tuition” (p. 114). Overall, as statistical techniques have improved, the evidence on the socioeconomic benefits of attending a higher quality institution has become increasingly clear, reinforcing the perception that the social mobility of low-income students is likely hindered by their underrepresentation at the most selective institutions.

Field of Study and Earnings

While the quality and selectivity of the institution one attends has been found to significantly influence socioeconomic outcomes, perhaps even more important is the influence of the subject one elects to study during postsecondary. The earnings disparity between majors is now a widely documented phenomenon. For example, Census data show that the mean monthly earnings in 2009 for those with a bachelor’s degree were approximately \$5,400 (Ewert, 2012). However, engineering majors earned more than \$7,100 on average compared to \$3,800 earned by education majors, or nearly twice the monthly pay. This same patterns holds at the master’s degree level with those majoring in business, computer science, and engineering earning more than \$8,000 monthly compared to less than \$5,700 for liberal arts, social science, and education majors. The

same conclusions hold when analyzing median annual earnings. Engineering majors with a bachelor's degree earned a median annual salary of \$91,600 in 2011 while those who studied education earned \$50,902 (Ryan, 2012). In their analysis of employment outcomes after the recession, Carnevale, Cheah, and Strohl (2012) documented similar disparities between bachelor's degree recipients in terms of their likelihood of maintaining employment. They found that business and engineering majors had much lower unemployment rates compared to those who studied the arts, humanities and liberal arts, the social sciences, and particularly architecture (although this was largely caused by the collapse of the home construction industry resulting from the recession).

While such data provide a compelling picture of the relationship between major and earnings, it is also important to control for other background characteristics of students given that those who pursue different majors may be systematically different from each other in terms of their achievement and ability levels. Interesting, much of the early research which estimated how college major affects subsequent earnings was primarily intended to explain gender disparities in earnings of college graduates. For example, Angle and Wissmann (1981) used NLSY:72 data from the BLS to estimate the impact of gender on earnings for those who go on to postsecondary and found that controlling for field of study reduces the estimated gap in earnings, although only slightly. Daymont and Andrisani (1984) conducted a similar analysis using NLS:72 data but found that college major accounts for a much larger share of the gender variation in earnings among college graduates than the amount estimated by Angle & Wissman (1981), between one-third and two-thirds of the variance, even when controlling for pre-

achievement levels. They concluded that omitting college major leads to a significant overestimation of the degree of labor market discrimination against young female college graduates.

Estelle et al. (1989) also discovered significant differences in earnings for college graduates based on their choice of major, but once again their primary intent was not to explore how field of study influences socioeconomic outcomes but rather to estimate the influence of institutional quality on subsequent earnings. However, by controlling for other variables that could influence socioeconomic outcomes in their analyses, they found pronounced earnings gaps between various majors. Education majors were estimated to make significantly less than all other majors, while engineering majors earned 30% more annually than the reference group. These authors concluded that “while institutional characteristics do not explain a large proportion of the variance in earnings, other aspects of the *higher education experience* such as choice of major...matter a great deal” (p. 251). McGuinness (2003) reached the same finding in his analysis of institutional quality and labor market outcomes, concluding that “subject choice and degree classification are likely to be of greater importance in determining the return from a degree than having attended a more prestigious institution” (p. 12).

Given the substantial variance in the earnings of college graduates based on their field of study, it is also important to explore how the background characteristics of students influence their likelihood of choosing particular subjects. But while much research exists on gender stratification between fields within higher education (Angle & Wissman, 1981; Charles & Bradley, 2002; Davies & Guppy, 1997; Jacobs, 1995), less

research has explored how socioeconomic origin may influence the subject of one's specialization (Gerber & Cheung, 2008). As Goyette and Mullen (2006) stated, "In comparison to the abundance of research directed toward access and inter-institutional differentiation, the topic of intra-institutional differentiation has been largely neglected" (p. 497-98). One exception from the United States is Davies and Guppy's (1997) analysis of field of study and inequality in higher education. These authors found that once gender and ability variables are controlled for, socioeconomic origin variables on average do not affect the chances that students will pursue the more lucrative fields. However, they did find evidence that SES predicts both entry into selective colleges, congruent with much of the research previously discussed, and the choice of major for students attending elite colleges. In other words, while low-SES students are just as likely as their high-SES peers to pursue higher earning degrees on average, major stratification based on socioeconomic origins still exists within the most selective institutions.

Studies from other national contexts show conflicting results on this topic. Ayalon and Yogev's (2005) study of postsecondary expansion in Israel showed that "the opportunity to study prestigious and lucrative fields of study in the college is utilized mainly by students who resemble traditional students of these fields in their social origin, but not in their scholastic ability" (p. 237). In other words, students of higher socioeconomic origins were more likely to gain entry into the subjects with higher economic returns, even when they demonstrated lower ability levels. In contrast, van de Werfhorst, de Graaf, and Kraaykamp's (2001) study of students in the Netherlands showed that low-income students were more likely to pursue lucrative fields compared to

students from more privileged backgrounds. They interpreted this finding as evidence of students from privileged families placing a premium on accumulating social and cultural capital, conferred by subjects such as the humanities, arts, and literature, as opposed to emphasizing careers with high economic rewards.

Taken as a whole, the literature base on field of study and economic returns provides clear evidence that certain majors tend to command higher salaries than others, even when controlling for institutional selectivity, students' pre-collegiate achievement and ability levels, and students' demographic characteristics. However, what is less clear is the degree to which students' socioeconomic origins influences their field of study controlling for their ability and achievement. Some evidence points to low-income students being less likely to gain access into higher paying fields of study, particularly when attending elite institutions, while other studies argue that low-income students might actually be more likely to pursue higher paying occupations compared to their more affluent counterparts, who may place a higher premium on the cultural capital conferred by some professions which may be lower paying. The general lack of research on the relationship between socioeconomic origins and major choice prevents clear conclusions from being drawn.

Influence of Socioeconomic Background on the Labor Market Outcomes of College Graduates

Although there is variation in the labor market outcomes of college graduates based on their college major and the quality of the institution they attend, research clearly shows that bachelor's recipients experience significantly better post-graduate outcomes

compared to students with a high school education or less. However, for the purposes of the current study what is of primary importance is not disparities in labor market outcomes between students with different levels of educational attainment, but whether socioeconomic background influences the socioeconomic outcomes of students with equivalent levels of attainment.

One of the first studies to investigate this phenomenon was Hout's (1988) analysis of changes in the relationship between socioeconomic origins and occupational status that occurred between 1972 and 1985. Congruent with both prior and subsequent research, Hout found that socioeconomic origins significantly influenced the level of education that children attained and that socioeconomic rewards in the labor market had become increasingly tied to educational attainment over time. Hout also showed that among children who terminated their education after high school, socioeconomic origin had a strong effect on the occupation that students were able to secure. However, his analysis demonstrated that socioeconomic origin had no significant influence on occupational status among students who had earned a college degree. He concluded that for college graduates "current occupational status is independent of origin status. This finding provides a new answer to the old question about education's overcoming disadvantaged origins. A college degree can do it" (p. 1391). After Hout's initial study, multiple studies appeared to confirm this finding in other national contexts such as France, Sweden, and Germany (Breen & Jonsson, 2007; Breen & Luijkx, 2007; Vallet, 2004).

While Hout's work provided compelling evidence that earning a bachelor's degree is the great equalizer for children from lower socioeconomic origins, his work also

suffers from some important limitations. First, the data he used were primarily from the 1970s, and while subsequent studies analyzing 1980s data appear to support his findings (Hauser & Logan, 1992) it is important to see if his findings hold for more recent generations given certain indications of growing inequality and stratification in the postsecondary system. But perhaps more importantly, Hout focused on a very specific aspect of socioeconomic status, that of occupational position. Hout's analyses showed that the occupations of parents had no bearing on the eventual occupational status of children, as long as the children attained a college degree. However, including other aspects of SES, such as family income and individual earnings of graduates, may lead to different conclusions as to the relationship between socioeconomic origin and socioeconomic outcomes controlling for attainment.

Torche (2011) extended Hout's study by conducting analyses on more recent cohorts of graduates, investigating whether there are disparities in labor market outcomes for students from different SES backgrounds who pursued and completed graduate education, and including other measures of SES in her analysis. Regardless of the measures of SES used, Torche's findings generally supported the original work of Hout that socioeconomic background influenced the socioeconomic outcomes of students with a high school degree or less but did not impact the outcomes of those students who had completed a bachelor's degree. This finding held across multiple analyses and when using multiple different datasets. However, Torche also found that socioeconomic origin did appear to influence the labor market outcomes of students who had completed graduate or professional school. As she stated, "The influence of parental income on

sons' income is substantial among those without a college degree, it declines to insignificance among college graduates, and then it regains strength among advanced-degree holders, to levels even higher than for those with less than high school" (p. 788). Torche thus theorized a U-shaped pattern of the influence of SES on socioeconomic outcomes controlling for educational attainment. Although she was unable to definitively say what might be causing this U-shaped pattern, her findings provided some evidence that socioeconomic origin continues to influence the labor market outcomes of children, even for those who attained high levels of education.

However, not all researchers have reached the degree to which attaining a bachelor's degree reduces disparities in the socioeconomic outcomes of students from different SES backgrounds. For example, Rumberger (2010) analyzed the influence of socioeconomic background, ability, and postsecondary attainment on subsequent earnings in the labor market using data from NELS:88. He found that SES significantly influenced students' earnings even when controlling for students' postsecondary experiences. However, Rumberger elected to convert degrees attained into years of schooling (e.g., a bachelor's degree represented 16 years of schooling) and use this continuous variable of years of schooling in his analyses, rather than focus specifically on the influence of SES on earnings for bachelor's degree recipients.

These studies importantly contributed to our understanding of the relationship between SES and labor market outcomes for students who have attained the same level of education, but neither study controlled for the field of study which students pursued. Given the substantial variation in earnings between fields of study, it is also important to

determine how this factor may influence socioeconomic outcomes. One of the few studies to investigate this phenomenon was Hansen's (2001) study of the Norwegian population. She found that students who came from higher classes tended to have the highest earnings, even when controlling for educational level and field of study. However, her analyses also indicated that among students who had majored in the "hard" fields, such as science, engineering, and mathematics, few socioeconomic disparities in earnings were present, while earnings gaps between SES subgroups were far more present for students who pursued fields such as the humanities, arts, and social sciences. Hansen hypothesized that the cultural capital transmitted by higher class parents to their children may provide them with greater advantages in fields that value such cultural capital, while this cultural capital is less economically rewarded in fields that place a premium on the knowledge and skills often defined as human capital, such as the more scientific or technical fields. While no such studies investigating this phenomenon have been conducted on American students to the author's knowledge, Hansen's work highlights another mechanism through which socioeconomic background may influence students' eventual socioeconomic outcomes, even when controlling for educational attainment.

Although investigating whether earnings disparities exist among individuals with the same level of educational attainment based on their socioeconomic origin is important in order to determine the degree to which higher education serves as an effective vehicle for social mobility, research in this area is quite scant. Early studies showed a limited relationship between socioeconomic origins and outcomes once educational attainment

had been controlled for, at least for students who had attained a degree, while some American studies and research from other national contexts suggest that SES may continue to influence labor market outcomes above and beyond its influence on educational attainment. However, once again the dearth of research in this area prevents strong conclusions from being drawn about the influence of SES on students' socioeconomic outcomes controlling for educational attainment.

Explanations of the Impact of SES on Labor Market Outcomes

Although research on the impact of socioeconomic background on the labor market outcomes of college graduates is somewhat limited, two theoretical perspectives are perhaps most relevant to this phenomenon: human capital and social capital. Human capital theory generally posits that individuals' experiences in the labor market are a product of their degree of human capital (measured primarily by education, experience, and ability level) and the demand for that capital in the market (Becker, 1962, 1964; Card, 1999; Card & Lemieux, 2000; Mincer, 1974; Schultz, 1961). Thus, from the human capital perspective, one's socioeconomic background should be irrelevant to the level of compensation one commands in the market after controlling for postsecondary attainment and other human capital variables.

In contrast, social capital theory highlights how the social ties individuals enjoy may also influence their eventual labor market outcomes (Coleman, 1988; Conley, 2001). As applied to the current study, social capital theory would therefore predict that students from privileged backgrounds may be able to access their social networks more effectively than low-SES students in order to obtain higher paying and more prestigious positions in

the labor market, even among students who attained a bachelor's degree. The absence of labor market disparities between students from different socioeconomic backgrounds who traversed similar postsecondary pathways would therefore support the human capital framework, while the presence of such disparities would suggest that alternative perspectives, such as social capital theory, might be necessary to explain this phenomenon.

SUMMARY

The process of experiencing social mobility through higher education requires the successful transition through a series of postsecondary stages. Research investigating the relative impact of SES across educational transitions using the technique of sequential logit modeling, the methodological approach used in the current study, have generally found that the impact of SES declines steadily across educational transitions as students progress through postsecondary. Researchers using a variety of alternative methodological techniques have reached a similar conclusion regarding the impact of SES on students' transition from baccalaureate attainment to graduate school enrollment, namely that SES ceases to exert a significant influence on this transition, particularly once the quality or selectivity of students' undergraduate institution has been controlled for. However, the literature reviewed above highlights a number of limitations of the body of research on stratification and social mobility in higher education using sequential logit modeling.

The first is that the majority of studies using sequential logit modeling have only analyzed three postsecondary transitions: college enrollment, the receipt of a degree or

credential, and graduate school participation. Yet a large and growing body of research has identified significant disparities in other intermediate stages of students' postsecondary pathways, such as college application and acceptance. Thus, while sequential logit modeling research has identified significant disparities in enrollment, without also analyzing the impact of SES on application and acceptance rates it is impossible to know whether disparities in enrollment are caused by disparate rates of application, acceptance, or matriculation.

The reviewed research also underscores the importance of accounting for the extreme degree of stratification in the higher education system. For example, socioeconomic disparities exist in both college application rates and enrollment even when the outcomes are defined as applying to and enrolling in any postsecondary institutions, but the gaps are substantially larger when selective institutions in particular are considered. In contrast, while research on college completion has identified significant socioeconomic in postsecondary attainment overall, some research suggests that no disparities exist among students that enroll in particular types of institutions, such as highly selective ones. Research using sequential logit modeling often aggregates all postsecondary institutions together, but this aggregation may result in a loss of nuance and contextual understanding of how socioeconomic disparities at particular postsecondary stages vary based on the selectivity of the institution.

Another common theme of much of the research discussed is a degree of ambiguity regarding the extent to which disparities in academic ability or preparation are sufficient to explain disparities in postsecondary outcomes. For specific stages, such as

college application, it appears that even high-ability students from disadvantaged backgrounds apply to colleges, and in particular selective colleges, at rates significantly lower than their high-SES counterparts. However, in other stages, such as acceptance and attainment, some research argues that controlling for academic preparation accounts for the majority of socioeconomic disparities. Either way, this research highlights the importance of investigating how variation in academic preparation impacts the magnitude of socioeconomic disparities at particular stages.

Finally, while sequential logit modeling research has been primarily interested in estimating the magnitude of socioeconomic disparities in postsecondary stages, it is also important to consider the effects of social background on college graduates' transition into the labor force. Once again, there is a degree of ambiguity regarding the extent to which socioeconomic background influence this transition. Some research suggests that baccalaureate attainment is sufficient to overcoming the effects of a disadvantaged upbringing, while other research has concluded that significant disparities in labor market outcomes based on socioeconomic origins exist even among college graduates. Thus, in order to fully understand how and to what extent socioeconomic background influences students' likelihood of experiencing social mobility, the transition into the labor force must also be analyzed.

CHAPTER 3: METHODOLOGY

As highlighted in the previous chapter, socioeconomic disparities have been identified in nearly all stages in students' college-to-career pathways, yet only a modest amount of research has attempted to quantify and statistically estimate the relative impact of SES at each stage in order to determine where SES is most influential. The body of literature that has sought to answer that question, stimulated by Mare's (1980, 1981) seminal work, has contributed to a common perception that the effect of socioeconomic background declines steadily across educational transitions, particularly as students progress through postsecondary (Hauser & Andrew, 2006; Mare, 1980; Shavit, Arum, & Gamoran, 2007). However, this research tradition has a number of important limitations.

The purpose of this chapter is to discuss the methodological approach that will be used in the current study. We will begin by reviewing sequential logit modeling, the methodological approach underlying the body of research on the relative impact of SES across educational transitions, and discuss its strengths and weaknesses. The next section will discuss how this methodology will be applied, expanded, and refined in the current study. The subsequent sections will then describe the dataset that will be used for this research, characteristics of the sample, and the variables used in the statistical analyses.

REVIEW OF SEQUENTIAL LOGIT MODELING

Although many researchers studied the relationship between socioeconomic background and educational attainment prior to the 1980s, Robert Mare (1980, 1981) is widely believed to be the first researcher to apply the technique of sequential logit modeling to the study of the effects of SES on educational progression. As Hauser and

Andrew (2006) noted, prior to Mare's studies the majority of research on social stratification in educational attainment employed linear probability models of school continuation or linear models of highest grade completed, and the majority of this research "uniformly emphasized the stability of the stratification process in general and the effects of parental socioeconomic status on educational attainment" (p. 2).

Mare re-conceptualized this process as a series of "school continuation decisions," each of which may be influenced by SES to a different degree, and applied a logistic response model in which he restricted the sample for later educational transitions to only those students who had successfully passed through earlier stages (Hauser & Andrew, 2006). Mare argued for the importance of this methodology given that "analyzing the causes of college attendance for all persons, for example, confounds the effects of family background on making the transition from high school to college with the cumulative impact of background over all previous transitions" (p. 295). Failing to restrict the sample in this way can therefore lead to erroneous conclusions about the influence of SES on later stages of educational attainment. In his seminal study, Mare (1980) used data from the 1973 Occupational Changes in a Generation Survey (OCGS), a supplement to the March 1973 Current Population Survey (CPS), which sampled noninstitutionalized working males between the ages of 20 and 65. Mare then estimated the impact of SES on the likelihood that students passed through a number of stages, including completing eighth grade, attending high school, graduating from high school, attending college, graduating from college, and attending graduate education. Mare's results showed that the influence of SES is pronounced as children pass through the

earlier stages of educational attainment but that this influence weakens considerably over time. Social background variables explained approximately 27% of the variance in elementary school completion but accounted for half as much variation in high school completion and had no significant impact on graduate school attendance for those who had finished a bachelor's degree. Mare concluded that SES has a profound influence on school continuation at earlier stages but minimal impact on postsecondary outcomes.

Mare's studies subsequently spawned a broad array of research from sociologists and educational researchers that sought to apply this statistical technique, which has also been described as sequential response modeling (Maddala, 1983) or the continuation ratio logit model (Agresti, 2002), to the study of educational progression in other contexts. Sequential logit modeling was used in two pioneering international comparative studies of educational expansion and social stratification at the K-12 (Shavit & Blossfield, 1993) and postsecondary (Shavit, Arum, & Gamoran, 2007) levels. The empirical estimates of the impact of social background variables across educational traditions also inspired various theories of the relationship between education, inequality, and social mobility, most notably Raftery and Hout's (1993) theory of Maximally Maintained Inequality (MMI) and Lucas' (2001) similar theory of Effectively Maintained Inequality (EMI).

However, sequential logit modeling and the research on education and stratification it stimulated has not been met with praise and support from all corners. One of the more notable criticisms of the approach came from the field of economics by Cameron and Heckman (1998), which argued that the approach had a number of important limitations. First, they contended that the model did not provide informative

results given that it is not behaviorally motivated. In other words, the model does not represent how socioeconomic background influences the choices of rational actors to continue through particular educational stages. Second, the authors also noted that the estimates of the family background variables included in sequential logit models can potentially be significantly biased by unobserved variables. Finally, they also argued that the declining magnitude and significance of SES variables across educational transitions is a statistical artifact of the logit functional form rather than an accurate reflection of a true decline in the importance of social background across transitions.

Another critique of the traditional sequential logit modeling approach is that it is unable to sufficiently account for stratified pathways within the educational system. As Breen and Jonsson (2000) argued:

While sequential transitions are important in all school systems, many – notably those of European countries – also contain parallel branches of study. These can be seen as qualitatively different and alternative pathways that may or may not converge at a later stage. If they do converge, different transition probabilities typically attach to them. (p. 754)

Although this critique may be far more salient in many European nations compared to the United States in terms of K-12 education, it is particularly relevant in the study of higher education in the US. Postsecondary institutions in the US are stratified on a number of dimensions, including selectivity, institutional resources, the levels of degrees they award, and other factors. This fact has two important implications for the study of SES and postsecondary progression. The first is that treating the entire postsecondary system

as a unified entity may result in the underestimation of the impact of SES on postsecondary enrollment, as low-SES high school graduates are more likely to attend college than not but are substantially underrepresented at the more selective institutions (Bastedo & Jaquette, 2011; Carnevale & Rose, 2003). Additionally, it is possible that the impact of SES on later transitions, such as persistence, attainment, graduate school participation and completion, and even labor market outcomes, may depend on the type of institution in which students enroll. It is therefore important to account for institutional stratification when attempting to estimate the relative impact of SES across transitions.

Given these criticisms of the traditional sequential logit model, this methodological approach has been revised and expanded by a number of researchers. Breen and Jonsson (2000) proposed a multinomial model to account for the possibility of more than two discrete outcomes (progressed or did not progress) at each stage. Stolzenberg (1994) used probit regression to overcome the possibility that the declining significance of SES across transitions was simply an artifact of the logistic parameterization of the model. Hauser and Andrew (2006) introduced a modified sequential logit model approach in which social background effects are constrained to vary proportionally across transitions, which they termed the conditional logistic model with partial proportionality constraints (CLPPC). But while the sequential logit model approach has been modified in a number of ways and each approach has revealed additional nuances of this phenomenon, the conclusion from the majority of studies in this tradition has remained relatively unchanged during the more than three decades of this research tradition's history, namely that the effect of social background is more

pronounced on earlier transitions and declines in significance as students progress through the educational system (Hauser & Andrew, 2006; Mare, 1980, 1981; Shavit, Arum, & Gamoran, 2007; Stolzenberg, 1994).

While the various modifications which have been made to the sequential logit modeling approach have not significantly changed our understanding of the relative impact of socioeconomic background across educational transitions, this line of research still suffers from a number of shortcomings. Perhaps the most obvious is that it has often failed to include important postsecondary stages as outcomes in the analysis. The postsecondary stages which are generally included in these studies include high school graduation, college enrollment, college completion (i.e., baccalaureate attainment), and graduate school enrollment and/or completion. However, as discussed in Chapter 2, there are a number of intermediate stages in which significant socioeconomic disparities have been identified (Klasik, 2012). Just as Mare argued for the importance of analyzing transitions separately and restricting the sample for a later transition to only individuals that had passed through all previous transitions to ensure that the parameter estimates accurately reflect the impact of SES on that stage, the exclusion of important stages may result in skewed understandings of the relationship between family background and educational progression. For example, most research in this vein has analyzed college enrollment, but almost none has analyzed college application and acceptance. Even if SES is estimated to impact postsecondary enrollment, it is not clear whether this is caused by low-SES students not applying to college, not being accepted, or not enrolling conditional upon acceptance with the same frequency as their equivalent high-SES peers.

The second limitation of this research tradition is that it has failed to sufficiently account for the extreme degree of stratification within higher education. Although Breen and Jonsson (2000) rightly underlined the importance of attending to stratified pathways within the educational system and used a multinomial approach to model the possibility of more than two discrete options at each transition point, their study still treated all university enrollment as one and the same. The three postsecondary outcomes they included were non-enrollment, short-cycle enrollment (the analog to the sub-baccalaureate system in the US), and university enrollment, and they did not further disaggregate universities. While this may be appropriate in national contexts with less inequality between universities in terms of student populations and institutional characteristics, the highly stratified nature of the US higher education system makes this approach less than ideal.

Third, this research has traditionally focused on deriving estimates of the average impact of SES for all students. While this approach is reasonable a priori, some studies suggest that this assumption may not be reflective of the actual relationship between SES and postsecondary progression. In Hoxby and Avery's (2012) study, they found that there were no disparities in acceptance, enrollment, persistence, or attainment for high-ability students that applied to highly selective colleges. Their study therefore suggests that academic ability may mediate the relationship between socioeconomic background and the likelihood that students will pass through postsecondary stages, yet to the author's knowledge no research has intentionally investigated this possibility.

However, it is not immediately evident whether it is students' academic ability, institutional selectivity, or the combined interaction of the two factors that results in students' socioeconomic background to no longer influence their likelihood of earning a degree. The study therefore raises a number of important questions about the relationship between socioeconomic background, academic ability, and institutional selectivity. For example: do socioeconomic disparities in completion exist among high-ability students that enroll in less-selective institutions; do attainment disparities exist among lower ability students that enroll in highly selective institutions, and; do socioeconomic disparities exist in earlier stages such as acceptance and enrollment when high-ability students apply to less selective institutions? In short, it is possible that socioeconomic background, academic ability, and institutional selectivity may interact in unexpected ways, yet limited research has explored these interactions. It is therefore important to examine how this "trinity" of postsecondary resources, namely socioeconomic resources, academic resources, and institutional resources, may interact to influence postsecondary outcome.

Finally, while sequential logit modeling rightly points to the importance of conceiving of the process of educational attainment as a sequence of stages and separately examining the impact of SES on each stage, to the author's knowledge no research in this tradition has also examined students' transitions into the labor market. This is somewhat unsurprising given that this is not an "educational transition," and the only labor market outcome which makes sense to investigate through logistic regression is whether students are employed or not. Rates of employment and unemployment are

important measures of the health of the economy, as well as the efficacy of the educational system to promote social mobility by helping students find employment, but research on individuals' labor market outcomes often analyzes their wages or earnings in order to provide a more holistic understanding of their socioeconomic status. But although students' transition into the labor force is not an ideal fit for sequential logit modeling, it is also important to assess the degree to which socioeconomic background impacts the labor market outcomes of college graduates in order to determine the degree to which the higher education system is truly promoting the social mobility of low-SES students.

METHODOLOGICAL APPROACH AND RESEARCH QUESTIONS OF THE CURRENT STUDY

Given these limitations in our understanding of the relationship between socioeconomic background, postsecondary progression, and social mobility, the current study addresses four overarching research questions:

- 1) To what extent does socioeconomic background influence the likelihood that students will successfully pass through each postsecondary transition?
- 2) How do academic ability and institutional selectivity moderate the impact of socioeconomic background across postsecondary stages?
- 3) To what extent does socioeconomic background impact the labor market outcomes of college graduates?
- 4) How do academic ability and institutional selectivity moderate the impact of socioeconomic background on students' transition into the labor market?

The first research question will be addressed following Mare's (1980, 1981) general approach, but with a few modifications. In addition to the commonly analyzed stages of college enrollment, baccalaureate attainment, and graduate school enrollment, the study will also include the postsecondary transitions of college application, acceptance, persistence, and graduate school completion, for a total of seven postsecondary stages. Separate logistic regression models are fit to each stage in the postsecondary process and thereby restricting the sample to only students who are eligible for a given transition. The same variables are generally included in each model, allowing for a picture of how the impact of each variable varies across transitions.

One additional modification will be made to Mare's original approach. The dataset used for this study (discussed in the following section) first selects a sample of high schools from across the country, and then selects a sample of students from each school. Students are thus considered to be clustered in schools. Researchers have noted that such clustering often results in students from the same school to be more similar to each other compared to students from other schools, violating the independence of observations assumption of regression techniques which can introduce bias in both the parameter estimates and the standard errors of the estimates. Multilevel modeling techniques (Guo & Zhao, 2000; Raudenbush & Bryk, 2002) are therefore utilized in order to account for the potential clustering and non-independence of students within schools. The statistical equation for the models can be described as:

$$\text{logit}(\pi_{ij}) = \alpha_j + \beta_1 x_{1ij} + \beta_2 x_{2ij} + \dots$$

$$\alpha_j = \alpha + \gamma_1 z_{1j} + \gamma_2 z_{2j} + \dots + u_j$$

where the outcome is the log odds of student i from high school j successfully making a particular postsecondary transition and the β terms are the estimates of the impact of the student-level covariates (x_{ij}) on the log odds. The equation also assumes that the intercept varies randomly at the school level, with each school's intercept being a combination of the grand mean intercept (α), estimates (γ) of the school-level covariates (z_j) and that school's deviation from the grand mean after controlling for school-level covariates (u_j), or the level-2 random effect which is assumed to be normally distributed with mean 0 and standard deviation σ_u .

The second research question is then addressed by further expanding Mare's approach in a number of ways. First, the total sample is disaggregated into separate ability quartile cohorts and the same sequential logit models are fit to each ability sub-sample. This technique therefore illuminates whether the magnitude of socioeconomic disparities in transition probabilities varies by student ability level. Next, institutions are disaggregated into three tiers of institutional selectivity (selective, moderately selective, and non-selective), based on Barron's Admissions Competitive Index (described below), and once again the logit models are fit for the different selectivity levels. This allows us to explore if socioeconomic disparities are greater at particular types of institutions. Finally, these techniques are combined and logit models are fit to each combination of student ability group by institutional selectivity level. This provides an understanding of whether disparities vary by ability level controlling for institutional selectivity and, conversely, whether gaps vary by selectivity level controlling for student ability.

The one outcome which is slightly different than the other outcomes is persistence, which warrants additional discussion. Sequential logit modeling assumes that one must pass through all previous transition points in order to be eligible for a later transition. For example, one cannot earn a bachelor's degree unless one enrolls in college. This makes persistence a difficult outcome to analyze in the context of sequential logit modeling. Whether persistence is defined as persisting in the institution in which the student first enrolled or persisting in higher education altogether, students frequently stopout from higher education temporarily but return and complete a degree (Goldrick-Rab, 2006). Thus, persistence as it is defined in this study is not a prerequisite to attainment. In order to account for this possibility, the outcome in the models of persistence is whether students did not stopout or transfer to a community college by the summer of 2006 (two years after high school graduation) but the subsequent models of attainment are not restricted to only students who persisted by this definition. The sample size for the models of persistence and attainment are therefore equivalent in all analyses.

The third research question is addressed by focusing exclusively on students that earned a bachelor's degree by the completion of the study and analyzing their labor market outcomes. The first outcome that is analyzed is whether students were able to find employment after graduation. Given the dichotomous parameterization of this variable (employed/unemployed), this stage is also analyzed using logistic regression and can be considered the final transition in students' college to career pathways. However, this model should not necessarily be considered as part of the sequential logit framework given the fact that students in the sample are not required to have sequentially passed

through each prior stage. For example, students that began at a community college before transferring to a university and earning a degree are included in the analysis, even though they were excluded from the postsecondary sequential logit models.

The impact of socioeconomic background on the wages and earnings of college graduates will then be analyzed. As the variables in these analyses are continuous, regression methods for a continuous outcome variable will be used. In the first set of models, the outcome variables will not undergo any type of transformation, and the parameter estimates of the independent variables included in the models will therefore represent their impact on real earnings or wages. However, linear regression techniques require that the outcome variable be normally distributed, which is often not the case for either wages or earnings as small numbers of high-earners often creates a positively skewed distribution. A common and long-established means of addressing this issue is to have the outcome variable undergo a log-transformation, which results in a more normal distribution of the wages and earnings variables (Mincer, 1974). Separate models are therefore fit with log-transformed dependent variables. For all labor market outcomes multilevel techniques are once again utilized, but in this instance the level-2 variable is the postsecondary institution which students graduated from.

Similar to the postsecondary analyses, the fourth research question will be addressed by disaggregating the sample and fitting separate models to each sub-sample. Students will be disaggregated both into separate ability groups and based on the selectivity of the institution from which they graduated in order to determine whether socioeconomic disparities in labor market outcomes vary based on students' background

ability or institutional selectivity. However, because the number of students that earned bachelor's degrees and did not go onto graduate school is far smaller than the original sample, models of student ability by institutional selectivity combinations are not feasible.

DATA AND SAMPLE

This study utilizes NCES' Education Longitudinal Study of 2002 (ELS:02). As described in the Base Year Data File User's Manual for ELS:02 created by NCES, the survey has followed a nationally representative cohort of students since their sophomore year in 2002. ELS:02 is the latest in NCES' series of National Education Longitudinal Studies. The former studies in this series include the original National Longitudinal Study of the High School Class of 1972 (NLS:72), the High School and Beyond study of 1980 (HS&B:80), and the National Education Longitudinal Study of 1988 (NELS:88). While many studies reviewed in Chapter 2 utilized these former studies, few studies have analyzed ELS:02 given its novelty, particularly for analyzing postsecondary attainment and labor market outcomes. Additionally, ELS:02 currently provides a wealth of data on student backgrounds, high school experiences, and initial college access and choice information.

In terms of its sampling design, ELS:02 used a two-stage sample selection process. In the first stage, NCES chose a target population of regular public schools, Catholic schools, and other private schools that contain 10th grade students. Schools were selected with probability proportional to size (PPS) using a stratification method which used US Census divisions to divide the country into eight regions and select a

representative sample of schools from each of those regions. Substrata of metropolitan status (urban, suburban, and rural) were also created within states that were large enough to provide reliable substrata. School contacting resulted in an eligible population of 1,221 public, Catholic, and other private schools which contained 10th grade students. Of the 1,221 eligible schools 752 participated in the study, and these 752 schools constitute a nationally representative sample of schools that contained 10th grade students in the United States in 2002.

After these 752 schools that participated in the study were identified, each school provided lists of all 10th grade students. A stratified systematic sample of students was then performed with the student strata being racial/ethnic categories. Asian and Hispanic students were intentionally oversampled in order to estimate subpopulation parameters within precision requirements. This stratified sampling procedure produced a list of approximately 17,600 students who were eligible for the study. During the base year in 2002, these students were contacted and more than 15,000 high school sophomores elected to participate in the study for a weighted response rate of 87.3%. This cohort of students constitutes a nationally representative sample of the entire population of American 10th grade students attending schools in the target population of eligible schools (once weights are applied to correct for oversampling). Investigating the educational patterns and pathways of these students thus provides a representative picture of the educational trajectories of all students who were sophomores in 2002. Students were provided with a series of assessments during the base year in order to determine their academic ability in multiple subjects. Also during the base year, non-student

respondents, including teachers, administrators, and parents, were asked to participate in the study by completing interviews and questionnaires. The ELS:02 thus provides a rich array of data on other school and contextual variables that may influence students' educational progression.

After the initial base year study in 2002, students were surveyed again in 2004, 2006, and in 2012. During the first follow-up in 2004, students were once again given the same battery of assessments that were administered in 2002 in order to determine their learning growth from their sophomore to their senior year. Data on whether students transferred to another school, dropped out of high school before their senior year, or graduated from high school early were collected during this time. Student high school transcripts were also collected during the first follow-up which provided data on courses completed, grades, and SAT/ACT scores, among other variables. The second follow-up occurred in 2006 when the majority of students had been out of high school for approximately two years. Data on postsecondary applications, postsecondary enrollment, financial aid, and other postsecondary information were collected during this time for those students who had attended postsecondary, and labor market experiences were analyzed for students who had not enrolled in a college or university. The third and final follow-up occurred in 2012, six years after the second follow-up and eight years after students had presumably graduated from high school. Students were surveyed regarding their postsecondary enrollment experiences, postsecondary persistence and transfer behavior, and whether students had entered graduate school. These data were supplemented with actual postsecondary transcripts collected for each institution that

students attended between 2004 and 2012. Additionally, employment and earnings data were collected during the final follow-up. In sum, ELS:02 contains detailed data for a ten-year window on the college-to-career pathways of a nationally representative cohort of students.

While a number of separate analyses on sub-samples will be conducted, the initial sample that is used for the study includes students that were present in the base year and graduated high school by the summer of 2004, for a sample of $n = 13,146$ students. This sample will be used to calculate descriptive statistics and progression rates, such as the percentage of students that passed through each stage. Descriptives of the sample can be found in Table 1 below. For dichotomous variables, the mean can be interpreted as the percentage of students in the sample that fall into that category. For example, the sample is slightly biased toward more affluent students, as only 20% of students in the sample are low-SES compared to 31% which are high-SES. This is due to the fact that low-SES students were less likely to have completed high school by 2004. However, the statistical analyses require that students also participated in the base year and first-year follow-up surveys and that their high school transcripts were collected. Students that did not participate in these phases of the study had large sections of data missing, preventing statistical imputation of missing data from being a viable approach. The sub-sample of students that met all of these criteria includes $n = 11,749$ students, which is the sample used for the statistical analyses. Descriptives of this sub-sample are included in Table 2. The analytic sample is very similar to the full sample of HS graduates in most respects and has an equivalent socioeconomic distribution.

Table 1: Descriptives of Full High School Graduate Sample

	Min	Max	Mean	SD
Lowest SES Quartile	0	1	0.20	0.40
Second Lowest Quartile	0	1	0.23	0.42
Second Highest SES Quartile	0	1	0.25	0.44
Highest SES Quartile	0	1	0.31	0.46
Native Haw/Pac Isl, Amer Ind, or Multiracial	0	1	0.06	0.23
Asian	0	1	0.10	0.29
African-American	0	1	0.12	0.33
Hispanic	0	1	0.13	0.34
White	0	1	0.60	0.49
Male	0	1	0.48	0.50
Female	0	1	0.52	0.50
Student is not native English speaker	0	1	0.16	0.36
Math test standardized score	19.38	86.68	51.85	9.65
Reading test standardized score	22.57	78.76	51.63	9.69
Zscore: Math test standardized score	-3.36	3.61	0.00	1.00
Zscore: Reading test standardized score	-3.00	2.80	0.00	1.00
Total AP/IB courses	-4	18	0.55	2.05
GPA for all courses	-9	4	2.42	1.80
Attended Public High School	0	1	0.76	0.43
Attended Catholic High School	0	1	0.14	0.35
Attended Other Private High School	0	1	0.10	0.30
Attended Urban High School	0	1	0.33	0.47
Attended Suburban High School	0	1	0.49	0.50
Attended Rural High School	0	1	0.18	0.39
Attended High School in Midwest	0	1	0.26	0.44
Attended High School in South	0	1	0.36	0.48
Attended High School in West	0	1	0.20	0.40
Attended High School in Northeast	0	1	0.18	0.39

Notes: $n = 13,146$ students

Table 2: Descriptives of Analytic Sample

	Min	Max	Mean	SD
Lowest SES Quartile	0	1	0.20	0.40
Second Lowest Quartile	0	1	0.23	0.42
Second Highest SES Quartile	0	1	0.25	0.43
Highest SES Quartile	0	1	0.31	0.46
Native Haw/Pac Isl, Amer Ind, or Multiracial	0	1	0.06	0.23
Asian	0	1	0.10	0.29
African-American	0	1	0.12	0.32
Hispanic	0	1	0.13	0.33
White	0	1	0.60	0.49
Male	0	1	0.49	0.50
Female	0	1	0.51	0.50
Student is not native English speaker	0	1	0.16	0.36
Math test standardized score	19.38	86.68	52.01	9.61
Reading test standardized score	22.57	78.76	51.79	9.67
Zscore: Math test standardized score	-3.36	3.61	0.02	1.00
Zscore: Reading test standardized score	-3.00	2.80	0.02	1.00
Total AP/IB courses	0	18	0.87	1.76
GPA for all courses	0	4	2.86	0.74
Attended Public High School	0	1	0.76	0.43
Attended Catholic High School	0	1	0.15	0.35
Attended Other Private High School	0	1	0.09	0.29
Attended Urban High School	0	1	0.32	0.47
Attended Suburban High School	0	1	0.50	0.50
Attended Rural High School	0	1	0.18	0.39
Attended High School in Midwest	0	1	0.26	0.44
Attended High School in South	0	1	0.36	0.48
Attended High School in West	0	1	0.20	0.40
Attended High School in Northeast	0	1	0.18	0.38

Notes: $n = 11,749$ students

To highlight some of the differences between socioeconomic subgroups, Table 3: Sample Means by SES Subgroup below presents the sample means by SES subgroup. As evidenced by this table, students from different socioeconomic backgrounds vary on a number of important characteristics. More than 70% of the high-SES subgroup is white, compared to less than 40% of low-SES students. High-SES students also score about one standard deviation higher on the ELS assessment on average and have a GPA 0.5 points higher than low-SES students, and are much more likely to have attended private schools.

Table 3: Sample Means by SES Subgroup

	Low-SES	Low-Mid-SES	High-Mid-SES	High-SES
Native Haw/Pac Isl, Amer Ind, or Multiracial	0.05	0.06	0.06	0.05
Asian	0.13	0.07	0.08	0.10
African-American	0.18	0.15	0.11	0.07
Hispanic	0.26	0.13	0.10	0.07
White	0.38	0.59	0.65	0.72
Male	0.45	0.48	0.50	0.50
Female	0.55	0.52	0.50	0.50
Student is not native English speaker	0.32	0.13	0.11	0.11
Zscore: Math test standardized score	-0.54	-0.22	0.08	0.50
Zscore: Reading test standardized score	-0.56	-0.21	0.08	0.50
Total AP/IB courses	0.45	0.42	0.76	1.57
GPA for all courses	2.62	2.73	2.88	3.13
Attended Public High School	0.93	0.84	0.76	0.59
Attended Catholic High School	0.05	0.11	0.15	0.23
Attended Other Private High School	0.03	0.05	0.09	0.17
Attended Urban High School	0.33	0.28	0.30	0.36
Attended Suburban High School	0.46	0.49	0.52	0.51
Attended Rural High School	0.21	0.24	0.18	0.13
Attended High School in Midwest	0.23	0.30	0.28	0.25
Attended High School in South	0.38	0.35	0.34	0.37
Attended High School in West	0.25	0.19	0.19	0.18
Attended High School in Northeast	0.14	0.17	0.20	0.19
<i>n</i>	2405	2705	2971	3660

VARIABLES

The primary purpose of this study is to explore the ways in which the “trinity” of postsecondary resources interacts across postsecondary stages. These three resources are: socioeconomic resources, academic resources, and institutional resources. As Sirin (2005) argued, while there is disagreement about the conceptual meaning of SES, there is a good deal of agreement among researchers on the tripartite nature of SES originally proposed by Duncan, Featherman, and Duncan (1972) consisting of parental income, parental education, and parental occupation (Gottfried, 1985; Hauser, 1994; Mueller & Parcel, 1981). Students’ socioeconomic resources are therefore defined as a composite of five separate socioeconomic variables, including total family income, mother and father’s educational attainment, and mother and father’s occupational status. This composite variable is included in the ELS dataset. The quartile version of this variable is used to define students who are low-SES, low-mid-SES, high-mid-SES, and high-SES.

Academic resources are defined as students’ academic ability level measured by an ELS-administered assessment that tests students’ proficiency in mathematics and reading/ELA. The assessment is similar to the SAT in terms of its content but has the benefit of being administered to all students in the sample. A quartile version of the composite assessment variable is used to define students as high-ability, low-ability, etc. Although this assessment is only a rough proxy of students’ overall academic resources, which could also include factors such as students’ GPA and the type of curriculum they completed, the number of low-SES students who scored in the top quartile of the assessment was relatively small ($n \sim 300$ out of $\sim 3,600$ students who scored in the top

quartile) and further restricting the sample would have limited statistical power, particularly for later analyses.

Institutional resources are defined in accordance with Barron's Admissions Competitiveness Index. This index combines information on institutions' admission rates, the average standardized assessment scores of incoming students, and students' high school GPA. This index places all four-year institutions into one of six categories, from most competitive to noncompetitive. Selective institutions are defined as those that fall into the top two categories of competitiveness, moderately selective include those in the middle two categories, and non-selective institutions include those in the bottom two categories.

The variables included in the ELS dataset relating to postsecondary stages are based on this classification scheme. For example, for college application the variable represents the highest selectivity of all the institutions students applied to, as represented by one of the three selectivity categories. Similar variables are constructed for college acceptance (i.e., the highest selectivity of the institutions students were accepted to), enrollment (i.e., the selectivity of the institution students initially enrolled in), and attainment (i.e., the selectivity of the institution from which students earned a degree). The data used to create these variables were collected during the second follow-up in 2006, two years after students were scheduled to graduate from high school. Thus, students that applied to, were accepted to, or enrolled in college after this second follow-up in 2006 were not treated as having experienced these outcomes. However, the sample of college graduates used in the labor market outcome analyses include all students that

earned degrees by the third follow-up in 2012, regardless of if they had enrolled in postsecondary prior to 2006.

While SES is the primary variable of interest in these equations, a number of student and school-level variables are also controlled for in order to more accurately isolate the influence of SES. The student variables include sociodemographic characteristics (race/ethnicity, gender, language status) and additional academic resource variables (actual scores on ELS assessments in Z-score format, high school GPA, and number of Advanced Placement/International Baccalaureate courses completed). School-level variables include the control of the school (public, Catholic private, and non-Catholic private) and urbanicity (urban, suburban, and rural). Control variables for region of the country in which the school was located were also included; as highly selective institutions are more concentrated in particular regions in the United States, the region of the country in which the student's high school is located may influence students' likelihood of applying to and attending these institutions. This set of variables is included in models of all stages in students' college-to-career pathways.

As mentioned previously, an important limitation of the sequential logit modeling approach is that the models of later outcomes often explain significantly less variability in the outcome given the fact that the same variables are included for each stage but additional factors may become more influential as students progress into later stages. For example, the major a student selects and the amount of financial aid she receives may influence her likelihood of persisting and earning a degree, but these variables cannot logically impact outcomes such as college application. To overcome this limitation,

additional variables will be included in the later postsecondary stages to determine if factors such as major and financial aid receipt influence these outcomes. The models of labor market outcomes also include additional categories of variables, such as the selectivity of the institution from which the graduated, the semester in which students received their degree (as a proxy for length of time in the labor market), and the region of the country in which they live (given regional variations in earnings).

LIMITATIONS OF THE METHODOLOGY

Although this study is designed to address a number of important limitations in the literature on the relationship between socioeconomic background and social mobility, this study is not without its own limitations, a number of which stem from the relatively limited sample size of the ELS survey. While disaggregating institutions into three levels of selectivity provides some insight into the ways in which the impact of SES varies by institutional selectivity, there is obviously a great deal of variation of institutional characteristics within each category. Yet even with these relatively broad categories of institutions, the sample sizes for specific analyses were often too small to generate informative results. For example, too few high-ability students applied to and enrolled in non-selective institutions for the analyses to provide statistically significant results, and the same was true for low-ability students at selective institutions. Larger datasets would likely be needed for such analyses.

As discussed in Chapter 1, another limitation of this methodological approach is that it restricts the analysis to four-year colleges and university, thereby excluding all students that attended sub-baccalaureate institutions. Community colleges in particular

enroll a substantial percentage of the undergraduate population and are frequently conceived as a stepping-stone for students who aspire to baccalaureate attainment, making them an important component of the relationship between the higher education system and social mobility. However, many of the stages included in the analysis are less applicable to community colleges, such as application and acceptance, making the methodology less suited to the study of these institutions.

The relatively tentative nature of the analyses of labor market outcomes should also be emphasized. While the majority of students that participate in and complete college do so within eight years of graduating from high school, making the ELS an ideal data source for analyzing these transitions, students in the sample that attended postsecondary had limited experience in the labor market when compared to their full future labor market history. Additionally, students that went on to graduate school are excluded from the labor market analyses as many of these students had only one or two years of experience after graduate school. Exploratory analyses suggested that students that earned graduate degrees made less on average than students which terminated their schooling after baccalaureate completion, but this is surely a result of differences in time in the labor force rather than baccalaureate degrees being more valuable than graduate degrees. The labor market analyses can therefore be understood as exploring the impact of SES on the initial transition into the labor force, rather than an attempt to accurately predict how college graduates will fare in their future careers.

Finally, and perhaps most importantly, although the purpose of this study is to illuminate socioeconomic disparities in various postsecondary stages, the results do not

provide for any causal interpretation of the effects of SES on any particular postsecondary outcome. Not only does the correlational nature of the analysis prevent any discussion of causation, the composite nature of the SES variables also makes it difficult to say definitively which aspect of SES is the most influential at any particular stage. For example, the educational attainment of parents may be more influential in shaping students' college aspirations, which would be reflected in the number and types of institutions students apply to, while financial factors may be more influential in students choosing whether or not to enroll in a particular institution. Future research would be needed to provide stronger evidence of the potential causal mechanisms whereby various elements of students' socioeconomic background influence specific stages in students' college-to-career pathways.

CHAPTER 4: EXPLORING THE INTERACTION BETWEEN SOCIOECONOMIC, ACADEMIC, AND INSTITUTIONAL RESOURCES ACROSS POSTSECONDARY STAGES

The purpose of this chapter is to present the results of the analyses related to the first two research questions, namely how socioeconomic background influences the likelihood that students will progress through each postsecondary stage and the extent to which these progression likelihoods depend upon students' background ability and the types of institutions they encounter. The actual rates at which students from different SES quartiles pass through each postsecondary stage will first be analyzed to provide a descriptive portrait of where in the postsecondary pipeline are socioeconomic disparities the largest. We will also analyze whether these disparities are equivalent for students of different ability levels or not. Next, the results of the statistical analyses estimating the impact of SES on the odds of progression for all high school students and for any four-year institution will be presented. This will be followed by the analyses first disaggregating the sample into ability quartiles and then conducting separate analyses for the various levels of institutional selectivity. Finally, the results of the models for the ability quartile by institutional selectivity combinations will be presented in order to investigate whether the impact of SES on transition likelihoods depends upon both student ability levels and institutional selectivity.

SOCIOECONOMIC BACKGROUND AND POSTSECONDARY PROGRESSION RATES

Table 4: Postsecondary Progression Rates for HS Graduate Sample below presents the rates at which students from the entire high school graduate sample

progressed through each postsecondary stage. The “Attained (*Degree*)” variables represent the highest degree that a student attained. For example, students that earned a graduate degree are not included in the “Attained Bachelor’s” estimate as the bachelor’s was not the highest degree they earned, but they are included in the “Attained Bachelor’s or Higher” category. As evidenced by the table, socioeconomic disparities of a significant magnitude exist at many of the stages. In terms of raw percentage difference, the gap between low-SES and high-SES students grows across the first three transitions; at the application stage there is about a 37% difference between these two subgroups, which increases to approximately 42% at the acceptance stage and 45% at the transition of enrollment. However, this gap does not appear to decrease much at all even for later transitions. Nearly 60% of high-SES students earned a bachelor’s or higher by the conclusion of the study timeframe compared to less than 18% of low-SES students for a gap of about 42%.

Table 4: Postsecondary Progression Rates for HS Graduate Sample

	Low-SES	Low-Mid-SES	High-Mid-SES	High-SES
Applied to a University	42.9%	49.9%	63.0%	80.0%
Accepted to a University	34.9%	43.3%	57.5%	76.7%
Enrolled in a University	25.4%	33.3%	47.3%	70.3%
Attained Associates	7.2%	9.2%	7.9%	4.8%
Attained Bachelors	14.1%	18.8%	29.3%	43.6%
Attained Post-Baccalaureate Cert.	0.3%	0.4%	0.8%	1.3%
Attained Masters or Post-Masters Cert.	2.5%	3.1%	5.2%	10.4%
Attained Doctorate	0.7%	0.8%	1.5%	4.0%
Attained Associates or Higher	24.7%	32.2%	44.6%	64.0%
Attained Bachelors or Higher	17.5%	23.1%	36.7%	59.2%
Attained any Graduate	3.1%	3.9%	6.7%	14.4%
<i>n</i>	2686	3049	3351	4060

Another way to represent this relationship is by visually depicting the decline in the remaining cohort across transitions, presented in Figure 1 below. This figure highlights the constancy of the SES gap across the first four transitions, with the four lines being roughly parallel. Naturally, the gap decreases in raw percentage terms substantially after the stage of baccalaureate attainment due to the significantly lower percentage of students that attend graduate school.

Figure 1: Decline in Cohort across Transitions for High School Graduate Sample

But while these figures are informative, they may provide a somewhat misleading perspective of the impact of SES across transitions, for two reasons. First, simply analyzing the percentage difference in transitions rates naturally produces the appearance

of larger socioeconomic disparities at transitions with greater percentages of students successfully progressing through. Thus, even though high-SES students are six times as likely to earn a doctoral degree compared to low-SES students (4% / 0.67%), the three percentage point difference between these subgroups for this outcome makes it appear as if the gap is insignificant. Additionally, these figures do not restrict the sample to students that successfully passed through previous stages which may bias our understanding of the relationship between SES and progressing through each stage.

In order to provide a more accurate picture of the impact of SES on transition rates, Table 5 uses the same data from the previous table but presents the rates for each stage as a percentage of students that passed through the previous transition. For example, the calculations for the percentage of students accepted to a university include only those students that applied. This table also includes an additional column which divides the low-SES rate by the high-SES rate. This figure represents the magnitude of the disparity at that particular stage, with larger percentages indicating greater parity between low-SES and high-SES students (100% indicates perfect parity and greater than 100% indicates low-SES students are more likely than their high-SES peers to pass through a transition) and smaller percentages indicating larger disparities. These figures provide a significantly different perspective of the degree to which SES impacts transition probabilities. The largest percentage difference between low-SES and high-SES students in the previous table was at the stage of enrollment, but by this calculation the gap at application is significantly larger. The rate at which low-SES students that were accepted to a university did indeed enroll was about 67% the rate for high-SES

students, but low-SES students were half as likely to apply to any university. The largest gap by this calculation is at the stage of doctoral degree attainment; out of students that earned a bachelor's degree, low-SES students were about half as likely as their high-SES peers to earn a doctorate. In contrast, out of students that enrolled in a university, the rates at which students from different socioeconomic backgrounds attained bachelor's degrees was roughly equivalent; 55% of low-SES students that enrolled in a four-year institution earned a bachelor's compared to 62% of high-SES students, meaning that the low-SES rate was roughly 90% of the high-SES rate, or nearly equivalent.

Table 5: Postsecondary Progression Rates for High School Graduate Sample as Percentage of Prior Transition

	Low-SES	Low-Mid-SES	High-Mid-SES	High-SES	Low-SES /High-SES
Applied to a University	42.9%	49.9%	63.0%	80.0%	53.6%
Accepted to a University	81.3%	86.9%	91.2%	95.8%	84.8%
Enrolled in a University	59.2%	66.8%	75.1%	87.8%	67.4%
Attained Bachelors Degree	55.4%	56.6%	61.9%	62.1%	89.3%
Attained Post-Baccalaureate Cert.	2.1%	1.9%	2.6%	2.9%	72.0%
Attained Masters or Post-Masters Cert.	17.5%	16.6%	17.8%	23.8%	73.2%
Attained Doctoral Degree	4.8%	4.2%	5.0%	9.1%	52.4%
Attained Bachelors Degree or Higher	68.9%	69.4%	77.6%	84.3%	81.7%
Attained Graduate Degree	22.2%	20.7%	22.8%	32.9%	67.5%
<i>n</i>	2686	3049	3351	4060	

POSTSECONDARY PROGRESSION RATES BY ABILITY LEVEL

The previous section provides a baseline understanding of the rates at which students from different socioeconomic backgrounds successfully complete each transition, both overall and as a percentage of the cohort that passed through all previous transitions. However, as highlighted in the descriptive statistics of the sample presented in Chapter 3, the SES subgroups also differ significantly in terms of their average ability

levels. Socioeconomic disparities in postsecondary transition rates may disappear when controlling for academic ability, and socioeconomic background may be more influential for students of particular ability levels.

In order to investigate these possibilities, Table 6 below disaggregates the progression rates by the four student ability quartiles. Two aspects of the relationship between SES, ability, and postsecondary progression are immediately evident. Unsurprisingly, students of higher ability levels are more likely to pass through each postsecondary stage, regardless of socioeconomic background. For example, 10.5% of low-SES students and 23% of high-SES students from the lowest ability group enrolled in a university, compared to 57.6% of low-SES and 84.7% of high-SES students from the highest ability group. Similarly, 6.7% of low-SES and 22.6% of high-SES students of low-ability earned a bachelor's degree or higher, compared to 44.6% and 71.1% of low-SES and high-SES students of high-ability, respectively. However, it is also true that socioeconomic disparities still exist at each stage of the process and for all ability levels. Even for high-ability students, there is no postsecondary transition in which the rates of low-SES students approach those of high-SES students.

However, the purpose of disaggregating progression rates by student ability is not simply to underscore the relationship between ability and postsecondary progression likelihoods, but rather how socioeconomic disparities in transition rates vary based on students' ability level. Table 7 therefore calculates transition rates as a percentage of the cohort that passed through all previous transitions and once again includes a column which calculates the ratio between the low-SES and high-SES rates for each stage. By

analyzing the data in this way, it appears that socioeconomic disparities in certain transitions are influenced by ability level, while others are not. As evidence of the latter, the rate at which low-SES students accepted to a university choose to enroll is between 80-90% of the rate for high-SES students for all ability levels. In other words, ability level does not seem to influence the extent to which SES impacts the likelihood accepted students will matriculate. In contrast, socioeconomic disparities in graduate degree attainment do appear to vary based on ability. High-SES students are about 15 times as likely as low-SES students of low-ability to earn a graduate degree, but this ratio shrinks to a little less than three times as likely for students in the next two ability quartiles and 1.5 times as likely for high-ability students.

SEQUENTIAL LOGIT MODELS FOR ANALYTIC SAMPLE AND ALL UNIVERSITIES

The previous section provided a descriptive portrait of the rates at which students from different socioeconomic backgrounds progress through each stage in their postsecondary pathways, examined the transitions in which there appear to be the largest socioeconomic disparities, and assessed the extent to which these socioeconomic disparities vary by student ability level. However, students from different socioeconomic backgrounds also differ on a number of other characteristics apart from their ability levels which could also influence their likelihood of progressing through postsecondary. It is therefore important to control for these various factors in order to arrive at more accurate estimates of the impact of SES on the likelihood that students will progress through each stage. As described in Chapter 3, this is accomplished using the technique of sequential logit modeling.

Table 6: Postsecondary Progression Rates for High School Graduate Sample, by Ability Level

	Low-Ability				Low-Mid-Ability			
	Low-SES	Low-Mid-SES	High-Mid-SES	High-SES	Low-SES	Low-Mid-SES	High-Mid-SES	High-SES
Applied to a University	27.6%	31.8%	35.8%	46.9%	44.5%	43.2%	51.4%	63.5%
Accepted to a University	18.9%	23.1%	26.9%	35.6%	33.8%	34.9%	43.6%	55.5%
Enrolled in a University	10.5%	13.6%	15.6%	23.0%	24.3%	24.4%	31.6%	46.3%
Attained Bachelors Degree	6.4%	5.8%	9.1%	19.7%	12.1%	14.6%	17.0%	32.7%
Attained Masters or Post-Masters Cert.	0.2%	1.2%	0.8%	1.3%	1.4%	1.0%	2.9%	4.1%
Attained Doctoral Degree	0.0%	0.0%	0.0%	1.7%	0.4%	0.1%	0.5%	0.7%
Attained Bachelors Degree or Higher	6.7%	7.2%	9.9%	22.6%	14.2%	16.0%	21.4%	38.2%
Attained Graduate Degree	0.2%	1.2%	0.8%	2.9%	1.8%	1.1%	3.4%	4.8%
<i>n</i>	991	685	495	239	843	914	757	587

	High-Mid Ability				High-Ability			
	Low-SES	Low-Mid-SES	High-Mid-SES	High-SES	Low-SES	Low-Mid-SES	High-Mid-SES	High-SES
Applied to a University	50.7%	55.5%	66.6%	79.4%	73.1%	72.8%	81.4%	88.9%
Accepted to a University	45.3%	50.6%	61.2%	75.6%	69.9%	69.2%	79.1%	88.1%
Enrolled in a University	35.6%	38.9%	51.3%	66.6%	57.6%	61.8%	70.8%	84.7%
Attained Bachelors Degree	21.5%	24.1%	33.6%	43.0%	31.0%	32.8%	43.9%	49.8%
Attained Masters or Post-Masters Cert.	4.3%	4.1%	4.0%	10.3%	9.2%	7.3%	10.6%	13.3%
Attained Doctoral Degree	0.6%	0.6%	1.2%	2.4%	3.8%	3.0%	3.2%	6.1%
Attained Bachelors Degree or Higher	26.7%	28.9%	39.2%	56.6%	44.6%	44.2%	59.0%	71.1%
Attained Graduate Degree	4.9%	4.7%	5.2%	12.6%	13.0%	10.3%	13.8%	19.4%
<i>n</i>	536	859	1104	1187	316	591	995	2047

Table 7: Postsecondary Progression Rates for High School Graduate Sample as Percentage of Prior Transition, by Ability Level

	Low-Ability					Low-Mid-Ability				
	Low-SES	Low-Mid-SES	High-Mid-SES	High-SES	Low-SES/High-SES	Low-SES	Low-Mid-SES	High-Mid-SES	High-SES	Low-SES/High-SES
Applied to a University	27.7%	31.8%	35.8%	46.9%	59.0%	44.5%	43.2%	51.4%	63.5%	70.0%
Accepted to a University	68.3%	72.5%	75.1%	75.9%	89.9%	76.0%	80.8%	84.8%	87.4%	87.0%
Enrolled in a University	55.6%	58.9%	57.9%	64.7%	86.0%	71.9%	69.9%	72.4%	83.4%	86.2%
Attained Bachelors or Higher	63.5%	52.7%	63.6%	98.2%	64.6%	58.5%	65.5%	67.8%	82.4%	71.1%
Attained Masters or Post-Masters Cert.	3.0%	16.3%	8.2%	5.6%	54.6%	10.0%	6.2%	13.6%	10.7%	93.3%
Attained Doctoral Degree	0.0%	0.0%	0.0%	7.4%	0.0%	2.5%	0.7%	2.5%	1.8%	140.0%
<i>n</i>	991	685	495	239		843	914	757	587	
	High-Mid-Ability					High-Ability				
	Low-SES	Low-Mid-SES	High-Mid-SES	High-SES	Low-SES/High-SES	Low-SES	Low-Mid-SES	High-Mid-SES	High-SES	Low-SES/High-SES
Applied to a University	50.8%	55.5%	66.6%	79.4%	63.9%	73.1%	72.8%	81.4%	88.9%	82.2%
Accepted to a University	89.3%	91.2%	92.0%	95.1%	93.9%	95.7%	95.1%	97.2%	99.1%	96.5%
Enrolled in a University	78.6%	76.8%	83.7%	88.2%	89.1%	78.8%	84.9%	86.9%	95.3%	82.7%
Attained Bachelors or Higher	74.9%	74.3%	76.5%	85.0%	88.1%	77.5%	71.5%	83.4%	83.9%	92.3%
Attained Masters or Post-Masters Cert.	16.1%	14.1%	10.2%	18.2%	88.6%	20.6%	16.5%	17.9%	18.8%	109.6%
Attained Doctoral Degree	2.1%	2.0%	3.0%	4.2%	50.4%	8.5%	6.9%	5.5%	8.6%	99.1%
<i>n</i>	536	859	1104	1187		316	591	995	2047	

We begin with the traditional sequential logit model in which all students are included in the analysis, all universities are aggregated together, and the sample for each outcome is restricted to only students that successfully passed through all previous transitions (excluding the outcome of persistence, which students did not need to experience in order to be included in the model of baccalaureate attainment). Table 8 presents the results of this analysis. Before discussing the results that pertain to the impact of SES on transitions, other features of the model and results should be mentioned. The estimates in the table are the actual parameter estimates from the logistic regression, also known as the log odds. These estimates can be exponentiated to create odds ratios. A number of model fit statistics are included at the bottom of the table including the log likelihood (ll), the log likelihood of the nested model which does not include a level-2 random intercept (ll_c), and the significance level of the log likelihood ratio test comparing the fit of the two models to determine if the inclusion of the level-2 random intercept significantly improves model fit (p_c). AIC and BIC are additional model fit criteria which can be used to compare the fit of nested models, although these estimates cannot be compared for models of different outcomes and are simply illustrative for the current analysis. Additionally, for each categorical variable one of the categories is excluded from the model and incorporated into the intercept. The intercept therefore represents the odds of each outcome occurring for students that are male, white, native English speakers, and so forth. The parameter estimates represent the likelihood of the outcome occurring compared to students in the excluded reference category (e.g., the “female” estimate is in relation to males who are excluded from the model). The low-SES

dummy variable is also excluded from the model, meaning that the three SES variables included in the models represent the difference in the likelihood of the outcome occurring between the included SES category and low-SES students.

As the focus of this analysis is primarily on the relationship between SES and postsecondary progression, subsequent results tables will exclude estimates for the non-SES variables. However, as an example of what the full models entail and to highlight some of the other relationships found in the analyses, these other estimates for the first model are presented in Table 8 and will be reviewed briefly. In terms of the non-SES variables, this analysis revealed a number of interesting findings. There was no postsecondary transition in which non-white students had significantly lower estimated likelihoods of experiencing the outcome, although there were a number of instances in which non-white students were significantly more likely than whites to experience the outcome. African-American students are an illustrative example; when controlling for the other variables in the model, African-American students are significantly more likely than whites to pass through nearly every postsecondary stage apart from baccalaureate and graduate attainment. As expected, the academic variables included in the models were also significantly related to the majority of postsecondary transitions, with only a few relationships not found to be statistically significant. School characteristics were also significantly related to postsecondary progression. Students at both Catholic and non-Catholic private schools were significantly more likely than public school students to progress through postsecondary and urban students were usually more likely than rural students to experience postsecondary transitions. The region of the country in which

one's school was located also seemed to play an important part in the process, as students from the three regions included as variables in the model having significantly lower rates of postsecondary progression compared to students from the northeast (the excluded category).

In terms of the impact of SES on postsecondary transitions, previous research using this technique has led to the conclusion that the impact of SES declines steadily as students progress through postsecondary. There is indeed a modest decline in the estimates of the SES variables over the first three transitions, and for students who earned bachelor's degrees, socioeconomic background no longer appears to influence the likelihood that students will enroll in graduate school or successfully complete a graduate degree, conditional upon enrollment, both findings which are generally congruent with the prior literature on the topic. However, a steady and consistent decline in the impact of SES across transitions is not found. Students in the top two quartiles of SES are significantly more likely to experience nearly every postsecondary outcome compared to low-SES students until the graduate education outcomes, and the estimates in the persistence and attainment models were larger than those in the model of enrollment and approximately the same size as the estimates in the model of acceptance. Firm conclusions about these trends are not necessarily supported by this analysis as each estimate has a margin of error and a different sample may reveal slightly different trends. However, at a minimum this analysis casts doubt on the perception that the impact of SES declines steadily across postsecondary transitions when these additional transitions are included in the analysis.

Table 8: Sequential Logit Model Results across Outcomes for Entire Sample and All Universities

	Applied	Accepted	Enrolled	Persisted	Bachelor's Attainment	Bachelor's Attainment (Selective)	Graduate Enrollment	Graduate Attainment
<i>Student Variables</i>								
LowMidSES	0.070 (0.069)	0.117 (0.132)	-0.078 (0.113)	-0.039 (0.137)	-0.040 (0.115)	0.197 (0.165)	0.025 (0.204)	-0.463 (0.547)
HighMidSES	0.384*** (0.071)	0.326** (0.136)	0.083 (0.116)	0.316** (0.138)	0.314*** (0.116)	0.434*** (0.157)	0.050 (0.191)	-0.375 (0.458)
HighSES	0.787*** (0.079)	0.660*** (0.153)	0.527*** (0.122)	0.623*** (0.137)	0.642*** (0.111)	0.843*** (0.150)	0.239 (0.190)	-0.397 (0.458)
OtherRace	0.298*** (0.097)	-0.105 (0.214)	0.032 (0.157)	-0.084 (0.177)	-0.196 (0.131)	-0.035 (0.188)	0.201 (0.235)	1.008** (0.497)
Asian	0.385*** (0.119)	-0.287 (0.210)	0.098 (0.159)	0.336 (0.215)	-0.059 (0.134)	0.308** (0.153)	0.151 (0.197)	-0.148 (0.441)
AfricanAmerican	1.170*** (0.093)	0.376** (0.166)	0.314** (0.129)	0.596*** (0.160)	0.039 (0.124)	-0.029 (0.158)	0.723*** (0.175)	-0.158 (0.516)
Hispanic	0.230** (0.097)	-0.100 (0.191)	-0.232 (0.151)	0.329* (0.171)	0.011 (0.132)	0.133 (0.165)	-0.148 (0.239)	0.100 (0.492)
Female	0.177*** (0.056)	0.188 (0.115)	-0.117 (0.089)	0.201** (0.097)	0.116* (0.068)	-0.237*** (0.078)	0.019 (0.103)	0.390* (0.233)
NonNatEnglish	0.082 (0.090)	-0.247 (0.188)	-0.273* (0.143)	0.309* (0.173)	0.028 (0.119)	-0.078 (0.146)	0.346* (0.178)	0.149 (0.425)
ELS Math Z-score	0.320*** (0.046)	0.415*** (0.096)	0.276*** (0.073)	0.241*** (0.082)	0.169*** (0.055)	0.182*** (0.064)	0.104 (0.087)	0.299* (0.180)
ELS Read Z-score	0.187*** (0.039)	0.401*** (0.084)	0.168*** (0.059)	-0.059 (0.068)	0.051 (0.050)	0.174*** (0.058)	0.075 (0.077)	-0.138 (0.184)
AP/IB Courses	0.292*** (0.036)	0.339*** (0.077)	0.221*** (0.039)	0.208*** (0.040)	0.048** (0.019)	0.213*** (0.020)	0.072*** (0.022)	0.050 (0.048)
HS GPA	0.948*** (0.139)	0.660** (0.284)	0.714*** (0.176)	0.825*** (0.226)	1.160*** (0.149)	1.238*** (0.104)	0.172 (0.197)	0.894*** (0.322)
<i>School Variables</i>								
CatholicSchool	0.898*** (0.101)	0.422** (0.178)	0.624*** (0.139)	0.530*** (0.115)	0.334*** (0.091)	0.568*** (0.131)	-0.096 (0.142)	0.679** (0.312)
OtherPrivateSchool	0.507*** (0.153)	0.726** (0.306)	0.234 (0.180)	0.556*** (0.175)	0.299*** (0.103)	0.673*** (0.175)	0.295** (0.139)	0.138 (0.350)
UrbanSchool	0.274** (0.108)	0.141 (0.193)	0.404*** (0.157)	-0.024 (0.155)	0.166 (0.117)	0.216 (0.162)	-0.035 (0.166)	-0.737* (0.385)

Table 8 (Cont.)

SuburbanSchool	-0.020 (0.086)	-0.174 (0.159)	0.074 (0.133)	-0.055 (0.128)	0.050 (0.102)	0.128 (0.142)	-0.086 (0.149)	-0.660* (0.355)
MidwestSchool	-0.197** (0.095)	-0.355** (0.169)	-0.402*** (0.130)	-0.291** (0.122)	-0.317*** (0.098)	-0.403*** (0.128)	0.079 (0.141)	0.020 (0.321)
SouthSchool	-0.407*** (0.096)	-0.342** (0.174)	-0.428*** (0.128)	-0.340*** (0.118)	-0.365*** (0.096)	-0.591*** (0.136)	0.044 (0.131)	0.078 (0.327)
WestSchool	-0.875*** (0.107)	-0.382* (0.215)	-0.779*** (0.147)	-0.427** (0.168)	-0.531*** (0.119)	-0.977*** (0.162)	-0.004 (0.176)	-0.150 (0.389)
Constant	-2.745*** (0.417)	0.258 (0.838)	-0.794 (0.529)	-1.468** (0.677)	-3.618*** (0.469)	-6.063*** (0.376)	-2.766*** (0.680)	-4.440*** (1.133)
Var(cons)	0.294*** (0.048)	0.487*** (0.127)	0.343*** (0.072)	0.059 (0.061)	0.043 (0.041)	0.493*** (0.086)	0.061 (0.057)	0.000 (0.000)
<i>n</i>	11749	7319	6648	5494	5494	5494	3454	580
ll	-5920.40	-1802.19	-2614.18	-2012.99	-3178.85	-2658.83	-1523.02	-257.61
ll_c	-5983.66	-1817.28	-2634.48	-2013.52	-3179.53	-2706.89	-1523.53	-257.61
p_c	0.00	0.00	0.00	0.15	0.12	0.00	0.16	
aic	11884.79	3648.39	5272.37	4069.98	6401.70	5361.66	3090.05	557.22
bic	12046.97	3800.15	5422.01	4215.43	6547.15	5507.11	3225.29	648.85

Notes: *p<.10, ** p<.05, *** p<.01. Standard errors in parentheses.

SEQUENTIAL LOGIT MODELS BY STUDENT ABILITY

The results of the previous analysis suggest that there are socioeconomic disparities at most stages in students' postsecondary pathways, even for later stages such as baccalaureate attainment for students that enrolled in college. However, it is possible that these disparities are not present for students of all ability levels, as suggested by the work of Hoxby and Avery (2012) among others. This section therefore disaggregates students into one of the four ability quartiles and then fits sequential logit models to each ability subgroup. The goal is to determine whether the impact of SES on the progression through each stage varies according to students' general ability level. Table 9 through Table 12 below present the results of these models for the four ability levels.

Disaggregating students in this way reveals a number of common patterns and unique relationships for particular subgroups. In terms of commonalities, for all ability levels the two highest SES subgroups were significantly more likely than low-SES students to progress through the stage of college application. The impact of SES on persistence also appears to be roughly constant across student ability levels, as the high-SES parameters in the persistence models were of the same magnitude for all four ability groups. Similarly, the results suggest that high-SES students are significantly more likely than their low-SES peers to earn a bachelor's degree conditional upon enrolling in a four-year institution for all ability groups (the high-SES parameter estimate in the attainment model for low-SES students was not significant, likely due to the limited sample size, but it was of the same magnitude as the estimates in the other ability-group models).

Contrary to the perception that the impact of SES declines to insignificance once students

reach postsecondary, both the results of these models and the previous analysis of all students estimated significant socioeconomic disparities in the likelihood of completing college.

Finally, while the results of the analysis of all high school graduates estimated that low-SES are not particularly disadvantaged in terms of the transition between completing a bachelor's degree and enrolling in graduate school, this was not the case for high-ability students. High-SES students were significantly more likely than low-SES students to make this transition among this ability subgroup. In contrast, none of the SES variables were significant in the graduate enrollment model for second-highest ability students, and one of the SES variables was actually negative in the same model for second-lowest ability students (indicating that students in the second-highest SES group were less likely to go to graduate school compared to low-SES students).

Another interesting trend suggested by these results relates to the relationship between SES, ability, and baccalaureate attainment at selective institutions. Separate models were fit to each subgroup estimating the impact of the variables on the likelihood that students would earn a bachelor's degree specifically from a selective college or university. High-SES students were significantly more likely than their low-SES counterparts to earn a bachelor's from a selective institution, conditional upon enrollment at any university, for the three highest ability levels, and the estimate was large but non-significant for the low-ability group likely due to the limited sample size. Additionally, the magnitude of the disparity appears to increase as we move to students of lower ability; the high-SES estimate for the highest ability group is 0.571, it is more than twice

as large for the second-highest ability group, and nearly three times as large for the second-lowest ability quartile. Thus, the extent to which socioeconomic background impacts the likelihood students will earn a bachelor's degree from a selective institution appears to depend upon student ability.

The reverse relationship, namely a decreasing magnitude of SES gaps as we move from higher to lower levels of student ability, is evident in the case of enrollment. Once again, this outcome is whether students enrolled in an institution given that they applied and were accepted. Interestingly, this estimated gap is the largest for high-ability students, statistically significant but much smaller in magnitude for the second ability group, and small and insignificant for students in the bottom two ability quartiles. This finding implies that socioeconomic background does not appear to influence the likelihood that lower-ability students will enroll in college, conditional upon acceptance, but socioeconomic background matters greatly in the enrollment decisions of high-ability students.

But while there are a number of commonalities and discernible trends across ability groups, certain stages are characterized by more ambiguous relationship between SES and ability. For example, high-SES students were significantly more likely to be accepted to a university, conditional upon application, for both high-ability students and students in the second-lowest ability group. However, these estimates were relatively small and insignificant for the second-highest and lowest ability groups. Thus, there does not appear to be a clear relationship between SES and ability for this particular postsecondary transition.

Table 9: Sequential Logit Models for High-Ability Students

	Applied	Accepted	Enrolled	Persisted	Bachelor's Attainment	Bachelor's Attainment (Selective)	Graduate Enrollment	Graduate Attainment
LowMidSES	0.028 (0.191)	-0.149 (0.473)	0.662*** (0.253)	0.087 (0.300)	-0.199 (0.221)	-0.230 (0.242)	0.168 (0.328)	-0.809 (0.763)
HighMidSES	0.426** (0.184)	0.263 (0.434)	0.577** (0.227)	0.431 (0.297)	0.163 (0.210)	0.216 (0.211)	0.427 (0.300)	-0.323 (0.629)
HighSES	0.770*** (0.185)	1.222*** (0.466)	1.293*** (0.236)	0.854*** (0.289)	0.465** (0.196)	0.571*** (0.200)	0.498* (0.288)	-0.346 (0.611)
cons	-2.309*** (0.895)	2.092** (0.929)	-0.893 (1.095)	-2.661** (1.109)	-4.341*** (0.448)	-5.609*** (0.536)	-3.764*** (0.736)	-4.771*** (1.673)
Var(cons)	0.257 (0.165)	0.819 (0.630)	0.459* (0.266)	0.026 (0.190)	0.000 (0.000)	0.409*** (0.102)	0.035 (0.068)	0.000 (0.000)
N	3599	3025	2960	2703	2703	2703	1974	380
ll	-1307.17	-263.07	-759.31	-728.86	-1429.76	-1605.02	-942.49	-182.85
ll_c	-1310.60	-263.94	-762.38	-728.87	-1429.76	-1621.10	-942.58	-182.85
p_c	0.00	0.09	0.01	0.44		0.00	0.33	
aic	2658.33	570.13	1562.62	1501.72	2901.53	3254.03	1928.97	407.70
bic	2794.48	702.45	1694.47	1631.56	3025.47	3383.88	2051.91	490.45

Notes: *p<.10, ** p<.05, *** p<.01. Standard errors in parentheses. Models control for demographic, academic, and school variables.

Table 10: Sequential Logit Models for High-Mid-Ability Students

	Applied	Accepted	Enrolled	Persisted	Bachelor's Attainment	Bachelor's Attainment (Selective)	Graduate Enrollment
LowMidSES	0.184 (0.133)	0.022 (0.295)	-0.254 (0.210)	-0.052 (0.244)	-0.261 (0.209)	0.514 (0.322)	-0.266 (0.397)
HighMidSES	0.601*** (0.137)	0.104 (0.284)	0.237 (0.212)	0.468** (0.231)	0.184 (0.188)	0.500 (0.323)	-0.131 (0.355)
HighSES	1.086*** (0.148)	0.382 (0.296)	0.446** (0.224)	0.596** (0.232)	0.558*** (0.191)	1.242*** (0.307)	-0.087 (0.354)
cons	-2.834*** (0.567)	-0.296 (1.956)	-0.484 (0.754)	-1.857* (0.957)	-3.103*** (0.671)	-5.734*** (0.629)	-3.792*** (0.972)
Var(cons)	0.300*** (0.100)	0.000 (0.000)	0.144 (0.148)	0.112 (0.168)	0.029 (0.109)	0.488** (0.237)	0.000 (0.000)
N	3304	2211	2051	1695	1695	1695	1013
ll	-1796.37	-505.23	-875.12	-694.19	-1055.51	-755.52	-369.78
ll_c	-1805.06	-505.23	-875.68	-694.44	-1055.55	-760.39	-369.78
p_c	0.00	.	0.15	0.24	0.39	0.00	.
aic	3636.73	1052.46	1794.24	1432.38	2155.01	1555.04	781.55
bic	3770.99	1172.18	1918.01	1551.96	2274.59	1674.62	884.88

Notes: *p<.10, ** p<.05, *** p<.01. Standard errors in parentheses. Models control for demographic, academic, and school variables.

Table 11: Sequential Logit Models for Low-Mid-Ability Students

	Applied	Accepted	Enrolled	Persisted	Bachelor's Attainment	Bachelor's Attainment (Selective)	Graduate Enrollment
LowMidSES	-0.020 (0.114)	0.236 (0.211)	-0.189 (0.207)	0.138 (0.257)	0.382 (0.253)	1.387** (0.551)	0.041 (0.484)
HighMidSES	0.236* (0.129)	0.576** (0.235)	-0.116 (0.221)	0.283 (0.265)	0.531** (0.253)	1.159** (0.556)	-1.059* (0.568)
HighSES	0.698*** (0.144)	0.810*** (0.264)	0.382 (0.239)	0.636** (0.279)	1.041*** (0.257)	1.575*** (0.535)	0.071 (0.495)
cons	-2.694*** (0.377)	0.346 (0.946)	-0.763 (0.867)	-0.386 (1.016)	-2.502** (1.224)	-6.980*** (1.332)	-2.062** (0.953)
Var(cons)	0.162** (0.074)	0.717*** (0.267)	0.252 (0.205)	0.000 (0.000)	0.283 (0.247)	0.348 (0.462)	0.000 (0.000)
N	2746	1389	1142	822	822	822	384
ll	-1661.24	-597.80	-632.82	-417.97	-505.06	-232.60	-149.77
ll_c	-1663.86	-602.97	-633.77	-417.97	-505.83	-232.94	-149.77
p_c	0.01	0.00	0.08	.	0.11	0.21	.
aic	3366.49	1239.59	1309.63	877.94	1054.12	509.20	341.54
bic	3496.68	1354.79	1420.52	976.88	1157.78	612.85	424.50

Notes: *p<.10, ** p<.05, *** p<.01. Standard errors in parentheses. Models control for demographic, academic, and school variables.

Table 12: Sequential Logit Models for Low-Ability Students

	Applied	Accepted	Enrolled	Persisted	Bachelor's Attainment	Bachelor's Attainment (Selective)
LowMidSES	0.204 (0.133)	0.103 (0.237)	-0.102 (0.262)	-0.463 (0.399)	0.069 (0.412)	-0.846 (1.290)
HighMidSES	0.383*** (0.138)	0.225 (0.253)	-0.260 (0.280)	-0.086 (0.398)	0.342 (0.433)	1.168 (0.758)
HighSES	0.903*** (0.182)	0.168 (0.323)	0.111 (0.323)	0.640 (0.498)	0.761 (0.464)	1.333 (0.857)
cons	-2.452*** (0.383)	-0.578 (0.678)	-0.993 (0.806)	1.475 (1.086)	-3.439*** (1.211)	-9.160*** (3.322)
Var(cons)	0.070 (0.086)	0.455 (0.296)	0.193 (0.437)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
N	2100	694	495	274	274	258
ll	-1160.39	-384.88	-312.27	-140.62	-139.93	-53.04
ll_c	-1160.74	-386.19	-312.41	-140.62	-139.93	-53.04
p_c	0.20	0.05	0.30	.	.	.
aic	2364.77	813.76	668.53	323.24	321.85	146.08
bic	2489.07	913.70	761.03	399.12	397.73	217.14

Notes: *p<.10, ** p<.05, *** p<.01. Standard errors in parentheses. Models control for demographic, academic, and school variables.

SEQUENTIAL LOGIT MODELS BY INSTITUTIONAL SELECTIVITY

The previous section demonstrated how fitting separate sequential logit models to different ability groups provides a more nuanced perspective on the relationship between socioeconomic background and the probability that students will successfully transition through each postsecondary stage. The literature discussed in Chapter 2 also suggests that socioeconomic background may have a more pronounced influence at particular types of postsecondary institutions. Rather than disaggregating students into different groups, the current analysis disaggregates universities into three levels of selectivity in order to determine if socioeconomic disparities in particular stages in the process are larger at certain types of institutions compared to others. The results of these models are presented in Table 13, Table 14, and Table 15 below.

A number of findings from this analysis are noteworthy, but perhaps the most surprising is the fact that only a single SES parameter estimate across all outcomes was found to be statistically significant for the non-selective institution analysis. It was not necessarily anticipated that there would be significant disparities at the first two stages, given that low-SES students are more likely to apply to non-selective institutions and these institutions, by definition, accept the majority of their applicants, but greater disparities between socioeconomic groups were anticipated for later stages. In contrast, a number of stages had significant socioeconomic disparities for selective and moderately selective institutions. Possible reasons for these findings will be discussed in later sections.

Comparing the high-SES estimates for the models of selective institutions to those for moderately selective institutions also reveals some intriguing patterns. High-SES students are significantly more likely than their low-SES counterparts to progress through each of the first three stages at both selective and moderately selective institutions. Additionally, for each of these stages the disparity appears to be greater at selective institutions. Thus, socioeconomic background appears to matter more in terms of applying to, being accepted to, and enrolling in selective institutions compared to moderately selective ones. However, the reverse is true for the models of persistence and attainment; students from different SES groups that enrolled in selective colleges persist at roughly the same rate, but students in the two highest SES groups are significantly more likely to persist compared to low-SES students at moderately selective institutions. The same is true of baccalaureate attainment at moderately selective institutions, with the top two SES groups being significantly more likely to earn a bachelor's degree than their low-SES peers. At selective institutions, only high-SES students are significantly more likely than low-SES students to earn a degree. Additionally, for students that enrolled in a selective institution, there are no socioeconomic disparities in the rates at which they earn bachelor's degrees specifically from selective institutions. These colleges therefore appear to be graduating students from different socioeconomic backgrounds at roughly the same rates, controlling for the other variables in the model.

Finally, only one SES quartile estimate was statistically significant for the models of graduate school enrollment or attainment (the graduate attainment model was only fit for the selective institution sample given the small number of students from moderately

selective and non-selective colleges that enrolled in graduate school), and that estimate indicated that for students that earned bachelor's degrees from non-selective institutions, students in the second-lowest SES group were significantly less likely than low-SES students to go onto graduate school. However, only 124 students were included in the sample for this model, making the results quite tentative. Overall, there did not appear to be a strong relationship between socioeconomic background and the transition to graduate school for any of the institutional selectivity levels.

Table 13: Sequential Logit Models for Selective Institutions

	Applied	Accepted	Enrolled	Persisted	Bachelor's Attainment	Bachelor's Attainment (Selective)	Graduate Enrollment	Graduate Attainment
LowMidSES	0.092 (0.100)	0.214 (0.178)	0.181 (0.225)	0.242 (0.530)	-0.180 (0.250)	0.023 (0.249)	0.175 (0.365)	-0.769 (0.821)
HighMidSES	0.421*** (0.091)	0.294* (0.176)	0.565*** (0.217)	-0.121 (0.506)	0.175 (0.235)	0.051 (0.227)	0.032 (0.336)	-0.387 (0.702)
HighSES	0.900*** (0.095)	0.473*** (0.173)	0.687*** (0.205)	0.231 (0.485)	0.429* (0.228)	0.248 (0.218)	0.125 (0.324)	-0.286 (0.674)
cons	-4.461*** (0.562)	-2.725 (1.811)	-3.295*** (0.465)	-2.626*** (0.913)	-2.857*** (0.521)	-2.136*** (0.555)	-3.604*** (0.810)	-4.950*** (1.845)
Var(cons)	0.779*** (0.085)	0.310** (0.129)	0.471*** (0.124)	0.327 (0.295)	0.000 (0.000)	0.033 (0.065)	0.067 (0.090)	0.000 (0.000)
N	11749	3752	2983	2030	2030	2030	1555	298
ll	-5085.61	-1396.15	-1647.33	-411.96	-1042.86	-1240.85	-733.62	-136.41
ll_c	-5285.78	-1401.80	-1664.80	-412.76	-1042.86	-1240.98	-733.85	-136.41
p_c	0.00	0.00	0.00	0.10		0.31	0.25	
aic	10215.22	2836.30	3338.66	867.92	2127.72	2525.71	1511.24	314.81
bic	10377.39	2973.36	3470.67	991.47	2245.66	2649.26	1628.92	392.45

Notes: *p<.10, ** p<.05, *** p<.01. Standard errors in parentheses. Models control for demographic, academic, and school variables.

Table 14: Sequential Logit Models for Moderately Selective Institutions

	Applied	Accepted	Enrolled	Persisted	Bachelor's Attainment	Graduate Enrollment
LowMidSES	0.068 (0.080)	0.082 (0.175)	-0.010 (0.172)	-0.087 (0.233)	0.187 (0.197)	-0.365 (0.376)
HighMidSES	0.425*** (0.084)	0.328* (0.177)	0.159 (0.165)	0.413* (0.236)	0.391** (0.190)	-0.257 (0.376)
HighSES	0.650*** (0.090)	0.350* (0.185)	0.474*** (0.182)	0.476** (0.230)	0.550*** (0.190)	0.243 (0.392)
Cons	-3.865*** (0.227)	-1.033 (0.633)	-0.397 (0.575)	-1.901** (0.961)	-4.025*** (0.775)	-1.739*** (0.646)
Var(cons)	0.384*** (0.054)	0.293** (0.123)	0.464*** (0.129)	0.049 (0.139)	0.000 (0.000)	0.168 (0.279)
N	7997	2747	2249	1541	1541	881
ll	-4352.22	-1045.55	-1294.45	-709.96	-947.82	-339.30
ll_c	-4417.91	-1048.66	-1306.40	-710.02	-947.82	-339.49
p_c	0.00	0.01	0.00	0.36	.	0.27
aic	8748.43	2135.10	2632.91	1463.92	1937.64	722.59
bic	8902.14	2265.30	2758.71	1581.40	2049.79	827.77

Notes: *p<.10, ** p<.05, *** p<.01. Standard errors in parentheses. Models control for demographic, academic, and school variables.

Table 15: Sequential Logit Models for Non-Selective Institutions

	Applied	Accepted	Enrolled	Persisted	Bachelor's Attainment	Graduate Enrollment
LowMidSES	-0.030 (0.116)	-0.030 (0.267)	0.243 (0.237)	-0.130 (0.344)	-0.293 (0.381)	-4.425** (1.792)
HighMidSES	-0.037 (0.121)	0.213 (0.312)	0.012 (0.270)	0.161 (0.378)	0.239 (0.376)	-0.446 (1.985)
HighSES	-0.013 (0.153)	0.353 (0.402)	0.422 (0.303)	0.238 (0.425)	0.440 (0.357)	-1.481 (1.967)
Cons	-3.426*** (0.314)	0.890 (0.656)	-0.762 (0.516)	-1.366* (0.740)	-3.326*** (0.730)	4.596 (3.394)
Var(cons)	1.038*** (0.151)	0.217 (0.263)	0.170 (0.239)	0.356 (0.481)	0.000 (0.000)	0.000 (0.000)
N	5250	820	686	431	431	124
ll	-2096.93	-328.26	-414.94	-240.09	-219.04	-26.26
ll_c	-2181.95	-328.60	-415.21	-240.46	-219.04	-26.26
p_c	0.00	0.21	0.23	0.20	.	.
aic	4237.85	700.52	873.87	524.17	480.08	92.52
bic	4382.31	804.13	973.55	613.63	565.47	148.93

Notes: *p<.10, ** p<.05, *** p<.01. Standard errors in parentheses. Models control for demographic, academic, and school variables.

SEQUENTIAL LOGIT MODELS OF ABILITY BY SELECTIVITY COMBINATIONS

The previous two sections attempted to provide a more nuanced understanding of the relationship between socioeconomic background and postsecondary transition rates by disaggregating students into ability levels or institutions into selectivity levels. However, it is also possible to combine both techniques and fit separate models to combinations of ability groups and levels of institutional selectivity. This technique allows us to determine whether the impact of SES on postsecondary progression rates for

students of the same ability level depends on the type of institution they enroll in and, conversely, whether socioeconomic disparities at particular types of institution depend on students' background ability levels.

As there are four ability quartiles and three levels of institutional selectivity, there are twelve possible combinations of ability by selectivity which can be explored. With approximately seven outcomes in each analysis, this technique requires the fitting of over 80 separate models, and a thorough description of the results of each model would likely prove tedious. Additionally, some of the ability by selectivity combinations produced samples that were too small to provide sufficient statistical power. In particular, too few high-ability students applied to and enrolled in non-selective institutions, and the same was true for low-ability students at selective institutions. This section therefore focuses on the more notable findings and insights gained from this analysis.

We begin by analyzing the impact of SES on the college progression of high-ability students at selective institutions, revisiting the work of Hoxby and Avery (2012) and others who found that high-ability students from disadvantaged backgrounds were significantly less likely than their high-SES peers to apply to selective institutions, but conditional upon application, there were no further socioeconomic disparities in the rates at which students were accepted, enrolled, persisted, and attained degrees. The results of this analysis are presented in Table 16. Consistent with Hoxby and Avery's findings, the largest statistically significant socioeconomic gap in the postsecondary outcomes of high-ability students appears to be at the stage of application. High-SES students were significantly more likely to apply to selective institutions compared to low-SES students,

although neither of the other socioeconomic groups applied to selective institutions at rates significantly higher than low-SES students. Additionally, the SES estimates were not significant in the model of attainment, suggesting that socioeconomic background does not strongly influence the likelihood of completing a bachelor's degree for high-ability students that apply to, are accepted by, and enroll in selective institutions. And although Hoxby and Avery did not specifically analyze the impact of SES on the rates of graduate school participation among high-ability students that earned bachelor's degrees from selective institutions, the results of this analysis also suggest that SES does not have a pronounced effect on the likelihood that high-ability students that completed a bachelor's from a selective institution will pursue and attain graduate education.

But contrary to Hoxby and Avery's results, low-SES students were significantly less likely to be accepted by and enroll in these institutions compared to students in the top two SES quartiles, even when controlling for the large number of covariates included in the models. While encouraging more high-ability, low-SES students to apply to institutions that better match their academic credentials may be a logical approach given the magnitude of disparities in the selective application rates of high-ability students from different socioeconomic backgrounds, these results suggest that encouraging such application behavior may not be sufficient to fully reducing gaps in later socioeconomic outcomes. Possible reasons why these estimates and Hoxby and Avery's provide different perspectives of this phenomenon will be discussed in following sections.

While the results of this analysis suggest that no socioeconomic disparities exist in the attainment rates of high-ability students that enroll in selective institutions, as

discussed previously one concern of the sequential logit modeling technique is the exclusion of potentially important variables in analyses of later postsecondary outcomes.

Table 17 therefore presents the results of two additional models of baccalaureate attainment for high-ability students that enroll in selective institution. Model 1 is the same model as the attainment analysis in the previous table, variables for college major are added in Model 2, and Model 3 includes variables on major and financial aid.

Interestingly, adding variables relating to college major did not substantially change the estimates of the SES variables, but after including data on financial aid in the model high-SES students were estimated to attain degrees at significantly higher rates than their low-SES peers. Put differently, high-ability students from different SES backgrounds that enroll in selective colleges are estimated to earn degrees at roughly equivalent rates when financial aid receipt is not controlled for, but socioeconomic background does appear to influence baccalaureate attainment when controlling for financial aid.

It is somewhat difficult to make sense of this finding, but one hypothesis is that low-SES students are more likely to receive financial aid and financial aid overall has a positive impact on attainment, so excluding financial aid variables from the model results in the appearance that socioeconomic background is not influential for attainment. In other words, financial aid may help to close socioeconomic gaps in attainment, but low-SES students do not graduate at the same rates as high-SES students when controlling for financial aid receipt. An analogy that comes to mind is having children of different ages participate in a race in which the younger students receive a head start. By simply observing the outcome and ignoring the head start, students of different ages may appear

to complete the race at the same time. However, when considering the head start provided to the younger students, it is evident that the older students were indeed faster. In the current context, this would imply that socioeconomic background does matter for baccalaureate attainment, even among high-ability students at selective institutions, but providing low-SES students with financial aid is sufficient to reducing this socioeconomic disparity. This explanation is merely suggestive however and other interpretations may be equally plausible.

Table 16: Sequential Logit Models for High-Ability Students at Selective Institutions

	Applied	Accepted	Enrolled	Persisted	Attained Bachelor's	Bachelor's Attainment (Selective)	Enrolled Graduate	Attained Graduate
LowMidSES	-0.298 (0.195)	0.193 (0.380)	0.359 (0.317)	0.128 (0.769)	0.019 (0.367)	-0.160 (0.327)	0.229 (0.474)	-0.487 (1.104)
HighMidSES	0.218 (0.181)	0.423 (0.342)	0.548* (0.280)	0.372 (0.726)	0.188 (0.318)	-0.129 (0.296)	0.396 (0.430)	-0.081 (0.908)
HighSES	0.719*** (0.179)	0.642* (0.338)	0.678** (0.267)	0.844 (0.708)	0.445 (0.302)	0.090 (0.282)	0.346 (0.419)	-0.089 (0.877)
Constant	-3.597*** (0.916)	-1.545 (3.547)	-3.402*** (0.637)	-3.105** (1.394)	-3.207*** (0.707)	-2.145*** (0.717)	-3.255*** (1.019)	-4.325* (2.214)
var(Constant)	0.762*** (0.134)	0.757 (0.513)	0.548*** (0.190)	0.624 (0.706)	0.000 (0.000)	0.000 (0.000)	0.005 (0.095)	0.000 (0.000)
N	3599	2112	1925	1428	1428	1428	1133	235
ll	-1932.95	-511.58	-997.40	-236.04	-687.08	-841.14	-561.72	-114.87
ll_c	-1983.78	-514.96	-1006.52	-236.71	-687.08	-841.14	-561.72	-114.87
p_c	0.000	0.005	0.000	0.123	.	.	0.484	.

Notes: *p<.10, ** p<.05, *** p<.01. Standard errors in parentheses. Models include demographic, academic, and school variables.

Table 17: Results of Supplemental Attainment Models for High-Ability Students Enrolled at Selective Institutions

	Model 1	Model 2	Model 3
LowMidSES	0.019 (0.367)	0.013 (0.365)	0.182 (0.385)
HighMidSES	0.188 (0.318)	0.174 (0.318)	0.388 (0.331)
HighSES	0.445 (0.302)	0.448 (0.302)	0.740** (0.325)
Demographics	X	X	X
Academics	X	X	X
School controls	X	X	X
Major		X	X
Financial aid			X
Constant	-3.207*** (0.707)	-3.388*** (0.716)	-3.457*** (0.747)
var(Constant)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
N	1428.000	1428.000	1428.000
ll	-687.082	-679.712	-658.229
ll_c	-687.082	-679.712	-658.229
p_c	.	.	.
aic	1416.164	1415.423	1390.458
bic	1526.709	1562.816	1585.227

Notes: *p<.10, ** p<.05, *** p<.01. Standard errors in parentheses.

In addition to analyzing the results of the models for ability by selectivity combinations separately, the benefit of this technique is that we can also investigate socioeconomic disparities in transition rates for different ability groups attending the same types of institutions, or the same ability group attending different types of institutions. We begin with an example of the former. Table 18 provides the results of the models for the top three ability groups at selective institutions (as mentioned before, an insufficient number of low-ability students applied or were accepted to selective colleges for the analysis to produce informative results). Some interesting trends begin to emerge when the results are viewed in this manner. One common finding for all ability subgroups is that there were no significant differences between socioeconomic subgroups in terms of attainment rates, conditional upon enrollment at selective institutions. Although this could be a simply byproduct of smaller sample sizes in the later models reducing statistical power and preventing the identification of significant estimates, for all three ability subgroups the size of the SES estimates in the attainment models are smaller than the estimates in both the application and enrollment stages. These findings would therefore suggest that socioeconomic disparities in attainment are smaller than disparities in earlier stages, at least for high-ability students at selective institutions.

Some additional findings are noteworthy. For both the application and enrollment stages, the magnitude of the disparities appears larger for students of lower ability levels. For example, among high-ability students, only high-SES students apply to selective institutions at significantly higher rates than low-SES students, but among the low-ability subgroup all three SES subgroups in the model are statistically significant and positive.

Although less pronounced, a similar trend is found in the enrollment analysis. In contrast, the reverse trend is found in the analyses of acceptance, with the only significant socioeconomic difference being found among high-ability students. One way to make sense of these findings, particularly for the application and acceptance analyses, is as follows. Among lower-ability students, high-SES students are significantly more likely to apply to “reach” schools, or those institutions with student bodies that have greater average academic achievement than the applicant, compared to low-SES students. However, because high-SES students, particularly those of lower ability, are more likely to reach, they are also no more likely to be accepted than low-SES students. It is important to point out, however, that even though high-SES, high-ability students apply to selective institutions at significantly higher rates than their low-SES peers of similar ability, they are still significantly more likely to be accepted. The trend in the enrollment rate disparities for students who applied and were accepted to selective institutions is also important to note. Across ability levels, high-SES students were significantly more likely than their low-SES peers to enroll in a selective institution they were accepted to, and the relationship between SES and enrollment appears to grow larger for students of lower ability. This finding will also be discussed in greater detail in the following section.

Table 18: Sequential Logit Models for Selective Institutions across Ability Groups

	Applied	Accepted	Enrolled	Persisted	Attained Bachelor's
<i>High-Ability</i>					
LowMidSES	-0.298 (0.195)	0.193 (0.380)	0.359 (0.317)	0.128 (0.769)	0.019 (0.367)
HighMidSES	0.218 (0.181)	0.423 (0.342)	0.548* (0.280)	0.372 (0.726)	0.188 (0.318)
HighSES	0.719*** (0.179)	0.642* (0.338)	0.678** (0.267)	0.844 (0.708)	0.445 (0.302)
<i>High-Mid-Ability</i>					
LowMidSES	0.161 (0.179)	0.015 (0.320)	-0.057 (0.397)	0.891 (1.188)	-0.213 (0.521)
HighMidSES	0.455*** (0.171)	0.219 (0.291)	0.522 (0.390)	-0.954 (0.994)	0.283 (0.481)
HighSES	1.131*** (0.174)	0.355 (0.279)	0.822** (0.378)	-0.644 (0.902)	0.670 (0.472)
<i>Low-Mid-Ability</i>					
LowMidSES	0.401** (0.185)	0.514 (0.362)	0.679 (0.552)	1.158 (1.195)	-0.531 (0.740)
HighMidSES	0.659*** (0.194)	-0.068 (0.353)	1.061** (0.539)	1.130 (1.658)	0.385 (0.841)
HighSES	1.204*** (0.193)	0.244 (0.363)	0.991* (0.585)	-0.164 (1.207)	0.440 (0.807)

Notes: *p<.10, ** p<.05, *** p<.01. Standard errors in parentheses.

Table 19 below presents the results of the models of moderately selective institutions across ability groups. Many of the themes which have been identified in previous analyses are likewise reflected in these results. First, it appears that the stage of college application is the transition that is far more likely to exhibit socioeconomic disparities, regardless of the ability group being considered; students in the top two SES groups were significantly more likely than low-SES students to apply to moderately selective institutions for all ability levels. The same was true in the previous analyses of selective institutions. Additionally, few of the SES variable estimates for the models of persistence at moderately selective institutions were found to be significant, the same pattern which was identified at selective institutions. This finding provides additional evidence that socioeconomic background does not significantly influence the likelihood that students will stopout or transfer to a community college, regardless of ability level or institutional selectivity, while controlling for other variables. However, there are also some patterns at moderately selective institutions that were not evident at selective institutions. One example of this is that the gap between socioeconomic groups at the stage of enrollment is large and significant for high-ability students, but this disparity was not found for any other ability group.

As a caveat, the number of students from the lowest ability quartile that enrolled in moderately selective institutions was quite small, reducing confidence in the estimates of SES for that subgroup. Nevertheless, it appears that a clear trend emerges when investigating the likelihood of attainment for students of different ability levels that enroll in moderately selective institutions. For high-ability students, no significant differences

exist in the rates of attainment. The estimates are somewhat larger for students in the next highest ability group (2TQ, or second test quartile), but the estimates still remain insignificant. This changes once we move to the next ability group, with high-SES students being significantly more likely to complete their degree compared to low-SES students, and the magnitude of the estimate more than doubles when moving to the lowest ability group. In fact, the estimates for all three SES subgroups included in the model of lowest ability students are quite large, although the limited sample size likely prevents two of the three estimates from being significant. It is important to underscore that these results do not simply mean that higher-ability students or those from more privileged backgrounds are more likely to earn a degree after enrolling in a moderately selective institution, although that is the case. Rather, these findings suggest that SES is relatively inconsequential for high-ability students attending these institutions, but extremely influential for students that may be less prepared for college. It appears that socioeconomic background may serve as an “attainment buffer” for students of lower demonstrated ability, although this buffer is less necessary if students are sufficiently prepared for college. In short, these results highlight that socioeconomic background and ability interact in complex but potentially predictable ways in their influence on postsecondary attainment.

Table 19: Sequential Logit Models for Moderately Selective Institutions across Ability Groups

	Applied	Accepted	Enrolled	Persisted	Attained Bachelor's	Enrolled Graduate
<i>High-Ability</i>						
LowMidSES	0.358 (0.224)	-0.158 (0.646)	0.976*** (0.353)	-0.337 (0.548)	-0.374 (0.459)	0.792 (0.883)
HighMidSES	0.611*** (0.225)	0.747 (0.647)	0.545 (0.342)	0.200 (0.574)	-0.267 (0.454)	0.541 (0.902)
HighSES	0.600** (0.234)	0.801 (0.672)	1.334*** (0.359)	0.276 (0.540)	0.115 (0.436)	0.980 (0.856)
<i>High-Mid-Ability</i>						
LowMidSES	-0.010 (0.151)	0.004 (0.361)	-0.155 (0.317)	-0.123 (0.389)	-0.014 (0.335)	-1.683** (0.755)
HighMidSES	0.420*** (0.150)	0.093 (0.341)	0.288 (0.299)	0.677* (0.372)	0.261 (0.298)	-0.745 (0.578)
HighSES	0.674*** (0.158)	0.036 (0.363)	0.251 (0.306)	0.596 (0.381)	0.339 (0.317)	-0.354 (0.624)
<i>Low-Mid-Ability</i>						
LowMidSES	0.017 (0.143)	0.430 (0.294)	-0.339 (0.280)	0.306 (0.463)	0.470 (0.476)	-1.411 (1.266)
HighMidSES	0.368** (0.151)	0.600** (0.289)	0.226 (0.290)	0.457 (0.463)	0.783 (0.481)	-1.587 (1.005)
HighSES	0.777*** (0.166)	0.752** (0.319)	0.290 (0.309)	0.776 (0.497)	0.999* (0.519)	-1.233 (1.131)
<i>Low-Ability</i>						
LowMidSES	0.062 (0.174)	-0.374 (0.364)	-0.412 (0.528)	-0.425 (1.303)	1.347 (0.960)	
HighMidSES	0.370** (0.187)	0.054 (0.385)	-0.068 (0.552)	0.087 (1.702)	1.606 (1.040)	
HighSES	1.054*** (0.215)	-0.056 (0.419)	0.44 (0.533)	3.920* (2.128)	1.983* (1.096)	

Notes: *p<.10, ** p<.05, *** p<.01. Standard errors in parentheses.

The final analysis that will be presented investigates the impact of SES for a single ability group across levels of institutional selectivity. Because models of all three institutional selectivity levels could not be run for either high-ability or low-ability students (high-ability students did not apply to non-selective institutions at sufficient rates and low-ability students did not apply to selective institutions at sufficient rates), one of the middle ability groups, namely students in the second-lowest ability quartile, was chosen for the analysis. Although the interactions between SES and institutional selectivity are not quite as evident as many of those identified in the previous analyses, some notable trends do emerge.

Unsurprisingly, socioeconomic disparities in application to highly selective institutions are most pronounced, and low-SES students are far more likely to apply to non-selective institutions compared to their peers of the same ability level. However, the relationships between SES and institutional selectivity are perhaps less obvious for the acceptance, enrollment, and attainment analyses. In terms of acceptance, no significant socioeconomic disparities exist in the acceptance rates of students that applied to selective institutions, but the disparities appear to grow as we move to lower levels of institutional selectivity. This finding may support the premise that more selective institutions, which on average have greater resources at their disposal, are more capable of admitting students regardless of financial need, while institutions with fewer resources may be more likely to admit students that are able to bear the cost of admission. But while selective institutions may be more willing to accept students regardless of their socioeconomic background, the higher costs characteristic of more selective institutions

may still act as a deterrent to low-SES students actually enrolling, as evidenced by the larger enrollment disparities for selective institutions compared to moderately and non-selective institutions.

Finally, while the evidence is less strong for the analyses of attainment, the only significant socioeconomic gaps in completion were found at moderately selective institutions. It may be the case that resource-rich institutions are more capable of promoting the completion of all students regardless of socioeconomic background, resulting in no socioeconomic disparities in attainment at these institutions, while the relatively high dropout rates of non-selective institutions results in no significant socioeconomic disparities in attainment, but for the opposite reason. At moderately selective institutions, however, high-SES students may be better able to capitalize on their own socioeconomic background and what resources the institution has to offer to promote their attainment. In short, even for students with roughly equivalent levels of demonstrated ability, the impact of their socioeconomic background on the likelihood that they will successfully pass through a given transition appears to depend heavily on the selectivity of the institution which they are interacting with.

Table 20: Sequential Logit Model for Second-Lowest Ability Group across Institutional Selectivity

	Applied	Accepted	Enrolled	Persisted	Attained Bachelor's
<i>Selective</i>					
LowMidSES	0.401** (0.185)	0.514 (0.362)	0.679 (0.552)	1.158 (1.195)	-0.531 (0.740)
HighMidSES	0.659*** (0.194)	-0.068 (0.353)	1.061** (0.539)	1.130 (1.658)	0.385 (0.841)
HighSES	1.204*** (0.193)	0.244 (0.363)	0.991* (0.585)	-0.164 (1.207)	0.440 (0.807)
<i>Moderately Selective</i>					
LowMidSES	0.017 (0.143)	0.430 (0.294)	-0.339 (0.280)	0.306 (0.463)	0.470 (0.476)
HighMidSES	0.368** (0.151)	0.600** (0.289)	0.226 (0.290)	0.457 (0.463)	0.783 (0.481)
HighSES	0.777*** (0.166)	0.752** (0.319)	0.290 (0.309)	0.776 (0.497)	0.999* (0.519)
<i>Non-Selective</i>					
LowMidSES	-0.273 (0.180)	-0.066 (0.387)	-0.359 (0.425)	-1.094 (0.688)	-0.131 (0.794)
HighMidSES	-0.402* (0.213)	1.032* (0.611)	-0.038 (0.465)	-0.126 (0.678)	0.301 (0.802)
HighSES	-0.471* (0.257)	1.004 (0.954)	0.699 (0.651)	0.818 (0.887)	0.405 (0.855)

Notes: *p<.10, ** p<.05, *** p<.01. Standard errors in parentheses.

SUMMARY

Students' socioeconomic background surely influences their postsecondary outcomes in diverse ways, making it difficult to quantify the relationship between the socioeconomic status of the household in which students' were raised and their eventual outcomes. However, the technique of sequential logit modeling is one of the most intuitive and widely used methodologies for estimating the relative impact of SES at each transition point in students' postsecondary pathways. This technique has been used for decades by educational researchers, sociologists, and scholars of social mobility and stratification in higher education, in both the United States and countries around the world. And although the methodological approach has been modified and refined in multiple ways, the overarching conclusion from this line of research has remained fairly constant since Mare first pioneered this approach in the early 1980s, namely that socioeconomic background is more influential at early stages in students' educational pathways and declines to insignificance as they progress through the postsecondary pipeline.

The results presented in this chapter provide quite a different perspective on this phenomenon. Although it is true that, on average, socioeconomic background was not found to be impactful in students' transition between a bachelor's degree and graduate school, congruent with the prior literature in this tradition, significant socioeconomic disparities were identified at the stage of bachelor's attainment for students that had enrolled in a university, even when controlling for the rich set of covariates included in the models. And when including additional postsecondary transitions in the analysis, such

as college application, acceptance, and persistence/transfer rates, there does not appear to be a steady decline in the influence of SES across transitions.

But perhaps an even more important finding is the degree to which socioeconomic disparities in postsecondary transitions rates are a product of students' background ability levels, the selectivity of the institutions they're engaged with, and the combination of the two. In a number of instances, large and significant disparities at a particular transition point were identified for one ability group or at one type of institution, but these disparities were non-existent in other instances.

At times this variation in socioeconomic gaps was too inconsistent to draw firm conclusions, but in other instances it appeared that clear patterns emerged from the results. For example, in the model of bachelor's degree attainment at moderately selective institutions that did not disaggregate students by ability group, high-SES students were estimated to be significantly more likely to earn a degree compared to their low-SES counterparts. However, when separate models were fit to each ability group, this finding did not hold for all subgroups; no disparities were identified among high-abilities students, but the estimated disparity became larger and statistically significant as we moved down in the ability distribution. In this instance, the results strongly suggest that the impact of socioeconomic background depends not simply on students' ability level or the types of institutions they gain access to, but the combination of both factors. In short, these results underscore the need to consider both students' background and the types of institutions in which they enroll when attempting to ensure that students from difference

socioeconomic upbringings successfully pass through each postsecondary transition point at roughly the same frequency.

CHAPTER 5: EXPLORING THE INTERACTION BETWEEN SOCIOECONOMIC, ACADEMIC, AND INSTITUTIONAL RESOURCES IN THE LABOR MARKET OUTCOMES OF COLLEGE GRADUATES

The previous chapter was dedicated to analyzing the extent to which students' socioeconomic upbringing influences their likelihood of progressing through each postsecondary stage, from applying to college to earning a graduate degree, and assessing whether socioeconomic gaps in particular transitions vary based on students' academic ability level, the selectivity of the institution they engage with, and the combination of both factors. The purpose of that chapter was to identify where in students' postsecondary pathways, for whom, and in what institutional contexts socioeconomic background is most influential. But in order to understand the degree to which the higher education system is promoting the social mobility of socioeconomically disadvantaged students, it is also critical to examine the labor market outcomes of students who completed college. The purpose of this chapter is therefore to provide a descriptive portrait of the magnitude of socioeconomic disparities in the labor market outcomes of students who successfully earned a bachelor's degree and to statistically estimate the impact of social upbringing on the employment outcomes of college graduates.

Before presenting the results of the analyses a few points regarding the methodology should be reiterated. The first relates to the study timeframe and students' experiences in the labor market. The cohort used for this study graduated from high school in 2004. If they completed college within four years, they would have had approximately four years of post-college labor market experience by the time the

employment data were collected. While the early years of one's career can significantly impact one's future career trajectory, this is obviously a highly truncated sample of individuals' work experience. Additionally, many students in the sample took longer than four years to earn their bachelor's degree, meaning they had even less time in the workforce before the data were collected. In short, this analysis is not meant to estimate the degree of social mobility per se experienced by the study cohort, as such an estimation requires analyzing students' labor market outcomes over a much longer timeframe, but rather to describe and seek to understand how socioeconomic background shapes the early labor market experiences of college graduates.

A few points should also be repeated regarding the sample used for these analyses. Students were only eligible for the labor market analyses if they had completed a bachelor's degree by the time of the third follow-up survey in 2012, and the sample was restricted in a number of other ways as well. Students that earned a graduate degree were generally excluded from the analyses given that these students would have had hardly any time in the labor market after completing their graduate degree. In fact, in some exploratory analyses students that earned graduate degrees were estimated to earn significantly less than students that terminated their schooling after completing a bachelor's, even though research clearly shows that those individuals with graduate education earn more on average than workers with bachelor's degrees. This finding is likely due to the limited time in the labor market for individuals who completed graduate school. Many college graduates were also still enrolled in graduate school at the time of the third follow-up, and these students were excluded from the analyses. Additionally,

earnings data were not collected on a small but not insignificant number of college graduates, further restricting the sample.

The byproduct of this shrunken sample is that there was insufficient statistical power to conduct the same types of analyses that were conducted in the previous chapter. Specifically, the sub-sample of each student ability group that earned a bachelor's from institutions of a particular selectivity level was almost always too small to generate informative results. It was therefore impossible to conduct the same ability by selectivity analyses that are found in the previous chapter. However, results are still disaggregated for ability groups and then institutional selectivity levels in order to investigate whether these factors impact the magnitude of socioeconomic disparities in students' labor market outcomes.

Finally, as discussed in the methodology section, earnings and wages are rarely normally distributed, and these outcomes showed a large positive skew in the current sample. For example, the mean earnings for most sub-samples were between \$30,000 and \$40,000, but some students earned upwards of \$600,000. Such outliers not only bias the means but also skew the distribution, violating the normality assumption of linear regression. In order to overcome this non-normal distribution, both annual earnings and hourly wages undergo a log-transformation. The benefit of taking the logarithm of earnings and wages is that the distributions of the log-transformed outcome variables are much closer to normal. However, the drawback of this type of transformation is that the parameter estimates in the model are more difficult to interpret, as they represent changes in the log-earnings or log-wages. Thus, we will first begin with models in which the

outcome variables are not transformed in order to estimate the effect of socioeconomic background on actual earnings and wages.

SOCIOECONOMIC BACKGROUND AND LABOR MARKET OUTCOMES OF COLLEGE GRADUATES

We begin by analyzing the descriptive statistics for the labor market outcomes of college graduates, found in Table 21. The first set of columns includes all students whose highest degree was a bachelor's by the conclusion of the study, while the second set of columns restricts the sample to students who were not enrolled in postsecondary at the time labor market data was collected. Whether the sample is all bachelor's recipients or just those not enrolled in postsecondary, the relationship between socioeconomic background and earnings and wages is roughly equivalent. For bachelor's recipients, the mean earnings of high-SES students were approximately \$5,200 more than those of low-SES students, and the median difference was slightly under \$4,000. The disparities are slightly larger when the sample is restricted to respondents not enrolled in postsecondary, with a mean disparity of approximately \$6,500 and a median disparity of \$5,000. Similar socioeconomic differentials in wages are observed. Both the mean and median wage difference between high-SES and low-SES college graduates was approximately \$2.50, while the disparities for graduates not enrolled in postsecondary was about \$3.00. However, restricting the sample to students not enrolled in postsecondary is particularly important when analyzing unemployment rates. For all college graduates, high-SES students actually had the highest rates of unemployment at 12.7%, slightly higher than low-SES students and approximately 3.5% higher than students in the second lowest SES

quartile. In contrast, for college graduates not enrolled in postsecondary, high-SES students had about a 3% lower rate of unemployment compared to low-SES students (6.8% vs. 9.7%), the lowest unemployment rate in the sample. These results suggest that socioeconomic background continues to exert an influence on the labor market outcomes of college graduates.

However, as low-SES students have lower average ability levels and are more likely to attend less selective institutions compared to their high-SES peers, it is also important to investigate whether background ability and institutional selectivity impact the magnitude of socioeconomic disparities in the labor market outcomes of college graduates. Table 22 contains the labor market outcomes descriptives disaggregated by ability level for college graduates not enrolled in postsecondary. The first point that should be highlighted is the clear relationship between ability and earnings. The mean earnings of high-ability students is close to \$40,000, while low-ability students earned approximately \$26,500 on average. The same finding generally holds for both wages and unemployment rates, with high-ability students experiencing significantly better labor market outcomes on average compared to low-ability students.

But in contrast to many of the analyses of postsecondary transitions, it does not appear that the magnitude of disparities in students' labor market outcomes varies consistently by background ability. For example, low-SES students have significantly higher unemployment rates in both the high-ability and low-ability subgroups, but have lower than average unemployment rates in the two middle categories of ability. We also get somewhat conflicting interpretations of the relationship between background ability

and socioeconomic disparities in labor market outcomes depending on if we're considering earnings or wages. For example, low-SES students actually had the highest median earnings among low-ability students, but their mean hourly wages were more than \$4.00 less than high-SES students. Part of the reason for this inconsistent relationship is likely due to the smaller cell sizes when the sample is disaggregated by ability. For example, there would be a consistent disparity in mean earnings across subgroups were it not for the second lowest ability group. At least one low-SES student in this category earned approximately \$400,000, resulting in low-SES students having the highest mean earnings out of any socioeconomic subgroup in this ability category. In short, the limited sample size prevents definitive conclusions from being drawn on the degree to which ability levels impact the magnitude of socioeconomic disparities in students' labor market outcomes.

Table 23 presents the labor market outcome descriptives for college graduates not enrolled in postsecondary disaggregated by institutional selectivity. While there was a clear and consistent relationship between average labor market outcomes and ability, in this instance there is less of a steady decline as we move to institutions of lower selectivity. Instead, average earnings and hourly wages are roughly similar for students who graduated from moderately selective or non-selective institutions, but these outcomes are significantly higher for students that graduated from selective institutions. The mean earnings for students who graduated from moderately selective and non-selective institutions were both approximately \$32,500. In contrast, students who graduated from highly selective institutions earned approximately \$10,000 more than that

on average. Similarly, mean wages for students who graduated from moderately selective and non-selective colleges were both approximately \$18.50, while graduates from selective institutions earned about \$22.00 per hour on average. Thus, although there is not a consistent trend in labor market outcomes across levels of institutional selectivity, these results do underscore the importance of graduating from a selective institution for improving students' socioeconomic outcomes.

There is a similarly inconsistent relationship in terms of how institutional selectivity impacts the magnitude of disparities in students' labor market outcomes. The mean earnings of high-SES and low-SES students are roughly equivalent for both selective and non-selective institutions, while for moderately selective graduates high-SES students earned over \$5,000 more than their low-SES peers on average, suggesting that earnings disparities are greatest among graduates from moderately selective institutions. However, the reverse is true of disparities in the unemployment rates. Low-SES students are significantly more likely to be unemployed among students who graduated from selective and non-selective institutions, while the disparity is much smaller for students who graduated from moderately selective institutions. Once again, while it does appear that disparities in students' labor market outcomes stemming from socioeconomic origins do vary according to the selectivity of the institution from which they graduated, it is likely that the relatively small cell sizes when the sample is disaggregated in this fashion prevents the identification of clear trends in disparities across selectivity levels.

Table 21: Labor Market Outcome Descriptives for Bachelor's Recipients

		All Bachelor's Recipients			Not Enrolled in Postsec.		
		Earnings	Wages	Unemp.	Earnings	Wages	Unemp.
Low-SES	Median	29000	15.50	0	30000	16.00	0
	Mean	30923.17	17.82	12.4%	32905.57	18.2	9.7%
	Range	400000	97.87	1	400000	97.87	1
	SD	33680.53	9.8	0.33	36148.23	10.01	0.296
	N	378	343	378	300	269	300
Low-Mid-SES	Median	28000	16.00	0	29000	16.00	0
	Mean	31299.06	17.67	9.2%	32325.91	17.8	7.3%
	Range	600000	72.87	1	600000	72.87	1
	SD	31572.22	9.01	0.29	32913.72	8.42	0.26
	N	574	535	574	481	448	481
High-Mid-SES	Median	32000	17.00	0	33000	17.31	0
	Mean	32642.65	18.71	10.4%	33959.31	18.97	8.1%
	Range	150000	74.79	1	120000	62.87	1
	SD	20463.19	8.88	0.305	19945.27	8.66	0.274
	N	982	928	982	811	764	811
High-SES	Median	32775	18.00	0	35000	18.91	0
	Mean	36143.58	20.36	12.7%	39533.3	21.19	6.8%
	Range	250000	97.87	1	250000	97.87	1
	SD	27822.41	11.691	0.333	28045.78	11.68	0.252
	N	1770	1641	1770	1379	1279	1379
Total	Median	31000	17.00	0	33000	17.50	0
	Mean	33931.92	19.24	11.5%	36175.65	19.74	7.5%
	Range	600000	97.87	1	600000	97.87	1
	SD	27481.69	10.47	0.319	28109.19	10.35	0.264
	N	3704	3447	3704	2971	2760	2971

*Respondents with missing hourly wage data were excluded from the wage calculations.

Table 22: Labor Market Outcome Descriptives for Bachelor's Recipients by Ability Level

		High-Ability			High-Mid-Ability			Low-Mid-Ability			Low-Ability		
		Earnings	Wages	Unemp.	Earnings	Wages	Unemp.	Earnings	Wages	Unemp.	Earnings	Wages	Unemp.
Low-SES	Median	35000	16.90	0	32000	16.08	0	28000	15.00	0	29500	14.50	0
	Mean	34414.56	19.27	12.5%	32571.67	19.47	6.9%	37943.81	17.51	7.2%	22708.70	15.00	14.0%
	Range	115000	68.12	1	83000	96.67	1	400000	55.56	1	60000	26.16	1
	SD	21883.52	10.35	0.333	19971.58	11.97	0.255	60241.83	8.59	0.261	16589.46	6.23	0.351
	N	80	74	80	87	82	87	83	71	83	50	42	50
Low-Mid-SES	Median	35000	18.08	0	27000	16.00	0	25500	14.00	0	23000	13.24	0
	Mean	36995.57	19.36	5.6%	32527.04	17.41	5.2%	27385.07	16.44	11.4%	25557.58	16.55	12.1%
	Range	175000	36.45	1	600000	68.00	1	80000	72.87	1	65000	39.25	1
	SD	23432.57	8.24	0.230	46504.23	8.04	0.223	19063.46	8.90	0.319	18777.83	8.80	0.331
	N	161	154	161	173	162	173	114	103	114	33	29	33
High-Mid-SES	Median	35000	19.23	0	31000	17.00	0	30000	15.38	0	30000	15.00	0
	Mean	37244.35	20.11	7.1%	31969.60	18.64	8.5%	30576.63	16.68	10.4%	29927.63	17.66	7.9%
	Range	120000	44.88	1	97000	62.67	1	115000	38.23	1	80000	38.00	1
	SD	21202.92	8.68	0.258	18531.06	8.92	0.279	18790.89	7.30	0.307	18462.24	8.63	0.273
	N	351	337	351	307	288	307	115	107	115	38	32	38
High-SES	Median	40000	20.00	0	35000	18.00	0	30000	16.72	0	25000	16.83	0
	Mean	41988.51	21.78	6.4%	37193.76	20.45	7.2%	36275.44	20.66	7.1%	29283.88	19.34	9.8%
	Range	250000	97.70	1	140000	97.87	1	250000	97.76	1	90000	46.00	1
	SD	29932.41	11.37	0.244	22312.30	11.17	0.260	31900.96	14.74	0.258	22772.08	9.79	0.300
	N	770	723	770	414	385	414	154	134	154	41	37	41
Total	Median	36250	19.23	0	32000	17.00	0	29000	15.24	0	26000	15.00	0
	Mean	39730.82	20.91	6.8%	34325.99	19.26	7.2%	32991.34	18.05	9.0%	26646.44	17.07	11.1%
	Range	250000	97.87	1	600000	97.87	1	400000	97.87	1	90000	50.00	1
	SD	26855.51	10.36	0.252	27159.80	10.13	0.259	34158.31	10.90	0.287	19245.35	8.44	0.315
	N	1362	1288	1362	981	917	981	466	415	466	162	140	162

*Respondents with missing hourly wage data were excluded from the wage calculations.

Table 23: Labor Market Outcome Descriptives for Bachelor's Recipients by Institutional Selectivity

		Selective			Moderately Selective			Non-Selective		
		Earnings	Wages	Unemp.	Earnings	Wages	Unemp.	Earnings	Wages	Unemp.
Low-SES	Median	38000	18.49	0	30000	16.16	0	29000	15.00	0
	Mean	44771.58	20.43	10.9%	29327.01	17.99	7.8%	31755.08	17.39	12.4%
	Range	396000	64.87	1	83000	55.56	1	400000	96.00	1
	SD	53945.78	10.58	0.315	19788.88	8.86	0.270	43187.34	11.45	0.331
	N	55	48	55	153	138	153	89	81	89
Low-Mid-SES	Median	33000	17.21	0	29000	16.00	0	27000	15.00	0
	Mean	37120.65	19.34	5.8%	29231.01	17.19	6.4%	34398.26	17.52	10.1%
	Range	175000	69.96	1	120000	72.87	1	600000	46.45	1
	SD	24345.87	9.47	0.234	17598.01	7.63	0.245	58139.46	8.80	0.303
	N	121	112	121	250	235	250	109	101	109
High-Mid-SES	Median	36298	18.86	0	31500	16.83	0	32000	16.80	0
	Mean	37838.53	20.18	6.8%	32345.05	18.45	8.3%	32740.52	18.50	10.2%
	Range	100000	44.88	1	120000	62.87	1	115000	62.85	1
	SD	20318.80	8.64	0.253	19821.30	8.34	0.277	19096.19	9.37	0.304
	N	234	222	234	420	391	420	147	141	147
High-SES	Median	40000	20.77	0	33000	17.50	0	28560	16.25	0
	Mean	45346.14	23.22	6.8%	34717.17	18.97	6.7%	31935.77	19.90	7.3%
	Range	250000	97.85	1	250000	97.85	1	130000	97.87	1
	SD	31777.75	12.32	0.252	22597.92	9.37	0.251	22358.52	13.55	0.261
	N	678	629	678	506	473	506	192	174	192
Total	Median	39500	20.00	0	30000	16.83	0	29000	16.00	0
	Mean	42787.63	21.99	6.9%	32314.97	18.36	7.3%	32625.95	18.61	9.5%
	Range	396000	97.87	1	250000	97.87	1	600000	97.87	1
	SD	30668.62	11.33	0.253	20641.17	8.70	0.260	35576.80	11.25	0.293
	N	1088	1011	1088	1329	1237	1329	537	497	537

*Respondents with missing hourly wage data were excluded from the wage calculations.

MODELS OF LABOR MARKET OUTCOMES FOR ALL COLLEGE GRADUATES

Now that we have reviewed the descriptive characteristics of students' employment outcomes we may turn to our statistical analyses for the entire sample of college graduates, but once again before we begin a few points should be reiterated. As mentioned in Chapter 3, all models are multilevel with students assumed to be nested within the postsecondary institution which they graduated from and include a level-2 random intercept. Additionally, while the postsecondary analyses focused primarily on the impact of pre-collegiate factors on students' postsecondary outcomes, including only pre-collegiate variables in analyses of students' labor market outcomes would exclude a number of factors related to students' postsecondary experiences which research has identified as being significant contributors to employment and earnings. In order to assess the impact of these variables on labor market outcomes and to determine how controlling for these factors impacts our SES estimates, each results table below presents a series of models in which blocks of variables are added successively to the equation. The first model includes only the SES variables, and the next three models add variables related to students' demographic characteristics, high school achievement and ability, and high school characteristics, respectively, the same variables which were included in the postsecondary analyses. The next five models (numbers 5-9) add variables related to major, financial aid, institutional selectivity, the semester which students attained their degree, and their region of residence. The variables in model 9 were then reviewed to determine whether specific blocks of variables were not significantly related to students' labor market outcomes, and the final model excludes those blocks of variables. In nearly

all instances this elimination of non-significant variables resulted in improvements in model fit, as evidenced by the AIC and BIC values presented at the bottom of the table. Finally, the results tables presented in this section include all the variables included in the models in order to highlight which variables are significantly related to students' labor market outcomes, but the results tables included in the subsequent sections will exclude these variables and only present the results for the SES variables. Table 24 presents the results from the logit models of unemployment, Table 25 and Table 26 present the results for hourly wages and the logarithm of wages, respectively, and Table 27 and Table 28 present the results for annual earnings and the logarithm of earnings, respectively.

We begin with the model of unemployment. The outcome variable in these models is whether students are unemployed, defined in accordance with the federal definition of not currently employed but seeking work. Positive parameter estimates therefore represent an increase in the odds of unemployment, while negative estimates indicate a decrease in the odds of unemployment. Negative estimates therefore represent factors which are beneficial to finding employment. As evidenced by these results, a number of factors were found to significantly impact students' likelihood of being unemployed. Women were significantly more likely than men to be unemployed, and Asian students were more likely than white students. No other demographic characteristics were significantly related to unemployment. Interestingly, performance on the ELS-administered math assessment decreases the odds of unemployment, but it appears that reading proficiency actually increases one's likelihood of being unemployed. Students that majored in the social sciences or the humanities and arts were also more

likely to be unemployed, but the relationship between reading proficiency and unemployment was present even when controlling for college major. The factor that appears to be most influential in determining whether students are able to secure employment is the semester in which they graduated; students that graduated later in the study timeframe were significantly and substantially more likely to be unemployed. While a number of factors are therefore related to unemployment, one of the factors that was not found to significantly influence students' likelihood of unemployment was the socioeconomic background variables. While high-SES students were significantly less likely to be unemployed when no other variables were controlled for, this effect was reduced to insignificance once other demographic characteristics had been controlled for.

Although the benefit of analyzing hourly wages separately from annual earnings is that socioeconomic disparities could exist in one measure but not the other if SES groups varied in the average number of hours they work, in many respects the results of the wages and annual earnings analyses are quite similar and reinforce each other. Additionally, the log-outcome models do not provide significantly different perspectives from the models with the non-transformed outcomes. Thus, the next four models will be discussed together. Many of the estimates for the non-SES variables are also similar for the wages and earnings analyses compared to the previously discussed model of unemployment. Women were found to have significantly lower earnings and wages than men, math proficiency was positively related to these outcomes while reading proficiency was negatively related, college major was found to significantly and often substantially impact both wages and earnings, and students that took longer to complete their degree

also had significantly lower outcomes than students who graduated earlier. However, the one critical difference between the analysis of unemployment and the current models is that high-SES students were found to earn significantly more than their low-SES peers, even when controlling for the variables which significantly impacted these outcomes. In the final annual earnings model, high-SES students were estimated to earn approximately \$3,650 more per year than low-SES students. The estimated wage difference between these SES subgroups was \$1.33. Although this figure does not seem substantial, this translates into a difference of about \$53 per week for full-time work. Assuming a full 52-week year of work at these wages, high-SES students would earn approximately \$2,760 more per year than low-SES students, once again controlling for background characteristics, major, the semester which students completed their degree, and all other variables in the model. The modest discrepancy between the disparity estimated by the annual earnings analysis and the estimate derived from the hourly wages analysis may be due to high-SES students being able to secure more hours of work than low-SES students. Either way, both analyses support the contention that college graduates from more privileged backgrounds fare better in the labor market than students from humble origins.

Table 24: Models of Unemployment for All College Graduates

	Model Number									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
LowMidSES	-0.351 (0.301)	-0.227 (0.327)	-0.305 (0.328)	-0.268 (0.331)	-0.210 (0.333)	-0.147 (0.339)	-0.140 (0.341)	-0.135 (0.349)	-0.139 (0.351)	-0.196 (0.343)
HighMidSES	-0.169 (0.271)	0.0312 (0.292)	0.000956 (0.293)	0.0231 (0.290)	0.0435 (0.290)	0.0546 (0.293)	0.0688 (0.295)	0.0807 (0.301)	0.0835 (0.304)	0.0644 (0.301)
HighSES	-0.460* (0.242)	-0.232 (0.275)	-0.209 (0.282)	-0.250 (0.284)	-0.250 (0.284)	-0.224 (0.290)	-0.209 (0.295)	-0.197 (0.307)	-0.203 (0.311)	-0.235 (0.303)
OtherRace		0.214 (0.373)	0.143 (0.378)	-0.00550 (0.400)	-0.0932 (0.404)	-0.137 (0.402)	-0.140 (0.403)	-0.146 (0.416)	-0.129 (0.418)	-0.0670 (0.419)
Asian		0.599* (0.336)	0.700** (0.330)	0.621* (0.332)	0.616* (0.332)	0.587* (0.329)	0.584* (0.328)	0.554* (0.333)	0.564* (0.336)	0.578* (0.337)
AfricanAmerican		0.0262 (0.318)	-0.173 (0.333)	-0.176 (0.344)	-0.215 (0.339)	-0.240 (0.343)	-0.272 (0.349)	-0.298 (0.354)	-0.281 (0.353)	-0.238 (0.349)
Hispanic		0.235 (0.311)	0.124 (0.307)	0.136 (0.307)	0.112 (0.314)	0.0544 (0.314)	0.0430 (0.316)	-0.0323 (0.319)	-0.0233 (0.323)	0.0315 (0.323)
Female		0.661*** (0.171)	0.616*** (0.177)	0.584*** (0.176)	0.585*** (0.179)	0.610*** (0.177)	0.605*** (0.178)	0.642*** (0.183)	0.643*** (0.184)	0.627*** (0.185)
NonNatEnglish		0.136 (0.296)	0.190 (0.301)	0.199 (0.286)	0.205 (0.293)	0.148 (0.294)	0.143 (0.296)	0.192 (0.302)	0.181 (0.303)	0.229 (0.304)
ELS Math Z-score			-0.387*** (0.140)	-0.392*** (0.142)	-0.382*** (0.145)	-0.388*** (0.147)	-0.387*** (0.147)	-0.343** (0.150)	-0.344** (0.150)	-0.335** (0.148)
ELS Read Z-score			0.299** (0.143)	0.314** (0.143)	0.297** (0.143)	0.300** (0.143)	0.305** (0.144)	0.320** (0.148)	0.315** (0.148)	0.318** (0.148)
F1RAPIB			-0.0470 (0.0455)	-0.0557 (0.0461)	-0.0690 (0.0465)	-0.0612 (0.0460)	-0.0601 (0.0475)	-0.0423 (0.0473)	-0.0487 (0.0478)	-0.0509 (0.0480)

Table 24 (Cont.)

F1RGP	-0.181** (0.0768)	-0.184** (0.0859)	-0.186** (0.0862)	-0.184** (0.0864)	-0.180** (0.0869)	-0.105 (0.0866)	-0.104 (0.0869)	-0.0977 (0.0852)
CatholicSchool		-0.557** (0.257)	-0.578** (0.257)	-0.571** (0.256)	-0.566** (0.254)	-0.486* (0.254)	-0.475* (0.255)	-0.474* (0.256)
OtherPrivateSchool		0.521** (0.230)	0.478** (0.234)	0.507** (0.233)	0.507** (0.231)	0.654*** (0.237)	0.669*** (0.237)	0.646*** (0.236)
UrbanSchool		-0.0854 (0.249)	-0.118 (0.256)	-0.0960 (0.253)	-0.0987 (0.252)	-0.189 (0.255)	-0.211 (0.257)	-0.241 (0.259)
SuburbanSchool		-0.154 (0.226)	-0.191 (0.231)	-0.176 (0.230)	-0.174 (0.230)	-0.235 (0.227)	-0.248 (0.230)	-0.272 (0.230)
MidwestSchool		0.0687 (0.277)	0.0957 (0.278)	0.0338 (0.280)	0.0271 (0.281)	-0.0268 (0.287)	0.370 (0.426)	0.409 (0.431)
SouthSchool		0.347 (0.241)	0.378 (0.243)	0.297 (0.242)	0.291 (0.243)	0.202 (0.247)	0.544* (0.319)	0.582* (0.320)
WestSchool		0.504* (0.279)	0.545* (0.282)	0.459 (0.283)	0.452 (0.285)	0.390 (0.293)	0.465 (0.391)	0.516 (0.398)
<i>Major</i>								
F2Major_CSTEM			-0.0234 (0.287)	-0.0284 (0.294)	-0.0222 (0.293)	0.0230 (0.290)	0.0386 (0.293)	0.0425 (0.287)
F2Major_SocSci			0.561** (0.239)	0.558** (0.237)	0.574** (0.237)	0.755*** (0.250)	0.769*** (0.250)	0.788*** (0.253)
F2Major_Educ			-0.423 (0.376)	-0.425 (0.378)	-0.419 (0.380)	-0.322 (0.389)	-0.313 (0.390)	-0.318 (0.388)
F2Major_HumArts			0.480* (0.255)	0.478* (0.255)	0.482* (0.254)	0.586** (0.263)	0.568** (0.266)	0.582** (0.264)

Table 24 (Cont.)

F2Major_AgrEnv	.	.	.	.	.	.
	.	.	.	.	.	.
F2Major_Arch	-0.390	-0.435	-0.461	-0.459	-0.463	-0.417
	(1.008)	(0.997)	(1.007)	(0.937)	(0.945)	(0.959)
F2Major_Business	-0.0437	-0.0230	-0.00156	0.150	0.154	0.140
	(0.250)	(0.249)	(0.251)	(0.263)	(0.265)	(0.266)
<i>Financial Aid</i>						
FinAidCoverTuitionLTHalf		-0.813	-0.801	-0.769	-0.769	
		(0.575)	(0.576)	(0.607)	(0.602)	
FinAidCoverTuitionGTHalf		-0.0667	-0.0443	-0.0370	-0.0319	
		(0.568)	(0.569)	(0.603)	(0.600)	
FinAidCoverTuitionAll		-0.00635	0.0136	0.00307	0.00560	
		(0.583)	(0.583)	(0.617)	(0.611)	
FinAidCoverExpensesLTHalf		0.226	0.221	0.230	0.234	
		(0.567)	(0.569)	(0.596)	(0.591)	
FinAidCoverExpensesGTHalf		0.219	0.204	0.215	0.233	
		(0.589)	(0.590)	(0.626)	(0.622)	
FinAidCoverExpensesAll		-0.0681	-0.0875	-0.118	-0.107	
		(0.670)	(0.670)	(0.702)	(0.699)	
FinAidLoans		0.115	0.120	0.132	0.145	
		(0.184)	(0.184)	(0.187)	(0.188)	
FinAidWorkStudy		-0.105	-0.102	-0.0670	-0.0688	
		(0.242)	(0.241)	(0.252)	(0.253)	
FinAidTuitionWaiver		0.00227	-0.0214	-0.119	-0.121	
		(0.295)	(0.296)	(0.314)	(0.312)	

Table 24 (Cont.)

Institutional Selectivity

AttainInstHighSelect	0.203 (1.060)	0.239 (1.145)	0.272 (1.159)	0.220 (1.132)
AttainInstModSelect	0.150 (1.051)	0.0651 (1.134)	0.125 (1.148)	0.0933 (1.121)
AttainInstNonSelect	0.389 (1.053)	0.232 (1.134)	0.281 (1.147)	0.229 (1.119)

Attainment Semester

AttainJune08		0.938 (0.626)	0.942 (0.631)	0.943 (0.630)
AttainDec08		0.985 (0.601)	1.009* (0.606)	1.050* (0.607)
AttainJune09		1.284** (0.647)	1.298** (0.652)	1.342** (0.651)
AttainDec09		1.394** (0.677)	1.412** (0.682)	1.464** (0.681)
AttainJune10		1.316** (0.631)	1.324** (0.638)	1.417** (0.639)
AttainDec10		1.750** (0.701)	1.785** (0.708)	1.823*** (0.703)
AttainJune11		1.157 (0.704)	1.176* (0.709)	1.237* (0.708)
AttainDec11		2.014*** (0.720)	2.056*** (0.729)	2.114*** (0.740)
AttainJune12		2.233*** (0.670)	2.251*** (0.678)	2.307*** (0.674)

Table 24 (Cont.)

AttainDec12								3.035***	3.055***	3.040***
								(0.830)	(0.843)	(0.858)
<i>Region of Residence</i>										
NortheastF3									0.530	0.517
									(0.421)	(0.423)
SouthF3									0.0651	0.0833
									(0.385)	(0.377)
WestF3									0.411	0.427
									(0.364)	(0.356)
cons	-2.411***	-3.108***	-2.437***	-2.479***	-2.535***	-2.442***	-2.684**	-4.188***	-4.723***	-4.787***
	(0.257)	(0.321)	(0.404)	(0.444)	(0.458)	(0.461)	(1.153)	(1.331)	(1.392)	(1.357)
Var(cons)	0.549**	0.509**	0.572**	0.478*	0.475*	0.427	0.412	0.404	0.441	0.481*
	(0.250)	(0.251)	(0.278)	(0.267)	(0.261)	(0.273)	(0.266)	(0.280)	(0.290)	(0.272)
-2LL	-674.683	-662.328	-654.275	-643.232	-634.532	-628.320	-627.730	-613.480	-612.177	-617.794
-2LL_c	-678.073	-665.130	-657.513	-645.526	-636.722	-630.041	-629.336	-614.990	-613.900	-619.925
p_c	0.005	0.009	0.005	0.016	0.018	0.032	0.037	0.041	0.032	0.020
AIC	1359.366	1346.656	1338.550	1330.465	1325.064	1330.640	1335.460	1326.960	1330.353	1323.588
BIC	1388.512	1410.777	1425.989	1458.708	1487.867	1545.773	1568.036	1617.680	1638.516	1579.422

Notes: *p<.10, ** p<.05, *** p<.01. Standard errors in parentheses.

Table 25: Models of Hourly Wages for All College Graduates

	Model Number									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
LowMidSES	-0.704 (0.826)	-0.754 (0.837)	-0.451 (0.830)	-0.448 (0.830)	-0.609 (0.825)	-0.745 (0.828)	-0.792 (0.827)	-0.829 (0.818)	-0.798 (0.816)	-0.691 (0.813)
HighMidSES	0.433 (0.756)	0.239 (0.781)	0.265 (0.776)	0.237 (0.778)	0.183 (0.773)	0.0480 (0.780)	0.0171 (0.780)	-0.176 (0.771)	-0.126 (0.770)	0.000525 (0.762)
HighSES	2.483*** (0.722)	2.186*** (0.759)	1.814** (0.762)	1.662** (0.771)	1.698** (0.765)	1.528* (0.782)	1.373* (0.785)	1.147 (0.775)	1.168 (0.774)	1.331* (0.757)
OtherRace		0.897 (0.989)	1.204 (0.980)	1.084 (0.986)	1.365 (0.981)	1.365 (0.981)	1.415 (0.980)	1.321 (0.966)	1.363 (0.965)	1.351 (0.964)
Asian		-0.0109 (0.830)	-0.549 (0.828)	-0.646 (0.853)	-0.706 (0.847)	-0.648 (0.848)	-0.713 (0.847)	-0.688 (0.835)	-0.694 (0.834)	-0.736 (0.832)
AfricanAmerican		-2.345*** (0.811)	-1.207 (0.827)	-1.012 (0.833)	-1.298 (0.829)	-1.049 (0.838)	-1.149 (0.839)	-0.946 (0.828)	-0.931 (0.828)	-1.177 (0.819)
Hispanic		-1.278 (0.802)	-0.755 (0.802)	-1.022 (0.814)	-0.962 (0.807)	-0.867 (0.809)	-0.917 (0.808)	-0.726 (0.798)	-0.711 (0.797)	-0.786 (0.795)
Female		-2.133*** (0.406)	-1.875*** (0.418)	-1.839*** (0.417)	-1.469*** (0.424)	-1.519*** (0.424)	-1.504*** (0.424)	-1.694*** (0.419)	-1.693*** (0.419)	-1.642*** (0.418)
NonNatEnglish		1.247 (0.805)	1.033 (0.801)	1.001 (0.800)	0.789 (0.794)	0.789 (0.794)	0.785 (0.793)	0.776 (0.782)	0.729 (0.781)	0.734 (0.781)
ZBYTXMSTD			1.568*** (0.344)	1.556*** (0.345)	1.340*** (0.345)	1.331*** (0.345)	1.270*** (0.345)	1.199*** (0.341)	1.225*** (0.340)	1.225*** (0.341)
ZBYTXRSTD			-0.793** (0.321)	-0.870*** (0.322)	-0.710** (0.320)	-0.677** (0.320)	-0.712** (0.320)	-0.817*** (0.316)	-0.870*** (0.316)	-0.906*** (0.316)
F1RAPIB			0.533*** (0.119)	0.556*** (0.122)	0.529*** (0.121)	0.513*** (0.121)	0.457*** (0.123)	0.355*** (0.122)	0.340*** (0.122)	0.350*** (0.122)

Table 25 (Cont.)

FIRGP	0.368 (0.328)	0.531 (0.335)	0.484 (0.335)	0.480 (0.338)	0.453 (0.339)	-0.0321 (0.340)	-0.0554 (0.341)	-0.0646 (0.338)
CatholicSchool		1.274** (0.562)	1.201** (0.557)	1.128** (0.558)	1.043* (0.558)	0.713 (0.552)	0.717 (0.551)	0.773 (0.551)
OtherPrivateSchool		0.490 (0.652)	0.587 (0.647)	0.532 (0.647)	0.345 (0.649)	-0.286 (0.647)	-0.268 (0.646)	-0.220 (0.645)
UrbanSchool		0.349 (0.670)	0.277 (0.666)	0.282 (0.666)	0.305 (0.664)	0.563 (0.656)	0.476 (0.656)	0.466 (0.656)
SuburbanSchool		0.422 (0.596)	0.361 (0.592)	0.364 (0.592)	0.412 (0.591)	0.512 (0.583)	0.442 (0.583)	0.444 (0.583)
MidwestSchool		-1.515** (0.638)	-1.567** (0.631)	-1.501** (0.632)	-1.454** (0.629)	-1.115* (0.622)	0.663 (0.985)	0.684 (0.985)
SouthSchool		-1.677*** (0.623)	-1.711*** (0.615)	-1.464** (0.623)	-1.379** (0.621)	-0.859 (0.619)	0.773 (0.877)	0.656 (0.873)
WestSchool		-0.472 (0.742)	-0.709 (0.736)	-0.502 (0.739)	-0.403 (0.736)	0.268 (0.730)	1.056 (1.050)	0.941 (1.048)
<i>Major</i>								
F2Major_CSTEM			1.695** (0.675)	1.661** (0.677)	1.675** (0.676)	1.490** (0.667)	1.576** (0.667)	1.599** (0.664)
F2Major_SocSci			-0.920 (0.666)	-1.035 (0.667)	-1.042 (0.667)	-1.792*** (0.663)	-1.743*** (0.663)	-1.686** (0.663)
F2Major_Educ			-2.721*** (0.851)	-2.768*** (0.852)	-2.548*** (0.854)	-3.041*** (0.844)	-3.012*** (0.843)	-3.006*** (0.842)
F2Major_HumArts			-2.894*** (0.690)	-2.880*** (0.691)	-2.838*** (0.690)	-3.271*** (0.682)	-3.329*** (0.682)	-3.393*** (0.680)
F2Major_AgrEnv			-1.447 (1.722)	-1.565 (1.726)	-1.393 (1.724)	-2.245 (1.706)	-2.231 (1.705)	-2.181 (1.699)

Table 25 (Cont.)

F2Major_Arch	-1.950 (2.114)	-1.804 (2.113)	-1.838 (2.110)	-2.117 (2.081)	-2.286 (2.079)	-2.458 (2.079)
F2Major_Business	0.170 (0.554)	0.172 (0.555)	0.240 (0.556)	-0.564 (0.557)	-0.585 (0.556)	-0.628 (0.555)
<i>Financial Aid</i>						
FinAidCoverTuitionLTHalf		-0.719 (1.204)	-0.751 (1.202)	-0.627 (1.186)	-0.572 (1.185)	
FinAidCoverTuitionGTHalf		-0.603 (1.264)	-0.573 (1.262)	-0.239 (1.246)	-0.164 (1.245)	
FinAidCoverTuitionAll		-0.959 (1.306)	-0.888 (1.304)	-0.409 (1.290)	-0.338 (1.288)	
FinAidCoverExpensesLTHalf		0.882 (1.172)	0.969 (1.170)	0.675 (1.156)	0.644 (1.154)	
FinAidCoverExpensesGTHalf		-0.257 (1.329)	-0.269 (1.327)	-0.590 (1.313)	-0.585 (1.311)	
FinAidCoverExpensesAll		-1.058 (1.479)	-1.043 (1.477)	-1.385 (1.459)	-1.370 (1.457)	
FinAidLoans		-0.281 (0.457)	-0.291 (0.457)	-0.451 (0.452)	-0.402 (0.451)	
FinAidWorkStudy		0.950* (0.557)	0.910 (0.557)	0.710 (0.549)	0.720 (0.549)	
FinAidTuitionWaiver		-0.607 (0.779)	-0.636 (0.779)	-0.650 (0.770)	-0.738 (0.770)	
<i>Institutional Selectivity</i>						
AttainInstHighSelect			0.182 (3.175)	-0.0234 (3.146)	0.0740 (3.141)	0.296 (3.142)

Table 25 (Cont.)

AttainInstModSelect	-1.441 (3.159)	-1.026 (3.129)	-0.839 (3.124)	-0.607 (3.126)
AttainInstNonSelect	-0.396 (3.173)	0.277 (3.140)	0.466 (3.135)	0.622 (3.138)
<i>Attainment Semester</i>				
AttainDec07		-1.520 (1.824)	-1.543 (1.821)	-1.517 (1.822)
AttainJune08		-0.751 (1.387)	-0.833 (1.386)	-0.893 (1.386)
AttainDec08		-1.832 (1.445)	-1.852 (1.442)	-1.898 (1.441)
AttainJune09		-4.197*** (1.432)	-4.243*** (1.430)	-4.285*** (1.429)
AttainDec09		-4.459*** (1.540)	-4.504*** (1.538)	-4.632*** (1.536)
AttainJune10		-4.068*** (1.531)	-4.171*** (1.529)	-4.150*** (1.526)
AttainDec10		-4.748*** (1.631)	-4.738*** (1.629)	-4.836*** (1.625)
AttainJune11		-5.613*** (1.634)	-5.673*** (1.632)	-5.636*** (1.632)
AttainDec11		-6.202*** (1.775)	-6.226*** (1.772)	-6.461*** (1.768)
AttainJune12		-6.034*** (1.710)	-6.070*** (1.707)	-6.320*** (1.706)
AttainDec12		-7.469*** (2.665)	-7.558*** (2.661)	-7.375*** (2.662)

Table 25 (Cont.)

<i>Region of Residence</i>										
NortheastF3									2.390**	2.430**
									(1.006)	(1.006)
SouthF3									0.136	0.134
									(0.827)	(0.828)
WestF3									1.285	1.284
									(0.887)	(0.888)
_cons	18.57***	20.05***	17.73***	17.70***	18.30***	18.48***	19.34***	24.01***	22.01***	21.63***
	(0.665)	(0.779)	(1.272)	(1.363)	(1.367)	(1.381)	(3.378)	(3.535)	(3.620)	(3.620)
lns1_1_1(cons)	1.139***	1.102***	0.986***	0.928***	0.873***	0.869***	0.837***	0.815***	0.811***	0.802***
	(0.118)	(0.125)	(0.141)	(0.153)	(0.163)	(0.164)	(0.171)	(0.176)	(0.177)	(0.180)
lnsig_e (cons)	2.272***	2.265***	2.259***	2.258***	2.252***	2.249***	2.249***	2.234***	2.232***	2.235***
	(0.0167)	(0.0168)	(0.0165)	(0.0165)	(0.0164)	(0.0164)	(0.0164)	(0.0165)	(0.0165)	(0.0165)
N	2475	2475	2475	2475	2475	2475	2475	2475	2475	2475
ICC	0.094	0.089	0.073	0.065	0.060	0.059	0.056	0.055	0.055	0.054
-2LL	-9237.51	-9216.40	-9183.77	-9174.54	-9152.73	-9146.93	-9141.89	-9104.19	-9099.81	-9104.61
AIC	18487.01	18456.81	18399.54	18395.09	18365.47	18371.87	18367.77	18314.38	18311.62	18303.22
BIC	18521.89	18526.58	18492.56	18528.81	18539.89	18598.61	18611.96	18622.52	18637.21	18576.48

Notes: *p<.10, ** p<.05, *** p<.01. Standard errors in parentheses.

Table 26: Models of Log-Hourly Wages for All College Graduates

	Model Number									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
LowMidSES	-0.016 (0.040)	-0.018 (0.041)	-0.001 (0.040)	-0.002 (0.040)	-0.011 (0.040)	-0.018 (0.040)	-0.021 (0.040)	-0.022 (0.039)	-0.020 (0.039)	-0.014 (0.039)
HighMidSES	0.037 (0.037)	0.029 (0.038)	0.031 (0.038)	0.032 (0.038)	0.029 (0.037)	0.021 (0.038)	0.018 (0.038)	0.008 (0.037)	0.009 (0.037)	0.017 (0.037)
HighSES	0.118*** (0.035)	0.105*** (0.037)	0.089** (0.037)	0.085** (0.037)	0.088** (0.037)	0.077** (0.038)	0.068* (0.038)	0.058 (0.037)	0.058 (0.037)	0.070* (0.037)
OtherRace		0.021 (0.048)	0.037 (0.047)	0.031 (0.048)	0.050 (0.047)	0.051 (0.047)	0.054 (0.047)	0.051 (0.047)	0.052 (0.047)	0.050 (0.047)
Asian		0.004 (0.040)	-0.021 (0.040)	-0.027 (0.041)	-0.029 (0.041)	-0.028 (0.041)	-0.030 (0.041)	-0.028 (0.040)	-0.028 (0.040)	-0.028 (0.040)
AfricanAmerican		-0.097** (0.039)	-0.037 (0.040)	-0.024 (0.040)	-0.040 (0.040)	-0.025 (0.040)	-0.026 (0.041)	-0.015 (0.040)	-0.016 (0.040)	-0.031 (0.040)
Hispanic		-0.043 (0.039)	-0.017 (0.039)	-0.027 (0.039)	-0.024 (0.039)	-0.018 (0.039)	-0.019 (0.039)	-0.010 (0.038)	-0.010 (0.038)	-0.015 (0.038)
Female		-0.101*** (0.020)	-0.092*** (0.020)	-0.090*** (0.020)	-0.071*** (0.020)	-0.073*** (0.020)	-0.072*** (0.020)	-0.080*** (0.020)	-0.081*** (0.020)	-0.078*** (0.020)
NonNatEnglish		0.048 (0.039)	0.039 (0.039)	0.039 (0.039)	0.028 (0.038)	0.028 (0.038)	0.028 (0.038)	0.028 (0.038)	0.026 (0.038)	0.026 (0.038)
ZBYTXMSTD			0.074*** (0.017)	0.072*** (0.017)	0.060*** (0.017)	0.060*** (0.017)	0.057*** (0.017)	0.054*** (0.016)	0.055*** (0.016)	0.054*** (0.016)
ZBYTXRSTD			-0.037** (0.016)	-0.041*** (0.016)	-0.032** (0.015)	-0.031** (0.015)	-0.033** (0.015)	-0.038** (0.015)	-0.040*** (0.015)	-0.042*** (0.015)

Table 26 (Cont.)

F1RPIB	0.026***	0.028***	0.027***	0.026***	0.023***	0.019***	0.018***	0.019***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
F1RGP	0.030*	0.036**	0.033**	0.035**	0.033**	0.008	0.007	0.004
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
CatholicSchool		0.058**	0.054**	0.050*	0.045*	0.028	0.027	0.031
		(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)
OtherPrivateSchool		0.018	0.023	0.021	0.013	-0.019	-0.019	-0.017
		(0.032)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)
UrbanSchool		-0.007	-0.012	-0.012	-0.011	0.001	-0.002	-0.001
		(0.032)	(0.032)	(0.032)	(0.032)	(0.032)	(0.032)	(0.032)
SuburbanSchool		0.008	0.003	0.003	0.004	0.009	0.006	0.007
		(0.029)	(0.029)	(0.029)	(0.029)	(0.028)	(0.028)	(0.028)
MidwestSchool		-0.059*	-0.063**	-0.060*	-0.057*	-0.040	0.041	0.042
		(0.031)	(0.031)	(0.031)	(0.031)	(0.030)	(0.048)	(0.048)
SouthSchool		-0.085***	-0.087***	-0.075**	-0.071**	-0.047	0.009	0.004
		(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.042)	(0.042)
WestSchool		-0.010	-0.023	-0.011	-0.006	0.025	0.075	0.068
		(0.036)	(0.036)	(0.036)	(0.036)	(0.035)	(0.051)	(0.051)
<i>Major</i>								
F2Major_CSTEM			0.095***	0.095***	0.095***	0.086***	0.088***	0.087***
			(0.033)	(0.033)	(0.033)	(0.032)	(0.032)	(0.032)
F2Major_SocSci			-0.035	-0.040	-0.042	-0.079**	-0.079**	-0.078**
			(0.032)	(0.032)	(0.032)	(0.032)	(0.032)	(0.032)
F2Major_Educ			-0.130***	-0.130***	-0.122***	-0.149***	-0.148***	-0.150***
			(0.041)	(0.041)	(0.041)	(0.041)	(0.041)	(0.041)
F2Major_HumArts			-0.172***	-0.170***	-0.168***	-0.190***	-0.192***	-0.197***
			(0.033)	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)

Table 26 (Cont.)

F2Major_AgrEnv	-0.096 (0.083)	-0.098 (0.083)	-0.093 (0.083)	-0.139* (0.082)	-0.135 (0.082)	-0.137* (0.082)
F2Major_Arch	-0.066 (0.102)	-0.055 (0.102)	-0.054 (0.102)	-0.064 (0.100)	-0.069 (0.100)	-0.080 (0.100)
F2Major_Business	0.030 (0.027)	0.031 (0.027)	0.032 (0.027)	-0.008 (0.027)	-0.009 (0.027)	-0.012 (0.027)
<i>Financial Aid</i>						
FinAidCoverTuitionLTHalf		-0.031 (0.058)	-0.033 (0.058)	-0.026 (0.057)	-0.023 (0.057)	
FinAidCoverTuitionGTHalf		-0.044 (0.061)	-0.044 (0.061)	-0.028 (0.060)	-0.024 (0.060)	
FinAidCoverTuitionAll		-0.043 (0.063)	-0.041 (0.063)	-0.019 (0.062)	-0.015 (0.062)	
FinAidCoverExpensesLTHalf		0.032 (0.057)	0.035 (0.056)	0.021 (0.056)	0.018 (0.056)	
FinAidCoverExpensesGTHalf		-0.012 (0.064)	-0.012 (0.064)	-0.024 (0.063)	-0.026 (0.063)	
FinAidCoverExpensesAll		-0.075 (0.071)	-0.074 (0.071)	-0.087 (0.070)	-0.088 (0.070)	
FinAidLoans		-0.013 (0.022)	-0.015 (0.022)	-0.023 (0.022)	-0.021 (0.022)	
FinAidWorkStudy		0.046* (0.027)	0.043 (0.027)	0.034 (0.026)	0.033 (0.026)	
FinAidTuitionWaiver		-0.052 (0.038)	-0.051 (0.038)	-0.050 (0.037)	-0.054 (0.037)	

Table 26 (Cont.)

<i>Institutional Selectivity</i>				
AttainInstHighSelect	0.037	0.007	0.009	0.015
	(0.154)	(0.152)	(0.152)	(0.152)
AttainInstModSelect	-0.032	-0.030	-0.026	-0.021
	(0.153)	(0.151)	(0.151)	(0.151)
AttainInstNonSelect	-0.019	-0.001	0.004	0.007
	(0.153)	(0.151)	(0.151)	(0.151)
<i>Attainment Semester</i>				
AttainDec07		-0.007	-0.008	-0.004
		(0.088)	(0.088)	(0.088)
AttainJune08		0.024	0.020	0.018
		(0.067)	(0.067)	(0.067)
AttainDec08		-0.006	-0.008	-0.009
		(0.070)	(0.070)	(0.070)
AttainJune09		-0.139**	-0.142**	-0.142**
		(0.069)	(0.069)	(0.069)
AttainDec09		-0.154**	-0.157**	-0.161**
		(0.074)	(0.074)	(0.074)
AttainJune10		-0.135*	-0.140*	-0.137*
		(0.074)	(0.074)	(0.074)
AttainDec10		-0.186**	-0.186**	-0.189**
		(0.079)	(0.079)	(0.078)
AttainJune11		-0.194**	-0.198**	-0.194**
		(0.079)	(0.079)	(0.079)
AttainDec11		-0.256***	-0.258***	-0.271***
		(0.086)	(0.085)	(0.085)

Table 26 (Cont.)

AttainJune12								-0.277***	-0.279***	-0.289***
								(0.082)	(0.082)	(0.082)
AttainDec12								-0.290**	-0.295**	-0.285**
								(0.128)	(0.128)	(0.128)
<i>Region of Residence</i>										
NortheastF3									0.108**	0.110**
									(0.049)	(0.049)
SouthF3									0.033	0.031
									(0.040)	(0.040)
WestF3									0.042	0.042
									(0.043)	(0.043)
cons	2.800***	2.868***	2.717***	2.731***	2.758***	2.769***	2.790***	2.977***	2.891***	2.872***
	(0.032)	(0.038)	(0.062)	(0.066)	(0.066)	(0.067)	(0.163)	(0.170)	(0.175)	(0.175)
lns1_1_1(cons)	-1.835***	-1.867***	-1.992***	-2.036***	-2.103***	-2.119***	-2.148***	-2.201***	-2.209***	-2.208***
	(0.108)	(0.113)	(0.129)	(0.138)	(0.149)	(0.152)	(0.158)	(0.170)	(0.172)	(0.173)
lnsig_e (cons)	-0.761***	-0.766***	-0.772***	-0.773***	-0.782***	-0.784***	-0.784***	-0.799***	-0.800***	-0.798***
	(0.017)	(0.017)	(0.017)	(0.017)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
N	2475	2475	2475	2475	2475	2475	2475	2475	2475	2475
ICC	0.104	0.100	0.080	0.074	0.066	0.065	0.061	0.057	0.056	0.056
-2LL	-1742.334	-1724.313	-1689.721	-1681.105	-1650.924	-1643.971	-1640.345	-1599.148	-1596.498	-1602.068
AIC	3496.667	3472.627	3411.442	3408.209	3361.847	3365.943	3364.689	3304.297	3304.996	3298.135
BIC	3531.551	3542.395	3504.466	3541.931	3536.267	3592.689	3608.877	3612.438	3630.580	3571.393

Notes: *p<.10, ** p<.05, *** p<.01. Standard errors in parentheses.

Table 27: Models of Annual Earnings for All College Graduates

	Model Number									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
LowMidSES	-804.6 (2,206.8)	-224.5 (2,229.0)	653.7 (2,206.0)	303.7 (2,203.5)	-44.19 (2,197.1)	-445.9 (2,202.5)	-633.4 (2,196.6)	-209.2 (2,144.2)	-143.2 (2,142.4)	448.7 (2,126.5)
HighMidSES	286.2 (2,015.1)	524.8 (2,071.9)	455.2 (2,056.2)	114.2 (2,060.5)	-4.915 (2,052.4)	-326.6 (2,068.0)	-366.8 (2,064.3)	-737.3 (2,015.3)	-802.9 (2,015.2)	-295 (1,978.3)
HighSES	5845.6*** (1,915.7)	5967.1*** (2,003.9)	4724.8** (2,010.6)	3975.6* (2,036.2)	4093.3** (2,028.9)	3653.8* (2,066.9)	3021.8 (2,071.3)	2636.2 (2,021.5)	2653.2 (2,020.1)	3647.9* (1,946.9)
OtherRace		-2580 (2,668.3)	-2023.2 (2,632.6)	-2123 (2,651.8)	-1325.4 (2,646.3)	-1275.4 (2,645.7)	-1102.1 (2,637.5)	-1816.8 (2,569.4)	-1870.5 (2,567.1)	
Asian		-276.8 (2,197.2)	-2285.9 (2,185.2)	-1948.4 (2,255.1)	-2108.7 (2,245.2)	-1801.6 (2,247.6)	-2038.9 (2,241.2)	-1585.8 (2,180.7)	-1529.2 (2,179.2)	
AfricanAmerican		-3109 (2,161.0)	-39.53 (2,192.5)	1052.8 (2,209.6)	516 (2,205.6)	838.1 (2,230.0)	491.3 (2,227.1)	780.9 (2,169.6)	568.4 (2,169.8)	
Hispanic		-4472.6** (2,151.9)	-3506.6 (2,141.4)	-3833.2* (2,174.5)	-3785.3* (2,163.4)	-3524.8 (2,168.2)	-3643.4* (2,160.2)	-2782.5 (2,107.0)	-2978.6 (2,106.5)	
Female		-7970.0*** (1,088.5)	-7745.3*** (1,114.5)	-7620.4*** (1,111.5)	-6936.2*** (1,134.7)	-7050.4*** (1,136.9)	-6981.0*** (1,134.0)	-7418.0*** (1,107.2)	-7480.5*** (1,106.4)	-7383.4*** (1,104.3)
NonNatEnglish		5939.1*** (2,132.8)	5429.0** (2,114.9)	5486.6*** (2,113.5)	5069.8** (2,104.7)	5183.5** (2,105.0)	5240.8** (2,097.8)	5216.9** (2,043.7)	5236.6** (2,042.7)	3832.1** (1,699.7)
ZBYTXMSTD			3415.5*** (907.6)	3271.0*** (909.3)	2877.7*** (912.2)	2853.1*** (912.3)	2594.5*** (912.8)	2269.1** (889.0)	2304.5*** (888.3)	2534.2*** (872.5)
ZBYTXRSTD			-2066.8** (853.0)	-2424.6*** (854.6)	-2071.7** (853.7)	-1975.1** (854.2)	-2115.7** (852.6)	-2527.8*** (830.8)	-2550.5*** (831.2)	-2583.1*** (829.5)
FIRAPIB			1746.7*** (318.8)	1967.2*** (326.2)	1962.8*** (325.8)	1931.9*** (325.7)	1707.6*** (329.7)	1369.8*** (324.8)	1377.3*** (324.8)	1403.8*** (315.1)

Table 27 (Cont.)

FIRGP	2582.8*** (889.1)	2985.1*** (907.0)	2832.9*** (909.5)	2783.1*** (919.2)	2612.9*** (918.4)	509.6 (913.0)	384 (913.9)	417.2 (900.3)
CatholicSchool		5027.0*** (1,500.8)	4834.7*** (1,493.3)	4668.7*** (1,495.2)	4367.3*** (1,491.1)	2941.9** (1,456.8)	2881.7** (1,455.5)	2559.0* (1,345.2)
OtherPrivateSchool		3411.7** (1,733.6)	3621.1** (1,725.8)	3486.7** (1,727.7)	2839.3 (1,726.7)	375.1 (1,696.2)	260 (1,695.9)	414.7 (1,621.5)
UrbanSchool		-1555.6 (1,782.3)	-1684.5 (1,777.1)	-1773.2 (1,774.9)	-1729.9 (1,767.6)	-918.8 (1,723.9)	-1017.7 (1,723.9)	
SuburbanSchool		25.21 (1,585.4)	-130.4 (1,581.4)	-232.9 (1,580.7)	-118.3 (1,574.3)	393.7 (1,535.4)	210.1 (1,536.2)	
MidwestSchool		-2332.5 (1,651.9)	-2404 (1,640.7)	-2208.1 (1,644.1)	-2031.8 (1,620.9)	-734.8 (1,587.4)	2947.8 (2,551.3)	2914.4 (2,557.0)
SouthSchool		-4361.4*** (1,610.5)	-4415.3*** (1,597.8)	-3828.6** (1,621.2)	-3545.2** (1,601.1)	-1619 (1,581.1)	144.3 (2,305.8)	-97.83 (2,291.5)
WestSchool		-1396.2 (1,915.6)	-1742.4 (1,908.8)	-1145.8 (1,920.2)	-803.4 (1,895.8)	1336.7 (1,860.3)	5635.7** (2,730.2)	4315.6 (2,696.4)
<i>Major</i>								
F2Major_CSTEM			3044.5* (1,788.1)	2969.2* (1,794.1)	2969.1* (1,787.2)	2519.4 (1,740.9)	2492.2 (1,741.6)	2422.5 (1,735.5)
F2Major_SocSci			-1179.3 (1,795.2)	-1355.5 (1,797.9)	-1475.2 (1,794.6)	-4208.3** (1,761.9)	-4355.1** (1,763.6)	-4539.0*** (1,762.0)
F2Major_Educ			-3300.1 (2,306.4)	-3458.6 (2,310.3)	-2736 (2,310.1)	-4620.1** (2,255.5)	-4593.9** (2,253.4)	-5099.3** (2,243.3)
F2Major_HumArts			-6921.4*** (1,867.6)	-6757.7*** (1,871.4)	-6687.8*** (1,864.8)	-8152.9*** (1,820.1)	-8239.0*** (1,819.8)	-8716.6*** (1,817.5)
F2Major_AgrEnv			-724.9 (4,476.2)	-574.2 (4,485.0)	-445.2 (4,470.2)	-4388.3 (4,373.3)	-3877.1 (4,374.7)	-4435.3 (4,367.7)

Table 27 (Cont.)

F2Major_Arch	-1882.5	-1604	-1581	-2761	-2848.2	-2931.8
	(5,139.0)	(5,133.8)	(5,119.9)	(4,988.9)	(4,985.4)	(4,989.5)
F2Major_Business	2312.3	2308.7	2516.4*	-380.3	-463.5	-892.5
	(1,485.0)	(1,488.0)	(1,488.4)	(1,472.5)	(1,471.3)	(1,465.0)
<i>Financial Aid</i>						
FinAidCoverTuitionLTHalf		332.6	193.7	-459	-303.3	
		(3,271.0)	(3,261.6)	(3,178.0)	(3,176.2)	
FinAidCoverTuitionGTHalf		-303.7	-250.4	-197.5	35.17	
		(3,434.3)	(3,424.2)	(3,338.1)	(3,336.8)	
FinAidCoverTuitionAll		-2960.5	-2775.2	-1846.1	-1632.7	
		(3,558.5)	(3,547.8)	(3,462.3)	(3,460.4)	
FinAidCoverExpensesLTHalf		1788	2074.7	2081	1951.1	
		(3,198.0)	(3,189.2)	(3,108.5)	(3,106.5)	
FinAidCoverExpensesGTHalf		-918	-991.8	-886.1	-1038.1	
		(3,616.7)	(3,606.3)	(3,521.2)	(3,518.7)	
FinAidCoverExpensesAll		1362	1475.5	1405	1376.8	
		(4,026.3)	(4,013.6)	(3,913.4)	(3,910.6)	
FinAidLoans		-1059.9	-1096.1	-1722	-1632.1	
		(1,229.3)	(1,225.9)	(1,196.8)	(1,196.8)	
FinAidWorkStudy		1273.2	1043.4	349.1	242.4	
		(1,494.2)	(1,490.7)	(1,452.5)	(1,451.9)	
FinAidTuitionWaiver		-2988.7	-2967.2	-2576.4	-2788.8	
		(2,123.6)	(2,119.4)	(2,067.7)	(2,067.9)	
<i>Institutional Selectivity</i>						
AttainInstHighSelect			10359.9	8817.2	8431.4	
			(7,682.6)	(7,534.6)	(7,525.9)	

Table 27 (Cont.)

AttainInstModSelect	4648.7 (7,645.5)	5201.8 (7,495.3)	4761.5 (7,488.2)	
AttainInstNonSelect	7565.5 (7,690.2)	9129.1 (7,528.9)	8800.8 (7,520.3)	
<i>Attainment Semester</i>				
AttainDec07		1864.3 (4,761.5)	1752.1 (4,757.4)	2239.9 (4,746.6)
AttainJune08		-636.2 (3,583.1)	-886.1 (3,581.8)	-745.6 (3,561.2)
AttainDec08		-6082.2 (3,741.3)	-6251.7* (3,738.6)	-6416.9* (3,716.5)
AttainJune09		-7593.4** (3,704.3)	-7784.9** (3,702.4)	-7884.3** (3,686.0)
AttainDec09		-12560.9*** (3,991.2)	-12767.4*** (3,988.2)	-13174.4*** (3,967.1)
AttainJune10		-10721.4*** (3,973.1)	-10978.1*** (3,971.3)	-10931.6*** (3,959.0)
AttainDec10		-16182.2*** (4,259.5)	-16247.8*** (4,255.7)	-17003.8*** (4,241.2)
AttainJune11		-19582.0*** (4,226.1)	-19792.1*** (4,224.0)	-19811.0*** (4,220.9)
AttainDec11		-22285.1*** (4,670.8)	-22424.4*** (4,666.7)	-22683.6*** (4,644.6)
AttainJune12		-24680.2*** (4,402.8)	-24967.7*** (4,400.2)	-25332.5*** (4,390.6)
AttainDec12		-27298.3*** (6,913.9)	-27708.6*** (6,909.7)	-27735.8*** (6,903.3)

Table 27 (Cont.)

<i>Region of Residence</i>										
NortheastF3									4641.3*	4724.9*
									(2,610.6)	(2,608.3)
SouthF3									2470.1	2359.8
									(2,155.2)	(2,157.7)
WestF3									-749.3	-382.3
									(2,314.7)	(2,319.1)
_cons	33685.3***	37871.7***	26992.3***	27359.2***	28110.3***	28408.1***	22315.9***	37986.1***	35214.9***	40742.3***
	(1,754.8)	(2,048.9)	(3,395.1)	(3,631.3)	(3,654.0)	(3,681.2)	(8,273.3)	(8,586.0)	(8,783.7)	(5,313.3)
lns1_1_1(cons)	8.905***	8.804***	8.601***	8.491***	8.431***	8.435***	8.248***	8.250***	8.225***	8.346***
	(0.148)	(0.170)	(0.211)	(0.244)	(0.265)	(0.265)	(0.357)	(0.354)	(0.367)	(0.300)
lnsig_e(cons)	10.22***	10.21***	10.20***	10.20***	10.19***	10.19***	10.19***	10.16***	10.16***	10.17***
	(0.016)	(0.016)	(0.016)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
N	2654	2654	2654	2654	2654	2654	2654	2654	2654	2654
ICC	0.068	0.057	0.039	0.032	0.029	0.029	0.02	0.021	0.02	0.026
-2LL	-30959.32	-30925.15	-30882.61	-30871.01	-30856.7	-30851.44	-30841.94	-30767.77	-30765.03	-30776.81
AIC	61930.64	61874.3	61797.21	61788.01	61773.4	61780.89	61767.88	61641.55	61642.05	61629.61
BIC	61965.95	61944.91	61891.35	61923.34	61949.91	62010.36	62015	61953.39	61971.55	61853.2

Notes: *p<.10, ** p<.05, *** p<.01. Standard errors in parentheses.

Table 28: Models of Log-Earnings for All College Graduates

	Model Number									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
LowMidSES	0.061 (0.064)	0.070 (0.065)	0.094 (0.064)	0.083 (0.064)	0.072 (0.064)	0.066 (0.064)	0.061 (0.064)	0.075 (0.062)	0.075 (0.062)	0.081 (0.061)
HighMidSES	0.115** (0.058)	0.113* (0.061)	0.113* (0.060)	0.103* (0.060)	0.100* (0.060)	0.096 (0.060)	0.092 (0.060)	0.077 (0.058)	0.074 (0.058)	0.081 (0.057)
HighSES	0.244*** (0.056)	0.233*** (0.059)	0.206*** (0.059)	0.185*** (0.059)	0.191*** (0.059)	0.179*** (0.060)	0.164*** (0.060)	0.150*** (0.058)	0.148** (0.058)	0.167*** (0.056)
OtherRace		-0.036 (0.078)	-0.018 (0.077)	-0.017 (0.077)	0.018 (0.077)	0.019 (0.077)	0.023 (0.077)	0.007 (0.073)	0.007 (0.073)	-0.000 (0.073)
Asian		-0.034 (0.064)	-0.087 (0.064)	-0.070 (0.066)	-0.075 (0.066)	-0.067 (0.066)	-0.068 (0.066)	-0.066 (0.063)	-0.064 (0.063)	-0.074 (0.062)
AfricanAmerican		-0.203*** (0.062)	-0.116* (0.063)	-0.088 (0.064)	-0.106* (0.063)	-0.089 (0.064)	-0.092 (0.064)	-0.086 (0.062)	-0.089 (0.062)	-0.106* (0.060)
Hispanic		-0.062 (0.062)	-0.037 (0.062)	-0.036 (0.063)	-0.034 (0.063)	-0.018 (0.063)	-0.017 (0.063)	0.008 (0.060)	0.006 (0.060)	-0.002 (0.060)
Female		-0.185*** (0.031)	-0.181*** (0.032)	-0.178*** (0.032)	-0.161*** (0.033)	-0.165*** (0.033)	-0.163*** (0.033)	-0.175*** (0.031)	-0.176*** (0.031)	-0.174*** (0.031)
NonNatEnglish		0.122* (0.063)	0.110* (0.062)	0.110* (0.062)	0.101 (0.062)	0.110* (0.062)	0.108* (0.062)	0.106* (0.059)	0.105* (0.059)	0.095 (0.059)
ZBYTXMSTD			0.097*** (0.027)	0.094*** (0.027)	0.083*** (0.027)	0.082*** (0.027)	0.077*** (0.027)	0.060** (0.026)	0.061** (0.026)	0.060** (0.026)
ZBYTXRSTD			-0.066*** (0.025)	-0.075*** (0.025)	-0.065*** (0.025)	-0.065*** (0.025)	-0.067*** (0.025)	-0.079*** (0.024)	-0.079*** (0.024)	-0.077*** (0.024)
F1RAPIB			0.044*** (0.009)	0.050*** (0.009)	0.051*** (0.009)	0.050*** (0.009)	0.045*** (0.009)	0.036*** (0.009)	0.036*** (0.009)	0.036*** (0.009)

Table 28 (Cont.)

F1RGP	0.088*** (0.025)	0.096*** (0.026)	0.091*** (0.026)	0.089*** (0.026)	0.084*** (0.026)	0.008 (0.026)	0.007 (0.026)	0.007 (0.025)
CatholicSchool		0.122*** (0.043)	0.115*** (0.043)	0.109** (0.043)	0.102** (0.043)	0.047 (0.041)	0.046 (0.041)	
OtherPrivateSchool		0.100** (0.050)	0.104** (0.050)	0.103** (0.050)	0.090* (0.050)	-0.000 (0.049)	-0.001 (0.049)	
UrbanSchool		-0.046 (0.051)	-0.048 (0.051)	-0.050 (0.051)	-0.049 (0.051)	-0.023 (0.049)	-0.023 (0.049)	
SuburbanSchool		-0.004 (0.046)	-0.009 (0.045)	-0.011 (0.045)	-0.009 (0.045)	0.005 (0.043)	0.004 (0.043)	
MidwestSchool		-0.027 (0.048)	-0.030 (0.047)	-0.024 (0.047)	-0.021 (0.047)	0.020 (0.045)	0.054 (0.072)	0.049 (0.072)
SouthSchool		-0.093** (0.047)	-0.097** (0.046)	-0.077* (0.047)	-0.070 (0.046)	-0.026 (0.045)	-0.035 (0.065)	-0.049 (0.064)
WestSchool		-0.034 (0.056)	-0.044 (0.055)	-0.025 (0.055)	-0.018 (0.055)	0.051 (0.053)	0.092 (0.077)	0.071 (0.076)
<i>Major</i>								
F2Major_CSTEM			0.072 (0.052)	0.062 (0.052)	0.063 (0.052)	0.048 (0.050)	0.046 (0.050)	0.049 (0.049)
F2Major_SocSci			-0.013 (0.052)	-0.018 (0.052)	-0.022 (0.052)	-0.114** (0.050)	-0.117** (0.050)	-0.121** (0.050)
F2Major_Educ			-0.074 (0.066)	-0.083 (0.066)	-0.071 (0.066)	-0.145** (0.063)	-0.145** (0.063)	-0.150** (0.063)
F2Major_HumArts			-0.225*** (0.054)	-0.223*** (0.054)	-0.222*** (0.054)	-0.270*** (0.052)	-0.270*** (0.052)	-0.279*** (0.051)
F2Major_AgrEnv			0.006 (0.129)	-0.001 (0.130)	-0.003 (0.130)	-0.141 (0.124)	-0.133 (0.125)	-0.132 (0.124)

Table 28 (Cont.)

F2Major_Arch	-0.025 (0.148)	-0.012 (0.147)	-0.004 (0.147)	-0.046 (0.141)	-0.044 (0.141)	-0.053 (0.141)
F2Major_Business	0.115*** (0.043)	0.110*** (0.043)	0.111*** (0.043)	0.014 (0.042)	0.013 (0.042)	0.011 (0.041)
<i>Financial Aid</i>						
FinAidCoverTuitionLTHalf		0.122 (0.095)	0.120 (0.095)	0.106 (0.091)	0.109 (0.091)	
FinAidCoverTuitionGTHalf		0.089 (0.100)	0.090 (0.100)	0.104 (0.096)	0.106 (0.096)	
FinAidCoverTuitionAll		0.072 (0.104)	0.075 (0.103)	0.112 (0.099)	0.115 (0.099)	
FinAidCoverExpensesLTHalf		-0.059 (0.093)	-0.056 (0.093)	-0.059 (0.089)	-0.061 (0.089)	
FinAidCoverExpensesGTHalf		-0.152 (0.105)	-0.154 (0.105)	-0.145 (0.101)	-0.148 (0.101)	
FinAidCoverExpensesAll		-0.180 (0.117)	-0.179 (0.117)	-0.193* (0.112)	-0.195* (0.112)	
FinAidLoans		0.027 (0.035)	0.026 (0.035)	0.001 (0.034)	0.002 (0.034)	
FinAidWorkStudy		-0.003 (0.043)	-0.009 (0.043)	-0.031 (0.041)	-0.033 (0.041)	
FinAidTuitionWaiver		-0.049 (0.061)	-0.047 (0.061)	-0.035 (0.059)	-0.037 (0.059)	
<i>Institutional Selectivity</i>						
AttainInstHighSelect			0.175 (0.226)	0.073 (0.218)	0.067 (0.218)	

Table 28 (Cont.)

AttainInstModSelect	0.076 (0.225)	0.046 (0.217)	0.038 (0.217)	
AttainInstNonSelect	0.090 (0.227)	0.104 (0.218)	0.097 (0.218)	
<i>Attainment Semester</i>				
AttainDec07		0.095 (0.134)	0.094 (0.134)	0.105 (0.133)
AttainJune08		0.102 (0.101)	0.099 (0.101)	0.104 (0.100)
AttainDec08		-0.019 (0.106)	-0.021 (0.106)	-0.017 (0.105)
AttainJune09		-0.127 (0.105)	-0.130 (0.105)	-0.122 (0.104)
AttainDec09		-0.196* (0.113)	-0.199* (0.113)	-0.197* (0.112)
AttainJune10		-0.255** (0.112)	-0.257** (0.112)	-0.248** (0.112)
AttainDec10		-0.460*** (0.121)	-0.462*** (0.121)	-0.459*** (0.120)
AttainJune11		-0.578*** (0.120)	-0.581*** (0.120)	-0.575*** (0.120)
AttainDec11		-0.635*** (0.134)	-0.636*** (0.134)	-0.638*** (0.133)
AttainJune12		-0.821*** (0.127)	-0.823*** (0.127)	-0.832*** (0.126)
AttainDec12		-1.049*** (0.201)	-1.054*** (0.201)	-1.034*** (0.200)

Table 28 (Cont.)

<i>Region of Residence</i>										
NortheastF3									0.042 (0.074)	0.040 (0.073)
SouthF3									0.057 (0.061)	0.051 (0.061)
WestF3									-0.008 (0.066)	-0.008 (0.065)
_cons	10.145*** (0.051)	10.260*** (0.060)	9.910*** (0.097)	9.912*** (0.104)	9.925*** (0.105)	9.920*** (0.106)	9.834*** (0.243)	10.310*** (0.247)	10.288*** (0.253)	10.357*** (0.151)
lnsl_1_1(cons)	-1.642*** (0.157)	-1.739*** (0.182)	-1.884*** (0.218)	-1.915*** (0.228)	-2.019*** (0.267)	-2.030*** (0.272)	-2.114*** (0.317)	-2.107*** (0.293)	-2.120*** (0.300)	-2.116*** (0.298)
lnsig_e (cons)	-0.259*** (0.016)	-0.264*** (0.016)	-0.275*** (0.016)	-0.277*** (0.016)	-0.282*** (0.016)	-0.284*** (0.016)	-0.283*** (0.016)	-0.330*** (0.016)	-0.330*** (0.016)	-0.327*** (0.016)
N	2553	2553	2553	2553	2553	2553	2553	2553	2553	2553
ICC	0.059	0.050	0.038	0.036	0.030	0.030	0.025	0.028	0.027	0.027
-2LL	-3030.93	-3006.22	-2967.20	-2959.17	-2939.76	-2933.98	-2930.59	-2814.38	-2813.65	-2819.60
AIC	6073.87	6036.44	5966.39	5964.33	5939.52	5945.96	5945.18	5734.76	5739.29	5719.20
BIC	6108.94	6106.58	6059.91	6098.77	6114.87	6173.91	6190.67	6044.54	6066.62	5953.00

Notes: *p<.10, ** p<.05, *** p<.01. Standard errors in parentheses.

MODELS OF LABOR MARKET OUTCOMES BY ABILITY LEVEL

The previous analyses strongly suggested that baccalaureate attainment does not entirely eliminate disparities in labor market outcomes stemming from socioeconomic origins. While the models included variables for background ability, which were significantly related to students' labor market outcomes, it is also possible that the magnitude of socioeconomic disparities might vary according to students' ability levels. The analyses contained in this section therefore disaggregate students by background ability and then fit the same ten models to each ability subgroup. Analyses of unemployment by student ability level were also conducted, but even when students were disaggregated into ability groups there was not a strong relationship between SES and unemployment rates. This section will therefore only present the models of the wages and earnings analyses. As mentioned before, the model buildup for this section follows the same pattern as the previous section with successive blocks of variables being added to the models, but for ease of interpretation only the estimates of the SES variables are presented. Table 29 and Table 30 present the results for the wages and log-wages models, respectively, while Table 31 and Table 32 present the results for the earnings and log-earnings, respectively.

For all outcomes and each ability group, the parameter estimate for the high-SES subgroup was positive, indicating that high-SES students on average do earn more than low-SES students, although the estimate for the high-SES parameter was not significant in every model. For example, for the high-ability subgroup, high-SES students were estimated to earn approximately two dollars more per hour than their low-SES peers in

the model controlling for no other variables, although this was not a statistically significant difference. For the low-mid-ability group, high-SES students were estimated to earn about \$3.22 per hour more than low-SES students, translating to approximately \$6,500 more annually. This was found to be a statistically significant difference, but only in the initial model controlling for no other variables. Indeed, for the three highest ability groups the pattern which emerges is a relatively large wage disparity between high-SES and low-SES students when just the socioeconomic variables are included, but this estimate shrinks and becomes insignificant as additional variables are added to the model.

However, this does not appear to be the case for low-ability students. Although the relatively small sample size resulted in model non-convergence when many of the variables were included in the models, even when controlling for background characteristics and major the high-SES estimate did not change significantly. The estimated wage difference between high-SES and low-SES students in the lowest ability group of roughly \$4.80 translates into a difference of nearly \$10,000 in annual earnings between these subgroups. And when investigating the high-SES estimate for the final model across ability groups, a clear pattern becomes evident; wage disparities grow as we consider students lower in the ability distribution. Put differently, socioeconomic background does not appear to strongly influence the wages of high-ability students, but significant and substantial disparities exist among lower-ability students. This trend does not necessarily appear in the analyses of log-wages, however. In those analyses, the high-SES estimate is roughly equivalent for the three highest ability groups, and this estimate is not significant in any of the models. But once again, we find quite large disparities

between high-SES and low-SES students in the lowest ability group, even after taking the logarithm of wages.

This pattern is somewhat evident in the analyses of earnings, although in this instance the models with the non-transformed outcome produce some unexpected results. In particular, for the second-lowest ability group low-SES students have by far the highest average earnings, about \$10,000 more than low-mid-SES. This is possibly due to the fact that with smaller sub-samples in each analysis, the estimates may be even more biased by outliers with extremely high wages. As the number of low-SES, low-mid-ability college graduates is likely relatively low, a small number of outliers can significantly bias the estimates. The log-earnings models likely produce more informative results therefore. In those models, once again there are no significant disparities stemming from socioeconomic background for either the high-ability group or the low-mid-ability group, congruent with the analyses of wages. Additionally, once again we find significant and substantial disparities between high-SES and low-SES students in the lowest ability group, and for this ability group, students in the second-highest SES quartile are also estimated to earn significantly more than their low-SES peers. However, this analysis also produced the curious result of a significant disparity between high-SES and low-SES students in the second-highest ability group. Thus, while the trend in socioeconomic disparities across ability groups is not quite as even in the analyses of annual earnings compared to those of wages, nevertheless it appears that much of the disparity in the labor market outcomes of college graduates stems from low-ability students.

Table 29: Models of Hourly Wages for All College Graduates by Ability Level

	Model Number									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<i>High-Ability</i>										
LowMidSES	-0.402 (1.520)	-0.273 (1.538)	-0.173 (1.514)	-0.215 (1.515)	-0.578 (1.496)	-0.491 (1.507)	-0.486 (1.500)	-0.456 (1.482)	-0.551 (1.475)	-0.692 (1.464)
HighMidSES	0.181 (1.385)	0.0724 (1.407)	-0.0558 (1.385)	-0.171 (1.388)	-0.377 (1.372)	-0.291 (1.384)	-0.420 (1.378)	-0.493 (1.363)	-0.642 (1.357)	-0.733 (1.343)
HighSES	1.995 (1.320)	1.975 (1.353)	1.340 (1.338)	1.238 (1.352)	1.118 (1.335)	1.230 (1.361)	0.859 (1.361)	0.689 (1.347)	0.589 (1.340)	0.454 (1.313)
<i>High-Mid-Ability</i>										
LowMidSES	-2.693* (1.423)	-2.269 (1.451)	-1.686 (1.454)	-1.486 (1.457)	-1.616 (1.449)	-1.866 (1.449)	-1.742 (1.448)	-1.698 (1.436)	-1.590 (1.437)	-1.402 (1.437)
HighMidSES	-0.898 (1.304)	-0.462 (1.352)	-0.124 (1.353)	-0.0286 (1.363)	-0.112 (1.352)	-0.616 (1.368)	-0.553 (1.366)	-0.747 (1.349)	-0.569 (1.352)	-0.151 (1.335)
HighSES	0.760 (1.273)	1.147 (1.330)	1.412 (1.333)	1.199 (1.357)	1.381 (1.351)	0.713 (1.377)	0.716 (1.383)	0.503 (1.366)	0.628 (1.367)	1.182 (1.341)
<i>Low-Mid-Ability</i>										
LowMidSES	-0.449 (1.687)	-0.260 (1.696)	-0.168 (1.698)	-0.242 (1.679)	-0.534 (1.666)	-0.985 (1.677)	-0.799 (1.675)	-1.227 (1.648)	-1.114 (1.635)	-0.918 (1.609)
HighMidSES	-0.139 (1.706)	0.112 (1.723)	0.222 (1.721)	-0.162 (1.713)	-0.603 (1.710)	-0.983 (1.736)	-0.885 (1.736)	-1.085 (1.721)	-0.763 (1.700)	-0.660 (1.659)
HighSES	3.223** (1.631)	2.612 (1.699)	2.526 (1.709)	1.989 (1.718)	1.681 (1.712)	1.467 (1.759)	1.628 (1.763)	1.550 (1.745)	1.818 (1.723)	1.821 (1.659)

Table 29 (Cont.)

<i>Low-Ability</i>					
LowMidSES	1.847	1.280	2.394	2.434	3.279
	(2.223)	(2.222)	(2.278)	(2.289)	(2.354)
HighMidSES	1.646	1.412	2.384	2.554	1.691
	(2.024)	(2.007)	(2.018)	(2.066)	(2.191)
HighSES	4.851**	4.240**	4.697**	4.766**	4.861**
	(2.041)	(2.151)	(2.136)	(2.134)	(2.224)

Notes: * $p < .10$, ** $p < .05$, *** $p < .01$. Standard errors in parentheses. Final models control for demographic, academic, school level, major, financial aid, institutional selectivity, attainment semester, and region of residence variables, as well as level-2 random intercept.

Table 30: Models of Log-Hourly Wages for College Graduates by Ability Level

	Model Number									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<i>High-Ability</i>										
LowMidSES	0.014 (0.074)	0.025 (0.075)	0.030 (0.074)	0.029 (0.074)	0.010 (0.073)	0.018 (0.073)	0.018 (0.073)	0.015 (0.072)	0.010 (0.072)	0.001 (0.072)
HighMidSES	0.035 (0.068)	0.033 (0.069)	0.030 (0.068)	0.027 (0.068)	0.017 (0.067)	0.024 (0.067)	0.019 (0.067)	0.012 (0.067)	0.005 (0.066)	-0.001 (0.066)
HighSES	0.108* (0.065)	0.112* (0.066)	0.091 (0.066)	0.094 (0.066)	0.091 (0.065)	0.097 (0.066)	0.082 (0.067)	0.072 (0.066)	0.067 (0.066)	0.062 (0.064)
<i>High-Mid-Ability</i>										
LowMidSES	-0.094 (0.068)	-0.078 (0.069)	-0.042 (0.069)	-0.033 (0.069)	-0.046 (0.068)	-0.056 (0.068)	-0.056 (0.068)	-0.047 (0.067)	-0.041 (0.067)	-0.032 (0.068)
HighMidSES	-0.025 (0.062)	-0.009 (0.064)	0.012 (0.064)	0.015 (0.064)	0.008 (0.064)	-0.012 (0.064)	-0.013 (0.064)	-0.021 (0.063)	-0.014 (0.063)	0.005 (0.063)
HighSES	0.033 (0.061)	0.044 (0.063)	0.061 (0.063)	0.049 (0.064)	0.056 (0.064)	0.029 (0.065)	0.023 (0.065)	0.012 (0.064)	0.018 (0.064)	0.043 (0.063)
<i>Low-Mid-Ability</i>										
LowMidSES	-0.060 (0.084)	-0.035 (0.084)	-0.029 (0.084)	-0.034 (0.083)	-0.037 (0.083)	-0.059 (0.085)	-0.047 (0.085)	-0.063 (0.083)	-0.056 (0.083)	-0.044 (0.080)
HighMidSES	-0.025 (0.083)	0.000 (0.084)	0.006 (0.085)	-0.003 (0.084)	-0.026 (0.084)	-0.056 (0.086)	-0.052 (0.086)	-0.057 (0.084)	-0.054 (0.084)	-0.032 (0.081)
HighSES	0.090 (0.079)	0.076 (0.083)	0.077 (0.084)	0.055 (0.085)	0.039 (0.085)	0.003 (0.088)	0.011 (0.089)	0.019 (0.086)	0.023 (0.086)	0.048 (0.082)

Table 30 (Cont.)

<i>Low-Ability</i>					
LowMidSES	0.081	0.051	0.098	0.081	0.130
	(0.116)	(0.114)	(0.116)	(0.116)	(0.122)
HighMidSES	0.067	0.073	0.122	0.130	0.097
	(0.104)	(0.098)	(0.097)	(0.100)	(0.106)
HighSES	0.233**	0.226**	0.244**	0.266**	0.282***
	(0.104)	(0.107)	(0.103)	(0.104)	(0.108)

Notes: * $p < .10$, ** $p < .05$, *** $p < .01$. Standard errors in parentheses. Final models control for demographic, academic, school level, major, financial aid, institutional selectivity, attainment semester, and region of residence variables, as well as level-2 random intercept.

Table 31: Models of Annual Earnings for College Graduates by Ability Level

	Model Number									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<i>High-Ability</i>										
LowMidSES	673.2 (3872.1)	1431.1 (3902.4)	2255.1 (3822.3)	1672.3 (3811.8)	970.0 (3772.0)	775.5 (3784.9)	555.7 (3779.6)	1352.1 (3673.4)	1373.5 (3668.6)	1373.5 (3668.6)
HighMidSES	1153.4 (3519.1)	1599.3 (3566.4)	1595.6 (3493.0)	849.1 (3489.8)	409.7 (3453.8)	115.7 (3475.4)	-376.5 (3465.9)	-606.9 (3368.8)	-712.6 (3364.1)	-712.6 (3364.1)
HighSES	6170.8* (3350.6)	6897.1** (3420.7)	5784.5* (3367.7)	5102.8 (3395.4)	5032.9 (3357.7)	4615.0 (3408.3)	3316.7 (3417.0)	3189.1 (3323.1)	3243.2 (3318.5)	3243.2 (3318.5)
<i>High-Mid-Ability</i>										
LowMidSES	1068.6 (3824.2)	2865.7 (3896.0)	4743.8 (3900.1)	4800.7 (3909.5)	4426.5 (3913.4)	4317.8 (3915.4)	4151.2 (3911.7)	4660.5 (3859.5)	4982.1 (3860.7)	4982.1 (3860.7)
HighMidSES	-64.78 (3500.5)	1782.2 (3617.7)	3052.6 (3611.6)	2824.3 (3641.6)	2637.4 (3634.2)	2163.1 (3670.4)	2172.6 (3666.9)	1433.9 (3604.6)	1643.1 (3614.4)	1643.1 (3614.4)
HighSES	5720.6* (3407.3)	7497.0** (3554.7)	8607.5** (3554.8)	7693.7** (3624.7)	7831.4** (3630.6)	7130.2* (3694.3)	6629.4* (3712.7)	5972.0 (3652.5)	6123.2* (3654.0)	6123.2* (3654.0)
<i>Low-Mid-Ability</i>										
LowMidSES	-11047.1** (5427.8)	-10428.2* (5330.1)	-9528.8* (5340.2)	-10521.9** (5309.6)	-10641.0** (5304.2)	-12702.7** (5431.9)	-12450.0** (5448.3)	-12425.4** (5322.1)	-12997.7** (5333.0)	-12997.7** (5333.0)
HighMidSES	-7692.8 (5405.7)	-7380.7 (5370.1)	-6882.7 (5351.2)	-7827.0 (5351.7)	-8749.2 (5366.2)	-11139.2** (5462.9)	-10800.2** (5467.3)	-9104.5* (5396.8)	-9248.7* (5384.1)	-9248.7* (5384.1)
HighSES	-2202.4 (5064.2)	-3633.7 (5174.6)	-3209.5 (5219.7)	-5724.1 (5307.1)	-6690.3 (5337.6)	-8337.3 (5513.5)	-8095.8 (5539.5)	-7244.0 (5421.9)	-7350.0 (5407.7)	-7350.0 (5407.7)

Table 31 (Cont.)

<i>Low-Ability</i>					
LowMidSES	3122.0	2228.2	4481.9	4413.7	7599.0*
	(4628.1)	(4494.8)	(4348.4)	(4329.5)	(4301.6)
HighMidSES	4028.4	3841.3	7019.0*	7723.6*	7093.7*
	(4101.8)	(4011.4)	(3948.6)	(3950.2)	(3885.7)
HighSES	7784.9*	7670.6*	10236.0**	10172.0**	9645.6**
	(4177.8)	(4360.1)	(4250.2)	(4192.3)	(4069.7)

Notes: * $p < .10$, ** $p < .05$, *** $p < .01$. Standard errors in parentheses. Final models control for demographic, academic, school level, major, financial aid, institutional selectivity, attainment semester, and region of residence variables, as well as level-2 random intercept.

Table 32: Models of Log-Earnings for College Graduates by Ability Level

	Model Number										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
<i>High-Ability</i>											
LowMidSES	-0.000	0.040	0.063	0.053	0.027	0.019	0.012	0.027	0.021	0.021	0.024
	(0.120)	(0.122)	(0.120)	(0.120)	(0.119)	(0.119)	(0.119)	(0.115)	(0.116)	(0.116)	(0.115)
HighMidSES	0.028	0.061	0.064	0.052	0.042	0.034	0.020	0.002	-0.005	-0.005	0.001
	(0.110)	(0.112)	(0.111)	(0.111)	(0.109)	(0.110)	(0.110)	(0.106)	(0.106)	(0.106)	(0.105)
HighSES	0.120	0.160	0.134	0.125	0.125	0.112	0.081	0.068	0.062	0.062	0.076
	(0.105)	(0.108)	(0.107)	(0.108)	(0.106)	(0.108)	(0.108)	(0.105)	(0.105)	(0.105)	(0.103)
<i>High-Mid-Ability</i>											
LowMidSES	0.004	0.008	0.071	0.066	0.052	0.053	0.044	0.072	0.076	0.076	0.073
	(0.101)	(0.103)	(0.103)	(0.103)	(0.103)	(0.103)	(0.103)	(0.098)	(0.098)	(0.098)	(0.099)
HighMidSES	0.029	0.033	0.073	0.060	0.053	0.050	0.045	0.021	0.024	0.024	0.026
	(0.093)	(0.096)	(0.095)	(0.096)	(0.096)	(0.096)	(0.096)	(0.092)	(0.092)	(0.092)	(0.091)
HighSES	0.219**	0.218**	0.251***	0.212**	0.211**	0.204**	0.184*	0.160*	0.161*	0.161*	0.164*
	(0.090)	(0.094)	(0.094)	(0.095)	(0.096)	(0.097)	(0.097)	(0.093)	(0.093)	(0.093)	(0.092)
<i>Low-Mid-Ability</i>											
LowMidSES	-0.046	-0.043	-0.013	-0.035	-0.033	-0.083	-0.080	-0.108	-0.129	-0.129	-0.086
	(0.135)	(0.135)	(0.135)	(0.134)	(0.134)	(0.136)	(0.137)	(0.129)	(0.129)	(0.129)	(0.127)
HighMidSES	0.023	0.011	0.029	0.002	-0.025	-0.085	-0.074	-0.053	-0.060	-0.060	-0.009
	(0.132)	(0.133)	(0.132)	(0.133)	(0.132)	(0.134)	(0.135)	(0.128)	(0.127)	(0.127)	(0.125)
HighSES	0.099	0.016	0.058	0.015	-0.028	-0.071	-0.064	-0.060	-0.066	-0.066	-0.030
	(0.124)	(0.129)	(0.130)	(0.132)	(0.132)	(0.135)	(0.136)	(0.128)	(0.128)	(0.128)	(0.124)

Table 32 (Cont.)

<i>Low-Ability</i>						
LowMidSES	0.287	0.272	0.273	0.206	0.253	0.350
	(0.254)	(0.246)	(0.244)	(0.244)	(0.246)	(0.248)
HighMidSES	0.291	0.328	0.451**	0.378*	0.554**	0.734***
	(0.217)	(0.205)	(0.211)	(0.212)	(0.222)	(0.222)
HighSES	0.389*	0.472**	0.638***	0.653***	0.640***	0.751***
	(0.220)	(0.227)	(0.230)	(0.226)	(0.236)	(0.237)

Notes: * $p < .10$, ** $p < .05$, *** $p < .01$. Standard errors in parentheses. Final models control for demographic, academic, school level, major, financial aid, institutional selectivity, attainment semester, and region of residence variables, as well as level-2 random intercept.

MODELS OF LABOR MARKET OUTCOMES BY INSTITUTIONAL SELECTIVITY LEVEL

The previous analyses demonstrated that the impact of socioeconomic background on the labor market outcomes of college graduates is not equivalent for all ability subgroups. High-ability graduates from different socioeconomic backgrounds had roughly equivalent experiences in the labor force, while socioeconomic origins appeared to have a pronounced effect on the outcomes of lower-ability students. However, this could be due primarily to the fact that lower-ability students often enroll in less selective institutions, while high-ability students are more likely to attend elite and well funded colleges and universities. In other words, it is possible that these disparities stem more from the types of institutions students attend rather than their background ability. While the multilevel modeling approach used in the previous analyses did control for the institutions students attended, the purpose of this section is to more intentionally investigate whether or not disparities in students' labor market outcomes are a function of the selectivity of institutions they attended. Table 33 and Table 34 present the results for wages and log-wages, respectively, and Table 35 and Table 36 present the results for earnings and log-earnings, respectively.

In regards to the analyses of wages, when fitting separate models to each institutional selectivity level, no socioeconomic disparities were found, and no pattern emerged. In the final models, high-SES students were estimated to earn \$1.13 more per hour than low-SES students for selective institution, this disparity was only \$0.42 for students that earned their degree from a moderately selective institution, and the difference at non-selective institutions was \$1.88. The magnitude of these disparities is

not trivial, as a \$1.88 difference in hourly wages translates into about a \$3,800 difference in annual wages, but this difference was not found to be statistically significant. This was true whether or not the wage outcome in the models was log-transformed, as none of the SES variables were found to be significant in the models of log-wages either.

However, a quite different pattern is identified in the models of earnings. Interestingly, for selective institutions low-SES students were estimated to earn significantly more than all of the other SES subgroups, and some of these estimates were statistically significant. In contrast, at both moderately selective and non-selective institutions, high-SES students were estimated to earn between \$4,000 and \$5,000 more than their low-SES peers, controlling for all other variables in the model, although the estimate for the non-selective model was not statistically significant.

Once again, due to the possibility of outliers, it is also important to investigate the models of log-earnings. For this outcome, we find a similar trend to what we identified when analyzing the relationship between student ability and socioeconomic disparities in earnings. For students that graduated from selective institutions, there were no disparities in earnings stemming from socioeconomic background. None of the SES variables were found to be significant in any of the models. In regards to the analysis of moderately selective graduates, high-SES students were estimated to earn significantly more than their low-SES peers up until the eighth model, which added variables for the semester in which students earned their degree. Thus, for students who graduated from moderately selective institutions, high-SES students earn significantly more than their low-SES peers controlling for demographic characteristics, background ability, high school

characteristics, major, and financial aid receipt, but it is likely that this disparity is caused by low-SES students taking longer to graduate at these institutions compared to their high-SES peers and thus having less time in the labor market. In contrast, at non-selective institutions every other socioeconomic subgroup is estimated to earn significantly more on average than low-SES students, even when controlling for the full range of variables included in the final model.

The results of these models analyzing the impact of institutional selectivity on the socioeconomic disparities in students' labor market outcomes are not quite as clear as the results of the analyses of ability, particularly as there does not appear to be a demonstrable relationship between institutional selectivity and disparities in wages. However, the analyses of earnings, and specifically log-earnings, at least suggest that the extent to which students' socioeconomic background impacts their transition from college into the labor market quite possibly depends on the type of institution they graduated from.

Table 33: Models of Hourly Wages for College Graduates by Institutional Selectivity

	Model Number									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<i>Selective</i>										
LowMidSES	-1.327 (2.006)	-1.737 (2.026)	-1.182 (1.989)	-1.232 (1.999)	-1.339 (1.987)	-1.324 (1.993)	-1.324 (1.993)	-0.710 (1.968)	-0.807 (1.945)	-1.011 (1.941)
HighMidSES	-0.299 (1.849)	-0.942 (1.901)	-1.021 (1.867)	-1.277 (1.890)	-1.150 (1.881)	-1.160 (1.885)	-1.160 (1.885)	-0.813 (1.862)	-1.003 (1.841)	-1.136 (1.840)
HighSES	2.717 (1.743)	2.019 (1.809)	1.411 (1.788)	1.094 (1.825)	1.310 (1.816)	1.444 (1.831)	1.444 (1.831)	1.593 (1.807)	1.363 (1.787)	1.133 (1.776)
<i>Moderately Selective</i>										
LowMidSES	-0.847 (0.982)	-0.908 (0.995)	-0.738 (0.997)	-0.544 (0.996)	-0.895 (0.980)	-0.897 (0.982)	-0.897 (0.982)	-1.126 (0.965)	-1.221 (0.966)	-1.193 (0.961)
HighMidSES	0.163 (0.899)	-0.0363 (0.928)	0.0231 (0.933)	0.237 (0.932)	0.0916 (0.915)	0.120 (0.927)	0.120 (0.927)	-0.403 (0.912)	-0.480 (0.914)	-0.451 (0.899)
HighSES	0.960 (0.882)	0.828 (0.926)	0.818 (0.934)	1.064 (0.939)	1.052 (0.923)	1.037 (0.944)	1.037 (0.944)	0.456 (0.930)	0.380 (0.930)	0.422 (0.907)
<i>Non-Selective</i>										
LowMidSES	-0.792 (1.757)	-0.714 (1.806)	-0.304 (1.806)	-0.517 (1.803)	-0.709 (1.809)	-1.549 (1.846)	-1.549 (1.846)	-1.222 (1.833)	-1.217 (1.812)	-0.332 (1.778)
HighMidSES	0.909 (1.646)	0.857 (1.726)	1.191 (1.733)	1.179 (1.730)	1.070 (1.718)	0.196 (1.783)	0.196 (1.783)	0.369 (1.754)	0.600 (1.733)	1.664 (1.673)
HighSES	1.843 (1.621)	1.516 (1.731)	1.657 (1.738)	1.149 (1.759)	1.380 (1.755)	0.435 (1.842)	0.435 (1.842)	0.834 (1.833)	0.774 (1.812)	1.878 (1.731)

Notes: *p<.10, ** p<.05, *** p<.01. Standard errors in parentheses. Final models control for demographic, academic, school level, major, financial aid, institutional selectivity, attainment semester, and region of residence variables, as well as level-2 random intercept.

Table 34: Models of Log-Hourly Wages for College Graduates by Selectivity Level

	Model Number									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<i>Selective</i>										
LowMidSES	-1.327 (2.006)	-0.044 (0.090)	-0.022 (0.089)	-0.025 (0.089)	-0.034 (0.088)	-0.032 (0.088)	-0.032 (0.088)	-0.008 (0.087)	-0.010 (0.086)	-0.020 (0.086)
HighMidSES	-0.299 (1.849)	-0.012 (0.084)	-0.014 (0.083)	-0.022 (0.084)	-0.015 (0.083)	-0.021 (0.083)	-0.021 (0.083)	-0.011 (0.082)	-0.017 (0.082)	-0.017 (0.082)
HighSES	2.717 (1.743)	0.095 (0.080)	0.071 (0.080)	0.061 (0.081)	0.075 (0.080)	0.072 (0.081)	0.072 (0.081)	0.078 (0.080)	0.070 (0.079)	0.069 (0.079)
<i>Moderately Selective</i>										
LowMidSES	-0.847 (0.982)	-0.022 (0.054)	-0.011 (0.054)	-0.004 (0.054)	-0.025 (0.053)	-0.024 (0.053)	-0.024 (0.053)	-0.035 (0.052)	-0.038 (0.052)	-0.037 (0.052)
HighMidSES	0.163 (0.899)	0.015 (0.050)	0.022 (0.050)	0.032 (0.050)	0.023 (0.049)	0.027 (0.050)	0.027 (0.050)	0.002 (0.049)	-0.003 (0.049)	-0.003 (0.049)
HighSES	0.960 (0.882)	0.056 (0.050)	0.059 (0.050)	0.073 (0.051)	0.071 (0.050)	0.070 (0.051)	0.070 (0.051)	0.044 (0.050)	0.040 (0.050)	0.043 (0.049)
<i>Non-Selective</i>										
LowMidSES	-0.792 (1.757)	-0.028 (0.085)	0.000 (0.085)	-0.006 (0.085)	-0.012 (0.085)	-0.043 (0.087)	-0.043 (0.087)	-0.018 (0.086)	-0.017 (0.086)	0.014 (0.084)
HighMidSES	0.909 (1.646)	0.062 (0.082)	0.082 (0.081)	0.084 (0.081)	0.081 (0.081)	0.049 (0.084)	0.049 (0.084)	0.054 (0.082)	0.063 (0.082)	0.102 (0.079)
HighSES	1.843 (1.621)	0.056 (0.082)	0.063 (0.081)	0.047 (0.082)	0.058 (0.082)	0.022 (0.087)	0.022 (0.087)	0.055 (0.086)	0.054 (0.085)	0.095 (0.081)

Notes: *p<.10, ** p<.05, *** p<.01. Standard errors in parentheses. Final models control for demographic, academic, school level, major, financial aid, institutional selectivity, attainment semester, and region of residence variables, as well as level-2 random intercept.

Table 35: Models of Annual Earnings for College Graduates by Selectivity Level

	Model Number									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<i>Selective</i>										
LowMidSES	-9565.6*	-8460.2	-6693.6	-7507.2	-7880.5	-8978.5*	-8978.5*	-7251.8	-7160.9	-5980.0
	(5248.1)	(5259.4)	(5147.2)	(5161.7)	(5108.7)	(5113.5)	(5113.5)	(4996.4)	(4977.7)	(4967.2)
HighMidSES	-8848.3*	-7978.7	-8176.7*	-9406.1*	-9247.7*	-9784.1**	-9784.1**	-8722.8*	-8818.0*	-7850.1*
	(4796.7)	(4885.2)	(4784.9)	(4831.3)	(4783.9)	(4778.9)	(4778.9)	(4673.4)	(4656.2)	(4617.9)
HighSES	-673.5	-4.856	-1397.8	-2692.3	-1956.4	-2693.3	-2693.3	-1835.5	-1939.3	-497.1
	(4504.3)	(4632.5)	(4568.3)	(4660.1)	(4615.4)	(4640.3)	(4640.3)	(4529.7)	(4514.0)	(4414.3)
<i>Moderately Selective</i>										
LowMidSES	596.6	437.7	751.6	600.2	247.2	262.6	262.6	171.5	147.1	526.7
	(2252.2)	(2279.8)	(2278.1)	(2269.0)	(2261.0)	(2267.5)	(2267.5)	(2173.4)	(2172.6)	(2162.0)
HighMidSES	3340.1	2627.0	2793.8	2709.4	2472.0	2690.7	2690.7	1716.5	1451.8	1676.9
	(2060.1)	(2124.5)	(2130.5)	(2122.3)	(2111.2)	(2138.0)	(2138.0)	(2051.3)	(2053.9)	(2024.4)
HighSES	5941.3***	5412.8**	5530.3***	5134.1**	5039.3**	5061.6**	5061.6**	4084.3*	4012.7*	4565.6**
	(2015.7)	(2113.3)	(2126.9)	(2134.3)	(2129.2)	(2171.3)	(2171.3)	(2085.0)	(2083.9)	(2026.5)
<i>Non-Selective</i>										
LowMidSES	2874.4	5901.4	6533.5	6562.5	7396.4	5978.4	5978.4	8053.2	8214.1	9656.7*
	(5675.4)	(5747.7)	(5782.0)	(5798.1)	(5839.5)	(5990.8)	(5990.8)	(5904.0)	(5908.6)	(5756.2)
HighMidSES	294.4	3728.8	4124.7	4135.1	4212.8	2440.2	2440.2	2940.7	3129.2	5462.1
	(5328.4)	(5479.9)	(5536.0)	(5548.7)	(5528.2)	(5771.3)	(5771.3)	(5655.6)	(5658.5)	(5419.6)
HighSES	55.62	1965.7	2030.8	1629.8	2311.0	172.2	172.2	1588.3	1747.8	4160.2
	(5156.2)	(5386.2)	(5484.3)	(5596.2)	(5600.7)	(5927.4)	(5927.4)	(5855.0)	(5859.7)	(5434.9)

Notes: *p<.10, ** p<.05, *** p<.01. Standard errors in parentheses. Final models control for demographic, academic, school level, major, financial aid, institutional selectivity, attainment semester, and region of residence variables, as well as level-2 random intercept.

Table 36: Models of Log-Earnings for College Graduates by Selectivity Level

	Model Number									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<i>Selective</i>										
LowMidSES	-0.096 (0.141)	-0.074 (0.143)	-0.024 (0.140)	-0.036 (0.141)	-0.038 (0.139)	-0.049 (0.139)	-0.049 (0.139)	0.000 (0.134)	-0.001 (0.134)	0.005 (0.133)
HighMidSES	-0.008 (0.130)	0.000 (0.134)	-0.002 (0.131)	-0.020 (0.133)	-0.006 (0.131)	-0.015 (0.131)	-0.015 (0.131)	-0.004 (0.126)	-0.010 (0.126)	-0.001 (0.125)
HighSES	0.117 (0.122)	0.119 (0.127)	0.089 (0.125)	0.068 (0.128)	0.105 (0.126)	0.096 (0.127)	0.096 (0.127)	0.116 (0.123)	0.108 (0.123)	0.122 (0.119)
<i>Moderately Selective</i>										
LowMidSES	0.003 (0.086)	0.006 (0.088)	0.017 (0.088)	0.008 (0.088)	-0.001 (0.088)	0.001 (0.088)	0.001 (0.088)	0.000 (0.083)	-0.005 (0.083)	0.006 (0.083)
HighMidSES	0.033 (0.079)	0.025 (0.082)	0.035 (0.082)	0.034 (0.082)	0.027 (0.081)	0.036 (0.082)	0.036 (0.082)	0.000 (0.078)	-0.014 (0.078)	-0.015 (0.077)
HighSES	0.167** (0.077)	0.163** (0.082)	0.177** (0.082)	0.171** (0.083)	0.162** (0.082)	0.160* (0.084)	0.160* (0.084)	0.117 (0.080)	0.111 (0.080)	0.116 (0.078)
<i>Non-Selective</i>										
LowMidSES	0.235* (0.131)	0.269** (0.134)	0.290** (0.134)	0.281** (0.134)	0.278** (0.135)	0.225 (0.137)	0.225 (0.137)	0.247* (0.131)	0.262** (0.130)	0.317** (0.128)
HighMidSES	0.312** (0.121)	0.342*** (0.126)	0.356*** (0.126)	0.359*** (0.127)	0.356*** (0.126)	0.299** (0.131)	0.299** (0.131)	0.307** (0.124)	0.318*** (0.123)	0.384*** (0.119)
HighSES	0.224* (0.118)	0.219* (0.124)	0.226* (0.125)	0.209 (0.128)	0.223* (0.128)	0.158 (0.135)	0.158 (0.135)	0.209 (0.129)	0.225* (0.128)	0.307** (0.120)

Notes: *p<.10, ** p<.05, *** p<.01. Standard errors in parentheses. Final models control for demographic, academic, school level, major, financial aid, institutional selectivity, attainment semester, and region of residence variables, as well as level-2 random intercept.

SUMMARY

Even among students in the sample that completed their bachelor's degree before the conclusion of the study, the results of this analysis suggest that the type of socioeconomic environment they grew up in continues to exert an influence on their transition into the labor force. Students from more privileged background have higher average earnings than their peers from less affluent households and were also less likely to experience unemployment, although the relationship between socioeconomic background and unemployment disappeared once other factors had been accounted for in the statistical models. Even when controlling for a wide range of pre-collegiate variables and postsecondary experiences, high-SES students were estimated to have higher wages and earnings than their high-SES peers.

However, these results also highlight the fact that socioeconomic disparities in labor market outcomes are not equivalent for all types of students, or students that graduated from all types of institutions. In particular, few disparities in wages or earnings were found for college graduates with high demonstrated ability, while significant and often substantial disparities were identified for low-ability students. Although the results were not quite as conclusive, a similar pattern was found in terms of institutional selectivity, in which socioeconomic background did not appear to strongly influence the outcomes of students who graduated from selective institutions but this influence was far more pronounced among students from non-selective colleges.

Unfortunately, the limited sample size prevented an analysis of labor market outcomes similar to the analyses of postsecondary progression in which separate models

are fit for ability group by institutional selectivity combinations. However, this analysis minimally suggests that postsecondary completion is not always sufficient in order to overcome the impact of being raised in a disadvantaged household, and this relationship may vary according to student ability and institutional selectivity.

CHAPTER 6: DISCUSSION

It is frequently stated that higher education is our nation's greatest vehicle for social mobility. Indeed, much of the impetus for the tremendous postsecondary expansion which began during the post-WWII period was fueled by a desire to expand opportunity for students historically underrepresented in higher education and provide a gateway to the middle class for students from humble origins. But despite the significant expansion of the postsecondary system and the strong relationship between college attainment and beneficial socioeconomic outcomes, little gains have been made in decreasing socioeconomic inequality, increasing rates of social mobility, or reducing disparities in postsecondary attainment stemming from socioeconomic origins in the United States.

While the causes of this conundrum are diverse, three explanations which have been put forth appear to be the most prominent in the literature. The first is that students' from low-income backgrounds are significantly less likely to be prepared for college than their higher-income peers, a product of systemic inequities stemming from the K-12 system. Thus, while postsecondary opportunity expanded over time, low-income students were not able to fully take advantage of this opportunity given their lack of academic preparedness. Given the wide body of literature on the relationship between pre-collegiate academic experiences and postsecondary outcomes, as well as the substantial body of research which has identified socioeconomic disparities in various factors related to college readiness, this argument is very much supported in the literature base.

However, many are unconvinced of the sufficiency of this argument for explaining socioeconomic disparities in students' college outcomes. Indeed, a significant

percentage of low-income students that are qualified to attend college either choose to enroll in an institution that is significantly less selective than the types of institutions they are likely to be accepted to or forgo postsecondary altogether. From this perspective, the primary issue is not that low-income students are less academically prepared for postsecondary compared to their higher-income peers, but rather they are more likely to attend institutions that are less effective at promoting student success, if they go onto postsecondary at all.

But even for low-income students who are academically prepared for college and apply to an institution that matches their academic credentials, socioeconomic background may still exert a powerful influence on their chances of postsecondary progression and attainment. Scholars have identified a number of troubling trends in higher education, such as decreasing state appropriations, rapidly rising tuition, the replacement of grant aid with loans, and a shift from need- to merit-based financial aid, which may thwart even highly qualified low-SES students from enjoying the benefits of higher education. And when a broad view of socioeconomic background is considered, other factors, such as the educational attainment of students' parents, may also significantly impact students' postsecondary outcomes, above and beyond their academic ability and the institutions in which they enroll.

A long research tradition, stimulated by Mare (1980) and his approach of sequential logit modeling, has investigated this third explanation in an attempt to statistically estimate the degree to which socioeconomic background influences the likelihood that students will pass through each postsecondary transition point. However,

the limitation of this line of research is that it has often ignored both the stratification of the higher education system and the potential heterogeneity in the effects of socioeconomic background across ability groups. This study was therefore designed to expand this research tradition and investigate the extent to which the impact of socioeconomic background on the probability that students will pass through each stage in their college-to-career pathways varies based on student ability, institutional selectivity, and the combination of both factors. This chapter is dedicated to reviewing the most prominent findings from the analysis of the impact of SES across transitions, describing a new conceptual model which these findings call for, identifying the study's limitations, and discussing some future directions for research.

SUMMARY OF FINDINGS OF THE RELATIVE IMPACT OF SES ACROSS TRANSITIONS

The overarching conclusion from the majority of research using the technique of sequential logit modeling to study this phenomenon is that the effect of SES declines steadily and consistently across educational stages. SES was indeed not found to be significantly related to graduate school enrollment or the attainment of a graduate degree among students that earned a bachelor's, congruent with prior literature. Although this could be due to the relatively limited sample sizes for the models of graduate school outcomes, the magnitude of the SES estimates were much smaller in the graduate school models compared to the analyses of previous transitions and, in fact, low-SES students were estimated to be the most likely to complete a graduate degree among students that enrolled in graduate school, although these differences were not statistically significant. However, the results of this study do not support the contention that the impact of SES

wanes steadily over the first five transitions. Indeed, high-SES students were significantly more likely to experience each of the first five transitions, and the magnitude of the estimates was roughly equivalent across outcomes. Even for students that enrolled in a university, SES was estimated to exert a significant influence on the likelihood that students would earn degrees, and the magnitude of the disparities in attainment were larger than in models of many of the previous stages.

The results also highlight the importance of including additional stages in research using sequential logit modeling. The three postsecondary stages that are traditionally included in such research are college enrollment, college completion, and graduate school enrollment and/or completion. However, the transition in which socioeconomic background was estimated to exert the largest influence for the entire sample of college graduates was college application. A number of studies have documented that low-income students, even those with high demonstrated ability, are significantly less likely than their more affluent peers to apply to any postsecondary institution, or apply to an institution that matches their academic credentials if they do apply, and the results of the current study support these conclusions. Despite the recognition of the importance of this stage, research using sequential logit modeling has often failed to include it as an outcome in the analysis.

Although the largest estimated disparity was at the stage of applying to college, a number of the analyses also suggest that low-SES students are significantly less likely than their high-SES peers to be admitted to an institution conditional upon application. As discussed in the literature review, many colleges and universities, particularly

selective institutions, often claim that they are striving to increase the socioeconomic diversity of their campuses but decry the absence of a sufficient amount of qualified applicants from disadvantaged backgrounds. Many such institutions also claim that they practice need-blind admissions and only consider socioeconomic background when making financial aid determinations. There are also at least some notable instances of selective institutions considering need in admissions even while claiming that they are need-blind, and less selective institutions may not have the financial capacity to practice need-blind admissions. However, overall there is a limited amount of empirical research on this postsecondary stage, likely due to the fact that admissions practice are frequently scrutinized and many institutions would prefer not to disclose their methodologies for making admissions decisions. Although there is a great deal of ambiguity regarding the impact of SES on the likelihood of admissions, the results of this study suggest that a disadvantaged upbringing adversely impacts the likelihood that students will be admitted, even when controlling for academic preparedness and a host of other demographic and school variables.

Including the additional stages of application and acceptance is not only important for estimating the scale of socioeconomic disparities at these stages, but also for providing a more nuanced and contextual understanding of the extent to which socioeconomic background influences other stages. Specifically, while previous sequential logit modeling research had estimated that SES is significantly related to the likelihood that students would enroll in college, this finding alone does not provide an understanding of why this disparity exists. Low-SES students could be applying to

institutions at lower rates than their high-SES peers, applying with the same frequency but being accepted less often, or being accepted at the same rates but being less likely to matriculate. Including application and acceptance as separate stages therefore revealed that there were also significant and substantial disparities in the likelihood of matriculation for admitted students. Once again, this study is not the first to have identified this phenomenon, as previous research has underscored that the transition from acceptance to enrollment is often a treacherous one for many socioeconomically disadvantaged students. However, including all of these stages in an analysis using sequential logit modeling provides a more accurate understanding of the relative impact of SES on the matriculation rates of admitted students compared to the effect of SES on other stages.

Finally, although somewhat outside of the scope of previous research which has investigated the relative impact of SES throughout students' educational pathways, this study also reinforces the perspective that the transition students' make from their baccalaureate programs to the labor force is a critical one. Even among students that completed bachelor's degrees by the conclusion of the ELS study timeframe, students from low-SES background were estimated to have significantly worse socioeconomic outcomes than their more privileged counterparts. Although the models of unemployment did not find significant disparities stemming from socioeconomic origins once other factors had been controlled for, low-SES students were estimated to earn less annually and be paid lower hourly wages than their high-SES peers even after controlling for a rich set of pre-college factors and postsecondary experiences. It should also be

emphasized that these disparities were evident even though college graduates had only been in the labor market for approximately four years at most. It is highly possible that these disparities could increase over time if these early career disparities represent different future earnings trajectories rather than merely different starting points.

POSTSECONDARY RESOURCE TRINITY MODEL

The previous section reviewed the average estimated socioeconomic disparities produced by the analyses of each stage in students' college-to-career pathways. But perhaps the most important contribution of this study are the insights it provides regarding the extent to which the magnitude of socioeconomic disparities vary according to students' background ability, the selectivity of the institution, and the combination of both factors. Research has consistently shown that all three postsecondary resources, namely socioeconomic, academic, and institutional resources, are positively related to student outcomes; high-SES students are more likely than their low-SES peers to participate in postsecondary and complete a degree, academic preparation is significantly related to postsecondary access and success, and there is a strong relationship between institutional selectivity and graduation rates. The contribution of this study is therefore not simply to demonstrate that each postsecondary resource is positively related to student outcomes, but rather to highlight how these three resources interact in complex and previously unknown ways.

Research using sequential logit modeling has traditionally aggregated all students together and treated all postsecondary institutions as equivalent. The result of this technique is that it produces estimates of the average impact of SES for all students on

each transition. While understanding where socioeconomic background matters most on average is beneficial for identifying the most significant obstacles in low-SES students' college-to-career pathways, some research had suggested that socioeconomic background may be more influential in particular institutional contexts and for particular students than others. Perhaps the most obvious example of this is that high-resource postsecondary institutions may have the financial capacity to ensure that cost is not a barrier for low-income students and provide additional supports to students that may be the first in their family to go to college. One might predict that SES would be less consequential in such contexts, and while some research had investigated this phenomenon no studies using the technique of sequential logit modeling had conducted separate analyses for different levels of institutional selectivity to determine whether this theory holds. Similarly, socioeconomic background may be less influential for students that demonstrate high academic ability. They may be able to attract additional financial support in the form of merit aid, and their ability may cause them to be savvier at navigating the postsecondary system. But once again, limited research using this methodological approach had investigated whether the magnitude of socioeconomic disparities varies according to students' ability levels.

A number of the findings appeared to support these initial hypotheses. One of the clearest examples of the degree to which socioeconomic disparities vary according to student ability comes from the models of baccalaureate attainment at moderately selective institutions. High-ability students from different socioeconomic backgrounds attending these institutions were estimated to attain degrees at nearly equivalent rates. For

students in the next ability group, the disparity was larger but still insignificant. The estimated gap was larger and statistically significant for students in the second lowest ability group, and low-ability students had by far the largest socioeconomic disparities in their rates of baccalaureate attainment. Thus, in this context, differences in the types of institutions students from different SES subgroups often enroll in cannot explain the disparities, as all students in this analysis were enrolled in the same category of institutions. Additionally, it would be somewhat misleading to say that socioeconomic background influences the likelihood that students who enroll in moderately selective institutions will complete a degree, as this was not the case for all ability subgroups. Instead, it is evident that the likelihood of baccalaureate attainment for students at moderately selective institutions depends upon the combination of their socioeconomic background and ability level. Failing to account for either factor might lead to erroneous conclusions about the probability that students will complete their degree.

Although this study was not designed to illuminate the causal mechanisms driving these relationships, some hypotheses can be derived from previous research. As discussed in the literature review, low-SES students, particularly those that are the first in their family to attend college, may have more difficulty identifying as college students on average. But this phenomenon may be mediated by students' background ability and academic preparedness. High-ability, low-SES students may encounter fewer academic obstacles in postsecondary, and performing at a high level may allow them to more easily develop their identity as a college student and feel a greater sense of belonging. In contrast, lower-ability students from disadvantaged backgrounds may be highly likely to

struggle academically, and these struggles may trigger feelings that these students do not truly belong in college. In contrast, while low-ability students from high-SES backgrounds may still encounter academic obstacles in college, these challenges may not pose as great a threat to their identity as a college student and thus would be less influential in their decision to persist or drop out. In other words, low-SES students may internalize struggles and view them as representations of their merit or worth (e.g., “I’m not smart enough for college”), while high-SES students may be more likely to externalize these difficulties (e.g., “That professor was a terrible lecturer”).

Similar variation in the size of socioeconomic disparities by student ability and institutional selectivity was found in the case of the labor market analyses. For example, among college graduates there were no disparities in wages or earnings for high-ability students, but the magnitude of the disparities became progressively larger as we moved to lower student ability groups. Indeed, high-SES, high-ability students only earned approximately \$0.45 more per hour compared to their low-SES college graduate peers, while the disparity among low-SES students was nearly \$5.00. Similarly, students from different socioeconomic background that earned degrees from selective institutions were estimated to earn roughly equivalent wages and annual earnings, but much larger disparities existed for students that graduated from non-selective institutions. This finding is potentially aligned with the social capital perspective. Highly selective institutions may be able to provide all students access to the information channels and professional networks needed to assist them in their transition into the labor market, making socioeconomic background less consequential. In contrast, these resources may not be as

abundant at less selective institutions, increasing the importance of one's own personal connections in navigating the job search. Although the results of this study cannot confirm this possibility, the findings at least underscore the likelihood that socioeconomic disparities in the labor market outcomes of college graduates are a product of both their ability levels and the types of institutions from which they graduated.

While many of the findings are congruent with initial predictions, many of the results were also unexpected. For example, no socioeconomic disparities in any postsecondary stages were found in the models of non-selective institutions. Thus, although the largest disparities in students' labor market outcomes were identified at non-selective colleges and universities, socioeconomic background was less consequential for postsecondary progression at these institutions. The lack of socioeconomic disparities in application, acceptance, and even enrollment at these institutions are logical given the fact that they are by definition non-selective. However, it was expected that socioeconomic disparities in attainment would be largest at non-selective institutions, although this is not what was found.

A similarly unexpected result was found in the analyses of the enrollment stage across ability groups. The largest gaps in enrollment for admitted students were identified in the high-ability group, and the estimated gaps decreased as we moved to students of lower ability. This is essentially the reverse of what was anticipated, making it somewhat difficult to explain this finding. Indeed, it was hoped that socioeconomic gaps in enrollment would be inconsequential for high-ability students, given that low-SES

students in this category had been admitted to college and are likely capable of succeeding in college based on their demonstrated ability.

Overall, the most important conclusion from this set of analyses is that the relationship between socioeconomic background and educational progression and attainment is far more nuanced than is often assumed. This finding has important implications for policy and practice aimed at reducing socioeconomic disparities in students' postsecondary outcomes. For example, developing a singular program for all low-SES students may not be an effective use of resources, as disadvantaged students of different levels of ability or attending different types of institutions may receive more or less benefit from such a program. Failing to account for all three postsecondary resources when designing higher education policy may therefore result in limited effectiveness in reducing socioeconomic disparities.

LIMITATIONS AND FUTURE RESEARCH

Although this study will hopefully add to our understanding of the effects of SES on students' college-to-career pathways, it does have a number of important limitations. One of the most important is that the analyses entirely excluded sub-baccalaureate institutions. This decision was made due to the fact that many postsecondary stages that were included in the analyses, such as application, acceptance, and even persistence, are less applicable to the study of community colleges, as well as due to this study's primary interest in baccalaureate attainment. However, sub-baccalaureate institutions are a substantial component of the higher education system, particularly for students from disadvantaged backgrounds. Future research should also explore how the magnitude of

socioeconomic disparities in the outcomes of students at community colleges compares to the size of SES gaps at universities.

Another important limitation of this study is that socioeconomic background was only treated as a composite variable in the analyses. While the use of measures which combine parental educational, parental occupation, and family income to represent a student's general socioeconomic status has a long history in educational research, the limitation of this approach is that it inhibits an understanding of the relationship between specific aspects of socioeconomic background and college or career outcomes. It may be the case that parental education is more important at certain stages, such as in shaping students' postsecondary aspirations which then manifest in their college application rates, while family income may be more influential in other stages, such as choosing whether or not to enroll and the student's likelihood of persisting and earning a degree. The methodological approach used in this study can therefore be extended by analyzing the impact of the separate components of SES on students' educational and career outcomes.

Although the ELS dataset used for this study is ideally suited to analyzing students' college-to-career pathways and provides a rich set of information on students' backgrounds and eventual outcomes, the primary limitation of this dataset is its relatively limited sample size for the types of analyses conducted in this study. Many of the subgroup sizes were far too small to provide the statistical power needed to detect significant differences. For example, only a handful of low-ability students enrolled in selective institutions, and few high-ability students attended non-selective institutions.

Using a similar methodological approach on datasets with a larger sample would therefore be quite beneficial for uncovering additional nuances in these relationships.

And while the disaggregated analyses often resulted in insufficient subgroup sizes, even the level of disaggregation used for this study likely masked significant sources of variation, particularly in regards to institutional selectivity. Each institutional selectivity category contains hundreds or thousands of institutions that surely vary on a number of important dimensions, such as the academic characteristics of their student bodies, their highest degrees offered, their level of resources, and the like. It is highly possible that socioeconomic disparities in each stage vary according to these institutional characteristics as well. Although a significant body of research has investigated the impact of various institutional characteristics on student outcomes, less research has explored whether socioeconomic disparities in outcomes vary according to these other institutional characteristics. This is another important avenue for future research.

Similarly, aggregating postsecondary institutions into categories rather than analyzing individual institutions likely also results in the loss of a significant amount of nuance regarding these relationships. For example, in the models of college acceptance based on selectivity level, all students that applied to at least one institution in that category were included in the models of acceptance. Students that applied to multiple institutions in that category likely increased their odds of acceptance, but the variables for both acceptance and enrollment were simply dichotomous and did not account for the total number of institutions students applied or were admitted to. Additionally, while the variables included in the models were all student-level, it is undoubtedly true that

institutional characteristics also influence the likelihood of each outcome occurring.

Techniques such as the conditional logit modeling, which are able to account for both individual and institutional characteristics in explaining the probability of an outcome occurring, would likely provide additional insights into the degree to which socioeconomic disparities exist when controlling for characteristics of the institution.

Overall, while the study does have a number of important limitations, the hope is that it still serves as a contribution to our understanding of the complex ways in which SES influences students' college-to-career pathways. By considering the interactions between socioeconomic background, academic ability, and institutional selectivity, policymakers and higher education practitioners may be able to design more effective policies and programs that are able to reduce socioeconomic disparities in students' outcomes. Additionally, the Postsecondary Resource Trinity model may be of use for scholars of stratification and social mobility in higher education that are seeking to better understanding the causal mechanisms whereby SES translates into educational attainment and impacts students' subsequent labor market outcomes.

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