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Who Studies the Arts and Sciences? Social Background and the Choice and Consequences of Undergraduate Field of Study

For several decades now, social scientists interested in the relationship between higher education and social stratification have directed their research efforts toward evaluating how college access is conditioned by students' social background characteristics. Studies have examined both the overall correlates of entry into postsecondary education (Alexander, Pallas, & Holupka, 1987; Choy, 2002), and, paralleling the rise of hierarchical differentiation among universities, the factors associated with entry into particular institutional locations, such as two-year versus four-year institutions, highly selective institutions, and types of graduate programs (Alexander, Holupka, & Pallas, 1987; Hearn, 1984, 1991; Karabel, 1972; Karen, 2002; Mullen, Goyette, & Soares, 2003). However, in comparison to the abundance of research directed towards access and inter-institutional differentiation,

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the topic of intra-institutional differentiation has largely been neglected. While we have learned much about how social background predicts college destination, we know very little about its effects on choice of curriculum once at college.

Just as universities may be classified by type or selectivity, an analogous set of divisions exists for university curricula, corresponding to profound and enduring philosophical differences around the purpose and value of a college education. Those advocating liberal learning envision the university as an idyllic setting in which students devote themselves to the pursuit of knowledge and intellectual growth, temporarily free from the material demands of life. Liberal learning values breadth of knowledge over narrow specialization and holds an appreciation of learning for its own sake rather than for utilitarian ends. Training in the liberal arts is believed to strengthen a student's character and to develop qualities such as reason, judgment, and a sense of social obligation. Traditionally, a liberal arts education was designed to prepare elite students with the qualities needed to govern (Brint, 1998; Kerr, 1991; Levine, 1986). The classic liberal arts curriculum historically consisted of Latin, Greek, philosophy, history, and science and now typically includes the arts and humanities, social sciences, math, and natural and physical sciences.[1]

The counterposition presents a practical vision of college as an institution that provides a concrete value to both students and society in the form of early career training. In this view, a university education trains a student for his or her desired occupation or profession. By providing specialized occupational training, a college degree provides the key to economic and social mobility for those less advantaged. At the same time, institutions of higher education cooperate with business and industry to fill their needs for a skilled workforce. Those valuing a college education for its utilitarian purpose promote specialized vocational or preprofessional training. Vocational fields include those designed explicitly to provide a student with the practical skills and job-related competencies necessary for entry into a specific occupation or profession, including business, education, engineering, health professions, and public administration. Currently, vocational fields are the most popular choice among undergraduate students, accounting for more than 60% of all bachelor's degrees awarded in the 1996 academic year (National Center for Education Statistics, 1999).[2]

While debates on college curricula have raged for well over two centuries (Bonvillian & Murphy, 1996), we currently know very little about how curricular divisions correlate with students' social background. If historically elite male students studied the arts and sciences in preparation for roles of leadership and power, is this still the case? If it is, how strong is the relationship between social background and choice of

field? Does it hold across gender and racial groups? In addition, what are the consequences? Do arts and science students benefit in the labor market? Are they more likely to go on to graduate education? By asking these questions, we hope to illuminate the possible role of curriculum as an additional site of social stratification at the postsecondary level.

Previous Research on Choice of College Major and Postcollege Outcomes

While the choice of an arts and science (A&S) versus a vocational field of study has been largely neglected in the sociological literature, researchers have not left the topic of college major selection completely untouched. Sociologists have launched key inquiries in three areas: gender and race disparities in the selection of fields of study, factors influencing entry into science fields, and the occupational outcomes associated with different majors.[3] Gendered patterns of choosing majors have been extensively documented (Jacobs, 1986, 1995). Men have traditionally concentrated in fields such as business, engineering, chemistry, and physics while women have studied education, humanities, nursing, and psychology. Studies examining the choice of major by race reveal that African American students are more likely than white students are to major in education, the humanities, and the social sciences, fields that offer lower incomes to college graduates than the natural and technical sciences (Thomas, 1985). Simpson (2001) coded fields of study into five broad types and found that most of the differences between racial and ethnic groups were between Asian Americans and other students. Considerable attention has also been focused on the factors predicting the selection of science majors, and studies have found that women and non-Asian minority students are underrepresented in these fields compared to their White male counterparts (Barber, 1995; Berryman, 1983; Hilton & Lee, 1988; Maple & Stage, 1991; Mullen, 2001; National Science Foundation, 1999; Powell, 1990).

Researchers have also explored the labor market returns to undergraduate fields of study. Generally, graduates in engineering, business, and math garner the highest annual salaries while education and psychology students earn significantly less (National Center for Education Statistics, 1999). It is important to note, however, that these figures also reflect confounding determinants of income besides field of study, such as the proportion of women in each field. While few researchers have explicitly compared the earnings of A&S students with those in vocational fields, those researchers that do note that A&S majors earn less in the short run than do other majors (Sharp & Weidman, 1989; Useem, 1989). However, A&S majors tend to be more likely to enroll in graduate

school than students in other fields (Jencks & Riesman, 1968; Sharp, 1963). These studies, though, do not explicitly consider how the link between social background and major choice affects differential earnings and graduate school outcomes.

Because the economic returns to fields of study vary widely (National Center for Education Statistics, 1999; Rumberger & Thomas, 1993; Smart, 1988), sociologists have been interested in the choice of fields leading to lucrative employment. Researchers have found that earnings differentials among fields play a strong role in a student's choice (Cebula & Lopes, 1982), and that male students differentiate between those fields offering the greatest future earnings and those with the highest entry earnings, showing a preference for the former (Berger, 1988). More recently, Davies and Guppy (1997) showed that men are much more likely than are women to select fields with high economic payoffs, but found no significant effects for race (in analyses comparing Asians and Whites to African Americans and Hispanics). Moreover, after controlling for academic ability, socioeconomic status held a slight negative effect on the selection of a lucrative field of study (Davies & Guppy, 1997). In contrast to the findings of Davies and Guppy (1997), Xie and Goyette (2003) found that race does influence choice of a profitable major. Asian Americans, many of whom are recent immigrants, may choose fields with high earnings potential as a way to ensure upward social mobility.

A smaller body of research has linked students' major choices to more nuanced measures of occupational returns (Hearn & Olzak, 1981; Wilson, 1978; Wilson & Smith-Lovin, 1983). Rather than limiting measures of fields of study strictly to future income, in 1978 Wilson ranked fields of study by their probability of "feeding" into high-level occupations (occupations with a high authority index). Basing his scale on the views of 13 informants from Texas, Wilson ranked fields such as engineering, medicine, business, and commerce quite highly, with fields such as social sciences, literature, and religion on the bottom end. He found that including this measure of educational attainment in statistical analyses considerably improved previous efforts to predict income. However, his research also revealed that, after academic ability was controlled, scores of father's occupational authority and prestige did not significantly influence a student's likelihood of selecting a curriculum likely to lead into an occupation with high authority. In a later study, Hearn and Olzak (1981) built on Wilson's scale in an effort to explain gender differences in choice of field. They coded 21 fields of study along two dimensions: how closely the field was linked to specific occupations and the likely status and power rewards of a major. Using data from a small sample of students from one university, Hearn and Olzak found that departments in fields that provide higher status rewards tended to have less

supportive social climates, and that "men tend to opt for unsupportive departments conferring higher rewards while women tend to opt for supportive departments with lower rewards" (p. 202). Their findings also suggest that women are more likely than are men to receive bachelor's degrees in vocationally linked areas. Unfortunately, Hearn and Olzak did not include analyses of social background differences.

In sum, the body of research on the selection of undergraduate fields of study reveals strong gender differences and modest race differences in students' choices. In addition, the evidence suggests that the future economic returns to fields of study play a role in a student's choice. Overall, men and Asians are much more likely than women and students of other races and ethnicities to enter fields with high earnings or status potential, while women are somewhat more likely to select an applied field of study. In terms of students' social background, previous research shows that socioeconomic status (SES) plays a negligible role in the selection of fields that lead to high incomes after graduation (Davies & Guppy, 1997) or high status occupations as defined by Wilson's informants (Wilson, 1978). Most importantly, the existing research uncovers how the selection of fields of study becomes a significant component of stratification after college.

Because of the historical role of arts and science fields in educating elite students, inquiry into the selection of these fields may provide further clues about how higher education stratifies students. Remarkably, however, attention to the selection of A&S versus vocational fields of study has been virtually nonexistent. The absence of research on the role of social background in the selection of A&S fields is all the more surprising because of the existence of striking relationships between curricula and social background at the secondary level. The literature on high school tracking has long documented a strong positive effect of social background on the likelihood of enrolling in an academic versus a general or vocational track (Fischer, Hout, Jankowski, Lucas, Swidler, & Voss, 1996; Oakes, 1985). In addition, the relationship is longstanding. For example, in a study of a Philadelphia high school at the turn of the 19th century, Labaree (1997) reports that 72% of students from the proprietary middle class enrolled in an academic program, compared to only 14% of the unskilled working class, who more commonly chose the commercial, or vocational, curriculum.

Furthermore, based on studies of French university students, Bourdieu and Passeron (1977, 1979) provide a theoretical explanation for the existence of this relationship and offer a comparative empirical case. Students from privileged families acquire high levels of cultural capital in their homes, in the form of verbal facility, general cultural awareness, and competence in a society's high status culture. In turn,

the acquisition of cultural capital enables students' academic mastery, in particular that which requires abstract and theoretical thinking. Bourdieu ranked academic fields along a continuum situated between the poles of cultural power (science and the humanities) versus economic and political power (law and medicine). This continuum corresponds to the hierarchy of students enrolling in fields in these areas. His research further shows that French students from less elite backgrounds are more likely to select technical and vocational options (Bourdieu, 1984). He argues that the accumulation of cultural capital acquired by elite students through the educational system then contributes to the maintenance of their privileged position in the social structure (Bourdieu & Passeron, 1977).

While these findings may not necessarily translate to the United States, they point to differences in status associated with fields of academic study, a pattern also firmly entrenched in this country. A liberal arts education was traditionally advocated as the training required by elite students to successfully endow them with the qualities needed to govern (Brint, 1998; Kerr, 1991; Levine, 1986). Because of this, the most prestigious and competitive postsecondary institutions have long been those offering a strong liberal arts curriculum (i.e., private liberal arts colleges, Ivy League universities). The positive relationship between the prestige of an institution and the representation of children from the most privileged families has been documented since the turn of the 20th century (Levine, 1986). Indeed, as far back as the 1920s, institutions implicitly suggested that a liberal arts education connoted higher social status than a practical one did. More recently, Delucchi (1997) showed that some institutions unjustifiably make claims to a liberal arts curriculum as a strategy to bolster their prestige and legitimacy. While liberal arts education holds a position of status, vocational education has often been disparaged for its "utilitarian corruption of the college curriculum" (Scott, 1991, p. 17). Almost 70 years ago, Robert Hutchins, then president of the University of Chicago, asserted

> Vocationalism leads to triviality and isolation; it debases the course of study and staff. . . . It deprives the university of its only excuse for existence, which is to provide a haven where the search for truth may go on unhampered by utility or pressure "for results." (Levine, 1986, pp. 89–90)

Both the patterns found at the secondary level and the strong positive status associated with liberal education suggest the likelihood of a link between social background and the selection of A&S fields. While there have been no direct studies of this topic in the United States, there is some indirect evidence on this question. James Davis (1965) conducted

a major study of undergraduate career decisions, drawing on a sample of over 30,000 students collected by the National Opinion Research Center. Though his focus was on tracking shifts in occupational preferences during the undergraduate years, Davis noted a strong correlation of major field of study with career preferences. His findings revealed that SES plays a positive role in the selection of careers in humanities, medicine, law, physical, biological, and social sciences and a negative effect on the choice of engineering, education, and business. These patterns suggest that high-SES students in the 1960s were more likely to enter A&S undergraduate fields of study in preparation for their chosen careers.

While we thus have grounds to suspect a positive relationship between social background and the selection of arts and science fields, we also identify two important trends in education and society that may have shifted or altered this relationship over time. First, as the system of higher education expanded post WWII, drawing ever-larger numbers of particularly non-elite students, the rapidly increasing rate of bachelor's degrees gave rise to a process of credential inflation (Collins, 2002). Consequently, the occupational value of the college degree steadily declined, and high-status occupations began to require more specialized training or graduate degrees. In this environment, it is probable that the value of an arts and science credential was driven down, resulting in student migrations to other fields. Indeed, we have seen a steady drop in the share of undergraduate degrees earned in A&S fields of study (Brint, Riddle, Turk-Bicakci, & Levy, 2002; Turner & Bowen, 1990; Useem, 1989). It is also conceivable that the process of credential inflation led to increasing emphasis on institutional type. As degrees were devalued, the value attached to the status of the college or university may have risen in significance. While beyond the scope of this paper, we speculate that perhaps A&S degrees previously stood on their own as markers of cultural capital; with credential inflation, these degrees now require a prestigious institution behind them.

In addition to the possibility that credential inflation has compelled students from all backgrounds to consider more carefully the immediate labor market value of their degree, a second trend in U.S. society may have also resulted in the decreased desirability of liberal arts degrees. Many observers now believe that the role of the high culture arts as a form of cultural capital is declining, particularly in the United States (see DiMaggio and Mukhtar, 2004, for a review of this literature). While familiarity with the high culture arts, obtained in part by participation and attendance at arts events, once was a reliable marker of cultural capital, some sociologists hypothesize that cultural capital now accrues to

the person who is familiar with and participates in many cultural forms, from low brow, to popular, to high brow (DiMaggio & Mukhtar, 2004). While this theory is still debated, if it is true that the characteristics of cultural capital have changed over time, then it may also be the case that the acquisition of an A&S degree no longer signals the same kind or amount of cultural capital, leading to a loss in the attractiveness of these degrees, particularly for members of the upper echelon of society.

In sum, while there are reasons to expect the continuation of a relationship between social background and A&S major choice and reasons to suspect its weakening or disappearance, the link between social background and the selection of an A&S field of study is an unexplored empirical question. In our research, we remedy this gap in the literature by investigating the following research questions. First, are students from higher SES backgrounds more likely to select an A&S major than are those students from lower SES backgrounds? Second, if this is the case, how can we explain the influence of SES? We explore four sets of mechanisms through which social background may affect choice of college field, including the roles of tested proficiency, characteristics of the student's undergraduate institution, educational and occupational expectations, and values about work. Third, how does college field of study influence education and employment outcomes 4 years after graduation? To find out, we analyze annual earnings and the likelihood of enrolling in a graduate program for A&S versus vocational majors.

Because choice of major has been found to vary by gender and race, we consider not only these potential differences in the selection of field but also whether the influence of socioeconomic background is similar for men and women, minority and White students. Though previous research suggests that the choice of major varies substantially by gender, the vocational versus A&S dimension may not be as salient as are other dimensions (i.e., science vs. non-science). For example, women may be more likely than are men to major in the arts and humanities but not the sciences (both included in the A&S grouping), and more likely to major in education but less likely to major in engineering than are men (both in the vocational category). It is also unclear whether the vocational versus A&S dimension will account for differences by race. While research notes that racial minorities may be more likely than are Whites to major in some vocational fields like education (in the case of African Americans) and engineering (in the case of Asians), Asians are also more likely than are Whites to major in math and the sciences, and African Americans have high rates of enrollment in the social sciences.

Data and Methods

We use data from the National Educational Longitudinal Study (NELS), 1992–1994, and the Baccalaureate and Beyond Longitudinal Study (B&B), 1993–1997, both conducted by the National Center for Education Statistics at the U.S. Department of Education. NELS began in 1988 with a nationally representative sample of eighth-graders. These students were surveyed again in 1990, 1992, and 1994. While the original sample was followed throughout these waves, the respondents were also refreshed with each wave so that the survey includes a nationally representative sample of 10th- and then 12th-graders. For this research, we use the 1992–1994 panel of 12th-grade respondents who were also surveyed 2 years after high school. Students from this sample were choosing college majors during the same years as those in the B&B sample were receiving their bachelor's degrees. B&B consists of a nationally representative sample of 10,080 individuals who were among the 1.1 million students who received bachelor's degrees in the academic year 1992–1993. This sample was drawn from a larger nationally representative sample of institutions, students, and parents selected for the 1993 National Postsecondary Student Aid Study (NPSAS). In addition to the NPSAS data, B&B comprises college transcript data, which include major fields of study. To both these sources of data, we attach information from the *U.S. News and World Report* (1993) survey of 1,279 postsecondary institutions. We obtain the type of institution and the average SAT scores of entering students at each school from this source.

Our analyses distinguish between A&S and vocational fields. We follow Delucchi's definition of vocational fields as those designed primarily to train students with the skills required for entry into a particular occupation upon graduation (Delucchi, 1997). A&S fields, on the other hand, seek to increase students' understanding of the natural and human world without immediate concern for particular career preparation (Brint et al., 2002). Appendix A reports our classification of majors into these two broad categories. We acknowledge that the distinction between A&S and vocational majors is ideal-typical and obscures differences within this broad division. To provide more detail and complexity, we also present tables with descriptive findings concerning more detailed categories of majors to assess the degree to which majors within A&S and vocational programs are similar.

Our research is divided into two parts. The first uses NELS data to explore the determinants of students' initial choice of major in the early years of college. The second draws on the B&B sample to examine the

labor market and graduate school outcomes of the major choices of bachelor's degree recipients. We chose NELS for the first part of our analysis because it contains student characteristics prior to their major choice. From NELS, we can measure students' educational expectations, and occupational expectations and values as well as their tested proficiency in the 12th grade—2 years before many of them chose their majors—and then analyze how these factors predict major choice. In addition, because we have information prior to college entry, we can control for selectivity into the sample of four-year college students that may be related to SES and major choice. For example, low-SES students may be choosing to go to four-year colleges precisely because they want the specific occupational skills they gain from vocational majors, while high-SES students may see college as a natural part of their life course, unrelated to major. We complement our analyses from the NELS sample with data from B&B in the second part of our study for three reasons. From NELS, we determine students' first major choice, but we do not consider their major at the time of graduation. For this, we use B&B.[4] The second reason is that the NELS data represent the 12th grade high school population. B&B, on the other hand, is representative of graduating college students, and thus provides a more accurate description of the college population. Finally, B&B tracks students for 5 years after their college graduation, allowing us to examine the effects of their major choices on later occupational and educational trajectories.

To discern whether SES and other background characteristics affect a student's choice of major, we present the results of two analyses. The first is an index of dissimilarity comparing low-SES and high-SES students' choice of an A&S major versus a vocational major using data from the B&B survey. An index of dissimilarity measures the proportion of one group (either low- or high-SES students) who would have to change majors for the proportions of low-SES and high-SES students in each category to be equal. Values of the index range from 0 to 1. The second analysis consists of results from multivariate Heckman probit models that predict major choice, allowing for selection into a four-year, postsecondary institution, using the 1992–1994 panel of NELS.

In the next part of the research, we focus on how major choice affects postgraduate outcomes. We explore differences in employment, earnings, and graduate school attendance among those who attained degrees in specific A&S versus vocational majors. Here we present descriptive statistics and two multivariate models to see whether we can explain the influence of major on earnings and graduate school enrollment through such variables as the individual's SAT score, college type and selectivity, educational expectations, or career values.

We consider three sets of explanatory variables in our multivariate models. First, tested proficiency has been shown to be a strong mediator of social background on academic outcomes. For example, because tested proficiency correlates highly with social background, it has been found to account for much of the connection between social origin and college destination (Alexander et al., 1987). It may be that A&S fields require a higher level of tested competence, as compared to vocational fields, and that the academic mastery of high-SES students contributes to their likelihood of choosing fields in this area. Although the concept of academic ability is controversial and difficult to measure, in these analyses we approximate it in NELS using the average of math and reading academic proficiency tests administered in 1992. When using B&B data, we use the combined quantitative and verbal SAT scores.

Second, we suspect that institution type may play a role. Because institutions differ in their curricular offerings, a student's SES may influence first his or her college destination, and consequently the likelihood of choosing an A&S over a vocational field. We employ two variables to evaluate college characteristics. First, we examine whether a student chooses a university, liberal arts college, or specialty school (military academy, engineering school, or arts and design academy) because this choice may affect course taking, and consequently, major choice, options.[5] Second, because there is a strong association between the status and selectivity of an institution and the proportion of A&S degrees awarded (Brint et al., 2002), we consider institutional selectivity. We approximate this using the average SAT scores of the entering class of students, following the practice of other researchers (Davies & Guppy, 1997; Ethington & Smart, 1986; Hearn, 1991).

Finally, in myriad ways, expectations and values have been found to play a strong role in mediating the effects of social background on academic outcomes. First, we consider educational expectations. We suspect that students with higher levels of educational expectations, specifically those anticipating later graduate school enrollment, may be more likely to select an A&S field as an undergraduate. These students have the option of reserving their vocational training for the graduate school years, freeing them to select a less practical undergraduate major. Second, occupational expectations may similarly influence a student's choice of field and help explain the role of social background. If lower-SES students have career expectations that are more modest, then an applied field of study may be a more likely choice. Finally, work values such as the importance of money, steady employment, and leisure could contribute to the choice of college major. Details of these measures are reported in Appendix B for the NELS variables and in Appendix D for the B&B variables.

Descriptive and Multivariate Results

Major Choice

Using B&B data, Table 1 shows that students' choice of an A&S versus a vocational major varied according to family background, as measured by the highest level of either parent's education (the most complete and reliable indicator of family SES in the B&B). Compared to their peers with parents who have lower levels of educational attainment, students from highly educated families were much more likely to select an arts and science field. Fifty and one-half percent of those students whose parents had some graduate training chose an A&S major, compared to only 32.9% of students whose parents had at most a high school degree. In contrast, less than half of those with the most highly educated parents earned bachelor's degrees in vocational majors, compared to 67.1% of students whose parents had high school degrees or less. The index of dissimilarity between these two groups was 0.17, meaning that nearly one in five low-SES students would have to change majors in order for the proportions of high- and low-SES students in each major group to be equal.

Table 2 presents statistics describing the SES, gender, and race of those who enrolled in a four-year institution and chose particular majors from the 1992–1994 panel of NELS.[6] A&S fields are disaggregated into humanities, science, math, and social science majors. Vocational majors are divided into business, education, engineering, preprofessional (like law, medicine, architecture, etc.),[7] and other occupationally oriented majors (such as agriculture, communications, design, protective services, and others). The first row presents the total percentages in each major, showing that only a minority of students selected an A&S field of study (36.8% compared to 63.2% in vocational fields). The most popular choice of A&S fields was science and math, with 13.6% of all students

TABLE 1
Index of Dissimilarity by Parent's Education for Bachelor's Degree Recipients in B&B, 1992–1993

	Major: Arts and Sciences	Vocational
Parent's Education		
High School Education or Less	32.9%	67.1%
Postgraduate Education	50.5%	49.5%
Index of Dissimilarity	17.1%	

NOTE: Percentages are weighted.

choosing this major. Students choosing vocational fields were most likely to be other occupationally oriented majors or business majors, at 20.3% and 16.3%, respectively.

The next set of results shows the relationship of SES to major choice.[8] Replicating the findings reported in Table 1, the mean SES value for A&S fields was much higher (0.50) than that for vocational fields (0.32). In addition, the table shows remarkable similarities of social background within A&S and vocational majors. Nearly all of the A&S majors showed higher mean SES values than did all of the majors in the vocational fields. The exceptions to this were science and math and engineering majors. Science and math majors tended to have lower mean SES than did either humanities or social science majors—even slightly lower SES than engineering majors—while engineering majors had the highest SES among the vocational majors. Bonferroni significance tests confirmed that there were many significant differences in SES scores between the A&S majors and the vocational majors. However, there were no significant differences in SES among the three majors included as A&S fields. The SES scores of humanities majors did not differ significantly from science and math majors or from social science majors. Similarly, science and math majors' average SES did not differ significantly from the SES of social scientists. Regarding vocational majors, only the engineers and preprofessional majors differed significantly from other vocational majors, with significant differences between the SES of engineers and preprofessional majors, and between preprofessional majors and other occupationally oriented majors. Results from this table provide an empirical justification for our conceptual distinction between A&S and vocational majors.[9]

The next rows show striking gender differences in major choice. While men and women were approximately equally likely to select an A&S field as to select a vocational field, strong differences appeared in the disaggregated fields. For example, among the arts and sciences, men were more likely to choose science and math majors (at 15.6%), while women preferred the humanities (12.9%). Among vocational fields, differences were even greater, with 13.2% of men choosing engineering compared to 2.4% of women and over 17% of women selecting education compared to less than 7% of men. The next rows explore variation in the influence of SES on major choice by gender. We see that the effects of SES worked quite differently for men and women. For example, the most privileged women tended to study the humanities, while the most privileged men opted for the social sciences. On the other hand, both men and women with the lowest SES scores gravitated toward preprofessional fields, although male engineering majors tended to have

TABLE 2

SES, Sex, and Race of the NELS 1992–1994 Panel by Major for Those Who Enrolled in a Four-year Institution

	Arts and Sciences				Vocational					
	Humanities	Sci. and Math	Social Sci.	All A&S	Business	Education	Engineering	Preprof.	Other Occ. Oriented[b]	All Voc.
Total	12.7%	13.6%	10.5%	36.8%	16.3%	12.4%	7.4%	6.8%	20.3%	63.2%
SES	0.601	0.407	0.502	0.501	0.297	0.284	0.435	0.143	0.360	0.315
(s.d.)	(0.670)	(0.743)	(0.780)	(0.734)	(0.703)	(0.652)	(0.702)	(0.750)	(0.694)	(0.700)
Sex*[a]										
Male	12.5	15.6	9.6	37.7	18.6	6.7	13.2	3.7	20.1	62.3
Female	12.9	12.0	11.2	36.1	14.3	17.3	2.4	9.4	20.6	63.9
SES by Sex										
Male	0.502	0.428	0.631	0.504	0.412	0.222	0.465	0.119	0.399	0.381
(s.d.)	(0.695)	(0.754)	(0.754)	(0.740)	(0.667)	(0.659)	(0.719)	(0.748)	(0.689)	(0.696)
Female	0.685	0.382	0.407	0.498	0.168	0.306	0.291	0.151	0.327	0.259
(s.d.)	(0.636)	(0.729)	(0.785)	(0.729)	(0.720)	(0.648)	(0.597)	(0.750)	(0.697)	(0.698)
Race*[a]										
Non-Hispanic										
White	14.0	13.3	10.4	37.7	15.5	13.7	7.1	6.5	19.6	62.3
African American	6.9	13.9	8.6	29.4	16.5	9.8	7.8	9.3	27.2	70.6
Asian American	9.4	19.8	12.0	41.2	22.7	4.3	9.6	2.4	19.8	58.8
Hispanic	10.2	11.7	12.8	34.7	20.7	8.4	8.8	8.7	18.7	65.3
SES by Race										
Non-Hispanic										
White	0.678	0.498	0.667	0.611	0.436	0.355	0.577	0.297	0.449	0.424
(s.d.)	(0.618)	(0.688)	(0.630)	(0.652)	(0.615)	(0.604)	(0.583)	(0.651)	(0.643)	(0.626)
African American	0.137	0.036	–0.114	0.016	–0.145	–0.094	–0.098	–0.279	–0.012	–0.099
(s.d)	(0.601)	(0.721)	(0.880)	(0.752)	(0.748)	(0.749)	(0.706)	(0.833)	(0.665)	(0.730)

TABLE 2 (*Continued*)

SES, Sex, and Race of the NELS 1992–1994 Panel by Major for Those Who Enrolled in a Four-year Institution

	Arts and Sciences				Vocational					
	Humanities	Sci. and Math	Social Sci.	All A&S	Business	Education	Engineering	Preprof.	Other Occ. Oriented[b]	All Voc.
Asian American	0.467	0.506	0.249	0.422	0.125	0.257	0.525	0.570	0.704	0.413
(s.d.)	(0.760)	(0.845)	(1.155)	(0.936)	(0.771)	(0.570)	(0.691)	(0.930)	(0.695)	(0.771)
Hispanic	0.005	–0.115	–0.180	–0.103	–0.173	–0.269	–0.161	–0.572	–0.068	–0.207
(s.d.)	(0.942)	(0.851)	(0.848)	(0.881)	(0.824)	(0.826)	(1.002)	(0.669)	(0.847)	(0.853)
N	*631*	*718*	*550*	*1,889*	*776*	*599*	*361*	*314*	*958*	*3,008*

NOTE: All descriptive statistics except the sample sizes are weighted using the 1992–1994 panel weights provided by NCES for the NELS. Interactions between SES and sex, and SES and race were tested in multivariate models, but did not significantly improve model fit. This may be due, in part, to small cell sizes. Three-way interactions between sex, race, and SES were not feasible due to very small numbers within each cell.

[a] Percentages reported are row percentages. All A&S includes the percentage who chose a humanities, science and math, or social science major. All vocational includes those who chose business, education, engineering, preprofessional, or other occupationally oriented majors.

[b] Other occupationally oriented majors include agriculture, air transportation, communications, community/mental health, computer programming, dental/medical technician, design, forestry, home economics, natural resources, protective services, public administration, secretarial, transportation, and vocational home economics.

* Chi-square test: $p < 0.05$

higher SES than did men choosing A&S fields. This was not true among women. The social backgrounds of men and women within the same field also differed dramatically. Men in social sciences, business, and engineering had higher average SES scores than did women in those fields, while women in humanities and education came from much more privileged backgrounds than did the men in those fields.

The next set of rows describes major choices by race. In contrast to the results for gender, here we see stark differences by race across as well as within the two broad programs of study. Asian Americans were the most likely to be found in A&S fields, followed by non-Hispanic Whites, while African Americans and Hispanics preferred vocational fields. Within the A&S fields, non-Hispanic Whites preferred the humanities more than did other groups, while Asian Americans were the most likely to choose science and math majors. Within the vocational fields, Asian Americans and Hispanics chose business more often than did other groups, while non-Hispanic Whites chose education. African Americans selected other occupationally oriented fields more than did other groups. The earlier positive associations of SES with A&S fields were not observed for all races, as the next lines of race and SES interactions show. African Americans choosing the social sciences were slightly less advantaged than those choosing the vocational fields of education and engineering, while Hispanics in the social sciences had lower SES than those in business and engineering. Asian Americans who majored in engineering, preprofessional, or other occupationally oriented fields had much higher SES than did A&S majors.

Because results from Table 2 show that SES differences between the two broad categories of A&S and vocational programs are more significant than differences within these programs, we present multivariate analysis of the 1992–1994 NELS panel according to these two categories in Table 3. While Table 2 considered demographic differences in the choice of field of study, Table 3 considers the explanatory characteristics that may account for the influence of SES on major choice. To determine whether differences in tested proficiency, college characteristics, educational and occupational expectations, and work values account for the variation in major choices among low- and high-SES students, we turned to multivariate Heckman probit regression models. Heckman models jointly estimated a model that predicts the dependent variable and one that predicts selection into the sample. This probit model that accounts for sample selection assumes an underlying, latent relationship

$$y_j^* = (x_j\beta + u_{1j})$$

for which the binary outcome is observed only if $y_j^{\text{probit}} = (y_j^* > 0)$. The dependent variable (y) for observation *j* is only observed if it is included in the sample for selection, which is estimated by the equation $y_j^{\text{select}} = ((z_j\gamma + u_{2j}) > 0)$. The correlation of the error terms of these two equations is estimated with the $\text{corr}(u_1, u_2) = \rho$. If $\rho \neq 0$ then an equation that does not account for selection produces biased results. In the probit model, a unit change in *X*, or the independent variable, produces a *b* unit change in the cumulative normal probability, or Z score, that $Y = 1$. In our case, the probit coefficients express the effect of a unit change in *X* on the cumulative normal probability that a student chooses an A&S major.[10] Results presented in Table 3 are weighted according to the panel weights from 1992–1994 provided by NCES, and robust standard errors are reported.

In Table 3, we report findings from two models estimating the probability of choosing an A&S major. We begin with a model including only demographic controls and then add our explanatory variables: tested proficiency, college characteristics, educational expectations, occupational expectations, and work values. We note changes to the SES coefficient after the inclusion of the explanatory factors. Model 1 shows the influence of SES on major choice, controlling for demographic characteristics. As in the previous tables, Table 3 shows that SES had a strong, positive relationship to choosing an A&S major, even after we controlled for demographic characteristics. In the second model, we add the explanatory factors. Tested proficiency significantly influenced the likelihood of choosing an A&S major over a vocational major. The higher a student's tested proficiency, the more likely she or he was to choose an A&S major. Attending a liberal arts college also significantly increased the probability that a student would major in A&S, as did institutional selectivity. As mentioned previously, the influence of college type is likely because liberal arts colleges promote a liberal arts vision of education and provide more limited vocational options for majors than do other types of universities. Students interested in liberal arts may self-select into these institutions. Since more selective institutions have been shown to award a higher proportion of degrees in arts and sciences, it is not surprising that students in these institutions were more likely to select fields in these areas. As anticipated, educational expectations significantly influence major choice: The more education students expected to attain, the more likely they were to choose an A&S major. Expecting a professional compared to a nonprofessional occupation (i.e. clerical, manual, farm, operative, or sales) had a significant impact on the choice of an A&S major, while desire for a technical career had little impact. Valuing a high income and steady employment were negatively and

TABLE 3

Heckman Probit Regression Coefficients and Standard Errors for Models Predicting Arts and Sciences Majors versus Vocational Majors Allowing for Selection into a Four-year College or University, NELS 1992–1994

	Model 1	Model 2
Constant	–0.269***	–4.145***
	(0.065)	(0.518)
SES	0.149**	0.254***
	(0.044)	(0.061)
Race (Non-Hispanic White = excluded)		
African American	–0.059	–0.013
	(0.093)	(0.077)
Asian American	0.113	0.097
	(0.099)	(0.083)
Hispanic	0.088	0.107
	(0.092)	(0.082)
Tested Proficiency		0.042***
		(0.007)
College Type (University = excluded)		
Liberal Arts College		0.383***
		(0.080)
Specialty School		0.251
		(0.175)
College Average SAT		0.054*
		(0.024)
Educational Expectations (Bachelor's or Less = excluded)		
Postgraduate Degree		0.244***
		(0.055)
Occupational Expectations (Non-professional = excluded)		
Professional		0.400***
		(0.111)
Technical		0.247
		(0.136)
Importance of Making A Lot of Money (Not or Somewhat = excluded)		
Very		–0.117*
		(0.049)
Importance of Steady Employment (Not or Somewhat = excluded)		
Very		–0.306***
		(0.085)
Importance of Leisure Time (Not or Somewhat = excluded)		
Very		0.224***
		(0.055)
Rho	–0.178**	0.637*
	(0.064)	(0.209)

NOTE: The entire sample size is 13,433, with 8,526 censored and 4,907 uncensored observations. Results are weighted according to the panel weights for the 1992–1994 sample. Models include variables that represent missing values for tested proficiency (19.2%), college type (8.5%), average SAT of college (48.9%), educational expectations (4.6%), occupational expectations (11.7%), the importance of making a lot of money (0.8%), the importance of steady employment (0.9%), and the importance of leisure time (1.1%).

*p < 0.050 ** p < 0.010 *** p < 0.001

significantly related to an A&S major choice. In contrast, those who valued leisure time chose A&S majors over vocational majors.[11]

In this final model, not only did SES remain a significant predictor of major choice, its influence on the choice of an A&S major increased. Results from models that added each of the explanatory factors separately showed that this was because differences in tested proficiency suppressed the effect of SES on the choice of an A&S major. While high-SES students had higher tested proficiency than did low-SES students, and while those with high tested proficiency were more likely to choose A&S majors, the tendency of high-SES students to chose A&S majors was stronger than that of low-SES students even among students with low tested proficiency. Other factors— institutional type and selectivity, educational and occupational expectations, and work values—all reduced the influence of SES on choice of an A&S major, after we controlled for tested proficiency.

The results in Table 3 indicate that a student's social background strongly influenced his or her selection of a field of study, even after we controlled for a multitude of other factors. In the next section, we address the implications of these decisions. Do these undergraduate choices result in different career tracks? How do they affect future stratification by SES?

Labor Force and Graduate School Outcomes by Major Choice

For the rest of the analyses, we switched from the NELS, representative of 12th-graders in 1992, to the B&B, representing college graduates in 1992–1993. Variables from these data are described in detail in Appendix D. In Appendix E, we present descriptive statistics from B&B to understand better who receives A&S versus vocational degrees. The patterns for parent's education repeated those we saw in Table 1. The higher the level of parent's education, the more likely the student was to select an A&S field. In terms of gender, we found that men and women were equally likely to select A&S fields. Non-Hispanic Whites and African Americans were somewhat more likely to choose vocational majors than were Asian Americans and Hispanics, but these differences were not significant. Using a continuous measure of age in years, we saw that vocational majors tended to be older students with a mean age of 26 at receipt of the B.A., compared to only 24.5 for A&S majors. The SAT scores of A&S majors were higher than were those of vocational students, with a combined score of about 1000 compared to less than 950 among vocational majors. Those who attended selective schools were more likely to major in A&S. College GPAs were approximately equal

among A&S majors and vocational majors. As expected, those who anticipated higher levels of academic achievement were more likely to be A&S majors, while graduates who highly valued making money were more likely to have chosen vocational majors. Differences in the value of steady employment and leisure between vocational and A&S majors were small.

Table 4 shows the employment, earnings, and postgraduate education of the 1993 college graduates disaggregated into eight major areas within the broad A&S and vocational fields. The first line shows the percentage of the sample with majors in each of the eight areas. Overall, about 40% of the respondents attained A&S bachelor's degrees and 60% received degrees in vocational fields. The most popular A&S major was humanities, with 14.7% of the sample earning a degree in that field. Business majors were the most popular choice in the vocational fields at 23.5%, followed by other occupationally oriented majors (agriculture, communications, design, forestry, and protective service majors, for instance) at 15.5% and education at 9.6%.

The next lines of Table 4 show respondents' employment or other activities in 1997, 4 years after their college graduation. The other category includes those who were caretakers at home and those who may be engaged in non-degree related training. Overall, students with degrees in vocational fields were more likely to be working full-time compared to their counterparts in A&S fields (75.5% vs. 62.5%). This difference held across the subfields, with the exception of social science majors, who reported working full-time more than did education majors by a small margin (64.7% vs. 63.0%). Social science majors were the most likely to be working full-time among the A&S majors, while business majors were the most likely to be working full-time among the vocational majors. Although they were the most likely of the A&S majors to be employed full-time, social science majors were also among those most likely to be unemployed in 1997. Social science majors and other occupationally oriented majors reported the highest rates of unemployment at 2.6%, while engineering majors reported the lowest at 0.8%.

In the next rows of the table, we report whether a respondent ever enrolled in a graduate program during the 4 years from 1993 to 1997. We measured graduate school enrollment according to the type of program: master's, master's of business administration (MBA), first-professional, or Ph.D. and doctoral programs. It was necessary to look at graduate school enrollment rather than at degree completion because the time between graduation from college in 1993 and the follow-up survey in 1997 was too short for the completion of some programs, particularly doctorate programs. The patterns of graduate school enrollment showed that,

TABLE 4

Bachelor's Degree Recipients' Labor Force, and Graduate School Enrollment Characteristics by Detailed Major

	Arts and Sciences				Vocational					
	Humanities	Sci. and Math	Social Sci.	All A&S	Business	Education	Engineering	Preprof.	Other Occ. Oriented[b]	All Voc.
Total	14.7%	11.2%	14.2%	40.0%	23.5%	9.6%	5.8%	5.7%	15.5%	60.0%
Activity in 1997*										
Full-time Work	62.1	60.0	64.7	62.5	82.1	63.0	77.7	67.9	74.9	75.5
Part-time Work	7.3	2.7	3.8	4.8	2.0	8.8	0.9	8.8	5.2	4.5
Graduate School	16.2	24.6	17.6	19.0	5.8	15.1	14.0	12.4	7.9	9.2
Unemployed	2.4	1.5	2.6	2.2	2.0	1.2	0.8	2.0	2.6	1.6
Other/Missing	11.9	11.2	11.3	11.5	8.7	11.8	6.6	8.9	9.4	9.3
Ever Enrolled in Graduate School*										
No	61.5	54.2	59.3	58.7	83.5	61.6	63.0	72.6	77.3	75.4
Master's	27.9	20.2	24.3	24.5	7.9	36.9	25.4	25.1	17.7	18.3
MBA	1.4	1.5	3.1	2.0	6.6	0.1	5.8	0.3	1.6	3.6
First-Professional	6.0	11.3	8.3	8.3	1.4	0.5	1.1	1.3	2.3	1.5
Ph.D.	3.0	12.7	4.6	6.3	0.3	0.5	4.4	0.4	0.6	0.8
Missing	0.2	0.1	0.4	0.2	0.3	0.4	0.3	0.3	0.5	0.3
N	*1,516*	*1,160*	*1,395*	*4,071*	*1,129*	*1,067*	*574*	*564*	*1,470*	*4,804*
Earnings[a]	$29,594	$35,285	$34,087	$32,769	$37,751	$26,012	$45,246	$34,913	$33,304	$35,521
(Std. dev.)	(17,379)	(18,071)	(24,723)	(20,691)	(18,296)	(16,138)	(14,506)	(16,764)	(15,139)	(17,476)
Log Earnings	10.155	10.362	10.294	10.261	10.438	10.081	10.661	10.386	10.315	10.376
(Std. dev.)	(0.646)	(0.467)	(0.610)	(0.596)	(0.455)	(0.386)	(0.384)	(0.384)	(0.477)	(0.465)
N	*873*	*642*	*849*	*2,364*	*841*	*628*	*392*	*372*	*1,027*	*3,260*

NOTE: All descriptive statistics except the sample sizes are weighted using the 1993–1997 panel weights for B&B.

[a] These statistics are means, not percentages as in the rest of the table. Earnings and log earnings are computed for only full-time workers with positive earnings. Percentages reported here are column percentages.

[b] Other occupationally oriented majors include agriculture, air transportation, communications, community/mental health, computer programming, dental/medical technician, design, forestry, home economics, natural resources, protective services, public administration, secretarial, transportation, and vocational home economics.

* Chi-square test: $p < 0.05$

without exception, those from A&S fields were much more likely to attend graduate programs than were those with vocational majors. Overall, just over 41% of A&S students entered a graduate program since their college graduation, compared to only 24.2% of vocational students. Looking at the subfields, we see that over 45% of science and math majors attended some type of graduate program, as did about 40% of humanities or social science majors. The vocational majors ranged from a high of 38% of education majors attending a graduate program to a low of 16.2% of business majors. Differences became more dramatic the further the educational hierarchy one climbs. Over 6% of A&S majors had enrolled in a Ph.D. program by 1997, with a high 12.7% of science and math majors enrolling. Only engineering majors (at 4.4%) approached these rates of enrollment in Ph.D. programs, while all other vocational fields reported less than 1% having enrolled in a doctoral program by 1997.

A&S majors tended to earn less than did vocational majors, though patterns within fields were less clear here. When aggregated, the earnings difference between A&S and vocational majors was not great. A&S majors earned $32,769 on average, a little under $3,000 less per year than vocational majors earned. Education majors actually reported earning the least in 1997, at $26,012, followed by humanities majors at $29,594. Among A&S majors, math and science majors made the most at $35,285. Among the vocational fields, engineering majors made the most, at $45,246, followed by business majors at $37,751. Bonferroni tests between the eight major categories showed significant differences both within subfields and across our two main categories.[12] Both math and science majors and social science majors who work full-time earned significantly more than did humanities majors. Business majors did not make significantly more than did math or science majors. Education majors and those in other occupationally oriented fields made significantly less than other vocational majors made, and earned the same as or even less than majors in some A&S fields earned. The picture here is not clear-cut, but clearly not all vocational majors enjoy an earnings advantage.

Because numerous factors beyond the degree may influence earnings, we used multivariate models to tease out the effects of major choice on earnings and then on graduate school attendance 4 years after college graduation, net of other explanatory variables. Here we assessed whether demographic characteristics, SAT scores, college selectivity and performance, educational expectations, and work values accounted for the influence of major on these two career outcomes.

Table 5 presents findings for the first outcome: earnings in 1997. The dependent variable was the logarithm of the positive earnings of full-

time workers. As in Table 3, we account for selectivity into the sample. It is possible that the coefficient predicting the logarithm of earnings by major could have been overestimated, if the opportunity and the decision to work full-time were also related to major. We used Heckman linear regression models to account for selection into the sample of full-time workers with positive earnings. As an instrument, we used the value for steady employment. This variable was not significantly correlated with earnings and was weakly, though significantly (at $p < 0.10$), correlated with being full-time employed with positive earnings. Significance tests of the rho (ρ) coefficients for each model convinced us that major choice did indeed influence entrance into the full-time workforce 4 years after college graduation, and that this may account for earnings differences observed between the two majors. Perhaps in anticipation of lower earnings, A&S degree holders go on to graduate school.[13] In this model, the interpretation of the coefficients was fairly straightforward. A unit increase in the independent variable corresponded to an increase of *x%* in earnings.

In our first model, we included only major, demographic characteristics, and educational attainment. Major was measured by comparing an A&S degree to the excluded category of vocational majors. In contrast to our descriptive findings, this model showed that an A&S major was *not* significantly, negatively correlated with earnings, when we controlled for demographic characteristics and educational attainment and accounted for selection into the sample of full-time workers. Other notable, though not surprising, results from this model were that women earned significantly less than did men, older graduates earned more than did younger graduates, and those with advanced degrees, with the exception of master's degrees, earned significantly more than did those with only bachelor's degrees. Interestingly, parents' education had little significant influence on their children's earnings.

In Model 2, we included other explanatory factors: student's academic proficiency as measured by individual SAT scores, college selectivity captured with the average SAT scores of entering students, our measure of college performance, GPA, and the career values for making a lot of money and having leisure time. Students' SAT scores and GPA were, not surprisingly, significantly and positively related to 1997 earnings. Each 100-point increase in SAT score corresponded to 4% more earnings, while a tenth of a point in college GPA significantly raised earnings returns by almost 1%. College selectivity was also positively and significantly related to earnings after college. For the career values, students who believed it is important to make a lot of money did indeed earn significantly more (14%) than did those who did not believe so.

TABLE 5

Heckman Linear Regression Coefficients and Standard Errors for Models Predicting Earnings in 1997 Allowing for Selection into Full-time Work, B&B 1993–1997

	Model 1	Model 2
Constant	10.482***	9.645***
	(0.048)	(0.104)
Major (Vocational = excluded)		
Arts and Sciences	–0.013	–0.018
	(0.020)	(0.020)
Parent's Education (High School or Less = excluded)		
Some College	0.034	0.032
	(0.023)	(0.022)
Bachelor's Degree	0.044	0.027
	(0.023)	(0.022)
Postgraduate	0.044	0.014
	(0.023)	(0.023)
Race (Non-Hispanic White = excluded)		
African American	–0.053	–0.014
	(0.028)	(0.028)
Asian American	–0.047	–0.024
	(0.038)	(0.037)
Hispanic	0.168***	0.131**
	(0.042)	(0.040)
Sex (Male = excluded)		
Female	–0.171***	–0.164***
	(0.020)	(0.020)
Age at BA	0.008***	0.007***
	(0.002)	(0.002)
Highest Degree Earned (Bachelor's = excluded)		
Master's	–0.013	–0.050
	(0.025)	(0.026)
MBA	0.299***	0.237***
	(0.056)	(0.051)
First-Professional	0.234***	0.143*
	(0.067)	(0.067)
Ph.D.	0.525***	0.354*
	(0.180)	(0.143)
Student's SAT Score		0.042***
		(0.007)
College Average SAT		0.013*
		(0.005)
College GPA		0.009***
		(0.002)
Important to Make A Lot of Money (No = excluded)		
Yes		0.143***
		(0.017)
Important to Have Leisure Time (No = excluded)		
Yes		–0.041
		(0.037)
Rho	–0.846***	–0.853***
	(0.030)	(0.028)

NOTE: The entire sample size is 8,875, with 3,251 censored and 5,624 uncensored observations. Results are weighted according to the panel weights for the 1993–1997 panel. Models include variables that represent other race (3.8%) and missing values for sex (0.1%), age at bachelor's degree (0.6%), highest degree ever earned (0.2%), SAT score (10.9%), average SAT of college (20.5%), GPA (3.5%), the importance of making a lot of money (14.2%), and the importance of leisure time (14.2%).

*p < 0.050 ** p < 0.010 *** p < 0.001

However, valuing leisure time did not have a significant influence on earnings after college graduation. Again, in this model, A&S majors did not make significantly less than vocational majors made, demonstrating that the overall differences we found in our descriptive data can be almost wholly explained by demographic characteristics, further educational attainment, and differences in the likelihood that A&S and vocational majors enter the full-time workforce in the 4 years after college graduation.

Table 6 presents results on the second career outcome: enrollment in types of graduate programs. We measured graduate school enrollment using five categories: Master's, MBA, first-professional, and Ph.D. programs were all compared to the excluded outcome of no enrollment. To account for the multiple, discrete categories of the dependent variable, we relied on multinomial logistic regression. For each category of the dependent variable, we present two models. The first model includes major and the demographic controls. The second adds the explanatory variables SAT scores, college selectivity and performance, educational expectations, and career values to see if they can account for the influence of major on graduate school enrollment. Like the previous tables, Table 6 reports coefficients and standard errors.

Model 1 shows the effect of an A&S major on enrollment in particular graduate programs, compared to the effect of a vocational major. In contrast to the findings concerning earnings, there were strong and significant differences in graduate school enrollment by major. An A&S major was positively and strongly related to enrollment in a master's, first-professional, and Ph.D. program, and negatively and significantly related to enrollment in an MBA program. Expressed in odds ratios, A&S majors ranged from a low of 1.7 times more likely than vocational majors to enroll in master's programs to a high of over 8 times more likely to enroll in Ph.D. programs, echoing the findings in our descriptive Table 4. Parent's education also had a significant impact, net of major, on graduate school enrollment. This impact was strongest on enrollment in Ph.D. programs.

The second set of models adds the explanatory factors SAT score, college selectivity, college performance, educational expectations, and career values. Students' SAT scores were significantly and positively related to enrollment in all graduate programs except the MBA. College selectivity was most strongly related to enrollment in first-professional and Ph.D. programs. GPA significantly affected enrollment in all graduate programs, though its effects were strongest for first-professional and Ph.D. programs. Educational expectations had predictable effects: The more education expected, the more likely a respondent was to enroll in a postgraduate program. However, the addition of career values

TABLE 6

Multinomial Logistic Regression Coefficients and Standard Errors for Models Predicting Enrollment in Graduate School by Type, B&B 1993–1997

	Master's		MBA		First-Professional		Ph.D.	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Constant	-1.953***	-6.252***	-2.589***	-11.709***	-2.021*	-13.126***	-2.617**	-13.970***
	(0.151)	(0.549)	(0.443)	(1.427)	(0.828)	(1.391)	(0.908)	(1.662)
Major (Vocational = excluded)								
Arts and Sciences	0.517***	0.304***	-0.357*	-0.266	1.840***	1.019***	2.139***	1.607***
	(0.066)	(0.077)	(0.174)	(0.193)	(0.155)	(0.196)	(0.193)	(0.215)
Parent's Education (High School or Less = excluded)								
Some College	0.085	0.089	0.137	0.092	0.301	0.421	0.212	0.298
	(0.098)	(0.112)	(0.255)	(0.277)	(0.212)	(0.259)	(0.296)	(0.349)
Bachelor's	0.101	0.086	0.090	-0.095	0.404	0.092	0.465*	0.255
	(0.083)	(0.098)	(0.227)	(0.262)	(0.183)	(0.245)	(0.232)	(0.297)
Postgraduate	0.430***	0.202	0.544**	0.121	0.984***	0.090	1.020***	0.201
	(0.088)	(0.103)	(0.208)	(0.232)	(0.176)	(0.245)	(0.231)	(0.290)
Race (Non-Hispanic White = excluded)								
African American	0.021	-0.107	0.222	0.281	0.291	0.275	-0.143	0.261
	(0.124)	(0.146)	(0.398)	(0.444)	(0.226)	(0.312)	(0.436)	(0.442)
Asian American	0.042	-0.064	-0.262	-0.342	0.727**	0.263	-0.112	0.052
	(0.149)	(0.174)	(0.417)	(0.416)	(0.276)	(0.362)	(0.335)	(0.437)
Hispanic	-0.269	-0.190	0.179	0.011	1.094***	0.393	-0.604	-0.843*
	(0.179)	(0.185)	(0.339)	(0.376)	(0.199)	(0.371)	(0.392)	(0.401)
Sex (Male = excluded)								
Female	0.326***	0.081	-0.779***	-0.389*	-0.623***	-0.795***	-0.600***	-0.772***
	(0.066)	(0.078)	(0.181)	(0.194)	(0.129)	(0.184)	(0.165)	(0.212)
Age at BA	0.007	0.006	-0.014	0.022	-0.091**	-0.033	-0.086*	-0.054
	(0.005)	(0.008)	(0.018)	(0.021)	(0.034)	(0.034)	(0.035)	(0.033)
Student's SAT Score								
		0.110**		0.076		0.201**		0.269***
		(0.035)		(0.090)		(0.062)		(0.075)

TABLE 6 (*Continued*)

Multinomial Logistic Regression Coefficients and Standard Errors for Models Predicting Enrollment in Graduate School by Type, B&B 1993–1997

	Master's		MBA		First-Professional		Ph.D.	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
College Average SAT		-0.022		0.104		0.128*		0.179**
		(0.023)		(0.058)		(0.053)		(0.066)
College GPA		0.056***		0.100***		0.115***		0.169***
		(0.009)		(0.021)		(0.020)		(0.025)
Educational Expectation (Bachelor's = excluded)								
Master's		2.503***		0.821		0.756		0.575
		(0.151)		(0.676)		(0.453)		(0.619)
MBA		0.967***		4.662***		-0.441		-1.681
		(0.221)		(0.553)		(0.709)		(1.151)
First-Professional		2.038***		3.267***		5.919***		2.506***
		(0.299)		(0.816)		(0.397)		(0.613)
Ph.D.		3.875***		4.244***		3.201***		4.486***
		(0.174)		(0.577)		(0.439)		(0.589)
Important to Make A Lot of Money (No = excluded)								
Yes		-0.212***		0.286		0.131		-0.151
		(0.077)		(0.243)		(0.215)		(0.265)
Important to Have Steady Employment (No = excluded)								
Yes		0.068		0.278		0.774		-0.536
		(0.199)		(0.572)		(0.483)		(0.451)
Important to Have Leisure Time (No = excluded)								
Yes		-0.154		-0.255		-0.006		-0.385
		(0.164)		(0.479)		(0.431)		(0.363)

NOTE: The sample size is 8,844. Results are weighted according to the panel weights for the 1993–1997 sample. Models include variables that represent other race (3.8%) and missing values for sex (0.1%), age at bachelor's degree (0.6%), SAT score (10.9%), average SAT of college (20.5%), GPA (3.5%), educational expectations (1.5%), the importance of making a lot of money (14.2%), the importance of steady employment (14.2%), and the importance of leisure time (14.2%).

*p < 0.050 ** p < 0.010 *** p < 0.001

significantly influenced only entrance into master's programs. A value for making a lot of money decreased the likelihood of enrolling in a master's program.

These explanatory factors played some role in explaining the influence of major on enrollment in graduate school. Across all types of programs, except MBA programs, the explanatory variables reduced the impact of an A&S major on the likelihood of enrolling in graduate school. However, they did not completely explain how major affects graduate school enrollment. Even after accounting for these factors, an A&S major versus a vocational major was a strong**,** significant predictor of enrollment in all graduate programs except the MBA. A&S majors remained almost 1.4 times more likely than vocational majors to enroll in master's programs and about 5 times more likely to enroll in Ph.D. programs.

Discussion

The goals of this research were to examine and explain the influence of gender, race, and, particularly, SES on major choice, and to document the influence of major on career outcomes. Though certainly not all students closely follow one of these routes, we have uncovered two trajectories through the college years and beyond clearly shaped by social background. Vocational majors are more likely to be employed full-time in the years following their college graduation and to be paid slightly more than are A&S majors. However, selection into the sample of full-time workers accounts for the observed earnings differences between majors. Though part-time work and unemployment are slightly greater for A&S majors, much of the differential selection into the sample of full-time workers is because A&S majors may instead enter graduate school. Our results support this. A&S majors are more likely than vocational majors are to enter all graduate programs with the exception of MBA programs, even after we account for other explanatory factors.

What is troubling about the portrait of these two trajectories through college and beyond is that these approaches to college appear to be related to a student's socioeconomic background. Low-SES students are more likely to choose vocational majors even after other factors like tested proficiency, college characteristics, expectations, and work values have been considered. High-SES students choose A&S majors. While evidence in this study suggests that vocational majors may be paid at least as much, if not slightly more, in the short term, there is reason for concern in the long term. Data from B&B measure only college graduates' early earnings, likely those from a first or second job. These are not lifetime earnings. Further, the last follow-up survey was conducted too

soon after college graduation to include the earnings of the majority of those who will go on to earn graduate degrees. Numerous studies find strong, positive relationships between graduate school completion and earnings (e.g., Day & Newburger, 2002). Whether these vocational majors will retain their slight earnings advantage over the life course is an empirical question for future research.[14]

The appearance of these trajectories raises questions about patterns of stratification in the higher education system and about how such stratification may serve to perpetuate existing social inequalities. As the system of higher education has become the central mechanism for sorting people into the occupational structure, patterns of educational inequality are directly linked to social stratification. Further, whereas once the most salient issues of equality concerned access to postsecondary education, after the post-1960 expansion of the higher education system, two axes of stratification have risen in importance: institution type and field of study. A growing body of literature now reveals the effects of selective institutions on earnings (Bowen & Bok, 1998; Hoxby, 1998; Karabel & McClelland, 1987) and educational continuation (Mullen et al., 2003) and shows the role college majors play in influencing occupational outcomes and gender disparities in earnings (Jacobs, 1986, 1995; Smart, 1988). Our findings build on this literature by uncovering distinct tracks through higher education, both related to social background and carrying implications for future occupational placement.

Though the limited period of our data collection prevents us from fully evaluating how strongly these trajectories may be related to later patterns of stratification, Ph.D. and first-professional degrees do provide access to some of the most remunerative and high status occupations (Cappell & Pipkin, 1990; Day & Newburger, 2002; Useem & Karabel, 1986). Thus, the high-SES students choosing A&S fields and then entering graduate and professional programs may be well poised to enter the labor market in much stronger positions than their counterparts in vocational fields. The third follow-up planned for B&B will allow future research to measure the extent of this advantage and to explore these important issues.

As experiences after graduation differ by major, it is also likely that the academic experiences of A&S and vocational students within colleges differ substantially. The vocational curriculum transmits applicable, occupationally oriented skills, while A&S students are taught general, discipline-specific knowledge and intellectual skills like critical thinking and writing. Both Dressel and Mayhew (1954) and Forrest (1982) found that students at institutions with a large proportion of required courses in arts and science fields experienced the greatest gains to critical thinking skills. A&S students accumulate cultural capital in

the form of familiarity with high culture, sophisticated use of verbal and written language, and confidence in their broad knowledge of history, culture, and politics. As suggested by other authors (Bourdieu & Passeron, 1977; Labaree, 1997; Van de Werfhorst & Kraaykamp, 2001), this cultural capital, along with the status value of a degree from a selective college or university, provides a concrete resource enabling A&S students not only to enroll in graduate school and obtain prestigious careers but also to comfortably navigate particular social situations, participate in exclusive social networks, and feel empowered to confront social issues and problems in daily life. Thus, our research supports the distinction drawn between the use value and exchange value of educational credentials (Labaree, 1997). Vocational students earn degrees with high use value: concrete skills that can open doors to "good jobs" (stable, solid income). A&S students, on the other hand, carry credentials with high exchange value: the status signaled by a generous cache of cultural capital with the name of a prestigious university attached. The value of this credential may be exchanged for far more than a "good job" because it allows for entry into elevated social and occupational strata.

While this research focuses primarily on social class, the interesting findings regarding gender and race deserve note here and suggest topics that merit further investigation. While numerous studies have shown a large gender gap in choice of college major, we find that men and women are about equally likely to select A&S fields as they are to select vocational fields. We show that the gender gap manifests itself within and not across the broad groupings we have examined here. Within the broad categories we defined, men and women choose majors with different rewards attached to them. For example, men choose the most remunerative majors within A&S— the science and math majors—more than do women. These majors are also associated with the highest rates of postgraduate enrollment. Men are also likely to choose the most financially rewarding of the vocational majors—engineering. Again, this major is associated with high rates of graduate school enrollment compared to other vocational fields.

Patterns in major choices can also be found by race. Asian Americans choose the most financially rewarding majors and those associated with the highest rates of postgraduate enrollment within A&S and vocational fields. African Americans and Hispanics are more likely than non-Hispanic Whites to choose vocational fields associated with higher earnings (that is, not education), perhaps as a way to gain steady employment and financial stability quickly. The different motivations and structural forces that influence major choices across gender and race deserve further and more careful attention in future work.

What do our findings suggest for the future of the liberal arts curriculum in American colleges and universities? While our data do not reveal

trends, other researchers have identified an increasing "vocationalization" of higher education. We posit that the future of the A&S fields could take two directions. First, as the stakes rise in an increasingly credential-saturated society, more and more students will turn to graduate education. As that happens, we may see a rise in the percentage of A&S students, as more students have the luxury of majoring in A&S before acquiring career-specific training in graduate programs. On the other hand, as higher education enrollments continue to expand and the proportion of students from lower SES backgrounds continues to grow, vocational offerings may be increased. This trend may eventually give way to a "two-track" system of college, paralleling the academic and vocational tracks at the high school level.

APPENDIX A

Classification of A&S and Vocational Majors

Arts and Sciences	Vocational
Humanities	Business
African American Studies	Accounting
American Civilization	Business Support
Area Studies	Business/Management Systems
Art History/Fine Arts	Finance
English/American Literature	Marketing Distribution
Film Arts	Education
Fine and Performing Arts: All Others	Early Childhood Education
Foreign Languages: All Others	Education: Other
Foreign Languages: Non-Europeann	Elementary Education
Interdisciplinary: All Others	Physical Education
Liberal Studies	Secondary Education
Music	Special Education
Philosophy	Engineering
Religious Studies	Chemical Engineering
Spanish	Civil Engineering
Speech/Drama	Engineering
Writing: Creative/Technical	Engineering Technologies
Science and Math	Engineering: All Others
Agricultural Science	Mechanical Engineering
Biochemistry	Preprofessional
Biological Science: All Others	Architecture
Botany	Audiology
Chemistry	Clinical Health Science
Computer and Information Science	Clinical Pastoral Care
Earth Science	Dietetics
Environmental Studies	Health Science Professions: All Others
Integrated General Science	Health/Hospital Administration
Mathematics: All Others	Health/Physical Education/Recreation: Non-School
Physical Science: All Others	

APPENDIX A (*Continued*)

Classification of A&S and Vocational Majors

Arts and Sciences	Vocational
Physics	Journalism
Statistics	Law
Zoology	Medicine
Social Science	Nursing
Anthropology/Archaeology	Paralegal (Including Pre-Law)
Economics	Public Health
Geography	Social Work
History	Other Occupationally Oriented
International Relations	Agriculture
Political Science	Air Transportation
Psychology	Communications
Sociology	Communication Technologies
	Community/Mental Health
	Computer Programming
	Dental/Medical Technician
	Design
	Forestry
	Home Economics: All Others
	Natural Resources
	Protective Services
	Public Administration: All Others
	Secretarial
	Transportation: All Others
	Vocational Home Economics: Other

NOTE: For the NELS data, major choice is recorded for the last institution in which students report being enrolled (MAJCD_E1–5). The B&B data report the major in which students received their bachelor's degree. If two majors are reported, we record only the first.

APPENDIX B

Table of NELS 1992–1994 Independent Variables and Their Measures

Variable	Categories
Sex (F2SEX): Measured in 1992. If sex is missing in 1992, then answers to previous survey waves were used. If still missing, NCES imputed sex from names.	Recoded to 0 = male; 1 = female. This variable has no missing information.
Race (F2RACE1): Measured in 1992. If race was missing in 1992, then answers to previous survey waves were used.	Recoded to 0 = Non-Hispanic White; 1 = African American; 2 = Asian American; 3 = Hispanic. Those who chose an "Other race" (including Native Americans) are retained in the sample (0.5%), but coefficients are not reported. This variable has no missing information.
SES (F2SES1): Measured in the base year of 1988 and in 1992. A composite index of both parents' years of	The scale was normalized so that the sample for 1988 has a mean of 0 and a standard deviation of 1. This variable has no missing information.

APPENDIX B (*Continued*)

Table of NELS 1992–1994 Independent Variables and Their Measures

Variable	Categories
education, the SEI score of their occupations, and annual family income, equally weighted, constructed by NCES. Information was taken from base-year parents' questionnaires, if available. If not, students' answers were used, as well as later waves of data.	
Tested Proficiency: Measured in 1992. Standardized reading scores (F22XRSTD) and standardized math scores (F22XMSTD). Tests were administered by NCES and designed by the Educational Testing Service (ETS) to measure mathematical knowledge and reading comprehension.	NCES standardized reading and math scores such that the mean for the 1992 sample was 50 and the standard deviation was 10. The index sums these two standardized scores and divides by two for those with non-missing information. Missing = 9999. A dummy variable representing those with missing information (test_m) is included in all analyses such that 0=non-missing; 1=missing.
College SAT: Measured in 1993. Information from the 1993 *U.S. News and World Report* college rankings was linked to the IPEDS codes of the institutions that respondents attended. ACT scores were approximately converted to SAT scores with a multiplier of 45.2 (derived from NCES comparisons of percentiles across the ACT and SAT).	Measured continuously in units of 100. Missing = 9999. A dummy variable representing those with missing information (SAT_m) is included in all analyses such that 0 = non-missing; 1 = missing.
College Type: Measured in 1993. Based on classifications used in the 1993 *U.S. News and World Report* ranking of colleges and universities. Linked to students' colleges by IPEDS codes.	Recoded to 0 = university; 1 = liberal arts college; 2 = specialty college; 3 = missing.
Educational Expectations (F2S43): Measured in 1992. "As things stand now, how far in school do you think you will get?"	Recoded to 0 = some college or less; 1 = bachelor's degree; 2 = postgraduate work; 3 = missing.
Occupational Expectations (F2S64B): Measured in 1992. "Which of the categories below comes closest to describing the job or occupation that you expect or plan to have … when you are 30 years old? Even if you are not sure, circle your best guess."	Recoded to 0 = manual, farm, operative, sales, or clerical; 1 = professional or managerial; 2 = technical; 3 = other/missing.
Importance of Making a Lot of Money (F2S40C): Measured in 1992. "How important is each of the following in your life… …having lots of money?"	Recoded to 0 = not or somewhat important; 1 = very important; 2 = missing.

APPENDIX B (*Continued*)

Table of NELS 1992–1994 Independent Variables and Their Measures

Variable	Categories
Importance of Steady Employment (F2S40E): Measured in 1992. "How important is each of the following in your life… …being able to find steady work?"	Recoded to 0 = not or somewhat important; 1 = very important; 2 = missing.
Importance of Leisure (F2S40L): Measured in 1992. "How important is each of the following in your life… …having leisure time to enjoy my own interests?"	Recoded to 0 = not or somewhat important; 1 = very important; 2 = missing.
Panel Weight (F2F3PNWT): For the 1992–1994 wave. All descriptive and multivariate analyses are weighted except for sample sizes.	Weights were assigned for over-sampling and non-response by the NCES. There is no missing information.

A note on the treatment of missing information: A category was assigned to those respondents who had missing information for ordinal or nominal variables. This missing category was included in all analyses. Because it is not substantively interesting, it is not reported in multivariate tables. For continuous variables, a dummy variable was constructed to represent those who had missing information. Those with missing information were assigned a value of 9999 for the continuous variable. Dummy variables for missing values were included in all analyses. Because these dummy variables are collinear with the 9999 code, that value is removed from the coefficient of the continuous variable. Therefore, the coefficient of the continuous variable represents only the influence of non-missing information. Dummy variables for missing cases are not presented in multivariate tables. Including missing values this way avoids listwise deletion of cases in analyses and, thus, preserves as much information as possible. Percentages missing for each variable are included in the note of Table 3.

APPENDIX C

Heckman Probit Regression Selection Equation Results for Enrolling in a Four-year College or University, NELS 1992–1994

	Model 1	Model 2
Constant	−4.302***	−4.273***
	(0.148)	(0.148)
SES	0.499***	0.503***
	(0.028)	(0.028)
Sex (Male = excluded)		
Female	0.113**	0.121**
	(0.037)	(0.035)
Tested Proficiency	0.067***	0.067***
	(0.003)	(0.003)
Occupational Expectations (Non-professional = excluded)		
Professional	0.701***	0.696***
	(0.053)	(0.053)
Technical	0.108	0.103
	(0.088)	(0.088)

NOTE: The entire sample size is 13,433, with 8,526 censored and 4,907 uncensored observations. Results are weighted according to the panel weights for the 1992–1994 sample. Models include variables that represent missing values for tested proficiency (19.2%) and occupational expectations (11.7%).
*p < 0.050 ** p < 0.010 *** p < 0.001

APPENDIX D

Table of B&B 1993–1997 Independent Variables and Their Measures

Variable	Categories
Primary activity: Measured in 1997. Respondent's primary activity in April 1997 from two B&B variables: enrollment and employment status (B2GR9704) and full-time/part-time status for those employed (B2FPJOB).	Recoded to 0 = full-time work only; 1 = part-time work only; 2 = graduate enrollment; 3 = unemployed; 4 = other/missing.
Earnings (B2APRSAL): Measured in 1997. Annual salary of those working in April 1997. Those earning over $500,000 were coded $500,000.	Converted to logarithm and measured continuously for those who are full-time employed with earnings greater than 0.
Graduate School Enrollment (B2HENPRG): Measured in 1997. The highest graduate program respondent enrolled in after BA receipt.	Recode to 0 = none; 1 = master's; 2 = MBA; 3 = first-professional; 4 = Ph.D.; 5 = missing. Missing values were deleted from the sample for multinomial analysis.
Sex (B2RSEX): Measured in 1993.	Recoded to 0 = male; 1 = female; 2 = missing.
Race (RACE2R): Measured in 1993. Reported race of student.	Recoded to 0 = Non-Hispanic White; 1 = African American; 2 = Asian American; 3 = Hispanic. Those who chose an "Other race" (including Native Americans) are retained in the sample, but coefficients are not reported.
Parent's Education (B2PARED): Measured in 1993. The highest level of education completed by either parent.	Recoded to 0 = high school or less; 1 = some college; 2 = bachelor's degree; 3 = postgraduate experience. There is no missing information.
Age at BA Receipt (B2AGATBA): Measured in 1993. Respondent's age at BA completion at sampled school. If missing, respondent's date of birth was subtracted from date of BA degree completion.	Measured continuously in years. Missing = 9999. A dummy variable representing those with missing information (age_m) is included in all analyses such that 0 = non-missing; 1 = missing.
Student's SAT Score (SATSCOR2 and ACTSCOR2): Measured in 1993. ETS reported score from the SAT and the ACT tests. If ETS report was unavailable, student's report was used. Verbal and math scores are summed for the total score. ACT scores are converted to their SAT equivalent.	Measured continuously. Missing = 9999. A dummy variable representing those with missing information (sat_m) is included in all analyses such that 0 = non-missing; 1 = missing.
College SAT: Measured in 1993. Information from the 1993 *U.S. News and World Report* college rankings was linked to the institutions that respondents attended.	Measured continuously. Missing = 9999. A dummy variable representing those with missing information (colsat_m) is included in all analyses such that 0 = non-missing; 1 = missing.

APPENDIX D (*Continued*)

Table of B&B 1993–1997 Independent Variables and Their Measures

Variable	Categories
College GPA (GPACUM): Measured in 1993. Student reported grade point average converted to a 4 point scale.	Measured continuously. Missing = 9999. A dummy variable representing those with missing information (gpa_m) is included in all analyses such that 0 = non-missing; 1 = missing.
Educational Expectations (B2HIEXP): Measured in 1997. "Now, thinking about the future, what is the highest degree you expect to receive?"	Recoded to 0 = bachelor's degree; 1 = master's degree; 2 = MBA; 3 = first-professional degree; 4 = Ph.D.; 5 = missing.
Highest Degree Earned (B2HDGPRG): Measured in 1997. Highest degree received by 1997.	Recoded to 0 = bachelor's degree; 1 = master's degree; 2 = MBA; 3 = first-professional degree; 4 = Ph.D.; 5 = missing.
Importance of Making a Lot of Money (WELLOFF): Measured in 1993. "As I read the following statements, please tell me whether they are important or not important: being very well-off financially?"	Recoded to 0 = no; 1 = yes; 2 = missing.
Importance of Steady Employment (FINDWORK): Measured in 1993. "As I read the following statements, please tell me whether they are important or not important: being able to find steady work?"	Recoded to 0 = no; 1 = yes; 2 = missing.
Importance of Leisure (LEISURE): Measured in 1993. "As I read the following statements, please tell me if whether they are important or not important: having leisure time to enjoy own interests?"	Recoded to 0 = no; 1 = yes; 2 = missing.
Panel Weight (BNBPANEL): For the 1993–1997 wave. All descriptive and multivariate analyses are weighted except for sample sizes.	Weights were assigned for over-sampling and non-response by the NCES. There is no missing information.

A note on the treatment of missing information: A category was assigned to those respondents who had missing information for ordinal or nominal variables. This missing category was included in all analyses. Because it is not substantively interesting, it is not reported in multivariate tables. For continuous variables, a dummy variable was constructed to represent those who had missing information. Those with missing information were assigned a value of 9999 for the continuous variable. Dummy variables for missing values were included in all analyses. Because these dummy variables are collinear with the 9999 code, that value is removed from the coefficient of the continuous variable. Therefore, the coefficient of the continuous variable represents only the influence of non-missing information. Dummy variables for missing cases are not presented in multivariate tables. Including missing values this way avoids listwise deletion of cases in analyses and, thus, preserves as much information as possible. Percentages of missing cases for each variable are included in the note for Appendix E and Tables 5 and 6.

APPENDIX E

Descriptive Statistics Concerning the B&B 1993–1997 Panel by Major Choice

	Arts and Sciences	Vocational
Parent's Education *		
High School or Less	32.9%	67.1
Some College	38.1	61.9
Bachelor's Degree	39.0	61.0
Postgraduate	50.5	49.5
Sex *		
Male	39.7	60.3
Female	40.3	59.7
Race		
Non-Hispanic White	39.5	60.5
African American	39.0	61.0
Asian American	43.9	56.1
Hispanic	48.9	51.1
Age at BA Receipt* [a]	24.5	25.9
(Std. dev.)	(6.0)	(6.8)
Student's SAT Score* [a]	998.8	941.5
(Std. dev.)	(143.6)	(126.0)
Average College SAT* [a]	1014.0	941.8
(Std. dev.)	(194.8)	(183.2)
College GPA [a]	3.18	3.18
(Std. dev.)	(0.47)	(0.45)
Educational Expectations *		
Bachelor's	31.2	68.8
Master's	39.0	61.0
MBA	27.1	79.2
First-Professional	73.4	26.6
Ph.D.	59.0	41.0
Highest Degree Ever Earned* [b]		
Bachelor's	38.4	61.6
Master's	49.9	50.1
MBA	28.4	71.6
First-Professional	73.2	26.8
Ph.D.	93.9	6.1
Important to Make A Lot of Money *		
No	45.6	54.4
Yes	34.7	65.3
Important to Have Steady Employment *		
No	36.7	63.3
Yes	38.9	61.1
Important to Have Leisure Time *		
No	39.3	60.7
Yes	38.7	61.3
(N)	4,071	4,804

NOTE: All descriptive statistics except the sample sizes are weighted using the 1993–1997 panel weights provided by NCES. The percent missing for the above variables are other race (3.8%), sex (0.1%), age at BA receipt (0.6%), student's SAT score (10.9%), average college SAT (20.5%), college GPA (3.5%), educational expectations (1.5%), highest degree ever earned (0.2%), importance of making a lot of money (14.2%), importance of steady employment (14.2%), and importance of leisure (14.2%).

[a] These statistics are means not percentages as in the rest of the table. Missing values were excluded for the calculation of means.

[b] This variable was measured during 1997. The remaining variables were measured in 1993.

* Chi-square statistic or t-test: $p < 0.05$

APPENDIX F

Heckman Probit Regression Selection Equation Results for Full-time Work with Positive Earnings, B&B 1993–1997

	Model 1	Model 2
Constant	0.371**	0.383**
	(0.125)	(0.128)
Major (Vocational = excluded)		
Arts and Sciences	–0.233***	–0.225***
	(0.036)	(0.037)
Important to Find Steady Employment (No = excluded)		
Yes	0.194*	0.162
	(0.089)	(0.092)
Sex (Male = excluded)		
Female	–0.156***	–0.157***
	(0.035)	(0.035)
Age at BA	0.001	0.002
	(0.003)	(0.003)

NOTE: The entire sample size is 8,875, with 3,251 censored and 5,624 uncensored observations. Results are weighted according to the panel weights for the 1993–1997 panel. Models include variables that represent missing values for sex (0.1%), age at bachelor's degree (0.6%) and the importance of steady employment (14.2%).
*p < 0.050 **p < 0.010 ***p < 0.001

Endnotes

[1]To avoid confusion with earlier definitions of "liberal arts," we employ the term "arts and sciences" to refer to fields in the humanities, arts, math, social and natural sciences.

[2]Not all fields fit neatly within the arts and sciences/vocational division. A small number of fields are designed to provide personal skills with titles such as "Personal Awareness and Self Improvement" or "Interpersonal and Social Skills." However, these fields are rare at the undergraduate level and are not considered here.

[3]In addition to these areas, the field of psychology has contributed research linking choice of field of study to personality characteristics. While this literature is outside the scope of this paper and not reviewed here, see Holland (1985); Smart, Feldman, and Ethington (2000); and Latona (1989) for relevant examples.

[4]Students commonly change majors, often more than once, while in college (Jacobs, 1986), and this process is likely related to students' experiences in college as well as to the difficulty of the major. Preliminary research using the 2000 wave of the NELS shows that almost 49% of those who chose arts and sciences or vocational programs in 1994 graduated with bachelor's degrees in these same programs by 2000. About 13% changed from arts and sciences programs to vocational programs or vice versa. Over 38% had not received their bachelor's degrees by 2000. Retention in majors and in college are important topics of study that are beyond the scope of this paper.

[5]We use the Carnegie Classification of institution types for these variables. Liberal arts institutions are defined as primarily undergraduate colleges with a major emphasis on baccalaureate programs that award at least half of their degrees in liberal arts fields.

[6]Overall, almost 64% of the panel had not enrolled in a four-year institution by 1994. This includes those who enrolled in a two-year school, many of whom will continue on

to four-year colleges. Because major choices in two-year schools differ dramatically from those in four-year schools, we have not included these students in our analysis.

[7]It is important to note that students planning careers in law or medicine do not necessarily choose these fields as majors in their undergraduate institutions. For example, students planning law careers may choose political science or government majors as a precursor to a graduate degree in law.

[8]In contrast to the measure in B&B, SES is measured here by an index of both parents' educations and occupations, and family income. Each factor is equally weighted and the index is standardized, such that the mean of the sample is 0 and the standard deviation is 1. A more complete measure of SES is available from the NELS because parents' occupations and family income information was asked of all respondents.

[9]Results are available from the authors upon request.

[10]The results from the selection equation predicting enrollment in a four-year institution are reported in Appendix C. Because gender is not found to be significantly related to choice of an A&S or vocational major, and it is significantly related to enrollment in a four-year college or university, we use it as the instrumental variable in our Heckman probit model equation. Because it is our instrument, it appears in the model for the selection equation reported in Appendix C, but not in the equation predicting major choice in Table 3.

[11]In other models, we tested interactions between the demographic characteristics, tested proficiency, college type and selectivity, educational expectations, occupational expectations, and work values, and the SES variable. None were a significant improvement over models without interactions.

[12]This information is available from the authors upon request.

[13]The results of the equation predicting selection into the sample are reported in Appendix F. The value for steady employment is used as the instrumental variable in the equation predicting selection into the sample of full-time workers because is significantly associated with major choice and working full-time, but not significantly related to earnings. Therefore, it does not appear in Table 5.

[14]It is likely that there are also cohort effects on the strength of the connection between major and employment after college graduation. During times of economic recession, when unemployment is high, students of all majors may be more likely to enroll in graduate school than to choose to enter the labor market. We do not have cohort data that would allow us to examine this variation.

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