Choice of Major and Continued Class Disadvantage in Higher Education

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Abstract
Although much postsecondary education research has been dedicated to differences across socioeconomic class and the transition to college, few scholars have considered the relationship between choice of major and social background once students have matriculated. This oversight may be a key reason why less advantaged students are more prone to dropout and tend experience different occupational returns to their education than middle and upper class students. I hypothesize that students from low socioeconomic families tend to select into fields of study that differ from those selected by other students, and that this process is a function of academic achievement and occupational goals. The results suggest that these two factors do influence the attractiveness of majors across socioeconomic backgrounds in ways that disadvantage students from lower class families.

1. Introduction

Postsecondary education has often been touted as the route to upward mobility for those from lower class origins. Indeed, the classic status attainment model seems to confirm that educational attainment is the key variable in attenuating the influence of family of origin and predicting occupational outcomes (Sewell, Haller, and Ohlendorf 1970; Sewell, Haller, and Portes 1969). Students from middle and high socioeconomic status backgrounds are more likely to enter well-paying, prestigious occupations like those of their parents because they are also more likely to attain higher levels of education. This process implies that after controlling for education, there should be little variation in occupational outcomes across social class background. While I do not question that college does represent a path to increased intergenerational mobility and attenuated influence of social class origin, some processes also continue to disadvantage lower class students seeking postsecondary education.

Although the rates of transition into college have been increasing for all groups for several decades, high school graduates from socioeconomically disadvantaged backgrounds still have relatively low enrollment probabilities (Mare 1981a). The class disadvantage continues even among the select students that do transition to postsecondary education. Lower class students disproportionately attend less selective colleges and have higher dropout rates (Choy 2001; Davies and Guppy 1997; Hearn 1984; Jencks, Bertlett, Mary Corocan, Eaglesfield, Jackson, McClelland, Mueser, Olneck, Schwartz, Ward, and Williams 1979; Manski 1983; Mare 1981b; Sewell, Haller, and Ohlendorf 1970). Each of these processes limits the potential intergenerational mobility promised by higher education and preserves some aspects of lower class disadvantage by influencing the actual completion rates of college and by providing differing quality of education to those

who do. The student's chosen major may also contribute to relative class disadvantage through influencing completion rates or which occupation the graduates eventually enter. This project does not focus on the possible effects of selecting a particular major over another, although I do speculate on the consequences of the students' decisions. Instead, I analyze the relationship between social class background and choice of major to suggest a possible mechanism through which origins continue to disadvantage (or advantage) students in postsecondary education.

I explore this relationship by treating the choice of major as a function of both the individual students characteristics and the attributes of the major. Using a conditional logit model, I allow to attraction of each major's characteristics to vary by the student's academic achievement. I also estimate the extent to which a variety of occupational outcomes that are associated with a field of study attract students of different social class backgrounds.

2. Influences on choice of college major

The literature examining the choice of college major suggests two factors that influence students: academic ability and occupational goals. According to the academic ability perspective, field of study is at least partly a function of the students own ability relative to the academic demands of the major. Occupational goals are also thought to affect why students prefer some majors to others because of variation in the careers they seek to enter after college. These two influences do not offer conflicting explanations, and some researchers posit that both of these influences act together to narrow the selection of majors that students find attractive (Montmarquette, Cannings, and

Mahseredjian 2002). Each of these influences may also contribute to the relationship between social class background and major in two ways, either through the correlations of background with academic achievement and occupational goals or class-specific effects of these two influences.

2.1 Academic achievement

Education represents an uncertain investment into which a student places large quantities of time, effort, and often money. Successful students complete their course of study and earn a baccalaureate degree, while the unsuccessful fail to reach this goal and have little to show for their investment. Although leaving school entirely represents a near total loss, students who choose to switch to a different major after having devoted resources into another field also experience some loss. This latter group of students may still ultimately graduate, but whatever time and effort they expended in their original major could have been directed toward the new major.

All students experience at least some hazard of either leaving college or switching to a new major, and it is in the student's interest to reduce this risk of failure. They can do this by avoiding majors in which the academic demands greatly exceed their abilities. High-achieving students have the least risk of failure, and they are not likely to be heavily influenced by the academic demands of the majors (Montmarquette, Cannings, and Mahseredjian 2002). In contrast, a lesser-achieving student will have a high level of risk across many potential fields of study because the hazard of falling below minimum academic standards will be high. This variability will cause him or her to be heavily influenced by the chance of failure. He or she will then be more likely to choose a major

with lower academic demands, although the tendency to do so will depend partially on the individual's particular aversion to risk.

The distribution of academic achievement across majors is (at least partly) the result of risk averse students acting to increase their probability of success. Students do not sort themselves perfectly in this manner for many reasons, and high variance in ability does exist within majors. On average, however, particular majors will be filled by more able students than others. Fields of study that require demanding skills, particularly quantitative aptitude, attract students with higher test scores. The low achieving student who enters engineering has a much higher risk of failure than his or her more able classmates. "Easier" majors, such as business and education, attract students with lower scores (Montmarquette el at 2002).

Social class background may affect the relationship between academic achievement and choice of major in several ways. First, students from low socioeconomic status families are academically disadvantaged relative to their middle and upper-class peers. Even the relatively select population of lower SES students who enter college do so with less academic preparation and lower SAT scores (Choy 2001). Under the assumption that students respond equally to the threat of failure, students from low socioeconomic status families will disproportionately select into majors with lower academic demands.

It is also possible that the level of risk aversion correlates with social class background. Disadvantaged students may be more sensitive to the risk of failure for two reasons. First, students from low SES families may perceive their hazard of failure to be high relative to others. Lower class students do drop out of college at higher rates than

middle and upper class students, so this fear may be warranted (Mare 1981). These students may also mistakenly inflate their perceived hazard of failure, which may increase their actual likelihood of failure (Breen and Lindsay 2002). Previous negative experiences with teachers throughout primary and secondary schooling may lower the student's estimation of their own academic abilities and potential. Second, the economic consequences of failure may be more burdensome to students from low income families. The tuition and fees of college represent a relatively large investment for students and their low socioeconomic status families.

However, it may be the case that middle and upper class students are actually more sensitive to the risk of failure than lower class students. Although the former have a lower probability of leaving before completion, they may be more sensitive to the threat of failure if they perceive the consequences to be greater. More advantaged students attend colleges that, on average, are more expensive; and they are more likely to take out loans to finance their education (Olson and Rosenfeld 1984). For these students, dropping out of college will be a larger net financial loss and leave them with large student loans. Middle and upper class students also enter college with higher educational expectations and greater social pressure to succeed academically. Students from less advantaged families have lower educational aspirations and may experience lower levels of disapproval from their parents if they choose not to continue (Sewell, Haller, and Ohlendorf 1970).

Lastly, social class background may mediate the influence of academic achievement on choice of major through the unequal distribution of information. The ability to accurately gauge one's risk of failure within a major depends on accurate

knowledge of the fields' academic demands. Students from low socioeconomic status families may have less knowledge about the relative demands of majors, and thus lack the ability to make such an assessment. Such a process would create the appearance that low SES students are actually less risk averse than high SES students, even if levels of risk aversion are constant across social class background. A risk-averse, relatively well-informed student will avoid fields in which the demands exceed her or his abilities. However, equally risk-averse students who lack such information may unintentionally choose risky majors. If this scenario represents the process, the achievement of low SES students within a major will be more widely distributed than high SES students, whose levels of achievement will cluster around or above the mean.

2.2 Occupational goals

In addition to the role of academic achievement, choice of college major is also influenced by occupational goals. This occurs because majors increase specific forms of human capital that are useful in some careers but not in others, increasing the probability of entering occupations that rewards the specific knowledge or skills. Thus majors act to create career trajectories into which their occupants follow. Students looking to the future will select the field of study that gives them the greatest probability of obtaining their desired occupation and its associated rewards.

The distribution of students across majors is partly a function of occupational goals, although these goals differ greatly among students. Some research suggests that students choose majors to maximize their potential lifetime earnings conditional on their academic

ability (Berger 1988; Cebula and Lopes 1982; Eide and Waehrer 1998; Montmarquette, Cannings, and Mahseredjian 2002; Paglin and Rufolo 1990), while other studies document the degree to which variation in preferences for earnings predicts choice of major (Daymont and Andrisani 1984). A smaller number of studies have examine the attraction of nonpecuniary rewards. Some students are drawn to majors that lead to occupations with authority or prestige (Wilson and Smithlovin 1983), or that require incumbents to help or work with others (Davis 1965; Daymont and Andrisani 1984). Some women choose majors leading to careers that help them balance family and occupational demands (Xie and Shauman 2003).

Although few researchers have focused explicitly on the link between social origins and college major, sociologists have been attentive to processes of occupational inheritance and class patterns of occupational preferences. Notable in these patterns is the emphasis placed on extrinsic or intrinsic occupation rewards. Extrinsic benefits include economic returns, such as income or job security. Low-skilled and low-educated workers tend to value their occupations largely for the extrinsic rewards they provide (Dubin 1956; Goldthorpe, Lockwood, Bechhofer, and Platt 1968; Goldthorpe, Lockwood, Bechhofer, and Platt 1969; Hearn 1977; Sofer 1970). Intrinsic rewards encompass rewards that people obtain through themselves from the actual act of labor or the social benefits obtained through association with a certain occupation. Members of the middle and upper class tend to place greater emphasis on intrinsic rewards like autonomy, self-direction, prestige, and opportunities for advancement (Hearn 1977; Kohn 1977; Kohn 1981; Kohn and Schooler 1983; Sofer 1970).

Without necessarily intending to do so, parents contribute to the inheritance of their socioeconomic status by cultivating values and attitudes that prove advantageous in accessing and maintaining positions in their respective occupational strata (Hout 1984; Kerckhoff 1972; Kohn 1959; Kohn 1981; Kohn and Schooler 1983). Working class children develop a taste for the cultural life of the shop floor and an aversion to white collar work (Willis 1977).[1] Their parents instill in them respect for authority, deference and discipline (Connell, Ashended, Kessler, and Dowsett 1982), and the secondary school reinforces these values (Bowles 1972; Bowles and Gintis 2002; Bowles and Gintis 1976; Oaks 1985). Middle and upper class children, in contrast, are taught to question authority figures freely and are infused by their parents with a sense of entitlement (Lareau 2003). These learned attitudes, values and preferences may lead to an association between class origin and choice of college major through the pursuit of occupational goals.

Given the distribution of occupational goals and attitudes across social class background and the role of these in the process of choosing a college major, it is likely that that the chosen field of study is conditional on the student's class background. Students will be more attracted to the major associated with occupations that provide levels of rewards similar to those of their parents. For students of low SES, attending college means that they will experience some degree of upward mobility regardless of their field of study. However, when choosing among the array of majors, they will still prefer those areas that offer the level of intrinsic rewards closest to those of their parent's

[1] Clearly student attending college must have overcome this aversion to some degree. Nonetheless, they may still prefer occupations that reflect the values of their parents.

occupations. Through this process, the choice of college major limits intergenerational mobility.

There is evidence that major varies by socioeconomic background in ways consistent with variation in occupational goals, particularly the extrinsic rewards from occupations. Some research suggest that students from low socioeconomic backgrounds are more attracted to lucrative majors than other students (Davies and Guppy 1997), although other work finds that both low and high socioeconomic status student value income potential more than those from middle-range socioeconomic backgrounds (Montmarquette, Cannings, and Mahseredjian 2002). Some students from high socioeconomic backgrounds purposefully choose very lucrative majors, but this group is also more likely than others to enter the humanities, which are not associated with high incomes (Davis 1965; Katchadourian and Boli 1985).

3. Hypotheses

In this study, I focus on how students' social class background influences their choice of college major and how this decision may continue to disadvantage lower class students and limit intergenerational mobility. I continue the tradition of the previous literature by framing this choice as the outcome of academic achievement and occupational goals. I differ from the previous research by explicitly using social class background as a predictor of major. Previous literature largely assumes that the effects of academic achievement and occupational goals are consistent across class. However, I propose that the influence of academic achievement varies by socioeconomic background, and that student's occupational goals are partly a function of the parents'

occupation. Thus, the student's social class background will impact the choice of major through these two influences.

Based on the literature previously discussed, I propose the following hypotheses to explain how social class background affects the process of selecting a college major:

(1) *Risk Aversion.* Students are more likely to select a major if their level of academic achievement meets or exceeds the average academic achievement of that major. They do so to reduce the risk of changing fields or dropping out of college.

(2) *Relative Risk Aversion.* Socioeconomic background affects how students respond to this risk. Disadvantaged students may be less likely to choose a field of study if they are likely to fail because they underestimate their academic abilities and have made a more burdensome financial investment in education. A competing hypothesis suggest that middle and high socioeconomic students may be more likely to select safe majors because their higher educational expectations, larger student loans, and greater social pressure to succeed may actually heighten their desire to avoid failure. If the latter hypothesis is true, then low socioeconomic status students, already academically disadvantaged relative to their college-going peers, will continue to be so even within their major.

(3) *Occupational Reproduction.* Students are more likely to choose majors associated with occupations that provide intrinsic rewards similar to the occupation of their father. By doing so, the students whose fathers have occupations that provide few intrinsic rewards will likely enter occupations with fewer expected intrinsic rewards.[2] However, students whose fathers receive intrinsic rewards from their labor will be drawn to majors

[2] Throughout the text, I use the term "expected rewards" to refer to the probabilistic level of rewards from the occupations that a certain major is associated with.

associated with occupations offering similarly high levels of intrinsic rewards. Through this process, college students from lower class backgrounds, despite their upward mobility, will still not experience the same occupational outcomes as middle and upper class students.

(4) *Extrinsic Rewards.* Disadvantaged students will be more likely than other students to select majors that lead into occupations with greater extrinsic rewards, such as income or job security, because they have been encouraged to adopt an instrumental attitude toward occupations.

4. Data

I use several sources of data for this analysis. The Beginning Postsecondary Students Longitudinal Study (BPS: 96/01) provides the individual-level data on the students' characteristics and their chosen major. To operationalize the intrinsic and extrinsic characteristics of occupations, I use the Occupational Information Network (O*NET), Nakao and Treas's (1994) prestige scores, and the 1993 National Survey of College Graduates (NSCG). I also use the majors and occupations provided by the NSCG to link the majors in the BPS: 96/01 to the data containing the occupational characteristics. Below I describe these data sources, the process of linking majors to occupations and then to occupational characteristics, and the construction of variables used in the analysis.

4.1 Sources of data

The BPS: 96/01 provides data on each student's academic achievement, chosen major, and social class background for a representative sample of students who were enrolled for the first time at postsecondary institutions in the United States and Puerto Rico during the 1995-1996 school year. These students were first interviewed in 1996 as part the National Postsecondary Student Aid Study, and a subsample of the original respondents were re-interviewed by telephone or in person as part of the first follow-up wave of the BPS: 96/01 in 1998. Of the 12,244 students targeted for inclusion in the 1998 BPS: 96/01 follow-up, 10,268 were contacted and interviewed, resulting in an overall response rate of 84.3 percent.

Analytic restriction and missing data further narrow the analytic sample. I dropped 5,112 students because they lacked information on father's occupation or parent's education. Although this listwise deletion approach decreases the sample significantly, most of the loss results because NPSAS only interviewed a subsample of parents in 1996 base year. Using the appropriate weights should significantly reduce the bias from this deletion. I drop 1,279 observations because they did not report or declare a major by 1998 or they lacked both SAT and ACT scores. I also restrict the analysis to first year students enrolled in not-for-profit baccalaureate-granting institutions in the base year of the survey, leaving a final sample of 5,076.

Limiting the analytic sample to first-time students at four-year institutions provides several substantive benefits. First, the influence of occupational goals on the choice of major only applies to students seeking to enter a career after obtaining a four-year degree. Although it is possible that some students who begin their postsecondary education at junior colleges will transfer to a senior college and complete a bachelor's

degree, few will actually do so (Bradburn and Hurst 2001). Additionally, some students at junior colleges enroll with the intention of obtaining only an associate's degree or vocational training, but the outcome of interest in this project is the field of study for a baccalaureate degree. Although the exclusion of junior college students who select their major with the intention of eventually completing a four-year degree may bias the estimates, the more restrictive sample will likely provide conservative estimates of the effects of social class background. This will happen because the lower class students disproportionately begin colleges at two-year institutions, and those beginning four-year institutions tend to be more like their middle and upper class peers regarding social class background and academic achievement (Nunez and Carroll 1998; Perna and Titus 2004). Second, students become a more select group as they progress through college and the socioeconomically disadvantaged leave school at higher rates (Nunez and Carroll 1998). This nonrandom dropout reduces the variation among students. Additionally, it seems probable that any effects of family background on the choice of major will be strongest at the beginning of the postsecondary education experience, before the student will have been exposed to and influenced by other factors. Lastly, many students may choose to change their field of study or leave college before graduating (Davis 1965). Both of these actions may be partly a function of their initial major (St John, Hu, Simmons, Carter, and Weber 2004).

The O*NET Database Release 4.0 provides most of the information on occupational characteristics that I use for this analysis. Released in June 2002, this database contains hundreds of measures of job-related attributes for over nine hundred occupations. For this study, I use indicators of intrinsic occupational rewards. These

measures include independence, initiative, advancement, achievement, and autonomy. I obtain a measure of occupational prestige from Takao and Treas's (1994) updates scores based on the 1989 General Social Survey.

Lastly, I use the 1993 NSCG to obtain measures of extrinsic occupational rewards and link the majors in BPS: 96/01 to the occupations in O*NET. The sample contains 214,643 individuals drawn from the population who reported holding at least one baccalaureate degree in the 1990 census. It provides data on each respondent's undergraduate field of study and current job detailed at the level of the three-digit census code, allowing me to link the student's majors in the BPS: 96/01 to the actual distribution of occupations in both NSCG and O*NET. I describe this linking process in greater detail in section 4.3.2.

4.2 Dependent variable

The dependent variable of this analysis is the first major chosen by the student. Although the student's major at graduation is likely to be a better predictor of occupational outcomes, I maintain that focusing on the initial major is preferable to the final major for some of the same reasons listed previously to justify the inclusion of only first year students. The effects of family background on choice of major are likely to be strongest early in the college career. Additionally, using only the major at graduation would eliminate all of the students that failed to complete their course of study. This is problematic because leaving college early may partly be a function of their initial major and lower class students disproportionately fail to graduate. Thus, using the final major would exacerbate the problems of the selection effect, reducing variance in the remaining

students' social class background and academic achievement. Seventy-five percent of the students in the BPS 96/01 sample had declared a field of study when first surveyed near the end of their freshman year. For those who were undeclared or did not answer the question as first-time freshman, I used the major reported two years later in the first follow-up. Students who had left college by this time were also asked to list their most recent field of study, bringing the proportion of the sample with a declared field of study to ninety-eight percent. I dropped from the analysis any respondents that did not report any major or attritted from the survey by the first follow-up before reporting a major.

The outcome of interest is the chosen major. Although the BPS: 96/01 distinguishes between 99 fields of study, I aggregate these majors into 60 categories for the analysis. The process of linking the BPS: 96/01 majors to the data containing the occupational characteristics necessitates this aggregation, although it does reduce variance of the characteristics across fields. The original and aggregated majors are listed in Appendix A, and I list a detailed account of the process in section 4.3.2.

4.3 Individual-level and major-level characteristics

This project analyzes the relationship between a student's social class background and characteristics of potential majors. Because of this, it is necessary to draw information on both students and fields of study. In the paragraphs below, I describe the information I use for each and how each variable used in the model is constructed.

4.3.1 Student social class background and academic achievement

I use categorical measures of the parent(s)' highest level of education and categorical measures of father's occupation from the BPS: 96/01 to derive student's social class background. Although it increases the complexity of the model, I keep these background measures as separate influences rather than resorting to a composite measure of socioeconomic status. Using measures of both allows me to estimate separate effects of specific components of social class background. Attempting to combine these two or three measures provides no substantive benefit in this analysis as any composite measure risks confounding the effects of it components. I divide the highest of both parent's education into five categories ranging from less than high school to master's degree or above. If information on one parent is missing, I assign the highest education to be that of the remaining parent. In the interest of parsimony and keeping with the tradition of previous stratification research, I use only the father's occupation in this analysis, even if mother's is available. The BPS: 96/01 groups father's occupation into twenty-nine categories.

The student's composite SAT and/or ACT score is used as a proxy for academic achievement. The BPS: 96/01 provides a conversion of ACT scores to SAT scores for students that only take the former test, and I will hereafter use SAT to include students with either test score. These means and standard deviations for these individual-level characteristics are shown in Table 1. The distributions of parent's education and occupation represent those of people with a child in a four-year college, and they reflect the unequal selection across socioeconomic background. Most of the students come from families with a college education and few have a parent in an unskilled labor occupation.

[INSERT TABLE 1 ABOUT HERE]

4.3.2 Characteristics of major and its expected occupation

Because I treat the probability of choosing a major as a function of the field's attributes rather than the field itself, it is necessary to create measure of the academic demands and expected occupational characteristics of each major. Using students' SAT scores in the BPS: 96/01, I proxy the academic demand or each field by calculating the mean within-major SAT score.

I use O*NET, NSCG, and Nakao and Treas (1994) prestige scores to obtain the occupational characteristics associated with each major by linking the majors in BPS: 96/01 to majors in NSCG and then to their corresponding occupations. First, I match the 99 majors in the BPS: 96/01 to the 149 majors in the NSCG. Aggregation of both datasets creates sixty major categories.[3] I then create a second link from the occupations in NSCG to the occupations in O*NET by using a crosswalk provided by the National Crosswalk Center to match the 1990 census codes used in the NSCG to the occupational codes used in the O*NET. I also link the occupations in NSCG to prestige scores provided by Nakao and Treas. These two links connect each major in the BPS: 96/01 to occupations in the NSCG to occupational characteristics in O*NET and to their prestige score.

I then create the expected levels of intrinsic and extrinsic rewards for each field of study by calculating the weighted mean of these occupational characteristics within each major. For each major, the mean is weighted according to the distribution of occupations in the NSCG. Doing this creates measures of occupational rewards associated with each specific major that take into account the variety of occupations that one field of study

[3] The original and aggregated fields of study are listed in Appendix A.

may lead to. Lastly, I merge the major-level expected occupational characteristics with the individual-level data so that each person-major case in the analytical data set contains the expected occupational characteristics for that major.

For this analysis, I use measures of six intrinsic characteristics. Each measure captures an occupational reward or quality required of the worker with the occupation. Measures of initiative, independence, achievement, advancement, and autonomy come from the O*NET database and are described in Table 2. "Initiative" and "Independence" refer to the qualities demanded of the person within the occupation. "Achievement," "Advancement," and "Autonomy" are intrinsic rewards from the occupation. The sixth intrinsic reward, prestige, is provided by Nakao and Treas (1994) and reflects the relative "social standing" of occupations as ranked by respondents in the 1989 General Social Survey.

[INSERT TABLE 2 ABOUT HERE]

4.4 Risk aversion predictors

I divide students into three groups to proxy their hazard of failure within a given field of study. I assume that students whose academic abilities fall in the far left of the distribution have a higher risk a failure than those with higher levels of achievement. For this project, students are considered to have a *High Risk* of failure in a given major if their SAT score is more than half a standard deviation below the mean SAT score within that major, while those with SAT scores greater than half a standard deviation above the mean are considered to have a *Low Risk* of failure. Students in the *Average Risk* category have SAT scores within half a standard deviation of the mean within-major score.

Across all majors, roughly one-third of the students fall into each category, suggesting a symmetric distribution of academic achievement within field of study.

4.5 Occupational reproduction predictors

4.5.1 Intrinsic occupational rewards

The variables used to estimate the attraction of intrinsic occupational rewards indicate the dissimilarity between the characteristics of the father's occupation and the occupational characteristics associated with a given major. To create this measure, I first matched the father's occupation in the BPS: 96/01 to the 1990 census codes. The BPS: 96/01 only distinguishes among twenty-nine occupations and I aggregated the corresponding census codes considerably to create comparable groupings. Once linked to 1990 census codes, I obtained characteristics of the father's occupation from O*NET database and Nakao and Treas's (1994) prestige score. I averaged the levels of these intrinsic rewards to derive characteristics of the father's occupation.[4]

I create measures of "occupational distance" to operationalize the dissimilarity between the father's occupation and the expected occupational characteristics of the major. The variables used in the analysis are the absolute values of the distances between the occupational characteristics of the father's career to the expected occupational characteristics of the major. Each of the intrinsic rewards variables *Independence, Initiative, Autonomy, Achievement, Autonomy, and Prestige,* indexes the dissimilarity

[4] Ideally, the characteristics would be weighted according to the actual distribution of the more detailed occupations within each BPS category. This would require knowledge at the level of the 3-digit census code of the occupations of fathers with a child beginning a four-year college in 1996. Unfortunately, at this time I know of no such existing data with this information.

between the father's occupations and the occupations associated with the major. This variable equals zero if the level of a characteristic is the same for the father's occupation and the expected occupation associated with a given major, and it increases as the expected occupational characteristics of the major differ from those of the father's occupation. Using these measures of occupational distance allows me to test the *Occupational Reproduction* hypothesis and estimate the probability of choosing a major as a function of social class background and expected occupational attributes.

4.5.2 Extrinsic rewards

I estimate the attraction of extrinsic rewards using a measure of job security derived from the NSCG. Within each major, I calculate the percentage of people who reported working full time. This variable *Percent Working Full-Time* proxies the respondent's employment potential after completion of a degree.

The final dataset contains sixty observations per student constituting the choice set of majors, with one line per student representing each of the possible majors. Each case includes a dichotomous outcome variable indicating whether or not the student choose that major, the student's hazard of failure within that major, social class background variables, an index of occupational dissimilarity between the intrinsic rewards of father's occupation and the occupation associated with that major ("occupational distance"), and the extrinsic reward of job security. This data structure assumes an identical choice set of majors for each student.

5. Methods

I use a conditional logit model to test the hypotheses because it has the ability to estimate the relationship between the attributes of the outcome (in this case, college major) and the individual's probability of choosing that outcome (Powers and Xie 2000). The model estimates the probability that person *i* will choose major *k* as a function of the attributes of the major and individual *i*'s attraction to that particular attribute, where P_{ik} represents the probability that person *i* chooses major *k*. J denotes the entire choice set of sixty majors with k = 1,2, …, *J*. The utility provided by the *k*th alternative for person *i is* $\mathbf{z'}_{ik}\boldsymbol{\alpha}$. The probability of person *i* choosing major *j* can be expressed as:

$$\Pr(y_i = k \mid \mathbf{z}_{ik}) = P_{ik} = \frac{\exp(\mathbf{z'}_{ik}\boldsymbol{\alpha})}{\sum_{j=1}^{j} \exp(\mathbf{z'}_{ij}\boldsymbol{\alpha})}$$

All the coavariates vary by both individual *i* and major *k*, so that $\mathbf{z'}_{ik}\boldsymbol{\alpha}$ represents the utility of major *k* for person *i*.

There are two reasons why the conditional logit model is more appropriate for this analysis than the multinomial logit model, although both models can estimate the relationship between multiple possible outcomes and attributes of the individual. First, the conditional logit model yields a number of coefficients equal to the number of independent variables, but the multinomial logit model creates a separate coefficient for each independent variable for each possible outcome. The sixty majors that compose the choice set for each student make the multinomial logit model impractical and cumbersome. Although the number of majors could be reduced to create a more parsimonious model, this aggregation would obscure the real differences between the particular majors among which college students sort themselves. Second, the conditional

logit model easily incorporates attributes of the majors as they relate to individual students. This allows me to estimate the attraction of the major-level characteristics based on the individual-level characteristics. Doing this in the multinomial model is possible only by interacting all of the individual-level and major-level characteristics, which greatly increases the numbers of coefficients.

I test the Risk Aversion hypothesis that students tend to avoid risky majors and include only the variables *High Risk* and *Low Risk* in Model 1. I then modify this model to test the Relative Risk Aversion hypothesis that the student's social class background affects how they respond to risk when choosing majors. I add to Model 2 interactions of dummy variables of highest parent's education with each of the variables *High Risk* and *Low Risk*.[5] A significant coefficient for any of these interaction terms indicates that the student's level of risk within a major does pose a different attraction or aversion, depending on the parent's education.

I test the Occupational Reproduction hypothesis in Model 3 by including only variables *Initiative, Independence, Achievement, Advancement, Autonomy, and Prestige* that indicate the dissimilarity between the expected intrinsic rewards of the major and the intrinsic rewards of the father's occupations. A significant negative coefficient on these occupational distance measures suggests that the probability of choosing a field of study decreases the more its anticipated intrinsic occupational rewards differ from the rewards of the father's occupation. Entering only the occupational distance measures in the model will would yield estimates of the attraction of occupational similarity for all

[5] I experimented with variations of this model and attempted interactions of *High Risk* and *Low Risk* with measures of family income, father's occupational prestige, and father's socioeconomic status. None of these alternative models yields results suggesting that the influence of risk aversion varies across these factors. I do not discuss these models further and the results are not presented.

students in the sample, but it does not allow this attraction to vary by social class background. The coefficients would more closely approximate the effects of occupational distance on choice of major for students from more educated families because these students compose a majority of the college-going population. Thus the effects of occupational distance for students from the least educated families would have little effect on the estimated coefficient. For this reason I interact parent's highest education with these measures of occupational distance and use students whose parents did not graduate from high school as the reference group. Doing so allows the effects of occupational distance to vary by social class background.

I estimate the attraction of extrinsic occupational rewards in Model 4 by interacting a variable representing the percent of people within a major who are employed full-time with dummy variables of parent's highest education to allow the attraction of this major-level attribute to vary across socioeconomic background.

6. Results

6.1 Influence of risk and choice of major

Table 3 presents the results from the models testing the risk aversion hypotheses. In model 1, the effect of having a high or low risk of failure within a major are assumed to be constant across social class background. The omitted category represents students with an SAT score within half of a standard deviation on either side of the mean to indicate that they would have "average risk" of failure within that major. The negative value of the *High Risk* coefficient suggests that the odds of selecting a certain major

decrease by 36% (1 - exp(-0.442) = 0.357) when a student's SAT score is far below the mean, supporting the premise that students are averse to risk. However, students also avoid majors in which their SAT score is far above the mean, even though this serves as a rough indication that they would likely succeed had they chosen that field. The similar magnitude and direction of the coefficients points toward a process of choosing a major in which students are likely to select fields in which their SAT score is within a half standard deviation the mean of the major.[6]

[INSERT TABLE 3 ABOUT HERE]

In model 2, I interact parent's highest education with level of risk to test if the effects of risk aversion are constant across social class background. The results from model 2 suggest that the level of risk aversion does vary by social class background and that the process of choosing a major puts students with parents without a high school diploma at the greatest disadvantage. The betas of the interaction terms represent the log odds of choosing a *High Risk* or a *Low Risk* major relative to students whose parents did not graduate from high school, and the main effects now represent the effects of risk levels for students whose parents did not graduate high school. The change in the coefficients of *High Risk* and *Low Risk* from model 1 to model 2 suggests that assuming all students respond equally to risk overlooks very different choice patterns by socioeconomic background. In general, most students are more likely to avoid "risky" majors in which their SAT score is more than half of a standard deviation below the mean. However, students from the least educated families respond this heightened risk

[6] This finding is not surprising and is likely overestimated by the construction of the variable. When calculating the within-major mean SAT scores, I included the students own SAT score. This creates an endogeneous effect whereby the mean is skewed toward the student's SAT if they choose that major. This bias will be slight in popular majors, such as Elementary Education, but much larger in sparsely populated majors, such as Special Education.

differently than students whose parents have at least a high school diploma. Compared to entering a field in which they have average risk of failure, the least advantaged student's odds of entering a *High Risk* field are 282% greater (exp(1.038) = 2.824). For students with high school and college educated parents, their probability of entering a field decreases by 40% and 34%, respectively (1 - exp(1.038 - 1.550 = 0.401; 1 – exp(1.038-1.455) = 0.341) This decision may place the least advantaged students at the greatest risk of academic failure in their pursuit of a bachelor's degree.

Although all students are less likely to select a "safe" major in which their SAT score is greater than half of a standard deviation above the mean than a major in which they would have "average risk," the least advantaged students are particularly less prone to do so. While the odds of entering a "safe" field decrease by factors of 0.72 and .058 for students of secondary and postsecondary educated parents (exp(-0.981 + 0.648) = 0.717; exp(-0.981 + 0.437) = 0.580), these odds decrease by a factor of 0.36 for the students whose parents did not graduate high school.

These results suggests that lower class students are actually less risk averse than their middle and upper class peers. This may be due to the latter's higher education aspirations which would heighten their sensitivity to risk. It is also plausible that the latter students have more accurate knowledge regarding the average academic achievement across various fields, giving them greater resources to make an informed decision. Alternatively, students may not select their fields of study with much regard to their relative risk. If this is true, the tendency for lower class students to enter majors with mean SAT scores much higher than their own may simply reflect their lower

distribution of SAT scores in the college going population and not indicate any process in which students assess their own abilities relative to the academic demands of the major.

6.2 Occupational rewards and choice of major

In this section I discuss the results of models 3 through 6 which test the *Occupational Reproduction* and *Extrinsic Rewards* hypotheses. Models 3-5 contain variables that test only these two hypotheses. Model 6 builds on model 5 and includes the risk aversion measures from model 2. Substantively speaking, the coefficients do not change much from the reduced models 3 though 5 to the full model 6, so I focus the following discussion on the full model only. I find that potential occupational rewards and the student's social class background do influence their probability of entering one field relative to another. However, the evidence fails to uniformly support the hypothesis that students prefer majors with intrinsic occupational rewards most similar to those of their father's occupation. The results also suggest that lower class students are actually less attracted to the extrinsic reward of job security than students from more educated families.

[INSERT TABLE 4 ABOUT HERE]

6.2.1 Occupational reproduction (intrinsic rewards)

Model 3 in Table 4 contains estimates of terms interacting the occupational distance measures with highest parent's education. I group the coefficients by level of education, and the omitted category is students whose parents did not graduate from high school. The coefficients under the heading of "High school or some college" and "Bachelor's

degree or higher" are estimates of dummy variables of that level of education interacted with occupational distance. They represent the change in the slope of the effect of occupational distance relative to the students whose parents did not graduate high school. Negative coefficients indicate that students are less likely to select a major as it's expected occupational rewards differ from the occupational rewards of their fathers.

Overall, the models offer mixed evidence for the occupational reproduction hypothesis. Occupational distance does seem to affect the attractiveness of majors, but both the magnitude and direction of this effect varies by social class background and the intrinsic reward. In general, students from highly educated backgrounds select majors in agreement with the hypothesis. For these students, the probability of selecting a particular major decreases as its associated occupational rewards differ from their father's occupational rewards. However, occupational distance seems to have the largest effect on students from the least educated backgrounds, although the direction of this influence is inconsistent.

Students whose parents did not graduate from high school become less attracted to a field as the occupational distances of initiative and achievement increase. A one-unit increase in the distance between the occupational initiative level associated with a major and the initiative level of the occupation of the student's father decreases the odds of selecting that major by a factor of 0.08 (exp(-2.502) = 0.082), while the same change in the occupational distance of achievement decreases the odds by a factor of 0.02 (exp(-3.786) = 0.023). These results strongly support the occupational reproduction hypothesis and suggest that these students select majors that disadvantage them relative to their middle class peers. They limit their potential for upward mobility by preferring majors

associated with occupations similar to that of their father's. However, the estimates for the intrinsic rewards advancement and autonomy suggest otherwise. Increases in the occupational distances for these two rewards actually increase the probability that these disadvantaged students will enter fields associated with occupations different than their father's. The odds of selecting a major more than double (exp(0.843) = 2.323) when it's occupational distance of advancement increase by one unit.

Similar to students from the least educated backgrounds, students who parents graduated from high school, but not college, become less likely to select a major as its occupational distances of initiative and achievement increase. They also display a similar preference for majors that increase the occupational distance of autonomy. However, the magnitude of the effects for the slightly more educated students is consistently smaller than the effect for those from the least educated families.

Students with at least one parent holding a college degree tend to select their majors in ways that support the occupational reproduction hypothesis. For four of the six intrinsic rewards, increases in the occupational distance decrease the odds of choosing one field relative to another. The effect of a one unit increase in occupational distance varies from a 49% decrease in the odds of selecting that major for the occupational reward advancement (1 - exp(0.843 - 1.512) = 0.488) to an 18% decrease in the odds for the occupational reward autonomy (1 - exp(0.614 - 0.809) = 0.177). Although the magnitudes of these effects are small, they do suggest that the students from college educated families are more likely to select a field associated with occupational rewards similar to those of their father's occupation. However, the effects of occupational distances of initiative and prestige are positive and do not support this conclusion. It

should be noted that the effects are quite small, and may not have much of a decisive impact when students actually choose a major.

Although the effects of occupational distance are not consistent across social class background or intrinsic reward, they may reflect the self-selection of low socioeconomic status youth into post secondary education. Fathers that do not have a high school diploma are likely to hold jobs offering low levels of advancement, yet their children are more attracted to majors associated with higher levels of advancement. According to the occupational reproduction hypothesis, these students should actually be more attracted to fields associated with lower levels of advancement similar to the occupations of their fathers. The fact that these students have made the decision to obtain higher education and pursue upward mobility implies that this group values opportunities for advancement, and their choice of major may simply reflect this trait.

The tests of the occupational reproduction hypothesis suggest that students from highly educated families prefer majors that place them on paths to careers with occupational rewards similar to those of their father's occupation. By doing so, these students use their field of study to maintain some occupational attributes of their social class background. Students from the least educated backgrounds display a mixed pattern when selecting their majors. Although they do prefer fields associated with occupations that differ from their father's occupation in term of autonomy and advancement, they also display a strong preference for fields associated with levels of initiative and achievement that are very similar to their father's occupation. The former trend increases the amount of intergenerational mobility that these students may experience through attending college, while the latter trend disadvantages them and reduces intergenerational mobility.

[INSERT TABLE 5 ABOUT HERE]

6.2.2 Extrinsic occupational rewards

Model 4 in Table 4 and model 6 in Table 5 test the *extrinsic rewards* hypothesis that students from low socioeconomic backgrounds will prefer majors associated with the extrinsic occupational reward of job security. The coefficient for students from the least educated family is positive, while the percent of people working full-time has either a negative or no effect for students from other backgrounds. This would support previous research arguing that people from the lower classes emphasize the instrumental aspect of occupations. However, the directions of the estimates change after controlling for the influences of intrinsic rewards. In models 5 and 6, students whose parents did not graduate high school are actually more likely to select a field as its probability of full-time employment decreases. The odds of the most disadvantaged student selecting that field decrease by 5% (1 - exp(-0.046) = 0.045) for every one-unit increase in the percent of people with a certain degree employed full-time.

The appearance of increased attraction of job security to the students from the least educated background may be endogenous to this variable's construction. The proportion of people working full-time within a major can indicate employer demand for people with a degree in that field, but it may also reflect the selection of people into those majors and the tendency for these people to seek full-time employment after college. The relationship in the models between the attraction of a field's associated job security and parent's educational attainment may be spurious and reflect some underlying factor that drives them both. Students of all backgrounds may select a major regardless of its value

in the labor market. However, the tendency for people to seek full-time employment may vary across family background. If those from low socioeconomic status backgrounds are less likely to seek full-time employment, this would increase the proportion of respondents not working full-time in majors that are composed disproportionately of disadvantaged students. Variation across fields in the percent of degree holder working full time may then be reflecting the variation in voluntary non-employment, and not the actual job security of major.

6.3 Summary

Social class background does influence the process of choosing a college major in ways that tend to disadvantage students from the least educated backgrounds. Although students, as a whole, appear to be risk averse when choosing their major, they do not respond equally to the risk of failure. Students whose parents did not graduate high school are the most likely of all students to enter a risky field and the least likely to enter a safe field. The results also suggest that students from college-educated families are prone to selecting majors leading to occupations with levels of intrinsic rewards similar to those of their father's occupation. Students whose parents did not graduate from high school seem to be more strongly influenced by occupational distance, although this effect varies by intrinsic reward. The results do not provide evidence that students from lower class families are more attracted to the extrinsic reward of job security. After controlling for the influences of the intrinsic rewards, they suggest that increasing the associated job security of a major actually deceases it's attractiveness to students from the least advantaged backgrounds.

7. Discussion

This analysis provides preliminary evidence that the selection of college major is another process that disadvantages lower class students in college. These students choose majors that make them prone to academic failure, limit their potential for upward mobility, and contribute to class reproduction in higher education. Although the results presented in this paper point to evidence that social class background does influence how students choose their college major, this study does have some limitations in its present state.

First, the occupational reproduction hypothesis that students find certain fields of study more attractive than others because of the occupations they lead into implicitly assumes that respondents have, at best, accurate knowledge of the links between specific majors and occupations. At worst, the students have no information concerning such links. This is may be especially problematic when the actors are making decisions based on their perceptions conditions four years into the future, and the accuracy and amount of knowledge varies by class (Betts 1996). For the purposes of this project, I believe that this assumption of perfect knowledge may be relaxed because many students across backgrounds do accurately perceive the *relative* benefits to education and occupations (Betts 1996; Dominitz and Manski 1996; Harvey and Kerin 1978; Smith and Powell 1990). Even though they may not be able to exactly quantify the returns to a specific major, they do have enough information to make accurate, rational comparisons across outcomes.

Another potential criticism of this study is the treatment of major choice set. The current analysis assumes that all sixty of the major categories are available at each institution. It may not be reasonable to include engineering as a possible choice for a student attending a small liberal arts college that has no such offering. Fortunately, colleges do offer a wide array of field to enter, so it seems unlikely that the consideration of institution specific choice sets will change the estimates a great deal. To test this in future versions of this paper, I will integrate data from the Annual Survey of Colleges to create a realistic choice set for each student.

Finally, although the models provide evidence that students from least educated families are more likely than others to select majors in which they have a higher risk a failure, this study does not attempt to uncover any causal mechanism. The students from more educated families may have better information or a greater desire to succeed, but data limitations preclude me from exploring this process further.

Despite these limitations, the analysis presented here have implications and suggest directions for suture research regarding the information students have when they choose a major and the consequences of this decision. As mentioned above, fully understanding the choice process requires knowledge of what information students have and how they utilize it. Very little research exists that has fully examined the distribution of information, despite its obvious importance to decision making.

Misperceptions of the students academic ability, demands of the major, and its occupational outcomes may have many negative consequences. One consequence is the wasted investment put into a major from which the student later leaves. With greater information, students may be more likely to select the "correct" major; one in which the

students will complete the course of study and enter their desired occupations. The distribution of students from less educated families into the lower half of the achievement distribution may also have implications for college dropout rates. Disadvantaged students are less likely than students from middle and upper class families to leave college with a bachelor's degree. Future research should examine what effect, if any, the concentration of disadvantaged students into the lower half of the distribution has on their probability of dropping out.

Lastly, the effects of social class background on the choice of college major may contribute to our understanding of the relationship between social origins and occupational outcomes for people who have earned a baccalaureate degree. Although obtaining this degree does greatly attenuate the disadvantages of coming from a low socioeconomic status background, variation in the choice of major may cause unequal occupational returns in which the lower class graduates do not experience the same gains as their middle and upper class peers.

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Table 1
Descriptive statistics for individual-level and major-level variables in BPS: 96/01

	Mean	SD
Individual-level variables (n=4,584)		
Academic achievement		
SAT score	975.39	207.6721
SAT score less than .5 SD below within major mean	0.36	0.47
SAT score greater than .5 SD above within major mean	0.36	0.48
Family Income	53,890.27	33,490.83
Highest parent's education		
Less than high school	0.02	0.13
High school	0.21	0.41
Some college	0.17	0.38
Bachelor's degree	0.28	0.45
Graduate degree or higher	0.29	0.45
Father's occupation		
Clerical-secretarial	0.00	0.06
Clerical- financial	0.02	0.14
Clerical- other	0.04	0.18
Craftsman/precision product/repair	0.10	0.30
Laborer	0.05	0.21
Manager/administrator	0.23	0.42
Skill operative	0.05	0.23
Professional-arts, entertainment, media	0.01	0.12
Professional-Medical	0.02	0.13
Professional-Engineer	0.07	0.26
Professional-Other	0.04	0.19
Preprofessional	0.08	0.27
Proprietor	0.08	0.27
Protective services	0.03	0.17
Sales	0.07	0.26
School teacher	0.03	0.18
Service occupations	0.03	0.16
Technical-computer related	0.03	0.17
Technical-non-computer related	0.02	0.14

	Minimum	Maximum	Mean	SD
Major-level variables (n=60) [1]				
Occupational characteristics				
Independence [2]	3.75	4.39	4.00	0.13
Initiative	3.80	4.38	4.10	0.10
Advancement	2.26	3.33	2.95	0.18
Achievement	3.04	4.48	3.79	0.26
Autonomy	2.35	4.21	3.72	0.28
Prestige	41.62	70.87	57.89	5.31
Percent NSCG respondents employed full-time	52.93	90.91	76.49	7.20

[1] These means and standard errors represent the weighted mean of the majors. Detailed descriptive statistics within each major are presented in the appendix

[2] These values represent the characteristics of the occupations associated with the majors

Table 2 O*NET description of occupational characteristics[1]

O*NET Code	Characteristic	Desription
1.C.1.c	Initiative	Job requires willingness to take on responsibilities and challenges
1.C.6	Independence	Job requires developing one's own ways of doing things, guiding oneself with little or no supervision, and depending on oneself to get things done
1.B.2.a	Achievement	Workers on this job make use of their individual abilities.
1.B.2.c.1	Advancement	Workers on this job have opportunities for advancement
1.B.2.f.3	Autonomy	Workers on this job plan their work with little supervision

[1] Source: Boese 2001

Table 3

Effects of hazard of failure on choice of major and the interaction of family background with this hazard (unstandardized coefficients)

	Model 1		Model 2	
	B	*SE*	*B*	*SE*
High Risk	-0.442**	(0.004)	1.038**	(0.038)
Parent High School or Some College * High Risk			-1.550**	(0.039)
Parent Bachelor's Degree or Higher * High Risk			-1.455**	(0.039)
Low Risk	-0.477**	(0.004)	-0.981**	(0.049)
Parent High School or Some College. * Low Risk			0.648**	(0.050)
Parent Bachelor's Degree or Higher * Low Risk			0.437**	(0.049)
Observations	268380		268380	

* $p < .05$ (two-tailed)

** $p < .01$ (two-tailed)

Table 4
Effects of expected occupational characteristics of a major and father's occupation on selection of that major (unstandardized coefficients)

	Model 3		Model 4	
	B	*SE*	*B*	*SE*
Intrinsic Occupational Rewards				
Parent less than high school				
Independence	-0.052	(0.093)		
Initiative	-1.963**	(0.095)		
Advancement	0.569**	(0.046)		
Achievement	-2.689**	(0.054)		
Autonomy	0.383**	(0.050)		
Prestige	0.084**	(0.002)		
Parent high school or some college * occupational reward				
Independence	0.843**	(0.095)		
Initiative	0.936**	(0.098)		
Advancement	-0.767**	(0.048)		
Achievement	2.113**	(0.055)		
Autonomy	-0.270**	(0.051)		
Prestige	-0.058**	(0.002)		
Parent bachelor's degree or higher * occupational reward				
Independence	-0.912**	(0.095)		
Initiative	1.970**	(0.097)		
Advancement	-1.249**	(0.047)		
Achievement	2.294**	(0.055)		
Autonomy	-0.601**	(0.051)		
Prestige	-0.079**	(0.002)		
Extrinsic Occupational Reward				
% Working Full-Time			0.015**	(0.001)
Parent High School or Some College * % Working Full-Time			-0.017**	(0.001)
Parent Bachelor's Degree or Higher * % Working Full-Time			-0.015**	(0.001)
Observations	268380		268380	

* $p < .05$ (two-tailed)
** $p < .01$ (two-tailed)

Table 5
Effects of risk aversion and expected occupational characteristics of a major and father's occupation on selection of that major (unstandardized coefficients)

	Model 5		Model 6	
	B	*SE*	*B*	*SE*
Risk Aversion				
High Risk			0.940**	(0.038)
Parent High School or Some College * High Risk			-1.498**	(0.038)
Parent Bachelor's Degree or Higher * High Risk			-1.379**	(0.038)
Low Risk			-0.850**	(0.049)
Parent High School or Some College. * Low Risk			0.569**	(0.050)
Parent Bachelor's Degree or Higher * Low Risk			0.352**	(0.050)
Intrinsic Occupational Rewards				
Parent less than high school				
Independence	-0.499**	(0.103)	-0.245*	(0.106)
Initiative	-2.685**	(0.093)	-2.502**	(0.096)
Advancement	0.760**	(0.052)	0.843**	(0.052)
Achievement	-3.861**	(0.091)	-3.786**	(0.095)
Autonomy	0.687**	(0.058)	0.614**	(0.062)
Prestige	0.129**	(0.003)	0.121**	(0.003)
Parent high school or some college * occupational reward				
Independence	1.257**	(0.105)	0.962**	(0.108)
Initiative	1.546**	(0.095)	1.289**	(0.099)
Advancement	-0.947**	(0.054)	-1.023**	(0.054)
Achievement	3.101**	(0.091)	2.997**	(0.096)
Autonomy	-0.539**	(0.059)	-0.455**	(0.063)
Prestige	-0.094**	(0.003)	-0.082**	(0.003)
Parent bachelor's degree or higher * occupational reward				
Independence	-0.466**	(0.104)	-0.699**	(0.107)
Initiative	2.689**	(0.095)	2.537**	(0.098)
Advancement	-1.439**	(0.053)	-1.512**	(0.053)
Achievement	3.460**	(0.091)	3.417**	(0.095)
Autonomy	-0.909**	(0.059)	-0.809**	(0.063)
Prestige	-0.123**	(0.003)	-0.117**	(0.003)
Extrinsic Occupational Reward				
% Working Full-Time	-0.044**	(0.002)	-0.046**	(0.002)
Parent High School or Some College * % Working Full-Time	0.034**	(0.002)	0.037**	(0.002)
Parent Bachelor's Degree or Higher * % Working Full-Time	0.043**	(0.002)	0.044**	(0.002)
Observations	268380		268380	

* p < .05 (two-tailed)
** p <.01 (two-tailed)

Appendix A. Linking of BPS and NSCG majors

Final Major Category	BPS Majors	NSCG Majors
Agriculture	Agriculture	Agriculture, economics
		OTHER, agricultural business and production
Agricultural Science	Agricultural Science	Plant sciences
		Food sciences and technology
		OTHER, agricultural sciences
	Architecture	Architecture/Environmental Design
Architecture		
Accounting	Accounting	Accounting
Business - Finance	Business - Finance	Financial management
Business - Business/Management Systems	Business - Business/Management Systems	Business administration and management
Business - Management/Business Admin	Business - Management/Business Admin	Business/managerial economics
		Business, general
Business - Marketing/Distribution	Business - Marketing/Distribution	Marketing research
		Business marketing/marketing mgmt.
Journalism	Journalism	Journalism
Communications	Communications	Communications, general
Communication Technology	Communication Technology	OTHER, communications
Computer Programming	Computer Programming	Computer programming
Data Processing Technology	Data Processing Technology	Data processing technology
Computer And Information Sciences	Computer And Information Sciences	Computer science
		Computer systems analysis
		OTHER, computer and information sciences
		Information services and systems
		Computer/information sciences, general
	Education - Early Childhood	Pre-elementary teacher education
Education - Early Childhood		
Education - Elementary	Education - Elementary	Elementary teacher education
		Counselor education/guidance
Education - Secondary	Education - Secondary	services
		Secondary teacher education

		Science teacher education
		Educational psychology
		Mathematics teacher education
		Computer teacher education
		Social science teacher education
Education - Special	Education - Special	Special education
Education - Physical Education	Education - Physical Education	Physical education/coaching
Education - Other	Education - Other	OTHER, education
	Engineering - Electrical	Electrical, electronics, communications engineering
Engineering - Electrical		
Engineering - Chemical	Engineering - Chemical	Metallurgical engineering
		Petroleum engineering
		OTHER, engineering
		Chemical engineering
Engineering - Civil	Engineering - Civil	Environmental engineering
		Civil engineering
		Engineering sciences, mechanics,
Engineering - Mechanical	Engineering - Mechanical	physics
		Mechanical engineering
		Aerospace, aeronautical, astronautical engineering
Engineering - All Other	Engineering - All Other	Industrial engineering
		Architectural engineering
		Agricultural engineering
		Mining and minerals engineering
		Geophysical engineering
		Nuclear engineering
		Bioengineering and biomedical engineering
		General engineering
		Naval architecture and marine engineering
		Electrical and electronic
Engineering Technology	Engineering Technology	technologies
		Industrial production technologies
		Computer/systems engineering
		Mechanical engineering-related technologies
		OTHER, engineering-related technologies

Health, Allied - Dental/Medical Tech	Health, Allied - Dental/Medical Tech	Health/medical technologies
Health/Pe/Rec(Hper) - Non-School Teacher	Health/Pe/Rec(Hper) - Non-School Teacher	Physical therapy and other rehabilitation/therapeutic services
Nursing - Nurse Assisting	Nursing - Nurse Assisting	Health/medical assistants
Nursing	Nursing	Nursing
Home Economics	Home Economics- All Others Voc Home Economics- Child Care/Guidance Voc Home Economics- Others	Home Economics
Letters	Letters	English Language and Literature/Letters
Biological Sciences	Biological Sciences	Pharmacology, human and animal Genetics, animal and plant Microbiology Ecology Biochemistry and biophysics Zoology, general Cell and molecular biology Botany Physiology, human and animal Biology, general Nutritional sciences OTHER, biological sciences
Mathematics	Mathematics	OTHER, mathematics Statistics Mathematics, general Operations research Applied Actuarial science
Leisure Studies	Leisure Studies	Parks, Recreation, Leisure, and Fitness Studies
Physical Sciences	Physical Sciences	Geological sciences, other Oceanography Physics Astronomy and astrophysics Earth sciences Chemistry Geology OTHER, physical sciences

		Atmospheric sciences and meteorology
Psychology	Psychology	Experimental
		Clinical
		Industrial/Organizational
		Social
		OTHER, psychology
		General
		Counseling
Protective Services	Protective Services	Criminal Justice/Protective Services
Social Work	Social Work	Social work
Anthropology/Archaeology	Anthropology/Archaeology	Anthropology and archeology
Economics	Economics	Economics
History	History	History of science
		History, other
Sociology	Sociology	Criminology
		Sociology
Political Science	Political Science	Political science and government
International Relations	International Relations	International relations
Arts - Speech/Drama	Arts - Speech/Drama	Dramatic arts
Arts - Music	Arts - Music	Music, all fields
Arts - Visual/Performing/Fine	Arts - Visual/Performing/Fine	Fine arts, all fields
	Natural Resources	OTHER, conservation/renewable natural resources
Forestry/Natural Resources		
	Forestry	Forestry sciences
		Environmental science studies
Area Studies	American Civilization	Area/Ethnic Studies
	Area Studies	
	African-American Studies	
	Ethnic Studies	
	Women's Studies	
		OTHER, business
Secretarial/Business Support	Business- Secretarial	management/admin. services
	Business- Business Support	
Language	Spanish	Linguistics
	Foreign Language: Non-European	OTHER, foreign languages and literature
	Foreign Language: European, not Spanish	

Applied/Com/Public Health	Health, Allied- Therapy & Mental Health	Public health
	Health, Allied- General & Other	Health services administration
		OTHER, health/medical sciences
Medicine	Health- Audiology	Animal sciences
	Health- Health Science	Medicine
	Health- Medicine	Medical preparatory programs
		Audiology and speech pathology
	Health- Veterinary Medicine	
Health- Other	Health- All Others	Pharmacy
	Health- Dietetics	
Law	Law- Para-legal (includes pre-law)	Law/Prelaw/Legal/Studies
	Law	
Liberal/ Interdisciplinary Studies	Liberal Studies	Liberal Arts/General Studies
	Interdisciplinary - Env/Biopsych/General	
		OTHER, philosophy, religion,
Philosophy/Religion	Philosphy	theology
	Religious Studies	Philosophy of science
	Clinical Pastoral Care	
	Public Administration- not	OTHER, social sciences
Social Sciences- Other	Social Work	
	Geography	OTHER, public affairs
	City Planning	Public policy studies
		Administration
		Geography
		Public administration
		Other Science and Engineering
Industrial Arts	Industrial Arts- Construction	field
	Mechanics- Transportation	
	Industrial Arts- Electronics	
	Mechanics- All Others	
	Precision Production	
	Transportation	
	Commercial Art	OTHER, visual and performing
Other Arts		arts
	Arts- Design	
	Arts- Film Arts	
	Arts- Craft/ Folk/ Artisanry	
Other Major	Consumer Services	Library Science

Cosmotology

Consumer Services
Mortuary
Textiles
Library/Archival Science
Military Sciences
Other Major

Materials engineering, including ceramics and textiles
Other Fields - Not Listed

Appendix B. Descriptives of SAT Scores Within Majors

	Choosen Major		SAT Score		Low SAT_1	High SAT
	Frequency	Mean	Mean	SD	Mean	Mean
Agriculture	7	0.15	913.08	193.11	0.29	0.43
Agricultural Science	25	0.55	987.32	213.68	0.32	0.24
Architecture	41	0.89	1023.26	195.43	0.27	0.34
Accounting	108	2.36	918.21	185.53	0.28	0.30
Business - Finance	84	1.83	987.05	165.06	0.31	0.35
Business - Business/Management Systems	38	0.83	943.02	196.45	0.34	0.26
Business - Management/Business Admin	442	9.64	916.02	177.16	0.31	0.32
Business - Marketing/Distribution	28	0.61	951.61	207.45	0.36	0.32
Journalism	42	0.92	1006.67	157.11	0.29	0.33
Communications	115	2.51	924.14	186.69	0.34	0.28
Communication Technology	24	0.52	928.85	176.10	0.29	0.42
Computer And Information Sciences	126	2.75	988.85	232.91	0.31	0.39
Education - Early Childhood	34	0.74	865.38	186.49	0.29	0.29
Education - Elementary	249	5.43	881.38	166.61	0.36	0.34
Education - Secondary	48	1.05	915.09	214.59	0.31	0.29
Education - Special	21	0.46	884.00	152.59	0.33	0.33
Education - Physical Education	35	0.76	844.32	153.07	0.29	0.31
Education - Other	38	0.83	871.88	188.78	0.34	0.24
Engineering - Electrical	40	0.87	1103.26	204.02	0.23	0.33
Engineering - Chemical	23	0.50	1049.29	208.93	0.22	0.35
Engineering - Civil	33	0.72	1099.47	196.15	0.30	0.36
Engineering - Mechanical	63	1.37	1074.06	173.62	0.30	0.33
Engineering - All Other	189	4.12	1107.61	182.99	0.30	0.33
Engineering Technology	60	1.31	973.19	217.16	0.25	0.33
Health, Allied - Dental/Medical Tech	23	0.50	830.40	172.35	0.39	0.26
Health/Pe/Rec(Hper) - Non-School Teacher	12	0.26	827.14	128.21	0.25	0.17
Nursing - Nurse Assisting	81	1.77	883.09	170.01	0.30	0.38
Nursing	48	1.05	841.54	184.37	0.38	0.31
Home Economics - All Others	32	0.70	885.90	173.63	0.34	0.28
Letters	141	3.08	1057.30	215.17	0.30	0.33
Biological Sciences	405	8.84	1031.58	202.93	0.29	0.32
Mathematics	52	1.13	1071.82	214.24	0.31	0.33
Leisure Studies	21	0.46	883.75	173.40	0.24	0.29
Physical Sciences	95	2.07	1086.38	203.46	0.27	0.37
Psychology	239	5.21	957.50	193.19	0.34	0.35
Protective Services	18	0.39	830.00	129.74	0.39	0.33
Social Work	26	0.57	842.22	201.14	0.35	0.27
Anthropology/Archaeology	28	0.61	1139.33	206.75	0.25	0.36
Economics	56	1.22	1114.41	199.51	0.27	0.36
History	86	1.88	1037.45	206.66	0.40	0.28

Sociology	64	1.40	954.35	207.42	0.33	0.28
Political Science	107	2.33	1036.61	212.11	0.29	0.32
International Relations	24	0.52	1130.37	175.84	0.38	0.21
Arts - Speech/Drama	26	0.57	979.64	203.24	0.38	0.23
Arts - Music	62	1.35	983.88	208.14	0.32	0.29
Arts - Visual/Performing/Fine	79	1.72	1004.55	202.78	0.34	0.37
Forestry/Nat Resources	23	0.50	965.83	210.05	0.30	0.39
Area Studies	20	0.44	1165.50	151.01	0.30	0.35
Secretarial/Bus. Support	30	0.65	829.70	231.85	0.30	0.37
Language	39	0.85	1117.73	212.87	0.28	0.33
Applied/Com/Public Health	177	3.86	921.40	176.61	0.31	0.36
Medicine	38	0.83	930.71	176.02	0.32	0.32
Health-Other	80	1.75	984.69	186.92	0.31	0.34
Law	77	1.68	863.45	174.74	0.38	0.30
Liberal/Intrdisc Studies	229	5.00	958.77	224.13	0.34	0.30
Philosophy/Religion	54	1.18	1017.33	214.10	0.30	0.30
Public Adm/Geography	17	0.37	1087.22	226.89	0.24	0.35
Industrial Arts	17	0.37	820.00	197.54	0.18	0.29
Other Arts	130	2.84	899.93	180.15	0.32	0.35
Other Major	15	0.33	920.63	222.28	0.27	0.27

[1] Students are considered to have a low SAT score if their SAT score is less than .5 standard deviations below the mean of that major. Students are considered to have a high SAT score if their SAT score is more than .5 standard deviations above the mean of that major.

Appendix C. Occupational characteristics within each major

	Independence		Initiative		Achievement		Advancement		Autonomy		Prestige		% Work Full Time
Major	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean
Agriculture	4.03	0.36	4.06	0.37	3.56	0.65	2.82	0.64	3.84	0.67	52.59	13.06	80.00
Agricultural Science	4.07	0.39	4.09	0.36	3.67	0.61	2.74	0.48	3.83	0.77	54.74	13.61	76.37
Architecture	3.57	0.29	4.08	0.23	4.27	0.59	2.87	0.28	3.91	0.41	65.32	12.76	85.19
Accounting	4.03	0.37	3.89	0.38	3.46	0.61	3.10	0.43	3.73	0.65	51.03	13.76	82.99
Business - Finance	3.87	0.37	4.07	0.36	3.44	0.59	3.21	0.44	3.54	0.65	51.01	14.29	83.89
Business - Business/Management Systems	4.02	0.35	4.05	0.37	3.49	0.62	3.12	0.42	3.64	0.69	52.22	13.22	82.85
Business - Management/Business Admin	4.02	0.36	4.09	0.36	3.57	0.61	3.14	0.44	3.55	0.84	54.06	13.07	78.19
Business - Marketing/Distribution	4.00	0.35	4.02	0.43	3.58	0.59	3.19	0.45	3.63	0.74	52.06	13.20	82.85
Journalism	4.03	0.30	4.19	0.35	3.78	0.58	3.20	0.41	3.73	0.62	55.03	11.11	74.50
Communications	3.99	0.33	4.12	0.35	3.70	0.66	3.09	0.40	3.70	0.68	53.11	13.30	80.42
Communication Technology	3.98	0.34	4.07	0.37	3.72	0.64	3.06	0.41	3.73	0.68	52.98	12.46	79.11
Computer And Information Sciences	4.14	0.40	4.19	0.25	3.41	0.54	3.16	0.49	3.66	0.53	63.75	9.62	90.91
Education - Early Childhood	3.95	0.33	4.09	0.37	4.07	0.58	2.91	0.28	3.84	0.52	58.31	10.71	63.17
Education - Elementary	3.99	0.31	4.09	0.32	4.10	0.57	2.88	0.24	3.85	0.45	59.86	9.85	68.03
Education - Secondary	4.02	0.32	4.15	0.31	3.88	0.78	2.92	0.29	3.67	0.75	57.85	13.02	72.30
Education - Special	4.04	0.36	4.15	0.31	4.21	0.46	2.89	0.22	3.90	0.40	61.73	8.38	77.33
Education - Physical Education	3.96	0.37	4.13	0.33	4.06	0.58	2.92	0.32	3.54	0.76	59.34	11.27	79.59
Education - Other	3.90	0.37	4.00	0.38	3.88	0.70	2.91	0.29	3.71	0.66	56.61	13.02	69.58
Engineering - Electrical	3.80	0.35	4.10	0.26	3.78	0.42	3.16	0.26	4.02	0.39	62.62	10.87	87.12
Engineering - Chemical	3.92	0.37	4.13	0.35	3.90	0.37	3.20	0.27	4.07	0.40	65.70	10.01	83.06
Engineering - Civil	3.70	0.33	3.95	0.33	3.96	0.34	3.33	0.27	4.11	0.38	65.47	8.55	86.09
Engineering - Mechanical	3.77	0.37	4.02	0.35	3.91	0.38	3.18	0.27	4.08	0.48	63.93	9.37	85.02
Engineering - All Other	3.82	0.37	4.12	0.32	3.89	0.47	3.13	0.33	3.94	0.55	62.29	10.89	82.43
Engineering Technology	3.83	0.39	4.06	0.33	3.75	0.48	3.15	0.32	3.90	0.58	61.02	11.65	88.16
Health, Allied - Dental/Medical Tech	4.39	0.20	4.38	0.18	3.05	0.85	2.71	0.22	2.35	1.00	58.03	15.41	75.46
Health/Pe/Rec(Hper) - Non-School Teache	4.28	0.29	4.29	0.20	4.44	0.57	2.95	0.24	3.80	0.48	60.31	8.98	67.29
Nursing - Nurse Assisting	4.26	0.20	4.11	0.19	4.03	0.89	2.48	0.29	3.25	1.25	64.64	18.23	76.60
Nursing	4.06	0.32	3.98	0.48	3.71	0.89	2.79	0.39	3.60	0.98	57.31	17.32	64.96
Home Economics - All Others	4.09	0.31	4.11	0.30	3.84	0.62	2.87	0.30	3.63	0.67	55.59	11.79	52.93
Letters	4.01	0.35	4.16	0.33	3.93	0.64	2.98	0.37	3.83	0.64	59.03	12.71	67.58
Biological Sciences	4.22	0.30	4.15	0.26	4.08	0.74	2.72	0.39	3.88	0.85	66.08	16.07	78.74
Mathematics	4.11	0.41	4.17	0.29	3.75	0.62	3.12	0.43	3.85	0.54	62.61	11.48	81.97

Leisure Studies	3.97	0.33	4.12	0.36	3.79	0.70	2.89	0.42	3.64	0.71	55.07	13.30	79.36
Physical Sciences	4.12	0.34	4.15	0.25	3.98	0.62	2.89	0.38	3.98	0.63	65.09	13.96	80.06
Psychology	4.01	0.31	4.20	0.30	3.86	0.64	2.94	0.35	3.85	0.71	58.96	12.71	74.82
Protective Services	3.96	0.31	4.19	0.29	3.56	0.62	2.91	0.35	3.26	0.75	51.10	11.97	83.99
Social Work	3.87	0.21	4.35	0.22	3.50	0.48	2.97	0.24	3.41	0.56	53.17	8.01	74.05
Anthropology/Archaeology	4.08	0.37	4.20	0.31	3.85	0.65	2.84	0.39	3.64	0.92	59.75	13.53	69.98
Economics	4.07	0.36	4.11	0.36	3.75	0.63	3.16	0.41	3.95	0.66	58.69	12.93	78.48
History	4.02	0.33	4.12	0.32	3.81	0.70	2.97	0.37	3.91	0.64	57.80	14.02	77.14
Sociology	3.93	0.28	4.21	0.31	3.68	0.61	2.97	0.31	3.59	0.70	54.99	11.18	74.73
Political Science	4.00	0.35	4.13	0.35	3.80	0.57	3.10	0.39	3.90	0.75	59.14	13.57	81.47
International Relations	4.01	0.39	3.76	0.53	3.39	0.79	2.92	0.49	3.78	0.73	50.17	15.46	79.30
Arts - Speech/Drama	4.03	0.38	4.11	0.35	3.85	0.73	2.95	0.43	3.74	0.69	56.45	14.21	66.81
Arts - Music	4.01	0.34	4.06	0.32	3.95	0.67	2.89	0.35	3.55	0.89	56.66	13.02	65.21
Arts - Visual/Performing/Fine	3.96	0.44	4.12	0.34	3.81	0.76	2.85	0.37	3.46	0.86	53.16	14.10	64.49
Forestry/Nat Resources	4.03	0.34	4.05	0.29	3.68	0.46	2.88	0.36	4.03	0.58	57.63	11.66	87.11
Area Studies	3.87	0.32	4.20	0.32	3.84	0.63	3.04	0.40	3.67	0.57	58.11	13.52	73.08
Secretarial/Bus. Support	4.02	0.37	4.11	0.35	3.43	0.68	3.08	0.40	3.43	0.86	50.77	14.53	80.93
Language	4.05	0.33	4.15	0.31	3.89	0.67	2.95	0.36	3.79	0.66	59.16	12.61	68.85
Applied/Com/Public Health	4.15	0.32	4.15	0.27	3.84	0.73	2.76	0.40	3.51	0.91	60.83	13.65	70.94
Medicine	4.27	0.23	4.08	0.17	4.28	0.89	2.57	0.44	4.21	0.71	66.36	20.15	77.43
Health-Other	4.11	0.18	3.80	0.23	3.92	0.71	2.34	0.44	3.79	0.48	61.79	14.91	75.43
Law	3.95	0.31	4.14	0.31	3.70	0.61	3.10	0.39	3.78	0.93	60.16	14.28	71.22
Liberal/Intrdisc Studies	4.04	0.33	4.13	0.31	3.85	0.68	2.97	0.40	3.77	0.75	58.84	14.05	71.99
Philosophy/Religion	4.01	0.33	4.14	0.35	4.12	0.70	2.85	0.37	3.89	0.93	61.13	13.17	75.33
Public Adm/Geography	3.98	0.33	4.09	0.39	3.62	0.69	2.93	0.38	3.66	0.71	51.87	15.49	76.12
Industrial Arts	3.97	0.37	4.09	0.30	4.08	0.55	2.98	0.42	3.96	0.66	64.83	13.20	82.59
Other Arts	3.91	0.47	3.93	0.46	3.80	0.71	2.88	0.38	3.04	0.88	50.22	11.73	70.00
Other Major	3.99	0.36	4.10	0.30	3.81	0.60	3.03	0.42	3.75	0.65	57.29	12.96	74.02
Total	4.00	0.13	4.10	0.90	3.79	0.26							