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COLLEGE MAJOR CHOICE: An Analysis of Person–Environment Fit

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Although recent research suggests that congruence between students and their academic environment is critical for successful student outcomes, little research has been done on student college major choice. Using Holland's theory of careers, we analyze college major choice using a multinomial logit model. We use the CIRP Freshman Survey and institutional data for three cohorts of first-year students at a selective liberal arts college to study the factors that affect college major choice, both at entry and at graduation.

KEY WORDS: major choice; Holland.

INTRODUCTION

The choice of a college major can be one of the most important decisions a student can make. The major choice determines where students will take most of their courses within an institution, thus in turn affecting much of their interactions with faculty and other students. Scholars have long understood the impact of academic majors (and departments) on students, and have concluded that they often produce quite different influences on the development of students' interests and abilities (Baird, 1988; Chickering, 1969). For example, several authors note the impact that departmental culture and climate have on student learning, satisfaction, and persistence (Cameron and Ettington, 1988; Hartnett and Centra, 1977; Pascarella, Ethington, and Smart, 1988; St. John et al., 2004). In their review of the literature, Feldman and Newcomb (1969) suggest

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that the "differential experiences in the several major fields do have impacts beyond those attributable to initial selection into those fields" (p. 193).

It seems the impact of college major choice lasts far beyond student learning and satisfaction while in college. Not surprisingly, salaries vary by bachelor degree major, but undergraduate major is also significantly correlated with job stability and job satisfaction (U.S. Department of Education, 1998, 2001). Others have found that academic major has a significant impact on career opportunities and rewards (Pascarella and Terenzini, 1991).

Gender and racial segregation between college majors is another important component of college majors. Several studies have found that the representation of women (Hagedorn, Nora, and Pascarella, 1996; Leslie and Oaxaca, 1998; National Research Council, 1991) and people of color (Leslie and Oaxaca, 1998; National Research Council, 1994) in the sciences and engineering remain substantially below their representation in the overall population. This is particularly important because some have suggested that the college major choice of women and minorities creates differential earnings, which perpetuate class differences (Hagedorn et al., 1996; Leslie and Oaxaca, 1998).

Researchers have developed an extensive body of literature on the predictors of college major choice, but it has been divided into several almost mutually exclusive areas. Many have emphasized academic ability, academic self-concept and demographic attributes of students and how these affect college major choice. Others have focused on the impact that social issues and family have on student major choice. Still others have examined the impact of student personality and political orientation on major choice. What researchers have failed to do is integrate the theories to provide a comprehensive examination of college major choice.

The purpose of this study is to integrate and test various theories to provide comprehensive understanding of student major choice. Given the larger social issues involved in college major choice, we pay particular attention to the relationship between race and gender and the selection of majors. Given this purpose, our study attempts to answer the following research questions:

1. What are the factors that predict student major choice?
2. Do race and gender affect the selection of college major?
3. Controlling for these factors, what role does personality play in college major choice?

Background

There is considerable evidence to suggest that student majors are segregated by race and gender. The representation of women (Hagedorn et al., 1996; Jacobs, 1986; Leslie and Oaxaca, 1998; National Research Council, 1991) and people of color (Leslie and Oaxaca, 1998; National Research Council, 1994) in the sciences and engineering remains substantially below their representation in the overall population. The same can be seen in the data on college majors taken from the institution in this study (see Table 1).

Some have argued that gender differences in student major choice are the result of socialization in traditional gender roles. It has been suggested that women are more likely to select majors that have been traditionally dominated by women (Jacobs, 1986; Lackland, 2001; Solnick, 1995). Researchers have explained that women tend to choose disciplines like education, nursing and English because of their female gender role orientation (Lackland, 2001).

Others (Lackland, 2001) have suggested that sex-role reinforcement is the reason for gender differences in major choice. Kanter (1993) uses the theory of proportions in social life to argue that minority status within an organization reinforces traditional roles and places constraints on women. The relatively few number of women in scientific and technical fields places tremendous pressure on the "token few" who have chosen those fields, resulting in a greater likelihood of departure. Kanter's (1993) theory of proportions can be extended to racial and ethnic minorities. People of color are not likely to choose a particular major where they are one of the few minorities present. If they do choose a major where there are few people of color, attrition is likely.

Some have also pointed to a "chilly climate" resulting in micro-inequities for women in higher education (Hall and Sandler, 1982; Sandler and Hall, 1986). Such inequities are especially marked in areas where women are underrepresented, such as science, mathematics, and technology

TABLE 1. Undergraduate Degree Majors by Race and Ethnicity

	Arts & humanities (%)	Inter-disciplinary (%)	Social sciences (%)	Life & natural sciences (%)	Total (%)
Asians	25.5	17.2	32.4	24.8	100.0
Blacks	25.7	37.9	30.0	6.4	100.0
Hispanics	27.7	24.1	44.6	3.4	100.0
Whites	36.7	15.9	29.8	17.6	100.0

(Davis et al., 1996). In such instances, the small proportions of female students in classes contribute to women feeling of a lack of belonging as learners and to their discomfort in the learning environment. Perhaps the ''chilly climate'' has an effect on major selection for women.

Theoretical Framework: Personality–Environment fit

A large body of research suggests that personality plays a critical role in college student major choice. Astin (1993) argues that students with certain personality characteristics are more likely to choose particular majors. For example, he suggests that those who rated high on a social activism scale were more likely to major in the social sciences and education. Those who had artistic inclinations were most likely to major in the fine arts, music, theater, journalism and English. Students scoring high on a hedonism scale were most likely to major in business, nursing, health technologies and secretarial studies. Leaders were most likely to major in pre-law, communications and military science. Status-striving students were most likely to major in architecture and agriculture.

Several recent studies of students have applied Holland's theory of careers (Holland, 1966, 1985) to further our understanding of the importance of person–environment fit in relation to academic major choice. The basic premise of Holland's theory is that human behavior is a result of the interaction between individuals and their environments. Applying Holland's theory, Smart, Feldman, and Ethington (2000, p. 33) suggest that students ''choose academic environments compatible with their personality types'' and in turn ''academic environments reward different patterns of student abilities and interests.'' Recent research suggests that congruence between person and environment is critical to the success of college students (Feldman, Smart, and Ethington, 1999; Smart et al., 2000). They argue, ''congruence of person and environment is related to higher levels of educational stability, satisfaction, and achievement'' (Feldman et al., 1999, p. 643).

Based on preferred activities, interests and competencies, Holland has developed six model environments that can be translated into a typology for academic disciplines—realistic, investigative, artistic, social, enterprising, and conventional (Smart et al., 2000).

- Realistic environments focus on concrete, practical activities that often use machines and tools. Outputs are often practical, concrete and tangible. Disciplines commonly associated with realistic environments are electrical engineering, mechanical engineering, and military science.

- Investigative environments emphasize activities that focus on the creation and use of knowledge. The goal is the acquisition of knowledge through investigation and problem solving. Some of the disciplines that are considered investigative are biology, mathematics, sociology, economics, and civil engineering.
- Social environments focus on the healing or teaching of others. They emphasize the acquisition of interpersonal competencies. Disciplines that are commonly associated with social environments are political science, nursing, special education, philosophy and history.
- Enterprising environments are oriented toward personal or organizational goal attainment through leadership or manipulation. They emphasize leadership development and reward popularity, self-confidence and aggressiveness. Enterprising disciplines include business, journalism, communications and computer science.
- Artistic environments are concerned with creative activities and emphasize ambiguous, unstructured endeavors. These environments encourage the acquisition of innovative and creative competencies. Arts, English, architecture, speech, music and theater are examples of artistic disciplines.
- Finally, conventional environments focus on meeting requirements or needs through the use of numbers or machines. They emphasize a conventional outlook and are concerned with orderliness and routines. Accounting and data processing are examples of conventional disciplines.

Holland's theory and the notion of student–environment fit may be a useful lens through which to study racial and gender differences in student major choice. While it is apparent that majors are segregated by race and gender, it is unclear how personality may influence the choices of women and students of color. Holland's theory also may provide some insight into the impact that personality has on the diversity of those in the pipeline for careers in science and engineering.

DATA AND METHODOLOGY

The data used in this study are three first-time, full-time degree-seeking cohorts of new students entering a selective liberal arts college in Fall 1993, Fall 1994, and Fall 1995, and who graduated within 6 years of entry. Data on student attributes and major(s) at graduation were taken from institutional databases. Students were excluded from the analysis for several reasons. First, if a student did not answer the Cooperative Institutional Research Program (CIRP) Student Information

Form during orientation, they were excluded because several of the independent variables are based on questions from the CIRP. Second, in order to keep the cohorts relatively homogenous, international students were excluded from the analysis. Third, some students were excluded because they did not answer enough of the questions used to develop scales for the independent variables. Fourth, the few students who designed their own major were not included, because their majors could not be classified into a major disciplinary category. After these exclusions, approximately 83% of each cohort is available for analysis.

Dependent Variable

Academic major(s) at graduation were collapsed into four categories for the dependent variable: arts and humanities, interdisciplinary, social sciences, and life and natural sciences. Interdisciplinary majors at the institution in this study are academic majors meant to combine aspects of both the arts and humanities and the social sciences, so they are classified into a separate group rather than coded with either the arts and humanities or the social sciences. About 35% of majors fall in the arts and humanities, 18% in interdisciplinary fields, 31% in the social sciences, and 16% in the life and natural sciences.

Independent Variables

We use six sets of independent variables to understand the factors affecting major choice: demographics, parental influence, academic preparation, future views of the academic career, political views, and personality/goals based on the Holland typology (descriptive data are provided in Tables 2 and 3; all variance inflation factors are less than or equal to 2). The first set of variables measures differences in background. We include dummy variables for *females*, *Blacks*, *Hispanics*, *Asians*, and *others* (for students indicating a racial group of Native American or 'other'). Because parents' income, father's education and mother's education are highly correlated, we constructed a *socio-economic status* factor scale constructed from these three questions on the CIRP (see Table 4).

Social capital and cultural capital, largely represented by parental influence, have a significant impact on major choice (Simpson, 2001). Evidence of this can be found in the literature on major choice. Astin (1993) found significant links between family influences and major and career choices. Students are more likely to choose business if they come from high-income families. He also found that students who chose to

TABLE 2. Descriptive Statistics for Independent Variables

Variable	Mean	SD
1. Age	18.15	0.51
2. Female	0.54	0.50
3. Black	0.08	0.28
4. Hispanic	0.07	0.25
5. Asian	0.09	0.28
6. Other race/ethnicity	0.04	0.19
7. Socio-economic status	0.00	1
8. Parental influence	1.91	0.77
9. Father's occupational status	53.71	16.85
10. Mother's occupational status	46.63	14.69
11. Private high school	0.47	0.50
12. SAT I – verbal	606.32	71.49
13. SAT I – math	652.10	75.02
14. Major uncertainty	0.00	1
15. Academic self-confidence	0.00	1
16. Left–right political views	0.00	1
17. Personality: investigative	0.00	1
18. Personality: artistic	0.00	1
19. Personality: social	0.00	1
20. Personality: enterprising	0.00	1
21. 1994 cohort indicator	0.36	0.48
22. 1995 cohort indicator	0.34	0.48

major in engineering noted a high level of parental involvement in their education. Some research has linked the attention a mother pays to a student's academic work to selection of a public service major (Simpson, 2001). *Parental influence* is taken from a CIRP question asking the student how important was 'my parents wanted me to go' as a reason in deciding to go to college, with responses on a three-point scale.

Closely related to parental influence, researchers also have found strong links between parents' socio-economic status and educational attainment (Gamoran and Mare, 1989; Heyns, 1974; Rosenbaum, 1976). Many have argued that the accumulation of social and cultural capital as a result of social class membership results in a reproduction of class structures (Bourdieu, 1977, 1986; Bourdieu and Passeron, 1977). It would therefore be natural to assume that college students are likely to choose majors where they would follow in their parents' footsteps (Simpson, 2001). To create a composite variable representing *socio-economic status*, we

TABLE 3. Correlation Matrix for Independent Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	–																					
2	−0.18	–																				
3	−0.11	0.10	–																			
4	−0.06	0.04	−0.08	–																		
5	−0.04	0.00	−0.09	−0.08	–																	
6	0.03	0.04	−0.06	−0.05	−0.06	–																
7	−0.04	−0.03	−0.24	−0.34	−0.08	−0.02	–															
8	−0.09	0.04	0.06	0.00	0.00	0.04	0.04	–														
9	0.01	−0.06	−0.15	−0.16	0.00	−0.02	0.51	0.01	–													
10	−0.04	0.04	−0.04	−0.10	−0.03	−0.01	0.34	0.00	0.25	–												
11	0.09	−0.05	0.13	0.07	−0.01	0.01	−0.02	−0.04	−0.01	−0.04	–											
12	−0.04	0.06	−0.36	−0.21	0.00	0.01	0.34	−0.05	0.17	0.05	−0.12	–										
13	−0.02	−0.14	−0.45	−0.27	0.12	0.01	0.35	−0.04	0.21	0.08	−0.23	0.49	–									
14	0.02	0.01	−0.17	−0.05	−0.07	0.04	0.14	0.02	0.06	0.07	−0.07	0.09	0.11	–								
15	−0.07	0.03	−0.01	−0.07	0.04	0.01	0.03	−0.02	0.04	−0.03	−0.07	0.19	0.14	−0.11	–							
16	0.01	0.14	−0.02	−0.07	−0.17	0.07	0.18	−0.02	0.10	0.11	0.01	0.29	0.09	0.17	0.00	–						
17	−0.04	−0.14	−0.12	−0.13	0.03	0.03	0.08	−0.06	0.06	0.01	−0.14	0.15	0.36	−0.09	0.46	−0.01	–					
18	−0.03	0.00	−0.03	−0.06	−0.01	0.06	0.14	0.04	0.06	0.04	−0.04	0.25	0.01	0.07	0.13	0.22	0.08	–				
19	−0.02	0.20	0.11	0.06	−0.03	0.02	−0.07	0.01	0.01	0.03	0.06	−0.08	−0.17	0.03	0.09	0.27	0.04	0.17	–			
20	0.00	−0.11	0.19	0.08	0.05	0.03	−0.14	0.07	−0.03	−0.08	0.07	−0.32	−0.21	−0.14	0.15	−0.23	0.24	0.04	0.22	–		
21	−0.01	0.03	0.02	0.02	−0.02	−0.01	−0.05	−0.02	0.02	−0.06	0.12	−0.09	−0.05	0.03	0.01	0.00	0.03	−0.03	0.00	−0.01	–	
22	−0.01	−0.04	−0.01	−0.02	0.01	−0.05	0.05	−0.02	0.00	0.06	−0.09	0.08	0.08	0.04	0.03	−0.07	0.01	0.04	−0.07	−0.01	−0.54	–

TABLE 4. Independent Variable Scales

Scale	Alpha	Scale items
Socio-economic status	0.73	Best estimate of parents' total income
		Father's highest level of formal education
		Mother's highest level of formal education
Major uncertainty	0.83	Best guess: change career choice
		Best guess: change major field
Academic self-efficacy	0.66	Best guess: be elected to an academic honor society
		Best guess: fail one or more courses
		Best guess: graduate with honors
		Best guess: make at least a "B" average
Political liberalism	0.75	Characterization of political views (left–right scale)
		Abortion should be legal
		Activities of married women best confined to home & family (reversed)
		Best way to control AIDS is mandatory testing (reversed)
		Courts have too much concern for rights of criminals (reversed)
		Death penalty should be abolished
		Gov't. is not doing enough to control environmental pollution
		Gov't. should do more to control sale of handguns
		Gov't. should raise taxes to reduce the deficit
		Important to have laws prohibiting homosexual relationships (reversed)
		Marijuana should be legalized
		National health care plan is needed to cover everybody's medical costs
		Racial discrimination is no longer a major problem in America (reversed)
		Sex is okay if two people like one another
		Wealthy people should pay a larger share of taxes than they do now
Personality: investigative	0.58	Goal: making a theoretical contribution to science
		Rating: academic
		Rating: drive to achieve
		Rating: mathematical ability
		Rating: self-confidence (intellectual)
Personality: social	0.73	Goal: becoming involved in programs to clean up the environment
		Goal: helping others who are in difficulty

TABLE 4. (*Continued*)

Scale	Alpha	Scale items
		Goal: helping to promote racial understanding
		Goal: influencing social values
		Goal: influencing the political structure
		Goal: participating in a community action program
Personality: artistic	0.68	Goal: becoming accomplished in one of the performing arts
		Goal: creating artistic work
		Goal: developing a meaningful philosophy of life
		Goal: writing original works
		Rating: artistic ability
		Rating: writing ability
Personality: enterprising	0.72	Goal: becoming an authority in my field
		Goal: becoming successful in a business of my own
		Goal: being very well off financially
		Goal: having administrative responsibility for the work of others
		Goal: obtaining recognition from my colleagues for contributions to my field
		Rating: leadership ability
		Rating: popularity
		Rating: self-confidence (social)

combine *mother's education*, *father's education*, and *family income*. We also include both *father's occupational status* and *mother's occupational status* in the models using the occupational prestige scores developed by Hauser and Warren (1997).

Several researchers have made a strong link between math preparation and college major choice (Simpson, 2001). Sells (1973) coined the term "critical filter" to describe the role that high school math achievement plays in the choice of scientific and technical majors. She and others (Astin, 1993; Simpson, 2001) found that success in high-level high school math courses and high math SAT scores were most likely to select scientific and technical majors in college. Therefore, we take into account a student's academic preparation using two variables. A dummy variable, *private*, measures whether the student attended a private high school. We also include the results of the *SAT I verbal* and *SAT I math* tests. Unlike Simpson, we do not have available detailed information about the number of years completed in various subject areas during high school.

Applying the work of Bandura (1986, 1997), a large body of literature points to self-efficacy as an important factor of student major choice. A student's choice of major is largely dependent on their belief that they will be successful in that major (Eccles, 1987). Although research has most often tied academic self-efficacy to success in higher education (Lent, Brown, and Larkin, 1984; Vrugt, 1994; Vrugt, Langereis, and Hoogstraten, 1997), several have found a strong link between self-efficacy and major choice. Some have linked math self-efficacy to the pursuit of a major in math (Betz and Hackett, 1983). Others (Lent et al., 1984) have linked high scientific and technical self-efficacy with choosing engineering as an undergraduate major. Astin (1993) found strong relationships between self-rated writing skills and course taking patterns and major choice. He suggested that students with high self-rated writing skills were less likely to take courses in math and science and less likely to major in engineering. To address this issue of self-efficacy, we include a factor scale constructed from four CIRP questions asking the student to give their best guess as to the chance they will be elected to an academic honor society, fail one or more courses, graduate with honors or make at least a 'B' average (see Table 4). Because the CIRP at this institution is administered during orientation just before classes start, this scale measures *academic self-efficacy* at the beginning of the college career.

Similarly, we also include a factor scale constructed from two CIRP questions asking the student their best guess that will change their major field or career choice (see Table 4). We expect *major uncertainty* to negatively affect the choice of a science major over other majors. Because science majors must follow a more structured and cumulative curriculum, it would be more difficult for a student in their junior year to suddenly decide to become, for example, a physics major, if the student does not already have a solid foundation of mathematics and lower level physics courses. Students suddenly deciding to become a social science major, on the other hand, would find an easier time completing major requirements in their last years of college. Thus, students uncertain about their major choice at the start of their college career will be less likely to major in the sciences, due to time constraints and the nature of the science curriculum.

We include two additional controls in our models. Based on Astin's (1993) research, we include a variable measuring a student's political beliefs in the model. The scale is constructed from a number of questions in the CIRP regarding political and issue beliefs (see Table 4). As our final set of controls, we include two dummy variables indicating membership in the *1994 cohort* and *1995 cohort* of incoming freshmen to control for differences in the probability of majoring in the sciences between cohorts.

To measure student personality, we use the Holland typology as operationalized by Smart et al. (2000, pp. 64–67). They used several batteries of questions from the CIRP to develop scales for investigative, artistic, social and enterprising personalities (see Table 4). We expect the investigative scale to be positively correlated with the probability of choosing a science major, the artistic scale to be positively correlated with the probability of choosing a major in the arts and humanities or an interdisciplinary major (recall that interdisciplinary majors combine aspects of both the arts and humanities and the social sciences), and the social scale to be positively correlated with the probability of choosing a major in the social sciences or an interdisciplinary major. Given that "behavioral tendencies in Enterprising environments lead ... to a deficit of scientific competencies," (Smart et al., 2000, p. 46), we expect the enterprising scale to be negatively correlated with the probability of choosing a science major.

Statistical Method

Because the dependent variable is a set of discrete nominal outcomes, multinomial logistic regression is the best statistical method for understanding why one major category is chosen over another (Long, 1997). We use a multinomial logit model with robust estimates of variance that take into account the non-independence of observations for students who double- or triple-major. Because we are particularly interested in why some students choose other majors over the life and natural sciences, this major category is used as the base category in the multinomial logit model. With this modeling choice, three sets of estimates are produced that describe:

- the probability of choosing an arts and humanities major over a science major (AH | Sci),
- the probability of choosing an interdisciplinary major over a science major (Int | Sci),
- and the probability of choosing a social science major over a science major (Soc | Sci).

RESULTS

We estimate three sets of models to understand the impact of personality on undergraduate degree major choice. The first model estimates the probability of choosing an arts & humanities, interdisciplinary or

social science major over a major in the life and natural sciences, controlling only for age, gender and race. The second model uses demographics and the variables reviewed above, excluding the Holland personality scales. The third model includes the control variables, as well as the four Holland personality scales. Table 5 presents the impact of each independent variable on the probability of choosing a major given the specified unit change.

Turning to the results for Model 1, we find gender differences in science major choice. Females are significantly more likely than males to choose interdisciplinary and social science majors over science majors. We also find racial and ethnic differences between Whites and minorities. Blacks are more likely than Whites to choose interdisciplinary and social science majors over science majors, while Hispanics are more likely than Whites to choose an arts & humanities, interdisciplinary or social science major over a science major.

Model 2 predicts college major choice while controlling for demographics, family influences, academic preparation, academic self-efficacy, and political views. After controlling for these differences, we can see that males and females are just as likely to choose a non-science major over a science major, while Blacks are still more likely than Whites to choose an interdisciplinary major, and significant differences still exist between Hispanics and Whites.

Of the additional variables in the model, academic preparation, beliefs about the major, self-efficacy and political view all consistently affect the probability of choosing a non-science major. Student with high SAT I verbal scores are more likely to choose a major in the arts and humanities, and students with high SAT I math scores are all less likely to choose a non-science major over a science major. As predicted, increases in uncertainty about the major lead to a larger probability of choosing a non-science major. As academic self-efficacy increases, students are less likely to choose a science major. We also find that political views are predictors of major choice, with more liberal students more likely to choose a non-science major.

The last three columns in Table 5 present the results of our final model, where we include the Holland personality scales as predictors of college major choice. From the percent correctly predicted for the three models, we can see that the explanatory power of the model increases with the addition of the personality scales.

Comparing the results to the results without the Holland scales, we still find differences among racial and ethnic groups, although these differences are now smaller. We also find that the impact of academic preparation is no longer significant, with the exception of private high

TABLE 5. Probability of Choosing a Non-Science Major over a Science Major

		Model 1			Model 2			Model 3		
Variables	Change	AH | Sci	Int | Sci	Soc | Sci	AH | Sci	Int | Sci	Soc | Sci	AH | Sci	Int | Sci	Soc | Sci
Age	Δ 1 yr.	0.2	2.4	3.3	−1.5	0.4	0.6	−3.2	−1.0	−1.4
Female	0 to 1	2.6	8.2**	11.1*	−3.5	3.6	5.1	−1.7	1.8	2.4
Black	0 to 1	15.4	40.2**	42.9*	15.9	30.5**	34.8	10.1	27.3**	31.0
Hispanic	0 to 1	31.6*	44.1**	45.9**	32.9*	38.7**	41.7**	27.6^{+}	33.6*	36.6*
Asian	0 to 1	−14.1**	−3.6	−5.4	−5.2	4.1	5.9	−14.4*	−1.5	−2.1^{+}
Other race/ethnicity	0 to 1	8.8	2.7	3.8	9.5	0.8	1.2	1.3	−2.5	−3.5
Socio-economic status	Δ 1 SD				4.3	1.4	2.0	0.8	0.4	0.6
Parental influence	Δ 1 SD				1.8	3.0	4.2	−0.5	2.2	3.1
Father's occ. status	Δ 1 SD				0.0	0.0	0.0	0.0	0.0	−0.1
Mother's occ. status	Δ 1 SD				−0.2	−0.2	−0.2	−0.2	−0.2	−0.2
Private high school	0 to 1				6.5	3.5	4.9^{+}	7.6^{+}	2.8	3.9
SAT I – verbal	Δ 100 pts.				12.2**	1.9	2.7	4.5	1.2	1.7
SAT I – math	Δ 100 pts.				−13.9**	−7.7**	−12.2+	−0.4	−2.0	−2.9
Major uncertainty	Δ 1 SD				5.8**	3.2**	4.6**	4.4*	2.4	3.2*

Academic self-confidence	Δ 1 SD				−4.4*	−3.3**	−5.0^{+}	−0.7	−1.9	−2.7
Left–right political views	Δ 1 SD				7.4**	10.2**	13.7^{+}	7.0**	9.6**	12.5*
Personality: investigative	Δ 1 SD							−17.4**	−9.3**	−14.2**
Personality: artistic	Δ 1 SD							25.4**	7.6**	10.0
Personality: social	Δ 1 SD							−3.6^{+}	5.0**	6.7**
Personality: enterprising	Δ 1 SD							10.8**	7.0**	9.3**
1994 cohort	0 to 1	2.8	0.6	0.9	3.1	1.4	2.0	5.6	4.2	5.7
1995 cohort	0 to 1	3.7	5.5	7.6	6.3	9.4**	12.7	5.0	11.2*	14.3*
Log likelihood		−2175.1			−2092.0			−1926.3		
% correctly predicted:										
AH		55.4			57.0			62.7		
Int		70.9			71.5			71.9		
Soc		57.9			59.2			61.4		
Sci		73.4			74.7			77.4		

Note: Coefficients are percentage-point changes in probability given unit changes listed in second column; $n = 1665$.
$^{+}p < .10$; $*p < 0.05$; $**p < .01$.

school: student who attended a private high school are more likely to major in the arts than in the sciences. In addition, academic self-efficacy is no longer statistically significant. Major uncertainty is still correlated with choosing an arts or social science major.

Two variables are consistent predictors of major choice: political views and personality. Again, students with more liberal views are more likely to choose a non-science major. The size of the coefficients remains similar to the previous model, even with the addition of the personality scales.

Turning to the personality scales, we find all four scales to be significant predictors of choosing a major in the arts, interdisciplinary fields, and social sciences over a major in the sciences. As expected, students with high scores on the investigative scale are less likely to major in a non-science field, while students with high scores on the artistic scale are more likely to major in an arts or interdisciplinary field. Similarly, students with high scores on the social scale are more likely to major in a social science or interdisciplinary field. These students are also less likely to choose an arts majors over a science major, but this coefficient, while statistically significant at the .10 level, is substantively small. We also find that high scores on the enterprising scale are correlated with a higher probability of choosing a non-science major.

CONCLUSION

In summary, we find that political views and the Holland personality scales are very strong predictors of student major choice. However, academic preparation, family influence and academic self-efficacy do not seem to matter after taking into account personality. Additionally, any gender differences observed prior to modeling are not significant after we introduced controls. Finally, racial differences remain significant even in our fully controlled models, but the differences were reduced slightly after introducing controls.

Limitations

Our study did have some limitations. First, our ability to generalize our findings to other schools is somewhat limited. All of our conclusions must be interpreted within the context of the institution studied, a highly selective liberal arts institution. However, studying only one institution does have its advantages. When using national data sets (e.g., CIRP, High School and Beyond), researchers are able to make statements about the larger population of college students, but they must

consider the impact that different institutions have on students. By studying only one institution, we were able to control for institutional effects on students.

While we were able to integrate and test many of the theories about student major choice in this study, we realize that we had some limitations in the variables we could include in our model. For example, Simpson (2001) found that cultural capital was an important factor in predicting student major choice. Our instrument did not have sufficient measures we could use to develop a cultural capital construct. Additionally, our investigative personality scale only had a reliability of .58. Similarly, because one of our measures, parental influence, was only based on a three-point scale, the impact of parental influence may have been underestimated.

Discussion

This study makes several important contributions to the literature on college student major choice. First, the Holland categories provide an excellent framework for the study of student major choice. Personality, as represented by the Holland categories, was extremely predictive of student major choice. When we account for student personalities, variables such as SAT were no longer significantly related to student major choice. We also provided additional evidence to support Astin's (1993) conclusion that political orientation is an important predictor of student majors. Even when controlling for student personalities, students with more liberal views are more likely to choose a non-science major.

Our findings add to a growing body of evidence that students in particular majors have very similar political views and personalities. Such knowledge holds important implications for colleges and universities. Student affairs practitioners, college counselors, and faculty responsible for guiding students through the college experience should seek to understand individual students' personality, values, and beliefs as they advise them on their academic major choices. Understanding the political values and personalities of individuals in a major field will provide students with a portrait of those they are likely to encounter if they select that major. Assisting students in making informed decisions about the selection of a major should promote greater student satisfaction with and success in their undergraduate experience. Holland's theory and instruments used to assess personality types (see Self-Directed Search, Holland, Powell, and Fritzsche, 1994) are useful tools in ensuring that students are satisfied and successful in their chosen academic

field. The benefits of these "wise" major choices are likely to extend beyond college.

However, knowing that diversity of ideas is an important component of the classroom dialogue on college campuses, findings from this study suggest that ideological diversity may in fact be limited in courses required of a major. In fact, Smart et al. (2000) suggests that students choose environments where certain behaviors and beliefs are supported and rewarded, which may further encourage the conformity of views. Faculty, who are central in creating distinctive academic environments that reward and reinforce their preferred patterns of interests consistent with Holland's theory (Thompson and Smart, 1999), should be aware of the homogeneity of their classrooms and work hard to provide support for alternative views. Campuses that wish to utilize differences on their campus might consider training for faculty that pays special attention to academic fields and the types of students attracted to those fields.

This study holds more important implications for the pipeline of people of color into the sciences. Table 6 shows the racial distribution of students in the sciences. We observe that only 6.4% of African Americans at the institution in this study major in the sciences. If we were to control for background characteristics and personality, 10.6% of the African Americans would major in the sciences. Differences remain, but we can see that part of the pipeline issue is personality. Similarly, only 3.4% of the Latinos in our study majored in the sciences. When we control for background characteristics and personality, that percentage increases to 6.1%. For Asian Pacific Americans and Whites, we observed only small changes when we controlled for personality and background characteristics.

Because personality appears to be a factor in minorities' decisions not to major in the sciences, it is important to understand how these personalities and ideas are formed. These results suggest that an

TABLE 6. Actual and Predicted Science Major by Race

		Predicted proportion, controlling for:	
	Actual proportion of science majors (%)	Demographics & background (Model 1) (%)	Demographics, background & personality (Model 3) (%)
Asians	24.8	18.6	22.8
Blacks	6.4	9.1	10.6
Hispanics	3.4	4.7	6.1
Whites	17.6	17.4	16.5

understanding of how students form these interests before they attend college may be the key to affecting the representation of people of color in the pipeline.

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