

The Reciprocal Relationship between College Major and Values: Family, Careers and Society

Colter Mitchell^{*}
Miles Kimball^{1†}
Arland Thornton^{1*}
and
Linda Young-DeMarco¹⁺

*Department of Sociology and
Institute for Social Research
The University of Michigan

†Department of Economics and
Institute for Social Research
The University of Michigan

⁺Institute for Social Research
The University of Michigan

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¹ All authors contributed substantially to this paper. The names are listed alphabetically after the name of the lead author to reflect the substantial contribution of each.

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Abstract

Education has long been recognized as an important influence on values. This paper considers not only college attendance, but the content of the curriculum as well. Using longitudinal data from the 1976-1995 cohorts of the Monitoring the Future study, we examine the motivating hypothesis that major in college differentially affects a wide range of values. In addition, we assess the role of values in selecting college major. We group the reported values into importance of family, importance of career, and importance of society. The analyses suggest that attending college—particularly in a humanities, social science, or natural science major—reduces students' reported importance of family. Attending college, especially in a non-business major, leads students to place more value on contributing to society. Majoring in business appears to foster career values, while not attending college at all leads respondents to rate money and steady work highly, but not other career values. At the same time, the values students come in with affect their choice of major. Placing importance on family is associated with avoiding the humanities, social sciences, education and physical sciences, or avoiding college altogether. Career values are associated with choosing a business major, while being concerned about society seems to discourage students from choosing business, vocational and office majors.

Introduction

Education has long been considered one of the most important arenas of socialization and a leading force behind social change (Cleland 2001b; Hyman and Wright 1979; Jejeebhoy 1995; Pallas 2000; Thornton 2005). Theorists in multiple fields have outlined numerous reasons why schools and educational attainment would affect a wide range of human values and behaviors, including earnings, wealth, family behavior and processes, interpersonal relationships, religion, and values about the universe, family, social relations, freedom, and equality. In addition, numerous empirical studies around the world consistently show that educational attainment is strongly related to these central dimensions of human life.³ This research consistently shows that higher levels of education are associated with greater emphasis on individuals and their achievements and less emphasis on families, marriage, and intergenerational relationships. More educated people also tend to be less restrictive concerning divorce, cohabitation, premarital sex, unmarried cohabitation, and childbearing outside of marriage. Similarly, educational attainment is positively associated with greater emphasis on careers, financial achievement, leadership, community service, and fulfillment.

Although there are multiple avenues through which school attendance and achievement can influence human behaviors and values, one of the most important is the role of education as a conduit distributing, legitimizing, and endorsing new ideas and views of the world (Meyer 1977; Pallas 2000; Stevens, Armstrong and Arum 2008). After all, unlike many other institutions producing change, schools are explicitly designed to provide students new information about the world—including new theories and ways of viewing the world (Thornton 2005). Schools are also

³ Alwin 1991; Axinn 1993; Axinn and Yabiku 2001; Barber 2004; Bledsoe and Cohen 1993; Caldwell and Caldwell 1997; Cleland 2001a; Cleland and Wilson 1987; Feldman and Newcomb 1969; Ghimire et al. 2006; Heaton and Forste 1998; Hill and King 1993; Inkeles 1969; Inkeles 1974; Jejeebhoy 1995; Jennings 1993; Kahl 1968; King and Elder 1998; Pascarella and Terenzini 1991; Pascarella and Terenzini 2005; Phelan et al. 1995; Price and Hsu 1992; Quillian 1996; Schultz 1993; Thornton 2005.

explicitly designed to provide students literacy, numeracy, and other cognitive skills that permit them to engage the larger world more fully after they complete their formal educations. Thus, compared to the less educated, the well-educated have greater access to new ideas and perspectives that can shape world views and beliefs later in life. Therefore, it should not be surprising to find schools and educational attendance to be key modes of spreading new ideas.⁴

Of course, the educational experience, especially at the college level, is not a homogeneous one. Colleges are heterogeneous organizations providing an extraordinary range of experiences and influences for their students (Pascarella and Terenzini 1991; Pascarella and Terenzini 2005). Colleges provide major courses of study ranging from music to anthropology, from engineering to history, from biology to sociology, from business to English, and from physics to the humanities. The primary philosophies, world views, perspectives, and emphases of these various fields of study vary widely, with the consequence that student exposures to various streams of thought and influence can be very different. We believe that differential exposure to various philosophies and perspectives will have fundamentally different influences on the attitudes, beliefs, values and identities of young people as they experience college and incorporate their college experiences into their worldviews. Our objective in this paper is to study the effects of college major on values concerning family, careers, and society. One of the complications in studying the effects of college major on values is that values can themselves affect the choice of whether to attend college and the field of study in which a student majors. In other words, values concerning family, careers, and society are not just inert elements molded by schools and other social institutions, but are also active forces influencing decisions and experiences concerning the post-high school experience. Therefore, a study of the effects of

⁴ Of course, education is also important in maintaining aspects of social continuity as well as social change. Educational policy often specifically aims at inculcating certain civic attitudes, such as patriotism, generation after generation.

college major on values must address the effects of values on college attendance and college major as well. This is just as well, since the effects of values on college major are of great interest in their own right. In particular, there have been important theoretical debates over the influence of attitudes, beliefs and values on individual decisions and behavior (Hitlin and Piliavin 2004).

In our efforts to study the reciprocal influences of college major and values concerning family, careers, and societies on each other, we are fortunate to have access to a unique data set, the Monitoring the Future Study. The Monitoring the Future Study is particularly valuable for our purposes because it has been interviewing high school students about their experiences, attitudes, beliefs and values since 1975. Every year, Monitoring the Future draws a large and representative sample of high school seniors in the United States. Beginning with the class of 1976, a randomly-selected sample from each senior class has been re-interviewed bi-annually after high school on a continuing basis. At each interview students are asked a wide range of questions about their attitudes, beliefs and values concerning family, careers, and society. In each of the follow-up interviews information is obtained about college attendance and program of study. Thus, this panel study permits in-depth examination of college experiences and their reciprocal relationship to values concerning several important dimensions of life.

Higher Education and Values

There is a long-held and empirically confirmed relationship between values and attitudes and education (Feldman and Newcomb 1969; Pascarella and Terenzini 1991; Pascarella and Terenzini 2005; Rudolph 1962). Pascarella and Terenzini (1991: p269) write “there can be little doubt that American colleges and universities are and have been deeply concerned with shaping the attitudes, values and beliefs of their students,” (see also Pallas 2000; Sayer, Wright and Edin

2005). Despite this research focus, it should also be noted that the nature of the relationship between college experience and values is hotly contested (Hyman, Wright and Reed 1975; Phelan et al. 1995). In fact, the estimated effects of education on values are often confusing (Phelan et al. 1995; Sayer, Wright and Edin 2005) and even appear contradictory between and within studies (Feldman and Newcomb 1969; Pascarella and Terenzini 1991; Pascarella and Terenzini 2005; Sayer, Wright and Edin 2005).

One important reason for this confusion is that over the last several decades, demand for higher education in the U.S. has increased the number and types of pathways and institutions of higher education, thus inducing variation in the analytical meaning of the number of years of education and educational attainment (Stevens, Armstrong and Arum 2008). Therefore, differences in the higher educational experience may now be as informative as overall participation in college in understanding the variance in values. In addition, recent reviews of the higher education literature suggest that sociological researchers have typically let other social sciences such as education, psychology and anthropology examine the time between entrance and exit of college, while they focus on research outside of that time period (Stevens, Armstrong and Arum 2008). Nevertheless, sociological theory may provide unique insight into the college experience itself.

The number of possible aspects of higher education that may be related to values is numerous. Pascarella and Terenzini (1991, 2005) divide these aspects into two groups: between college and within college differences. Between college differences include characteristics of the college or university such as: size, selectivity, curricular emphasis, diversity, etc. Although we do not consider the effect of type of higher education institution students attend in this paper, we note that Newcomb and his colleagues were some of the first scholars to examine the effects of

college on values—in this case the effects of attending an innovative elite college (Alwin 1991; Newcomb 1943; Newcomb et al. 1967). However, research examining the effects of “between college” differences on values has not been particularly large, especially over the last two decades.

Following Pascarella and Terenzini’s (1991, 2005) list, within college differences include extracurricular activities, service learning programs, peer and faculty interactions and college major. The literature relating these measures to variance in values has grown over the past several decades. Nevertheless, the application of sociological theory and sophisticated data and methods is still relatively rare. We focus on academic major and its relationship to a broad set of values about family, careers and society with college major.

College Major

Within the higher education experience, college major, or academic discipline, emerges as a primary candidate for understanding the causal relationship between higher education and values. Academic disciplines have formed through various pathways, leading to different methods, intellectual emphases, and priorities, even beyond the subject matter differences (Abbott 2001; Light 1974). Most work on college major has focused on two main components: 1) faculty and their instructional content and 2) the students within the major (Smart, Feldman and Ethington 2000). These two groups of influence are particularly important for the study of values, as we would expect both to influence what draws people to a major as well as influencing their values. However, we will not examine the specific mechanisms for how college majors are related to values, other than to acknowledge that both are likely to be important causal channels.

The literature on college major suggests that there are important differences between academic disciplines (Braxton and Hargens 1996). However, it is important to note that most

work proposing and examining the many possible dimensions of academic majors use data gathered on faculty, and few of these theories have been applied to students (Smart, Feldman and Ethington 2000). One notable exception is the application of Holland's (1966; 1997) theory of personality and academic majors to college students—which we will discuss in more detail later (Feldman, Ethington and Smart 2001; Feldman, Smart and Ethington 1999; Pike 2006; Porter and Umbach 2006; Smart and Feldman 1998; Smart, Feldman and Ethington 2000; Umbach and Milem 2004). Nevertheless, we expect college major to have an important relationship with students' values toward family, career and society.

College Major and Values

An extensive literature documents important correlations between the major of a student and that student's attitudes, beliefs and values. A consistent theme in the literature is that students majoring in business, management, accounting, and other related disciplines, place a higher value on occupational success, the making of money, and the goals of industry, compared to other academic majors (Duff and Cotgrove 1982; Easterlin 1995; Easterlin and Crimmins 1991; Jennings 1993; Leppel, Williams and Waldauer 2001). The research of Easterlin and Crimmins (1991; also see Easterlin 1995) even suggests that trends in the college majors chosen by students in the 1970s and 1980s are directly related to the values students place on economic success. Business majors also tend to place less emphasis than do other majors on freedom, empathy, protecting the environment, finding personal fulfillment, performing community service, fostering equality, and correcting social injustices (Bécares and Turner 2004; Jennings 1993; Shiarella and McCarthy 2000; Sidanius et al. 2003). In fact, the reputation of business majors for placing emphasis on material success and downplaying social and environmental responsibilities has led some business colleges to explicitly introduce social responsibility and

community service into their curriculums (Hogner 1996; Kolenko et al. 1996; Ridener 1999; Zlotkowski 1996).

Majors in the social sciences and humanities are also frequently identified as having distinctive values. For example, they tend to place more emphasis on the environment, an attribute shared by those majoring in biology (Ewert and Baker 2001; Hodgkinson and Innes 2001). They also tend to place more emphasis on egalitarianism, tolerance, and freedom and less emphasis on business (Biddle, Bank and Slavings 1990; Duff and Cotgrove 1982; Jennings 1993; Sidanius et al. 2003). Psychology and nursing students have been reported to be higher than others on empathy (Bécares and Turner 2004).

Despite use of cross-sectional data, the literature on college major and values is based on causal models that link values and educational attendance through mechanisms that operate over time (Pascarella and Terenzini 1991, 2005; Pallas, 2000). Our theoretical foundation for understanding the effects of college major on attitudes and values, therefore, also builds on the large literature on the effects of college on students' attitudes and values.

Considering the attention given to the effects of secondary education, it is not surprising that there are multiple theories to explain the effects of education on a wide variety of outcomes (Pallas 2000; Pascarella and Terenzini 1991; Pascarella and Terenzini 2005). Two recent reviews of the literature on the effects of higher educational attainment (Pallas 2000; Stevens, Armstrong and Arum 2008) organized these theories into three groups: socialization, allocation and institutional theories. Interestingly each theory tends to emphasize different directions of causation, although most acknowledge both directions. Socialization theories focus on the effect of education on values, while allocation theories typically imply that values determine college majors. Finally, institutional theories imply both directions of causality. In the paragraphs that

follow, we briefly discuss the implications of the socialization and allocation theories for understanding the relationship between college major and values about family, careers and society, and summarize the associated literature.

Socialization

Higher education socialization theories—or as Stevens et al (2008) label them, “incubator” theories—generally suggest that through interaction with faculty, fellow students, ideas and evidence, individuals experience a change in skills, beliefs and even behavior (Knox, Lindsay and Kolb 1993; Pallas 2000). Regardless of major, and net of other important variables, research examining the socializing effects of education on values toward family, career and society find that, in general, support for marriage and family is high among all education groups, but that attending college decreases students’ ratings of the importance about providing opportunities for their children (Knox, Lindsay and Kolb 1993; Sayer, Wright and Edin 2005). College attendance also appears to decrease the importance of financial success but increases the importance of advancement opportunities and influence within the job (Astin 1993; Johnson 2002; Knox, Lindsay and Kolb 1993) Attending college increases civic and community activities, concern about others, and social activism (Knox, Lindsay and Kolb 1993; Rhee and Dey 1996; Sax 2000). In fact there is substantial evidence of socialization due higher education (Feldman 1969; Pascarella and Terenzini 1991; Pascarella and Terenzini 2005).

Similarly, we might expect that interaction with different types of faculty, fellow students, ideas and evidence may produce different changes in skills, beliefs and behavior (Feldman and Newcomb 1969; Guimond 1999; Smart, Feldman and Ethington 2000). More specifically, different groups of majors (i.e. social science, natural science, business, etc) may

differentially influence changes in values through interaction with discipline-specific material and people while taking courses within those areas.

The literature on socialization due to college major is by far the largest of the three theories, and might also be the most confusing. Feldman and Newcomb (1969) devoted an entire chapter to reviewing the effects of college major and concluded that college major has an important socializing effect on values. However, most of these studies were not longitudinal and therefore conflate factors influencing selection into majors and the effects of being in a major. Later reviews by (Pascarella and Terenzini 1991; Pascarella and Terenzini 2005) suggest that when research methods improved, there was surprisingly limited evidence for college major socialization. Sax (2000) found that engineering majors have significantly lower levels of commitment to social activism compared to other college majors. Other studies found social science majors are more socially concerned (Pascarella and Terenzini 1991). In relation to values about the family, research on the effects of college major is essentially nonexistent.

One particularly relevant study is Knox, Lindsay and Kolb's (1993) analysis of NLS-72 data. Using several questions, asked during the respondent's senior year in high school, they estimate the effect of being in a business major, education major, or arts and sciences major on respondent's answers to the same values questions 14 years later, in 1986. This is the most complete study of values using a broad classification of college major. After controlling for 1972 values as well as several other characteristics they find no significant effects of the three broad major groups on the 1986 values they studied, and conclude that college major has little or no socializing effect on values about family, career and society.

We argue that two important limitations of Knox, Lindsay and Kolb's (1993) work reduce the strength of this conclusion. First, Smart, Feldman and Ethington (2000) point out that

one reason for this lack of an important estimated effect is that very broad categories of majors may not provide an accurate measure of the socializing agents in higher education. Their solution was to borrow from Holland's (1997) theory of personal and personality environments in college disciplines to regroup college majors into 6 environments related to the 6 personality types (Realistic, Investigative, Artistic, Social, Enterprising and Conventional). They find that students with personalities congruent with their major environment increase in that trait. That is, artistic students in artistic majors become more artistic, what they call an accentuation effect, or at least maintain their initial level, whereas artistic personalities in non artistic majors experience a decline in their artistic score. We agree that using broad categories of majors obscures differences and that a more finely grained grouping is essential. As we discuss below, we use 10 major categories. We argue that this is a detailed enough categorization to separate majors into similar socialization types without running into the within major heterogeneity problems addressed by Abbott (2001).

A second limitation of Knox, Lindsay and Kolb's (1993) study is that they use a model that may reduce the effect of college major on values by allowing too much time for intervening effects on value change to occur (Singer and Willett 2003). That is, by using a value measured 14 years after the initial value, and possibly 8-10 years after finishing college, they reduce the chance of finding an effect. The number of other events likely to have occurred in the intervening years may substantially raise the standard errors of the estimates. In addition, regression to the mean after college is completed may erode the magnitude of the effect before the second observation, leaving no evidence of effects on key attitudes during the intervening years when young adults make many key life decisions. In general, using only two widely spaced points in time makes the study of change more difficult (Singer and Willett 2003). As we discuss

more fully later, we improve on this by incorporating several years of data and shortening the time between major and value to two years.

Allocation

If socialization models theorize how college changes values, then allocation, or “sieve,” theories may be described as reversing the causal direction with values predicting change in college behavior (Stevens, Armstrong and Arum 2008). The general idea is that the interaction between characteristics of the students and characteristics of the educational institutions (including the people within the institution) sorts students into different niches in the educational system. For example, these theories have been used with great success in describing the roles of social backgrounds and psychological attributes in education attainment. Some theories emphasize choices by the students, while others emphasize choices by the institutions (Pallas 2000; Smart, Feldman and Ethington 2000).

In the case of college major, allocation theories suggest that students evaluate academic majors, in part, based on how their values and goals would be accommodated and fulfilled. Thus, students would prefer college majors that promote similar values and goals as their own, and contains students who resemble themselves (Apostol 1970; Holland 1966). Allocation theories with more emphasis on institutional control would suggest that certain majors would encourage students with congruent values to enter the major and discourage those with incongruent values from entering the major.

Some studies using complex panel data that have attempted to evaluate the reciprocal causation between college major and attitudes, beliefs and values (Bécares and Turner 2004; Biddle, Bank and Slavings 1990; Duff and Cotgrove 1982; Ethington and Wolfle 1988; Guimond 1999; Jennings 1993; Sidanius et al. 2003; Thistlethwaite 1973). That research uniformly

documents the existence of correlations between major and values very early in the college experience. In fact, there is some evidence suggesting that such correlations have their roots back in high school or even earlier. These early correlations are often interpreted as reflecting evidence of values influencing the choice of a major. If this interpretation were correct, values would be the active causal force (rather than college major) producing the correlation between major and values. However, this interpretation is speculative since it provides no evidence for the actual causal connections that produced the early college correlation.

More direct causal theories about values and attitudes affecting college major have centered around Holland's theory of personality and college environment (Holland 1997; Huang and Healy 1997; Smart, Feldman and Ethington 2000). Huang and Healy (1997), for example, found that freshman who expressed a desire to be "very well-off financially" tended to be in Conventional and Enterprising majors (which primarily consist of business and finance majors) in Holland's typology. They also found that people who desire to help "others who are in difficulty" were more likely to be in Social majors (a mix of some social science, education, health and humanities majors). Smart, Feldman and Ethington (2000) find that Holland's personality typologies, as measured in a student's freshman year, not only correlate strongly with freshman college environment (as classified by Holland), but predict college environment four years later. Although based on cross-sectional data, another recent study found that students with Holland's Investigative personality type are more likely to be in a science major, and having the social personality type is correlated with being in a non-science major (Porter and Umbach 2006).

To date, confidence in the role of values in predicting college major has been based on the lack of evidence for the socialization effect of college major on values (Pascarella and

Terenzini 2005). Other research has used the evidence of correlations between college major and values early in the higher education experience as evidence of selection or allocation theories (Biddle, Bank and Slavings 1990). Even the evidence that shows some longitudinal effect has been evidence that personality types predict specific environment types. However, the personality types do not cover the values we are addressing, and the environment types do not use the more standard college major classifications available to most sociologists. In fact, in order to classify college majors into Holland's 6 environments requires collecting department level college major information. Finally, these studies typically look at only one cohort as it moves from its freshman to its senior year, with no information before or after those years. In our analyses we will address each of these issues by examining the causal effect of values about family, careers and society on the standard classification of college major by using longitudinal data from several cohorts of high school seniors.

In light of this review of the theoretical and empirical literature on college major and values, our paper makes three important contributions to the field. First, we argue that college major has an important reciprocal causal relationship with values. We suggest that without considering both sides of the causal direction the evidence is confusing and misleading. Until recently researchers had only limited use of longitudinal data on both education and values (Johnson 2002; Pascarella and Terenzini 2005). Without longitudinal data researchers cannot differentiate the causal effects of values on education from the effect of education on values (Ajzen and Fishbein 2005; Olson and Stone 2005). This results in a lack of understanding, or in some cases, the oversimplification, of the reciprocal relationships between education and values. In particular, without longitudinal data, it is easy to overlook important "maintenance" effects of education, mistaking them for selection effects (Feldman and Newcomb 1969). To address this

issue we use longitudinal data and estimate both causal directions. As we mentioned above, we use a unique data set that follows young adults from the senior year in high school through the young adult years. These data allow us to evaluate changes in both majors and values during the college years.

A priori, there is some reason to think that causality might run both ways between majors and values. In America, students are not randomly assigned to a major, but choose it on the basis of their goals and interests. Students also probably have some ideas about the extent to which the underlying philosophies and approaches of a major and the occupations it leads to match their own values and beliefs. Furthermore, the college experience provides substantial additional information about majors. Some students who initially decide upon a major become disillusioned with it and decide to change their major in mid-stream. We test the hypothesis that values influence the choice of college major by relating current levels of values to subsequent decisions about college majors.

It also seems plausible that that students will experience a change in, or maintenance of, values. We understand that several factors may affect this change, and that the change we observe in college may be due to events or characteristics that existed before entering college. For this reason we examine the effect of college experience on values while adjusting for possible latent change already occurring. Similarly, we improve on previous research by looking at the size of effects both at 3-4 years out of high school and 5-6 years out of high school.

The second contribution of this paper is our measure of college major. Previous research has tended to use very broad classifications (with 2-5 majors). By using 10 major categories we gain additional leverage for finding possible differences between majors while avoiding the issues that would arise from having too finely grained a division of academic major (Abbott

2001). Abbott's conclusion that academic disciplines tend to be more heterogeneous within disciplines than between disciplines suggests that college major may be a false classification. On the other hand, Abbott examined specific disciplines (i.e. sociology, economics, etc) not broad groups (i.e. social sciences) which may be large enough to accentuate between major differences over within major differences. Similarly, although Holland's classification system of college environments has proven useful in personality studies, it is specifically designed for that purpose, and it requires very detailed initial measures, which researchers categorize into the 6 larger environments. We believe using standard measures of college major best relates our study of values to the larger work on college majors.

Although we believe that the comparison of the values of people following different courses of instruction will provide useful information on the effects of college attendance and curriculum, we also recognize that these cross-major comparisons will provide an underestimate of the overall influence of college attendance. The reason is that virtually all college students are exposed in some degree to ideas not as easily encountered outside of college. Many colleges have a common core curriculum that everyone takes. It is also fairly common to have distribution requirements, with the explicit purpose of ensuring a broad education in many different disciplinary traditions. There are also campus-wide speakers that draw students from a wide range of majors. In addition, dormitories, extracurricular activities, and innumerable peer interactions informally distribute what is learned in one area across the entire campus. In practice, this mixing should make the differences across majors less marked. However, we believe that this mixing is unlikely to totally remove the influence of college majors on important values.

Our third contribution is to use three broad sets of values. We add to the work on attitudes toward careers and society primarily by improving the measurement of major and by improving the longitudinal methods used. However, there is almost no work on the effect of college major on family values or attitudes. We also provide some of the first work on the effects of these values on college major and attendance. Using three different sets of values not only allows us to contribute to three areas of research, but also provides a larger test of our hypothesis that college major and values are reciprocally related.

Our basic research strategy begins by using the information gathered from high school seniors to provide baseline levels of family, career, and community values at that point in the life course. Then, we follow the students over the subsequent years of the transition to adulthood and examine how their values change. We are particularly interested in the ways in which changes in values vary systematically by experiences in college. In particular, we examine how changes in values over an interval of time are affected by educational activities we see students enrolled in at the beginning of that interval. We also consider the ways in which values influence subsequent decisions about college major.

Data and Methods

Our investigation of the reciprocal influences of education on values concerning family, careers, and society relies on data from the Monitoring the Future Study (MTF). Each year since 1975 MTF has interviewed approximately 16,000 high school seniors in the United States using a multistage sampling strategy (Bachman, Johnson and O'Malley 2000). Each cohort is nationally representative of high school seniors in the coterminous United States, and includes students that attend both public and private schools. Beginning in 1976 and every year thereafter, a subset of approximately 2400 students has been drawn from the high school senior sample

(using stratified random sampling procedures) and asked to participate in follow-up studies. These mail-in follow-up surveys update demographic information and replicate the attitudinal and behavioral measures originally collected during the high school contact. The first reinterview for one-half of the sample takes place one year post-high school and the first reinterview for the remaining 1200 students occurs two years after high school graduation. The entire panel subset is then reinterviewed every two years starting from the initial one or two year post-high school contact. This every-other-year strategy continues until respondents reach 35 years of age; thereafter individuals are surveyed once every 5 years. The overall design yields a longitudinal panel data set rich in demographic, behavioral, and attitudinal measures that make it possible to examine changes in these measures over time.

The baseline interview takes place at the high school, and follow-up interviews are done primarily via mail or occasionally by telephone. Every interview contains an identical set of core demographic measures asked of all sample respondents. In addition, at the baseline interview each respondent is assigned one of six sets of attitudinal modules that are repeated throughout all years of study participation. The follow-up samples are considered to be self-weighting.

--Table 1 here--

The high school survey, plus each follow-up interview, asked the young men and women to rate various aspects of life on a four-point importance scale, with "not important" on the left side of the scale, and "extremely important" on the right side. These measures included the importance of marriage and family life, the importance of dealing with social issues and purpose in life, the importance of personal career goals and material aspirations, and several additional themes. Of the 14 questions asked, we focus our analysis on nine measures, which we group into three subgroups of three. Under the heading of "Family" we list "having a good marriage and

family life,” “being able to give my children better opportunities than I have had,” and “living close to parents and relatives.” Under the heading of “Career” we list “being successful in my line of work,” “having lots of money,” and “being able to find steady work.” Under the heading of “Society,” we list “making a contribution to society,” “working to correct social and economic inequalities,” and “finding purpose and meaning in life.” Although “finding purpose and meaning in life” does not explicitly mention society, finding purpose and meaning is often a matter of identifying something to do that one feels will make a difference to society or one’s fellow human beings. For example, one might find meaning and purpose in art. For many people, at least part of the pleasure in creating art has to do with the idea that others might also take pleasure in one’s creation. More importantly, we suspect that encouragement and exhortation to find meaning and purpose in life are often accompanied by a recommendation of altruistic meanings and purposes.

The debate on what is and what isn’t a value is well documented (Hitlin and Piliavin 2004; Joas 2000). For the most part, our measures are in line with Schwartz and Bilsky’s (1987, p. 551) definition that “values are (a) concepts or beliefs, (b) about desirable end states or behaviors, (c) that transcend specific situations, (d) guide selection or evaluation of behavior and events, and (e) are ordered by relative importance.” One possible violation is that within our set of questions some may more easily be classified as attitudes. Typically the major difference between values and attitudes is that values tend to be evaluations of vague ideas (i.e. autonomy, equality, freedom, etc), while attitudes evaluate specific issues or objects (i.e. illegal immigration, recycling, stem cell research, etc) (Eagly and Chaiken 1993). Our questions are not nearly as specific as most attitudes but are also more specific than the values mentioned above.

Thus, since some of our questions appear to straddle the line between values and attitudes they may be more correctly seen as goal- or value-expressive attitudes (Maio and Olson 2000).

A second concern with our measures is that they are ratings and are therefore do not order the values by relative importance—part of Schwartz and Bilsky's (1987) definition. Also, the use of rating scales tends to induce positive correlations between items asked together (Alwin and Krosnick 1985). This could be due to assimilation effects of reporting (Tourangeau, Rips and Rasinski 2000), where the response of the first answer sets a precedent for the following questions. Ratings also tend to be susceptible to response styles, that is, some people may tend to agree to things more often or are more likely to give extreme answers (Alwin and Krosnick 1985).

To adjust for the possibility that some respondents will have these effects operating on their responses, we transformed each individual importance response to represent its level of importance relative to the respondent's mean score of all importance measures in the series. Consequently, instead of analyzing an absolute score, we analyze the importance of a particular item relative to the mean importance of all 14 items. (This is the only use we make of the other 5 questions in the series.) In essence, this standardizes their response patterns, and eliminates effects due to response styles and assimilation effects on reporting⁵. It also forces each measure then to be a measure of the order of the value relative to the other values measured, thus fulfilling Schwartz and Bilsky's (1987) requirements for a value.

This transformation of the values from absolute to relative not only changes the substantive interpretations, but also has statistical implications. Table 1 provides the initial and

⁵ All analyses were also conducted using the raw, interval 4-point scale. The estimates change little if we use difference estimations techniques (Muthén and Muthén 2006), and we found no substantive differences. In fact, due to the issue of positive correlation in saying everything is important, we believe the adjusted scores to be more conservative, if not more accurate measures of the value.

3rd follow-up means for all nine value statements as well as their adjusted means and the changes in those means and adjusted means over the entire period of analysis. The absolute values have 4 possible order categories and a range of 3, while the relative value scores are more continuous with a range of closer to 4.8. So while the adjusted mean is substantially smaller than the absolute mean, the standard deviations are typically similar. Also, by looking at Table 1, one can see that absolute changes and relative changes are not necessarily of the same magnitude or even in the same direction. We want to capitalize on this difference by focusing on the relative changes in the value over time.

Although we organize several of the values under the headings of family, career and society, we do not believe these values form a cohesive scale or latent factor. For example, although the three family values all relate to the family, each one touches on a very different aspect of family life. Whereas “having a good marriage and family” is a general value statement, “living close to parents” may relate to work, family and housing opportunities. Similarly, “give my children better opportunities” clearly has a family aspect, but it also deals with issues of class and social mobility. In sum, we believe the measures do not form theoretically clear latent constructs, and thus the value headings are used only as an organizational technique to streamline the paper.

Another obvious limitation of our analysis is that, ultimately, we cannot distinguish variation in genuinely held values from variation in styles of self-presentation in relation to values. However, the fact that respondents admit with substantial frequency to illegal drug use on this survey gives us some expectation that they will be honest about the much less charged topic of what they think is important in life. Even in the worst case in which the data reflect primarily styles of self-presentation, these styles are themselves important.

An important factor in the interpretation of these questions about what is important is that a high value on money, for example, might reflect either an underlying difference in preferences or simply a lack of money. We expect that, to the extent respondents achieve what they value, they will have some tendency to take that objective for granted and report a lower level of importance. This interpretive principle of satiation or “taking an achieved objective for granted” is particularly apt for those things that a young adult could reasonably achieve during the college years or soon after. Taking for granted an already achieved goal is less likely to be relevant for the values concerning family, careers and society that we focus on, since many of these would typically require many years to achieve. Of the nine measures we focus on, the ones most likely to be achieved quickly and then taken for granted are “being able to find steady work,” and “living close to parents and relatives.” In addition, “being able to give my children better opportunities than I’ve had,” involves an explicit comparison to one’s own material circumstances. Therefore, we would expect people to put a higher value on giving their children “more” if they feel they have not had enough.

Our analyses control for the year of initial survey, (5 year cohorts with the oldest group -- those originally interviewed from 1976 through 1980 -- as the omitted reference group), region (Northeast-23%, South-29%, and West-17%, with Midwest-31% as the reference group), gender (female-57.2%), race (Black-6.2%), parental education (13.2 years), and religion, (Catholic-30%, conservative Protestant-22%, unaffiliated-12%, other-14%, with mainstream Protestant-22% as the reference group).

Our analyses required respondents to have had their first recontact interview no later than two years after high school graduation, and to have had a minimum of three sequential follow-up interviews. The sample was also restricted to those supplying four full sets, (i.e. no missing data),

of importance data—at the high school contact as well as during the next three follow-up surveys. In addition, respondents were required to provide valid post-secondary education status data at the first follow-up in order to remain eligible for these analyses. With these restrictions, the sample we use in our research includes 4173 individuals originally interviewed between 1976 and 1995.⁶

At each follow-up survey, Monitoring the Future asked those in school to categorize their current major into the following 12 categories: not attending secondary education, office and clerical, vocational and technical, biological sciences, business, education, engineering, humanities and fine arts, physical sciences and mathematics, social sciences, other academic fields, and academic, but undecided about which major field. For the purposes of our analyses we collapse office and clerical and vocational and technical into one vocational/office group, and we also combine “other” majors and undecided into one group (which primarily consists of undecided majors). As expected, the sizes of these majors change somewhat overtime, but not dramatically at this level of classification. That is, based on the last major recorded 20% of the sample had never attended college and the other categories were as follows: office/vocational-9%, biological sciences-4%, business-16%, education-7%, engineering-6%, humanities and fine arts-5%, physical sciences and mathematics-3%, social sciences-8%, other/undecided-23%.

Our objective is to investigate both the influence of college major on values and the effects of values on choice of college major. We now turn to describing our approach in analyzing the effects of college major on values and then we present the results of those analyses. After that we move to our approach in examining the effects of values on the choice of major and the accompanying results.

⁶ The number of cases available for analysis was also restricted by the fact that only one-sixth of the original sample was asked the set of values questions of interest to this project.

The Effect of College Major on Values

As mentioned above, our basic strategy for identifying the effects of college major on values is to follow individuals across time and see how changes in values are associated with previous school enrollment and choice of major. Latent growth curve models allow us to separate trajectories over time using repeated measures (Bollen and Curran 2006; Singer and Willett 2003). We model change for each individual, beginning with his or her values in the senior year of high school and ending at the third follow-up interview (5 or 6 years after high school). Figure one provides a visual representation of our model. Three latent factors, the intercept (α), the linear slope (β_1), and quadratic slope (β_2), represent the growth over time. Controls are used to predict the growth curve, while college major provides time varying adjustments to the scores, conditional on the growth curve. Thus, for individual i at year since high school t , their value score is determined by Equation 1.

$$\text{Value}_{it} = \alpha_i + \beta_{1i}t + \beta_{2i}t^2 + \gamma_t \text{College Major}_{i(t-2)} + \varepsilon_{it} \quad \text{Eq.1}$$

$$\alpha_i = \mu_\alpha + \delta_\alpha \text{Controls}_i + \zeta_{\alpha i} \quad \text{Eq.2}$$

$$\beta_{1i} = \mu_{\beta 1} + \delta_{\beta 1} \text{Controls}_i + \zeta_{\beta 1 i} \quad \text{Eq.3}$$

$$\beta_{2i} = \mu_{\beta 2} + \delta_{\beta 2} \text{Controls}_i + \zeta_{\beta 2 i} \quad \text{Eq.4}$$

Based on the configuration noted above the growth curve is constrained to be a quadratic function of time. Using elapsed time since high school to index time means there are two patterns of observation: one with years 0, 1, 3, and 5; the other with years 0, 2, 4, and 6. Growth curve models nicely account for these different observation patterns and allow individuals to have their own trajectories (Bollen and Curran 2006). The different factor loadings or constraints associated with each data observation pattern are shown in the table in Figure 1.

The effect of the individual's previous college major (γ) is the focus of our study. For simplicity, we constrain the effect of college major on values two years later to be the same regardless of the number of years out of high school. We get very similar results when we use other specifications for the effect of lagged college major on values. Statistical tests of whether the effects of lagged major on values differ at different ages find no significant difference. The interpretation of γ_t is therefore, the effect of college major in year $t-2$ on values at year t since high school, net of the underlying path of values predicted by the time-invariant controls.⁷ We report robust standard errors (Muthén and Muthén 2006).

Although we do not focus on the growth curve aspect of the model, it provides an important background from which to interpret our college major effects. We purposefully assume that there is already an underlying path for values. We do not address whether this path is due primarily to maturation, or changes that may have been initiated from precollege context, but may only be manifested during or after college (Feldman and Newcomb 1969; Pascarella and Terenzini 1991; Pascarella and Terenzini 2005; Smart, Feldman and Ethington 2000). Rather, we use the growth curve as a way of controlling for both intrapersonal changes and previous social context.

Equations 2, 3 and 4 relate the individual's background variables to the intercept, linear slope and quadratic slope, respectively, for that individual. Each latent parameter is regressed on several control variables, thus δ_α , δ_{β_1} , δ_{β_2} represent vectors of coefficients that estimate the effect of each of the control variables on the latent factors α , β_1 , and β_2 , correspondingly. These controls

⁷ Since we expect selection bias into college majors to work primarily in the direction of students choosing college majors that will tend to reinforce their preexisting tendencies, the greatest danger for over interpretation of results in our approach would be if there were a strong tendency for people in this age range to have preexisting beliefs reinforced over time, *regardless of college major*. Given the overwhelming pattern in attitudinal research of attitudes tending to regress towards the population mean, we do not believe this to be a serious issue.

help in more accurately fitting the growth curve model. Nevertheless, due to space limitations we do not report these coefficients or the growth parameters. Finally, ε_{it} , $\zeta_{\alpha i}$, $\zeta_{\beta 1i}$, $\zeta_{\beta 2i}$ are respective individual residuals for the value at time t, the intercept, the linear slope and quadratic slope.

--Table 2 here--

Table 2 displays the estimated effect of college major on later values. Our willingness to interpret this coefficient as the causal effect of college major on the value at a later point in time stems from our confidence in the ability of the growth curve to control for not only initial differences in values, but also changes in values that stem from systematic individual and social influences (Bollen and Curran 2006). Because the growth curve accounts for a substantial fraction of the variance in values, the growth curve also contributes to the precision of our estimates.

Family Values

In Table 2, look first at the effect of not attending college, as compared to majoring in business. Not attending college appears to have a positive effect on the relative importance of family values. Although all three estimates are positive, only those for giving children better opportunities and living close to family are statistically significant. The positive effect on the importance of giving more opportunities to one's children might be less a reflection of the increased importance placed on children and more of a reflection of the fact that the non-attenders might have fewer opportunities and resources for themselves and recognize a need for their children to have more opportunities than they themselves have had. Similarly, a lack of opportunities might also require greater use of family networks, thus increasing their perceived importance over the time period.

For those who do attend college, a business major is in fact relatively favorable to family values. For example, compared to majoring in business, majoring in the humanities, social sciences, biology, education or physical sciences reduces one's relative importance of providing children with better opportunities. As with the non-attenders, this may not be indicating a lower valuation of children, but rather that these students see themselves as having had great opportunities, and therefore would be happy to give their children the same opportunities, rather than insisting on better opportunities. Interestingly, we see similar negative results for living close to family. In this case majoring in the social sciences, humanities, physical sciences, engineering and biological sciences all lead to lower levels of the stated importance of living close to family. One important fact for interpreting these results is that the growth curve for business majors shows increasing relative importance of living close to family, so these students may be increasing in their appreciation of living close to family, just not as much as business majors. One additional noteworthy result is that social science majors were the only majors to have a strong statistically significant negative effect on all three family values. Those majoring in the social sciences (as well as those who were undecided about their majors) had a lower perceived importance for having a good marriage and family life. Thus, it appears there is something in the social sciences that influences students to reduce the priority of the family in their lives—although it should be noted that, in its overall level, having a good marriage and family still rates very high for social science majors in relation to other goals.

In general, these results fit with our expectations. Consistent with Sayer et al (2005) and Knox (1993) we find that attending college decreases students' ratings of the importance of providing better opportunities for their children—although some majors experience a greater decline than others. We also find that majoring in the social sciences significantly lowers support

for the importance of marriage and family—a result which contrasts with Knox, et al's (1993) finding of no effect of being in an Arts and Science major on values several years later. We attribute the finding that college attendance reduces the relative importance of living close to family (with some majors experiencing larger effects) to an expansion of horizons and increased confidence in being able to make it on one's own.

Career Values

The results of the analyses on the three value statements about careers are not as clear as for family values. For example, not attending college appears to increase the importance of having lots of money. Although the estimates are made comparing non-attenders only to business majors, individuals not attending college are higher on “lots of money” than are all attenders except for those in vocational and office majors. This makes sense since non-attenders typically earn less than college graduates, leading them to want more. On the other hand, relative to being a business major, not attending college appears to decrease the perceived importance of being successful in one's line of work. Indeed, non-attendance lowers the emphasis on success at work relative to being a college student in *any* major. Finally, not attending college appears to generate no significant difference from business majors for the importance placed on having a steady job—a value that, in general, started high and remained high.

Turning to the comparisons between academic majors, the effect of an engineering major is very similar to a business major—with these two groups contrasting sharply with most other majors. The humanities, social sciences, biological sciences and physical sciences all have negative effects on the perceived importance of having lots of money and having a steady job (although not all estimated effects are statistically significant), but none of them appear to have an effect on the importance of being successful. Here it is useful to remember that “being

“successful” is defined very differently in different lines of work, while making lots of money and having a steady job have a more uniform meaning. For example, one can be a successful social worker by helping people extensively even without making a lot of money.

Education majors provide an interesting comparison to the other majors. Majoring in education appears to have a small, statistically insignificant negative effect on the importance of money, an insignificant positive effect on the importance of finding a steady job, and a statistically significant positive effect on the importance of success. This difference is noteworthy as more than any other major the success of educators is directly tied to the success of others (their students).

These results parallel previous work in this area, which shows that college attendance appears to decrease the importance of financial success but increase the importance of general success within a job (Astin 1993; Johnson 2002; Knox, Lindsay and Kolb 1993). However, in contrast to Knox, Lindsay and Kolb (1993) who found no effect of college major, we find that within college, majoring in business (the comparison group), engineering, vocational and office or even undecided majors, tends to lead to a higher perceived importance of having lots of money and finding steady jobs (although some of these results fail to reach statistical significance).

Societal Values

The final set of values we examine measure respondent’s reported importance of activities for and within society. Compared to business majors—or to other majors—not attending college significantly decreases the perceived importance of contributing to society. Although not attending college also appears to have negative effects on the perceived importance of correcting social inequalities and finding purpose and meaning in life, these effects are small

and not statistically significant. Thus it appears that attending college does instill, to some degree, the imperative to contribute to society. This is in line with previous findings that attending college often increases civic and community activities, concern about others, and social activism (Knox, Lindsay and Kolb 1993; Rhee and Dey 1996; Sax 2000).

Differences among the academic majors provide a mix of results. For example, compared to business majors, students majoring in education, social sciences, humanities, and biological sciences all experience significant increases in the perceived importance of contributing to society. It is interesting to note that the difference from business majors is larger (and for education and social science majors twice as large) as the difference between business majors and those with no college. Thus, although college may increase the importance of contributing to society, the majors listed above have an even larger effect than college alone.

We see a slightly different result for the importance of correcting social inequalities. Both the humanities and social sciences have strong positive effects on values toward correcting social inequality. In fact, the effect of social sciences on the importance of correcting social inequalities is the largest single effect of any major on any of the nine values. Physical sciences and math (and to a lesser extent biological and undecided majors) also have a strong positive effect on the relative importance of correcting social inequalities. This begs the question of how these two distinctly different areas (the social science and humanities compared to biological and physical sciences) encourage correcting social inequalities and if their mechanisms for doing so are similar.

As mentioned above, finding purpose and meaning in life does not explicitly mention society, but we classified it as a societal value because meaning often involves something that will make a difference to society or one's fellow human beings. However, our results are quite

different for finding purpose and meaning in life than for the two previous, explicitly societal values. It is not surprising the humanities have a positive effect. But it *is* surprising that education and engineering majors have negative effects (and that the rest of the majors are not significantly different from business majors). It may be that education majors have found their purpose in teaching, and therefore do not report the “finding” of purpose to be a high priority. Similarly, the concreteness of the task of making physical things work and the excitement of technology may already provide a satisfying purpose for engineering students. If this is the right explanation, the psychology of why the lines of work associated with other majors do not provide such a clear and satisfying sense of meaning and purpose is intriguing.

In general we find substantial evidence that college attendance and college major have important and distinct effects on values toward family, career and society. These results suggest that higher education has a socializing effect on students—changing their values in often-predictable ways. Although teasing out the specific mechanisms of socialization is beyond the scope of this article, it is easy to theorize how student interactions with material, professors and other students might differentially affect students’ values. In the next section we turn the causal arrow in the opposite direction to look at the effects of values on college major.

The Effects of Values on College Major

We believe that values are likely to have important effects on the initial choice of college major. However, these effects are very difficult to disentangle from the effects of other forces that influence both values and college major. For example, it is possible that initial college majors are influenced heavily by parental values, which are not measured in our data set. Because these parental values are likely to be correlated with child values, a correlation between major and initial values could arise even in an extreme case in which the child’s values had no

causal effect on the child's college major. Although it is not possible to escape such issues entirely, we focus on our respondent's changes in majors after an initial choice of a major, which we hope will be more indicative of the college student's own preferences than the initial choice of major. For one thing, given the effort involved, a college student is likely to change a major only if the desire to do so is reasonably strong. Second, to the extent parents are a big influence on choice of major, one can presume their preferences are imprinted on the initial major, so any change away from that is more likely to reflect the child's own preferences. Third, by definition, a student changes majors at a later age than the age at which the initial major was chosen; that additional age will typically put more psychological distance away from parental authority. Given the limitations of our data set, this focus on changes in major is the cleanest test possible for the effect of the student's own values on his or her college major.

Given the well-known phenomenon of status-quo bias (the tendency to just stay put), we break our analysis of changes in major into two pieces: the analysis of the decision to leave one's initial major and the analysis of which major to choose instead. Intuitively, one can think of this as analyzing the attraction or repulsion of the initial major and the attraction or repulsion of alternative majors. Thus, in our analysis, we look first at how a student's values are related to variations in retention in different initial majors and then at how those values are related to the alternative major chosen.

Effects of Values on Stability of College Majors

--Table 3 here--

We begin in Table 3 with the first set of analyses, showing the values that influence retention in a particular major. We estimate the effects of the values and controls on retention in each major, separately for each of the initial majors—thus producing 90 logistic regressions. We

only report the coefficient associated with the value on the odds of remaining in the Time 1 (1 or 2 years after high school) major until Time 2 (3 or 4 years after high school). We interpret these coefficients as the causal effect of a congenial match or uncomfortable mismatch between a student's values and the values common in the major or other characteristics of the major. A coefficient above one indicates an increase in the odds of staying in the Time 1 major, while a coefficient below one indicates a decrease in the odds of retentions. The key identifying assumption is that we have managed to include all variables that have a strong correlation with both values and *changes* of major in our regression. It is also important to note that our sample sizes may be sufficiently small to produce sampling errors too large for reliable estimation. The large sampling errors are evident in the fact that several substantial estimated effects do not approach statistical significance. We recognize this drawback. Therefore, we will point out some substantively important, but statistically insignificant results.

Stability of Non-Attendance

As documented in Table 3, we observe a general pattern of strong family values encouraging a young adult not attending college to stay out of college. The signs of each of the family values are positive for remaining out of college, and both the importance of having a good marriage and family and the importance of living close to parents and relatives are large enough to be statistically significant. These data, therefore, suggest that family ties and perhaps the dislocations of moving away from family to attend college place a brake on college attendance among those who have not previously entered college.

Furthermore, it appears that placing great importance on being successful in work and contributing to society make staying out of college less likely. That is, each of these value dimensions seems to motivate people to leave their non-student status and enroll in college. High

ambition of several different varieties has an important effect on the decision to enter school in the young adult years. However, a high level of importance on having lots of money actually encourages remaining out of college. It may be that for those who do not initially choose to enter college, the desire for money is focused on making and enjoying money now rather than later.

Stability in the Humanities, Social Sciences and Education

For many of the previous analyses, students majoring in the humanities, social sciences and education had similar effects, at least in direction. However, the results in Table 3 could hardly be considered parallel across these measures. For example, high levels of perceived importance for having a good marriage and family encourages people to leave the humanities, but encourages them to remain in the social sciences and education. Similarly placing importance on giving children better opportunities encouraged remaining in the humanities and education, but leaving the social sciences. Valuing living close to family increased retention in the humanities, but lowered retention in the social sciences and education majors.

Career values appear to have little influence on remaining in the humanities, social sciences or education. One important exception to this is that a higher valuation of having lots of money seems to encourage leaving the humanities—which makes sense considering the lower financial outcomes typical for those majors (Knox, Lindsay and Kolb 1993; Pascarella and Terenzini 2005). As for societal values, those who value contributing to society tend to remain in all three majors. This, of course, parallels the effects of these majors in increasing this value. However, the rest of the societal values do not seem to have large effects.

Stability in Business

The final column of Table 3 displays the results for remaining in a business major. The results for the effects of family values on stability are unclear. Only a high level of importance

for living close to family has a significant, negative effect on remaining in the business major. Thus people who want to remain close to family tend to attrite from being a business major. As one would expect, placing importance on occupational success seems to encourage people who are in business to continue in that major: both the importance of success in work and having steady work have large and statistically significant effects on remaining in the business. Placing high importance on societal values leads to lower persistence in majoring in business: placing importance on correcting social inequalities, finding purpose and meaning in life, and contributing to society all have substantial negative effects on persistence in a business major, although only the effect of the importance of finding purpose and meaning in life is statistically significant.

For the most part, the other majors (biological, physical science and math, engineering and vocational\office) have few substantively or statistically significant results. One exception is that those who place high levels of importance on success in work tend to leave the physical sciences and math. It may be that due to the long path to becoming successful in these fields people opt for what they see as easier paths. Also, higher levels of perceived importance for having a good marriage and family and for giving children better opportunities both foster staying in vocational/office majors. Thus, more family-centered people may be somewhat more likely to remain in these vocational/office majors.

Effects of Values on Major Destinations

--Table 4 here--

Now shift attention from the stability of each major to the choice of major among those who leave a major (in this case *not* counting those leaving non-attendance to go to college—for whom the choice of major is more like an initial choice of major). Table 4 indicates the effects of

values on the new majors that switchers move into when they change majors. Since there is an adding-up constraint that students must switch to something⁸, we must again use the business major as a reference group. That is, we look at the likelihood of choosing a particular major compared to the likelihood of choosing a business major. We interpret the coefficient of values in this regression as the causal effect of values on which new major is chosen, conditional on having switched out of an earlier major. Again, the key identifying assumption is that we have managed to include all variables that have a strong correlation with both attitudes and *changes* of major in our regression.

Effects of Valuing Family

As we can see from the top three rows of Table 4, there is a general tendency for the three family values to reduce the odds of switching into humanities, social sciences, physical sciences, and engineering. All twelve of the estimates for the effects of three values on these four majors are negative, and all but four are substantial in size. The effects that are statistically significant are the negative effects of the importance of a good marriage and family life on switching into the humanities and physical sciences, the negative effect of the importance of giving children better opportunities on switching into the humanities and the negative effect of the importance of living close to parents and other relatives on switching into the social sciences. Of course, the comparison major in these analyses are business students, so placing importance on family values leads to choosing to switching into business majors over these four majors.

In general, there is little evidence of significant effects of family values on switching into biological majors over business majors. Family values may be related to increased switching into education majors, although these estimates are not statistically significant. We find a curious

⁸ We view major as the type of college education rather than the quantity, so we count a student as keeping the same major when he or she drops out of college.

result in the effects of family values on vocational and office majors. While the importance of having a good marriage and family has a large, negative and statistically significant effect on switching into vocational majors, higher levels of importance placed on living close to home increases switching into vocational majors. Thus, it appears that students who want to remain close to home while staying single tend to switch into these majors.

Effects of Valuing Careers

The middle three rows of Table 4 report the effects on college major choice of valuing having lots of money, having a steady job and being successful in work. Valuing careers appears to have a negative influence on switching into education, biological science and physical science majors. All nine of the effects for the three career values on these three majors are negative, and six are substantial in size. Three effects are statistically significant: the negative effects of valuing being successful in your line of work on switching into education and physical science majors instead of business, and the negative effect of valuing having lots of money on switching into the biological sciences instead of business. Equivalently, desiring money, success and a steady job encourages students to choose business as a major over education, biological science and physical science majors.

The only other results of note are that people who place high relative importance on having a steady job are more likely to switch into the humanities, engineering and vocational majors rather than business majors (although only the effect on switching into the humanities is statistically significant). It is not surprising that those who value a steady job would choose engineering and vocational majors over business majors, but choosing the humanities over business majors when one especially values a steady job is unexpected.

Effects of Valuing Social Improvement

The final 3 lines of Table 4 report the effects on major destinations of the importance people place on contributing to society, correcting social inequalities and finding purpose and meaning in life. The most important finding is that, in general, higher levels of valuing social improvement lead to choosing non-business majors over business majors. That is, of the 24 coefficients estimated, 20 have positive signs, implying that students choosing a major and wanting to have a societal impact will avoid entering business majors. Of course as business majors begin to implement more service learning opportunities into their curriculum, and students become aware of these opportunities, this result may change (Hogner 1996; Kolenko et al. 1996; Ridener 1999; Zlotkowski 1996). While

While placing high importance on contributing to society raises the odds of switching into all other majors instead of business, the increase in the odds of choosing biology is incredibly high, followed by social sciences, physical sciences, education and humanities. Those switching into these majors, and particularly biology, seem to be doing so with the intent of contributing to society. High valuations for correcting social inequalities have similar positive effects on the odds of choosing all other majors instead of business majors, but the effects are not as strong, and there are only two statistically significant effects, on switching into biology and humanities. The effect on choosing biological majors is unexpected, and may reflect the role of biological science majors as preparation for medical careers. That is, a medical career serving underserved populations is one avenue a student might think of for correcting social inequalities. There is little to report about the effect of valuing purpose and meaning in life on the choice of a new college major. In general, the effects are small and insignificant. Valuing finding purpose and meaning in life does seem to reduce the odds of choosing engineering and humanities majors

(although neither are significant), and significantly increases the odds of choosing biological sciences. Thus, in general we find that people with strong societal values tend to avoid the business majors, and tend to be particularly drawn to the biological, social science and physical science majors.

Overall, then, our work adds to past research by showing that values are important predictors of major choice and attrition—and thus, along with other factors, play a key role in the process of sorting students into college majors (Bécares and Turner 2004; Biddle, Bank and Slavings 1990; Duff and Cotgrove 1982; Ethington and Wolfle 1988; Guimond 1999; Jennings 1993; Sidanius et al. 2003; Thistlethwaite 1973). Clearly students are sometimes willing to leave a major due to values and they also appear to choose college majors based on values as well. It is important to note that by looking at changes in major we are only looking at part of the story. Certainly, we expect personal values to contribute to initial major selection, but pinning down those effects would require information on several additional influences on values and college major choice. Since over half of students in our sample never changed major, this is clearly an important area of exploration.

For those who study the choice of initial major in the future, the main hypothesis we offer for how patterns would differ for choice of initial major as opposed to switching majors is that parental influence is likely to be stronger for the choice of initial major. For example, some parents may put a higher value on a child making a good income than the child does, and push the child toward majors that lead to remunerative careers. If the parents have anticipated something the child will later feel is important, this could improve the choice of major (in the sense of higher major stability), but if the parent is simply substituting parental preferences for the child's preferences, it could lead to one of the uncomfortable mismatches that we find lead to

lower stability in a major. The empirical prediction stemming from this hypothesis is that a greater divergence between the values of a student and the student's parents would lead to lower stability in a major. Moreover, this effect would interact with the speed at which the strength of parental influence declines between the time when the initial major is chosen and later on when a student might contemplate switching majors.

Discussion

Our results are consistent with the overall theoretical framework guiding this research. We find that there is important variation among the college majors in values, beliefs and philosophies of life related to such things as families, careers and society. The world views in the various college majors influence the values of students in those majors. At the same time, students recognize, at least implicitly, and perhaps explicitly, the differences among the majors and choose their majors based, at least in part, on their family values, career values, and societal values. The evidence suggests a reciprocal causal relationship between college major and family, career and societal values. Thus, this research provides evidence for both socialization and allocation theories of education (Pallas 2000; Stevens, Armstrong and Arum 2008).

For many of the values we discussed, those with high levels of initial values choose majors that increased those values. Similarly, those whose low levels of a value often went into majors that decreased it more. Those with intermediate levels of a value were often in majors that had little effect on that value. Other majors that tended to be in the middle tended not to change too much. Thus while regression to the mean is a common finding in studies of values, we have found what some might consider "accentuation effects" (Smart and Feldman 1998). That is, those who value something will choose majors that will accentuate the value making

them even more extreme in the end than if they had not been able to choose their own major and sometimes more extreme than when they initially entered the major.

Although we found many of our hypothesized results, to some extent these results are surprising. As Abbott (2001) notes, disciplines, especially in the social and behavior sciences, are particularly “chaotic.” Abbott argues that, in fact, there are bigger differences within specific fields (i.e. sociology, history, economics) than there are between those fields. If this were also true of large groupings (social science, humanities, etc) we would not expect to find the strong results presented here. This leads us to the conclusion that these larger major classifications (with some remaining within major variation) do instill different values. In some ways this is not surprising since for many colleges these groups are located within schools or colleges, and are even located in similar geographic areas (or even within the same building). So even if a student takes a course outside of his or her major it may be more likely to be within the same school. Thus, the people the student interacts with the most, outside of his or her own major, are likely to be those within the same school, who will often be in the same major group. Thus, although specific disciplines may be may actually have more variability within the discipline than between other disciplines or fields, major groups may be the primary focus of the variability within the college experiences.

We close with some comments about how the late twentieth-century United States context might have influenced our results and what our results might mean for someone trying to understand changing behavior and values in the United States. First, because more people are entering college--over the last half of the 20th century, educational enrollments for 20-24 year olds tripled—college major, or more generally, detailed educational attainment group, may begin to explain more of the variation in attitudes (Johnson and Elder 2002). Moreover, if these values

and attitudes change and social norms are modified, we should expect to see shifts in related behavior (Axinn and Thornton 2000; Funk and Willits 1987; Sayer, Wright and Edin 2005). Thus we expect that college major may increase in its importance in predicting values, beliefs and behaviors, and therefore it should also be more prevalent in research on values (Axinn and Thornton 2000; Pascarella and Terenzini 2005).

A second, and related, point is that many of the effects we find for particular college majors extend at lower intensity throughout the college campus and beyond. On campus, there is often a common core curriculum, shared distribution requirements, campus-wide events, and interactions in dormitories and informal groups across majors. This mixing means that the effects we estimate are only for the added intensity of actually being in a major as opposed to being influenced by its ideas while officially outside it.

Third, the influence of college is cumulative over time. Colleges have been in existence for centuries and have been widely attended for decades in this country. It is likely that colleges and the ideas they foster have had effects for decades, if not centuries, and that effects in one generation form the foundation for the college students in the next generation. In this way, the effects of college and specific majors can cumulate across time, with the total effect across time being substantially greater than the effect in any one generation or cohort of students.

Fourth, the cultural elites in America and many other places are frequently recruited from America's colleges. To the extent that college and the majors chosen by the elites affect the values of those elites, these influences can be disseminated more broadly throughout the population. This could be especially important for elites in the entertainment and news industry, who may be more likely to have majored in the humanities or social sciences. In this way, there could be multiplier effects of the influence of college and college major.

Values have changed dramatically over the course of the past century, both in the United States and elsewhere (Alwin 1988; Alwin 1996; Bahr et al. 2004; Thornton 2005; Thornton and Young-Demarco 2001). Explaining these dramatic changes in values is a key research agenda for sociology. What we have documented in this paper about the influence of college on values is only one element in the explanation of these many changes. However, we believe that this close study of one element of the process gives some hints about the broader process of ongoing social change.

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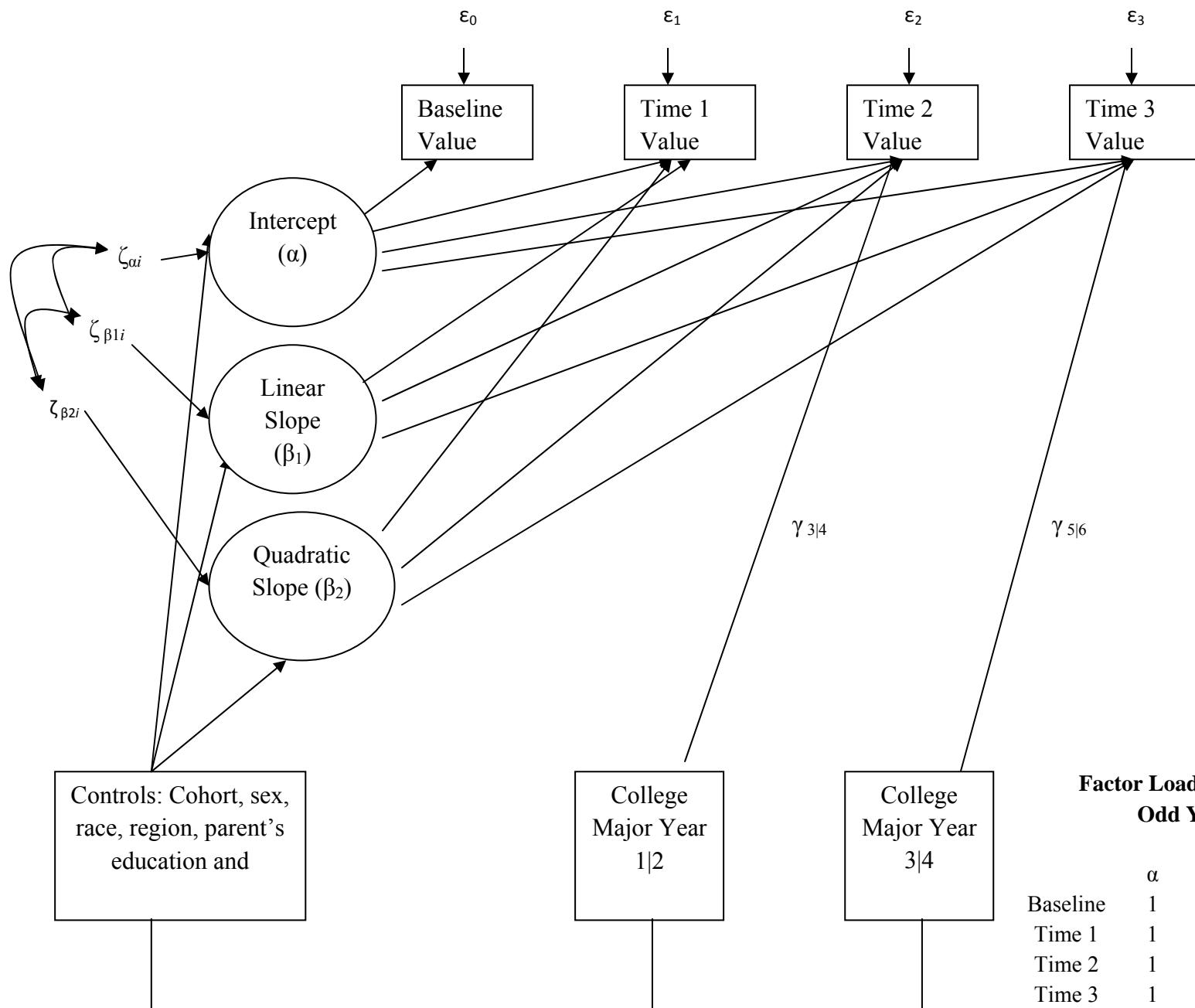
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Table 1. Attitude and Value Question Wording, Means, Adjusted Means, and Standard Deviations for Base Year, 1st Follow-up, and 3rd Follow-up (N=4173)

| | Base Year | | | | 3 rd Follow-up | | | | Time 3 – Baseline | |
|---|-----------|----------|------------------------|----------|---------------------------|----------|------------------------|----------|-------------------|------------------------|
| | Mean | Std. Dev | Adj. Mean ^a | Std. Dev | Mean | Std. Dev | Adj. Mean ^a | Std. Dev | Mean | Adj. Mean ^a |
| How important is each of the following to you in your life? | | | | | | | | | | |
| <i>1=Not Important 2=Somewhat Important 3=Quite Important 4=Extremely Important</i> | | | | | | | | | | |
| Family Values | | | | | | | | | | |
| Having a good marriage and family life | 3.67 | .71 | .78 | .70 | 3.73 | .63 | .94 | .64 | .06 | .16 |
| Being able to give my children better opportunities than I've had | 3.38 | .78 | .49 | .67 | 3.28 | .84 | .49 | .74 | -.10 | .00 |
| Living close to parents and relatives | 2.20 | .92 | -.69 | .86 | 2.39 | .92 | -.40 | .86 | .19 | .29 |
| Career Values | | | | | | | | | | |
| Having lots of money | 2.67 | .86 | -.22 | .80 | 2.46 | .81 | -.32 | .76 | -.21 | -.10 |
| Being able to find steady work | 3.63 | .61 | .74 | .57 | 3.56 | .69 | .77 | .63 | -.07 | .03 |
| Being successful in my line of work | 3.50 | .68 | .61 | .61 | 3.33 | .74 | .54 | .66 | -.17 | -.07 |
| Societal Values | | | | | | | | | | |
| Making a contribution to society | 2.70 | .85 | -.18 | .70 | 2.68 | .84 | -.11 | .68 | -.02 | .07 |
| Working to correct social and economic inequalities | 2.24 | .88 | -.64 | .75 | 2.13 | .85 | -.66 | .72 | -.11 | -.02 |
| Finding purpose and meaning in my life | 3.42 | .80 | .53 | .70 | 3.28 | .83 | .49 | .73 | -.14 | -.04 |

^a Each variable was adjusted to reflect its level of importance relative to all the attitude and value measures in the series by subtracting the respondent's mean importance score from the respondent's score for that variable.

Figure 1. Growth Curve Model of values with time varying effects of college major, with individually varying waves of observation



| | Factor Loadings for Growth Curve Model | | | | | |
|----------|--|-----------|-----------|---------------------|-----------|-----------|
| | Odd Year Follow-up | | | Even Year Follow-up | | |
| | α | β_1 | β_2 | α | β_1 | β_2 |
| Baseline | 1 | 0 | 0 | 1 | 0 | 0 |
| Time 1 | 1 | 1 | 1 | 1 | 2 | 4 |
| Time 2 | 1 | 3 | 9 | 1 | 4 | 16 |
| Time 3 | 1 | 5 | 25 | 1 | 6 | 36 |

Table 2. Estimate of college major on value two years later, conditional on growth curve model of value from senior year to 5-6 years after high school (N=4173)

| College Major | Family Values | | | | |
|---------------------|-------------------------------|-------------------------------|-----------------------------------|--|------------|
| | Good marriage and family life | Children better opportunities | Living close to parents/relatives | | |
| Business | -- | -- | | | -- |
| No College | 0.024 | 0.140 *** | | | 0.058 ** |
| Humanities | -0.050 | -0.162 *** | | | -0.113 ** |
| Social Science | -0.101 *** | -0.110 *** | | | -0.147 *** |
| Education | -0.039 | -0.097 ** | | | -0.006 |
| Biological Sciences | -0.047 | -0.109 *** | | | -0.075 * |
| Phy. Sci/Math | -0.035 | -0.064 * | | | -0.102 ** |
| Engineering | 0.004 | -0.026 | | | -0.093 ** |
| Vocational/Office | -0.026 | 0.044 | | | 0.026 |
| Other/Undecided | -0.034 * | -0.011 | | | -0.033 |
| log-likelihood | -15828.909 | -15988.504 | | | -18965.929 |
| AIC | 31779.818 | 32099.008 | | | 38053.858 |
| Career Values | | | | | |
| College Major | Lots of money | Steady job | Successful in work | | |
| Business | -- | -- | | | -- |
| No College | 0.048 ** | -0.005 | | | -0.061 ** |
| Humanities | -0.096 ** | -0.062 * | | | 0.012 |
| Social Science | -0.043 | -0.089 *** | | | -0.038 |
| Education | -0.049 | 0.065 | | | 0.067 * |
| Biological Sciences | -0.068 * | -0.119 *** | | | 0.040 |
| Phy. Sci/Math | -0.076 * | -0.055 | | | 0.013 |
| Engineering | 0.003 | 0.034 | | | 0.014 |
| Vocational/Office | 0.048 | 0.036 | | | 0.014 |
| Other/Undecided | 0.010 | -0.014 | | | 0.016 |
| log-likelihood | -16910.923 | -14316.471 | | | -15397.691 |
| AIC | 33943.847 | 28754.941 | | | 30917.381 |
| Societal Values | | | | | |
| College Major | Contribute to society | Correct social inequalities | Purpose and meaning in life | | |
| Business | -- | -- | | | -- |
| No College | -0.070 *** | -0.011 | | | -0.015 |
| Humanities | 0.093 ** | 0.110 ** | | | 0.094 ** |
| Social Science | 0.147 *** | 0.197 *** | | | 0.043 |
| Education | 0.156 *** | 0.012 | | | -0.086 ** |
| Biological Sciences | 0.110 *** | 0.040 | | | -0.055 |
| Phy. Sci/Math | 0.026 | 0.146 *** | | | -0.013 |
| Engineering | 0.009 | -0.005 | | | -0.075 * |
| Vocational/Office | -0.038 | -0.053 | | | -0.015 |
| Other/Undecided | 0.021 | 0.044 * | | | -0.023 |
| log-likelihood | -15908.757 | -17112.106 | | | -16266.967 |
| AIC | 31939.513 | 34346.212 | | | 32655.933 |

*-p-value ≤ 0.10, **-p-value ≤ 0.05, ***-p-value ≤ 0.001

Table 3. Estimate of Effect of Relative Importance of Value at Time 1 (1-2 years after High School) on the Odds of Remaining in Time 1 Major until Time 2 (3-4 years after High School)

| Value | No College (N=1251) | Humanities (N=188) | Social Science (N=223) | Education (N=206) | Biological Sciences (N=193) | Phy. Sci/Math (N=163) | Engineering (N=199) | Vocational/ Office (N=238) | Other/ Undecided (N=994) | Business (N=518) |
|-----------------------------------|---------------------------|-----------------------|------------------------------|----------------------|-----------------------------------|-----------------------------|------------------------|----------------------------------|--------------------------------|---------------------|
| Family Values | | | | | | | | | | |
| Good marriage and family life | 1.164 * | 0.679 * | 1.136 | 1.302 | 1.510 | 1.116 | 0.830 | 1.344 | 1.142 | 0.986 |
| Children better opportunities | 1.008 | 1.487 * | 0.770 | 1.825 * | 0.697 | 0.94 | 0.709 | 1.821 * | 1.206 ** | 1.152 |
| Living close to parents/relatives | 1.249 ** | 1.129 | 0.805 | 0.536 ** | 1.109 | 0.937 | 0.777 | 0.796 | 1.215 ** | 0.719 ** |
| Career Values | | | | | | | | | | |
| Lots of money | 1.180 * | 0.688 * | 0.893 | 0.739 | 1.175 | 1.073 | 0.960 | 0.853 | 0.949 | 1.184 |
| Steady job | 0.988 | 0.867 | 1.232 | 1.045 | 0.704 | 0.961 | 0.854 | 0.822 | 1.137 | 1.625 ** |
| Successful in work | 0.827 * | 1.031 | 1.059 | 1.212 | 1.065 | 0.478 ** | 1.138 | 1.075 | 1.098 | 2.076 *** |
| Societal Values | | | | | | | | | | |
| Contribute to society | 0.833 * | 1.500 * | 1.523 | 1.284 | 1.057 | 0.747 | 1.297 | 1.050 | 0.828 * | 0.795 |
| Correct social inequalities | 0.959 | 0.957 | 1.165 | 0.755 | 0.832 | 0.928 | 0.859 | 1.469 | 0.957 | 0.827 |
| Purpose and meaning in life | 0.979 | 1.047 | 1.04 | 0.92 | 1.012 | 1.271 | 0.786 | 0.999 | 0.915 | 0.508 *** |

*-p-value ≤ 0.10, **-p-value ≤ 0.05, ***-p-value ≤ 0.001 (two-tailed)

All analyses control for graduation cohort, gender, race, parent's education, region and religion

All coefficients are exponentiated, so a value of 1 is no effect.

Table 4. Multinomial Logistic Regression Estimates (Odds) for Time 2 College Major for those Students who Change Majors Between Time1 (1-2 years after High School) and Time 2 (3-4 years after High School) (N=835 for all models)

| | Humanities | Social Science | Education | Biological Sciences | Phy. Sci/Math | Engineering | Vocational/ Office | Other/ Undecided |
|-----------------------------------|------------|----------------|-----------|---------------------|---------------|-------------|--------------------|------------------|
| Family Values | | | | | | | | |
| Good marriage and family life | 0.620 ** | 0.805 | 0.918 | 1.004 | 0.583 ** | 0.674 | 0.643 * | 0.974 |
| Children better opportunities | 0.678 ** | 0.951 | 1.367 | 0.910 | 0.840 | 0.985 | 1.223 | 1.039 |
| Living close to parents/relatives | 0.774 | 0.733 ** | 1.301 | 1.133 | 0.922 | 0.947 | 1.380 * | 0.981 |
| Career Values | | | | | | | | |
| Lots of money | 0.861 | 0.827 | 0.727 | 0.594 ** | 0.787 | 0.776 | 1.002 | 0.933 |
| Steady job | 1.504 * | 1.096 | 0.921 | 0.835 | 0.972 | 1.434 | 1.250 | 1.172 |
| Successful in work | 1.218 | 0.761 | 0.665 * | 0.784 | 0.630 * | 1.173 | 0.866 | 0.770 |
| Societal Values | | | | | | | | |
| Contribute to society | 1.412 * | 1.703 *** | 1.414 | 2.978 *** | 1.530 * | 1.180 | 1.366 | 1.267 |
| Correct social inequalities | 1.446 * | 1.188 | 1.165 | 2.152 ** | 1.331 | 1.333 | 0.990 | 1.067 |
| Purpose and meaning in life | 0.789 | 1.197 | 1.107 | 1.439 * | 1.085 | 0.749 | 0.833 | 1.079 |

*-p-value ≤ 0.10, **-p-value ≤ 0.05, ***-p-value ≤ 0.001 (two-tailed)

Business majors are the reference categories for all regressions

All models control for graduation cohort year, gender, race, parent's education, region and religion

All coefficients are exponentiated, so a value of 1 is no effect.