PREFERENCES, PERCEPTIONS, AND EDUCATIONAL ATTAINMENT

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This dissertation attempts to answer the question "Why do some adolescents pursue college while others do not?" In attempting to answer this question my focus is on what I call "college-encouraging" preferences and perceptions, which are preferences and perceptions that make adolescents more likely to pursue college. The model I develop engages the rational choice literature in both economics and sociology, but it deals primarily with considerations outside the scope of traditional rational choice models. I deal with preferences and perceptions but not only those relating to pecuniary costs and benefits. Also, unlike most rational choice perspectives, I focus on interpersonal variation in preferences and perceptions and how this variation affects college entry decisions.

I analyze two preferences and two perceptions: preferences for academic activities, preferences for various labor-market outcomes, perceptions of the ability to complete college, and perceptions of the effect of education on labor-market outcomes. Using both propensity-score matching and regression estimators, I find that preferences for academic activities increase educational expectations, preferences for labor-market outcomes that education improves increase educational expectations and college entry, and that the subjective probability of college completion conditional upon college entry increases college entry.

Regarding perceptions of the effect of education on labor-market outcomes, I turn away from the maximization assumption of traditional human capital approaches and develop a simple satisficing model. Consistent with predictions of the model, results show that the more education an adolescent believes is required to enter the

occupation they expect, the more likely they are to enter college. Examination of reverse causality (i.e., educational decisions affect occupational decisions) found only weak effects.

Analysis of the determinants of preferences and perceptions shows that cognitive skill and parental education are both positively related to most college-encouraging preferences and perceptions. Blacks, Hispanics, and Asians have more college-encouraging preferences and perceptions than whites of comparable cognitive skill and family background. Multilevel models also suggest that high schools influence the preferences and perceptions of the students within them.

BIOGRAPHICAL SKETCH

Mark McKerrow was born in Toronto, Canada, and completed his Bachelor of Science in Engineering at the University of Guelph. He changed direction afterward to complete a Master of Arts in Sociology, also from the University of Guelph. From here he moved to Cornell University to enter the doctoral program in the Department of Sociology at Cornell University.

To my wife Laura and our children Benjamin and Ella.

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I also want to thank Kim Weeden and David Grusky, the other members of my committee, who provided useful input, positive and constructive comments, as well as patience and encouragement. They shaped the emphases and content of the final dissertation more than they likely know.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1. SUBJECTIVE RATIONALITY AND POSTSECONDARY SCHOOLING DECISIONS

This dissertation attempts to answer the question "Why do some adolescents pursue college while others do not?" In attempting to answer this question my focus is on what I call "college-encouraging" preferences and perceptions, which are preferences and perceptions that make adolescents more likely to pursue college. The model I develop engages the rational choice literature in both sociology and economics, but it deals primarily with considerations outside the scope of traditional rational choice models. I consider nonpecuniary costs and benefits, and I focus on interpersonal variation in preferences and perceptions and how this variation affects college entry decisions.

In this introductory chapter I justify my theoretical approach, outline the methods I use, and provide a brief overview of the subsequent chapters.

WHY DO SOME PEOPLE GET MORE EDUCATION THAN OTHERS?

The relationship that postsecondary education has with a variety of outcomes makes it among the most important issues in the study of social inequality. Most commonly cited is the effect of postsecondary education on earnings. Estimation of the causal effects of schooling on earnings has proven surprisingly difficult, with ability bias and measurement error in self-reported schooling representing formidable obstacles to credible estimation. Despite these difficulties a near consensus has formed among labor economists that education pays handsomely at the individual level and is well worth the investment (Card 1999). Education appears to have beneficial effects on other labor-market outcomes including employment (versus unemployment) and working conditions (Jencks, Perman, and Rainwater 1988; Duncan 1976). Evidence

also suggests that postsecondary education affects a range of nonmarket outcomes including health, attitudes, and marriage duration (Wolfe and Zuvekas 1997; Kingston et al. 2003).

Largely because of its centrality in the development and maintenance of the stratification order, considerable effort has gone into understanding why some adolescents obtain more education than others. Research is conducted across most of the social sciences, but the most influential theoretical perspectives for understanding educational decisions have been developed in sociology and economics. Status attainment models—especially the "Wisconsin Model" of status attainment—have been highly influential in sociology (often as a foil). Investment models are dominant in economics. It is useful to begin with early formulations of the Wisconsin Model and investment models because their simplicity and familiarity provide a useful point of departure to introduce developments after their original formulations, including the themes I wish to develop.

THE "WISCONSIN MODEL" OF STATUS ATTAINMENT

Blau and Duncan (1967) formulated a basic model of intergenerational status attainment linking family background to occupational attainment. In it, educational attainment mediates the relationship between family background and adult occupational attainment. Family background influences educational attainment, and educational attainment in turn influences occupational attainment.

A major development in the status attainment tradition occurred only two years later with the publication of Sewell, Haller, and Portes's (1969) "Wisconsin Model" of status attainment, so named because a sample of Wisconsin high school seniors was used in the empirical analysis. The objective of the research was to postulate and empirically examine the role of social psychological constructs that linked exogenous

variables—family background and cognitive skill—to educational and occupational attainment. Figure 1.1 presents the path model describing the proposed causal relationships among the variables. As Figure 1.1 shows, educational and occupational aspirations, which are assumed to represent underlying motivation, are the proximate causes of educational and occupational attainment. Based on social psychological findings showing the importance of others in the "definition of the situation" (e.g., Sherif 1935) and the influence of others' expectations on one's own aspirations, aspirations are assumed to be caused by the expectations of significant others, such as the expectations of parents, teachers, and peers. Significant others' expectations are primarily caused by adolescents' grades and family background. In theoretical elaborations significant others' expectations influence adolescents' educational aspirations through the combined forces of self-reflection, imitation, and adoption (Haller 1982), but focus has traditionally been on the most straightforward socialization model in which adolescents simply adopt significant others' expectations. Because aspirations are the proximate cause of attainment, it is proposed that manipulation of aspirations may influence later attainment.

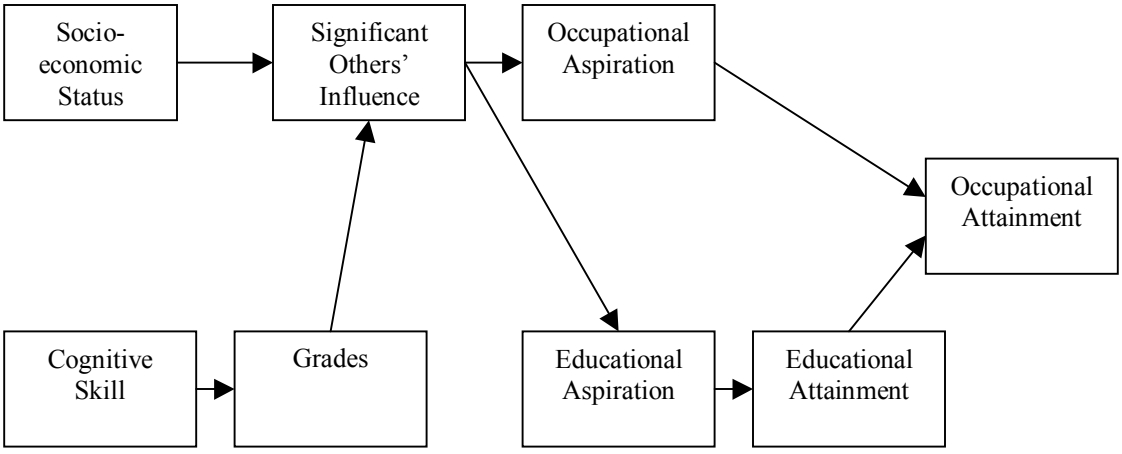

Figure 1.1 The Wisconsin Model of Status Attainment.

Subsequent research questioned the omission of several paths, such as the path leading from mental ability to significant others' influence (Sewell, Haller, and Ohlendorf 1970). However, most evidence is consistent with the Wisconsin Model, and the original study has been replicated with numerous datasets that all reach the same basic conclusion that the effects specified in Figure 1.1 are all fairly strong.

INVESTMENT MODELS OF SCHOOLING DECISIONS

Human capital and signaling theory dominate theory and research on educational attainment in labor economics. Human capital consists of inalienable personal assets that can be rented out in the form of labor to result in an income stream in the form of wages. If a person chooses to increase their human capital they must make investments that allow them to rent out their labor at a higher wage. Education is seen as an investment made to increase human capital. Signaling theory assumes that productivity differences across educational attainment levels exist before schooling differences. For example, those with a college degree are on average more productive than those with high school diplomas, but schooling did not cause these differences. Schooling does affect earnings, however, because it provides probabilistic information about these unobservable, preexisting productivity differences to potential employers.

For present purposes, the mechanism through which schooling affects earnings is unimportant. The essential point is that adolescents see schooling as an investment. Adolescents weigh the costs and benefits of schooling and their other alternatives (which could include labor market activity, leisure, domestic labor, criminal activity, and parenthood) and decide to continue their schooling if its net benefits are higher than those of their other alternatives. Schooling's benefits are primarily conceived of as higher future wages, but nonpecuniary labor-market outcomes may be considered

as well. Schooling's costs include direct costs (e.g., tuition, books), opportunity costs (i.e., forgone earnings), and "psychic costs" (e.g., the disutility of studying).

Evidence is generally consistent with predictions of investment models. An abundant literature on the causal effect of schooling on wages concludes that postsecondary schooling increases earnings (for a review see Card 1999), and trends in enrollment and educational expectations in the 1970s and 1980s suggest that adolescents respond to changes in the returns to education (Morgan 1998). Evidence also supports the importance of costs. Net direct costs, often defined as tuition minus financial aid, lower enrollment (for a review see Ehrenberg 2004). Less compelling evidence suggests that opportunity costs are important as well. Higher wages in local labor markets lower the probability of attending college (Venti and Wise 1983) as does a low rate of unemployment (Rivkin 1995). Psychic costs have generally been ignored except when they are inferred from behavior using the logic of "revealed preferences" (Lazear 1977; Cunha, Heckman, and Navarro 2006).

Some research has begun to look at adolescents' perceptions of the costs and benefits of college because perceptions—not information at researchers' disposal—should determine investment decisions. Avery and Kane (2004:382, Table 8.15) provide information from Boston-area high school students who estimated both tuition at several nearby colleges and the effect that a bachelor's degree would have on their own earnings. Avery and Kane used this information in conjunction with assumptions about discount rates to calculate the implied present value of a bachelor's degree for each student relative to working immediately after high school. They found that about 85 percent of students whose implied present value of a bachelor's degree was positive (i.e., it was higher than the present value of working immediately after high school graduation) planned to obtain bachelor's degrees. However, they also found that almost 70 percent of high school students whose implied present value was negative

planned to obtain a bachelor's degree and that 95 percent of students from affluent neighborhoods whose implied present value was negative planned to obtain bachelor's degrees. These findings led Avery and Kane to conclude that "subjective beliefs about the payoffs to college are only weakly related to students' plans for college" (385). Rouse (2004) also provides evidence that higher perceived returns are only weakly related to college plans.

What about the perceived ability to finance college? Avery and Kane (2004) found that the more a student thought college would cost, the less likely they were to plan to attend; however, the relationship was very weak.[1]

SHORTCOMINGS OF THE WISCONSIN AND INVESTMENT MODELS

Theoretical and empirical shortcomings have prevented widespread acceptance of either the Wisconsin Model or investment models, including the many variations of these models that have been developed. Most important among these shortcomings have been conceptual issues raised by critics, inattention to structural forces in the educational attainment process, and the inability of the models to explain some puzzling empirical findings.

CONCEPTUAL ISSUES. A good deal of research framed explicitly within the status attainment tradition was conducted in the 1970s and early 1980s, but concerns about key constructs led to a sharp decline after this period. The emphasis on aspirations and expectations was harshly criticized. Bourdieu (1973) questioned the claim that aspirations and expectations caused educational attainment and argued that expectations were largely statements of known probabilities that are determined by

[1] Strangely, the more a student thought college would cost, the *more* likely they were to think that they could afford it. This was true even among poorer students.

class background. Alexander and Cook (1979) convincingly showed that educational expectations do not always represent motivation. Using data on students surveyed in their senior year of high school, they found that some adolescents' expectations were essentially extemporaneous responses representing no real commitment to the stated outcome. That expectations are not necessarily goals that adolescents strive for is also apparent in the absurdly high educational expectations that have been recorded, especially recently (e.g., Reynolds et al. 2006).

Furthermore, developers of the Wisconsin Model showed a concern for the effects of education on occupational attainment in their models, but their models assume that adolescents don't share this concern. Labor-market goals play no role whatsoever in educational expectations or attainment, and the theory fails indicate why anyone would go to college to begin with. Even if the socialization story is accepted we do not really know why significant others might expect anyone to continue their education.

Rational choice theory has at times received a cool reception in sociology. Some argue that it is "masculinist" (England and Kilbourne 1990), not self-sufficient (i.e., it must be supplemented with other theories to explain all of what sociologists want to explain) (Wrong 1997), and not the domain of sociology its explanatory merits notwithstanding (Blau 1997). Investment models in economics have been developed largely within what I would call a "strict" rational choice framework, and the most common criticisms are leveled at the unrealistic assumptions that accompany strict rational choice models. The strictest variants make several logical assumptions about preferences, such as transitivity, which experiments reveal to often be false. More often criticized are the motivational and cognitive assumptions, such as the assumptions that actors seek to maximize their material self-interest and that they

possess all of the information and cognitive capacity necessary to select the course of action that maximizes their material self-interest.

STRUCTURAL FORCES. Both the Wisconsin Model and investment models have been criticized for ignoring structural factors that may operate as barriers to educational attainment, such as grade retention and tracking. This line of criticism (e.g., Kerckhoff 1976) led to research focusing on the structure of schools and the allocation of students to different positions within this structure. A large and growing body of "school effects" literature seeks to understand how different schools affect students differently (Sørensen and Morgan 2000).

Research taking this "structural perspective," as I term it, shows the importance of structural factors. Those in the academic track (also known as the college preparatory track) in high school appear to experience greater gains in cognitive skill than those in the general or vocational track (Gamoran and Mare 1989) and are much more likely to attend four-year colleges. Most of the literature suggests that the net effect of grade retention is harmful because it leads to higher dropout rates, but its role as a motivation for achievement is questionable (Hauser 2004).

The so-called "Coleman Report" (1966) concluded that school resources have small effects on learning. Since the Coleman Report, numerous studies have confirmed that some factors—such as homework, graduation requirements, and discipline—that one might assume would affect learning also have little or no effect (Chubb and Moe 1990). Other studies have shown that some school characteristics are important for some outcomes. Coleman and associates found that more learning occurs in Catholic schools (Coleman, Hoffer, and Kilgore 1982), perhaps because Catholic schools have a larger percentage of students in college preparatory tracks. Characteristics of schools, such as their racial-ethnic mix, have been found to affect a

range of outcomes such as dropout rates and aspirations (Goldsmith 2004). Some research points to the importance of school size. Wicker (1969) found that students in small high schools participated more and felt they were serving important roles. Others argue that small school size creates an inviting atmosphere (Meier 1995; Morgan and Alwin 1980).

UNEXPLAINED EMPIRICAL FINDINGS. Another line of criticism concerns empirical findings that neither the Wisconsin Model nor investment models have explained satisfactorily. Most troubling have been findings of minority-white differences in the educational attainment process. Conditional on family background and cognitive skill, blacks' (Morgan 1996; Hout and Morgan 1975; Bennett and Xie 2003) and Asians' (Goyette and Xie 1999) college plans, enrollment, and attainment are higher than those of whites' plans, enrollment, and attainment. Results are not as well documented for Hispanic-white differences, but the weight of the evidence suggests that Hispanics' conditional plans and attainment are higher than whites' plans and attainment as well (Kao and Tienda 1998).

Because the Wisconsin Model specifies that aspirations and attainment are ultimately determined by family background and cognitive skill, it cannot account for the high expectations and attainment of minorities that exist conditional on these factors. Investment models—at least traditional models that focus narrowly on pecuniary costs and benefits—have also been unable to explain minority-white differences. The evidence suggests that education has roughly the same returns for blacks, whites, and Hispanics (Barrow and Rouse 2006; Ashenfelter and Rouse 2000) and that blacks, whites, and Hispanics have roughly the same *perceptions* of the costs and benefits of postsecondary education (Avery and Kane 2004).

Alongside enduring minority-white differences, a new group difference puzzle has developed. The educational expectations and attainment of females have historically been below those of males, but a long-term, strong, upward trend has led to females having higher expectations and attainment than males (National Center for Education Statistics 2006:159; Buchmann and DiPrete 2006).[2] The secular trend in females' expectations relative to males is unsurprising given the rise of female labor force participation, but the Wisconsin Model cannot explain higher expectations and attainment among females because males and females have essentially identical test scores and family resources. Investment models also poorly explain sex differences because—although there is some evidence of higher returns for females (Jacob 2002; DiPrete and Buchman 2006)—education appears to have roughly the same return for males and females.

I also argue that the Wisconsin Model and investment models provide unsatisfactory accounts of the effects of cognitive skill and family background on educational attainment. The Wisconsin Model specifies that cognitive skill affects grades, which affect significant others' expectations, which affect students' attainment (see Figure 1.1). However, a fairly strong relationship between cognitive skill and educational attainment remains net of both grades and significant others' expectations. Human capital oriented researchers often suggest that cognitive skill increases schooling's returns (e.g., Frank 1985:211; Herrnstein and Murray 1994) or lowers schooling's psychic costs (Cunha, Heckman, and Navarro 2006; Garen 1985), but these claims have not been empirically demonstrated.

Despite the centrality of family background in the Wisconsin Model, it is never clearly spelled out why significant others of those with advantaged family

[2] This net-female advantage is now so great that some administrators are considering "affirmative action" admission policies for male applicants (Green and Green 2004, cited in Buchmann and DePrite 2006).

backgrounds have high educational expectations. Family income should be related to the ability to comfortably finance college (or finance it at all), but other measures of family background have strong relationships with educational attainment conditional on family income. Most notably, estimation always suggests that parents' education has a large effect on adolescent educational attainment conditional on family finances and other predictors of educational attainment. It is sometimes vaguely suggested that well-educated parents value the cultural or symbolic benefits of college (Raftery and Hout 1993; Boudon 1974; Ellwood and Kane 2000), but this has not been shown. Returns to education do not seem to vary systematically with family background (Altonji and Dunn 1996), which leaves traditional investment models unable to explain family background effects that exist conditional on the ability to finance college.

SUBJECTIVE RATIONALITY AND SCHOOLING DECISIONS

I propose a synthetic framework focusing on college entry and drawing on what I perceive to be the strengths of the Wisconsin Model and investment models. My explanatory framework adopts the basic structure and explanatory agenda of the Wisconsin Model. In the Wisconsin Model, interpersonal variation in educational attainment is explained by interpersonal variation in social psychological constructs, namely aspirations. My approach also posits that interpersonal variation in social psychological constructs causes variation in educational outcomes, but in my model these psychological constructs are *preferences and perceptions* rather than aspirations.

While drawing on the status attainment tradition, my approach could fairly be characterized as rational choice theory because adolescents are ultimately seen as making their schooling decisions in a purposive, goal-oriented manner. I pursue a rational choice strategy because, although other forces doubtlessly come into play, this

is exactly where we should expect people to think somewhat strategically: college entry is a major decision involving potentially large costs and benefits.

I mentioned earlier that rational choice theory has received at times a cool reception in sociology. Before laying out more of the specifics of my approach it is useful to defend at the outset against common criticisms of rational choice perspectives because doing so helps position my approach in broader debates in the literature.

Some criticize the unrealistic assumption of rational choice models, such as the assumption that actors possess complete information, act only in their self-interest, care only about material well-being, and so on. Rational choice theory is now considered more a "family of theories" (Hechter and Kanazawa 1997) than a single theory with a single set of assumptions. Several approaches, such as "bounded rationality" (Simon 1982), "subjective rationality" (Boudon 1989), and inclusive or "thick" modeling (Mansbridge 1990) have been offered as more realistic alternatives. The approach I offer is firmly within this "realistic tradition."[3]

Yet some sociologists object even to these more realistic models because rational choice has no place in sociology (e.g., Blau 1997). I concur with Goldthorpe's (2007:166) position that such sociologists "take an unduly partial view of what constitutes the sociological tradition" because the means-ends logic of rational choice theory represents a major portion of the work that mainstream sociologists engage in, including work performed by rational choice theory's detractors (Heckathorn 1997; Hechter and Kanazawa 1997).

[3] I find the arguments against rational choice theory generally unpersuasive and often unreasonable, but I note that uncharitable critiques run in both directions. When rational choice proponents criticize "over-socialized" actor models they characterize these models in ways that I think only a small minority of advocates of socialization models would accept as realistic. Just as rational choice researchers emphasize rationality without thinking that actors are thoroughly rational, I suspect that socialization-oriented researchers emphasize socialization without thinking that actors never make decisions.

Some important sociological traditions do downplay the role of subjectivity.[4] But at the same time, a major current in sociology has always been the importance of subjectivity, and sociology has long stressed the importance of beliefs, perceptions, social constructions, the "definition of the situation," and related concepts on the supposition that subjectivity is crucial to understanding human behavior (Weber 1978; Thomas 1923; Mead 1934). Indeed, subjectively rational action is emphasized in Weber's well-known "types of social action" framework (Weber 1978:24–26) as the most promising route to understanding social behavior. The rational choice approach taken here could fairly be called an interpretive approach in the spirit of Weber's sociology because it calls for beginning the analysis by *understanding others' way of seeing the world*—or in this case their way of seeing a particular decision—and then determining how their perspective affects their behavior.[5, 6]

I argue that rational choice research in education has concentrated too much on models without empirical content and that more empirical analysis is needed. However, my first step is to discuss in abstraction aspects of schooling decisions to develop a model that I believe captures much of adolescents' thinking when making these decisions. I build this model using utility functions. This is not strictly necessary, but utility functions provide a useful framework for the unambiguous communication of ideas. I begin with a traditional investment framework representative of the most

[4] For example, the Marxian tradition downplays consciously held beliefs on the assumption they are "epiphenomena" that do not themselves motivate or explain behavior. Important pieces of Durkheim's work also argue against appeals to the thought processes of individuals. Most famously, Durkeim warns that "Every time that a social phenomenon is directly explained by a psychological phenomenon, we may be sure that the explanation is false" (Durkheim 1966:104). He does not mean to exclude psychology and he did some backtracking in subsequent editions of the *Rules of the Sociological Method*. Nonetheless, Durkheim certainly downplayed individuals' subjectivity as a cause of behavior.
[5] My perspective is also in the spirit of Weber's types of social action schema in that—while I focus narrowly on rational action for the research at hand—I do not believe that all social action is rational. I believe that social action can sometimes be more fairly characterized as nonrational and oftentimes be more realistically characterized as a blend of the various ideal types of social action that Weber describes. The approach I offer is a one-sided exaggeration that focuses on a certain group of factors.
[6] In this spirit, Kiser and Hechter (1998:798) have referred to a variant of rational choice theory as "analytical Weberianism."

basic investment models to provide a clear and explicit system through which I introduce changes. I do so by relaxing and changing the assumptions to arrive at the flexible model I take as my empirical point of departure. The model is not parsimonious by most standards, and much of the framework has already been outlined by others (Morgan 2005; Breen and Goldthorpe 1997; Xie and Goyette 2003), it must be granted. What is valuable is that the model outlines an empirically testable agenda.

BASIC INVESTMENT MODEL. Taking only four-year colleges into consideration, in a basic investment framework students should enroll in college if:

$$(B_{BA} - C_{BA}) > (B_{HS} - C_{HS})$$

Where B_{BA} are the benefits of a bachelor's degree, C_{BA} are the costs of a bachelor's degree, B_{HS} are the benefits of a high school diploma, C_{HS} are the costs of a high school diploma, and all costs and benefits are pecuniary in nature.

UTILITY FUNCTIONS. Many models equate earnings with utility; doubling earnings doubles utility, tripling earnings triples utility, and so on. In all probability, however, earnings has diminishing utility; doubling earnings, for example, will increase utility but it will less than double it. This point is important in understanding choice under conditions of uncertainty where people are often found to be risk-averse (von Neumann and Morgenstern 1944). Regardless of the exact function, the notion here is that utility is a *function* of earnings and not necessarily a linear function.

Now the costs and benefits are the arguments of utility functions, and the decision rule is enroll if:

$$U(B_{BA} - C_{BA}) > U(B_{HS} - C_{HS})$$

Or equivalently:

$$U(B_{BA}) - U(C_{BA}) > U(B_{HS}) - U(C_{HS})$$

INVESTMENT WITH UNCERTAINTY. Comay, Melnik, and Pollatschek (1973) were the first to systematically treat postsecondary education decisions as choice under conditions of uncertainty and incorporate the probability of completing an educational stage into the decision of whether or not to commence that stage. An adolescent may not know, for example, if their current work habits are sufficient for graduation or if they can substantially improve them if they are not. This is important in the decision to pursue a postsecondary degree because labor market outcomes are contingent on the acquisition of educational credentials (Kane and Rouse 1995; Faia 1981), and most adolescents probably know this. Consequently, the decision of whether or not to enter college depends on the probability of graduation. Following convention, the probability of graduation is denoted π. Now the decision rule is enroll if:

$$\pi\big(U(B_{BA}) - U(C_{BA})\big) + (1-\pi)\big(U(B_{SC}) - U(C_{SC})\big) > \big(U(B_{HS}) - U(C_{HS})\big)$$

Where the subscript *SC* stands for "Some College" and indicates that the adolescent entered college but did not graduate. The meaning of "Some college" can range from withdrawing immediately after enrollment to withdrawing immediately before graduation, but for my purposes these differences are unimportant.

NONPECUNIARY COSTS AND BENEFITS. We know surprisingly little about what motivates investments in postsecondary education. Despite the decades old tradition of treating education as an investment made to improve earnings, there is little direct evidence that earnings in particular motivate noncompulsory schooling. The basic argument, generally unstated, is simply: everybody wants high earnings; schooling appears to increase earnings; therefore, people go to school to increase their earnings.

The only real supporting evidence is that trends in returns are followed by trends in college enrollment (Ehrenberg and Smith 2000:301–302) and educational expectations (Morgan 1998). It is worthwhile to examine these trends because those who have offered them as evidence have ignored alternative nonpecuniary explanations. Figure 1.2A presents trends in the proportion of 18 to 24 year olds enrolled in college for the years 1968 to 1999 and trends in the "college earnings premium," which is the ratio of the earnings of those with bachelor's degrees and the earnings of those with high school diplomas. The college premium declined in the early 1970s and has increased steadily beginning around 1980. Enrollment in college appears to have tracked this trend, especially from 1980 onwards. However, female enrollment in college has been increasing steadily for decades, likely as a result of changing gender role attitudes and changes in the role females play in the labor market. Figure 1.2B shows that among females trends in college earnings premiums and college enrollment do not track one another well and that female college enrollment was increasing through the period of declining college premiums from 1975 to 1980. Figure 1.2C shows the trends for males, which do seem to follow one another somewhat closely.

Just as a college premium can be generated for earnings, college premiums can also be generated for nonpecuniary labor-market outcomes. Ratios of some nonpecuniary outcomes are problematic because they have no clearly defined zero

point, but the difficulties can be ignored to generate some simple trends.[7] Figure 1.3 shows the percentage of 18 to 24 year old males enrolled in college and college premiums for six nonpecuniary labor-market outcomes measured using characteristics of the occupations respondents report. Occupational characteristics are taken from O*NET98. The O*NET98 data and variables will be described in greater detail in Chapter 4, but self-explanatory variable names should be sufficient for now. Just as Figure 1.2C showed that the college earnings premium could have caused the increase in male college enrollment, especially beginning around 1980, Figure 1.3 shows that college premiums in nonpecuniary outcomes could also have caused the increase. Specifically, Figure 1.3 shows that college premiums in job security, occupational status, work that satisfies "Investigative interests" (such as abstract problem solving), and work that involves decision-making and ability utilization (the use of one's skills) have all followed roughly the same trends as college enrollment.

Figure 1.3 also shows that the college premium increased for deductive reasoning requirements as well. Deductive reasoning requirements are not normally thought of as desirable nonpecuniary benefits, but they probably are sought after by many people. The trend in deductive reasoning requirements illustrates the more general trend that anything strongly related to cognitive skill (such as Investigative interests, occupational prestige, and so on) shows the same basic trend as college enrollment. (This is not true for females, but other factors were probably driving female trends in enrollment.)

It is unclear whether the trends in Figures 1.2 and 1.3 should be interpreted as evidence of pecuniary motives or nonpecuniary motives, but the broader evidence that nonpecuniary job characteristics are important is unequivocal. Studies find that job

[7] A less problematic approach would be to estimate changes in the effect of education as changes in the *differences* in nonpecuniary outcomes between those with bachelor's degrees and high school diplomas. Results based on differences yield nearly identical results.

satisfaction is only weakly affected by earnings (Gruenberg 1980). Research on compensating differentials shows that workers will forgo higher earnings for more pleasant and safer jobs. Jencks, Perman, and Rainwater (1988) developed an "Index of Job Desirability" using the rankings people gave of their own jobs in conjunction with their descriptions of their own jobs. While they found that earnings were the single strongest determinant of a job's desirability, other factors (such as autonomy, full-time employment, vacation time, on-the-job training, job security, variety, cleanliness, and unionization) were collectively twice as important as earnings. People care about having an interesting job, a safe job, a respectable job, and so on (Jencks, Perman, and Rainwater 1988; Johnson and Elder 2002), and it is reasonable to think that adolescents go to school to obtain these outcomes. Permitting nonpecuniary costs and benefits, the decision rule is enroll if:

$$\pi\left(U(B_{BA\bullet j}) - U(C_{BA\bullet j})\right) + (1-\pi)\left(U(B_{SC\bullet j}) - U(C_{SC\bullet j})\right) > \left(U(B_{HS\bullet j}) - U(C_{HS\bullet j})\right)$$

Now costs and benefits are indexed by *j*, which indicates that multiple types of costs and benefits—pecuniary and nonpecuniary—are permitted.

HETEROGENEOUS UTILITY FUNCTIONS. Thus far preferences have been assumed to be homogeneous across adolescents, which is not uncommon in rational choice models. This is one point at which investment models and the Wisconsin Model have diverged sharply. In the Wisconsin Model adolescents have different goals. Some adolescents want to go to college and others do not; some adolescents want to be plumbers and others want to be engineers. These differences in aspirations and expectations drive differences in attainment. In contrast, many investment models assume that all adolescents possess identical preferences or permit preferences to vary

interpersonally but infer them after-the-fact from behavior (e.g., random utility models) rather than measuring them before analysis for their predictive value.

Utility functions need not be the same for everyone. Surely most people want high earnings, but the subjective value of earnings just as surely varies from person to person. If education is believed to increase earnings, then a "preference for earnings" could increase the utility of schooling. The literature on job values, which is reviewed in Chapter 4, supports the notion that interpersonal differences in the conversion of earnings into utility are both considerable and directly measurable. These differences in preferences also appear to have consequences; for example, Long (1995) shows that self-reports of the importance of financial success predict annual income conditional on a range of covariates.

Of course adolescents also vary in their preferences for nonpecuniary outcomes and these too may affect postsecondary schooling decisions. Now the decision rule is enroll if:

$$\pi\left(U_i(B_{BA\bullet j}) - U_i(C_{BA\bullet j})\right) + (1-\pi)\left(U_i(B_{SC\bullet j}) - U_i(C_{SC\bullet j})\right) > \left(U_i(B_{HS\bullet j}) - U_i(C_{HS\bullet j})\right)$$

Where the subscript *i* has been added to indicate that preferences are allowed to vary interpersonally across adolescents.

Permitting heterogeneous utility functions deserves special attention because many rational choice proponents strongly object to it. Surprising though it may seem, there are those who have argued that utility functions are essentially invariant interpersonally (Becker and Stigler 1977; Becker 1976; Freidman 1953). Most rational choice proponents do concede that preferences vary interpersonally, but they caution against making models more realistic by permitting preferences to vary because the cure is worse than the disease. Allowing interpersonal variations in preferences, it is

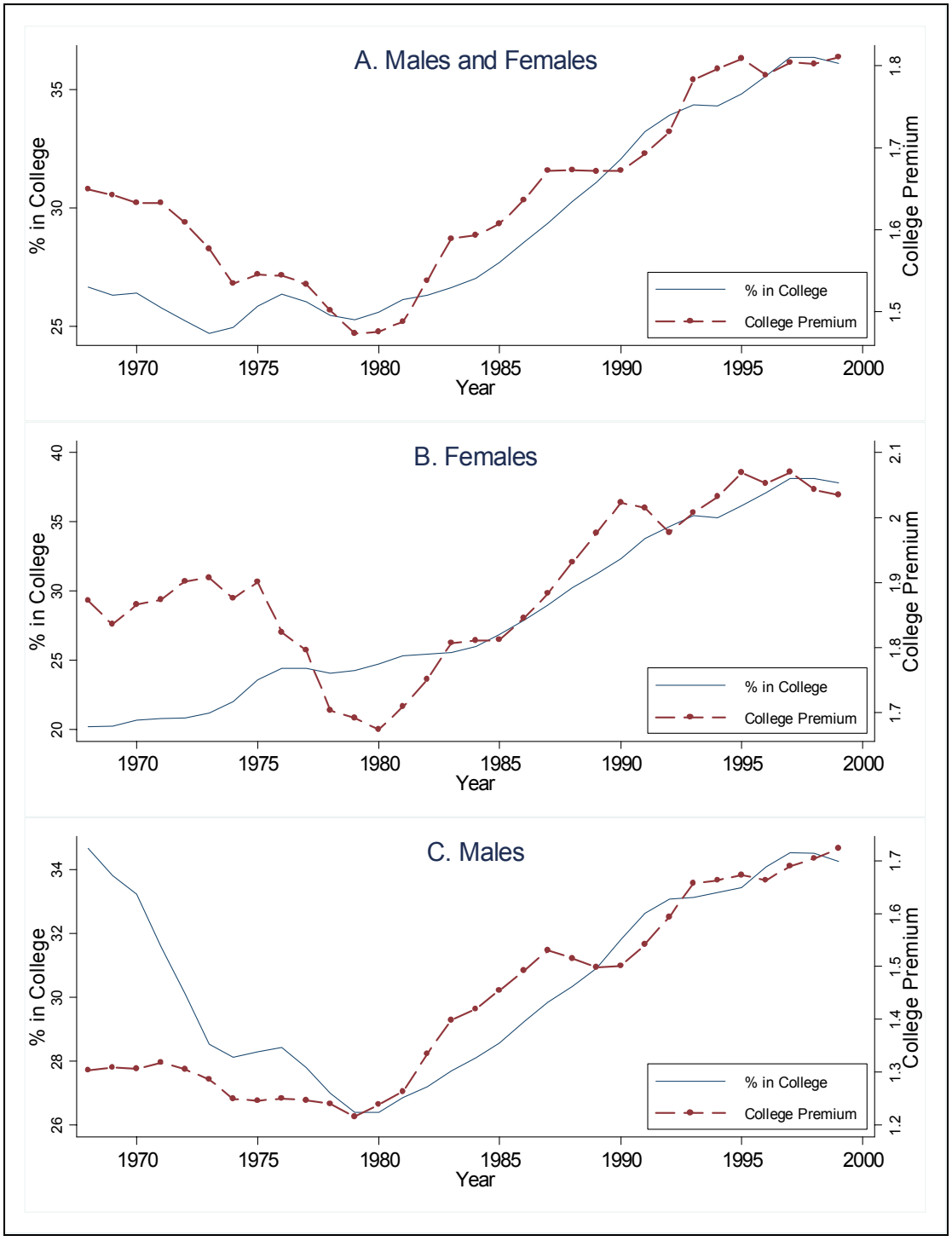

Figure 1.2. Trends in College Enrollment among 18–24 Year-Olds and the College Earnings Premium. CPS 1968–1999.

Notes. Enrollment data are from the October CPS. Earnings data are from the March CPS. Trends are three-year moving averages.

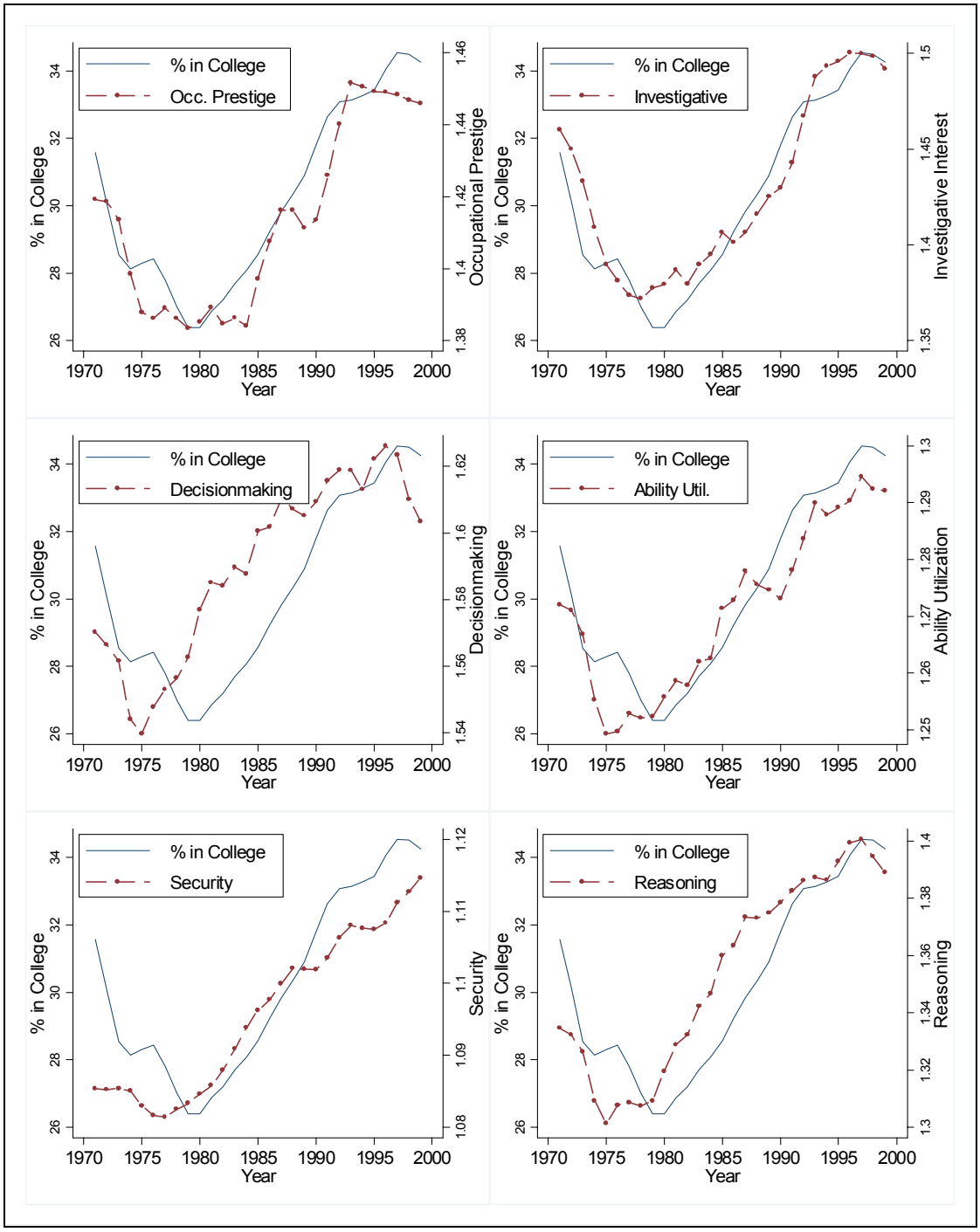

Figure 1.3. Trends in Male College Enrollment and Trends in Possible Incentives for College Enrollment. March CPS 1971–1999.

Notes. Enrollment data are from the October CPS. Earning data are from the March CPS. Trends are three-year moving averages. See text (the section titled Data) for details on the occupational characteristics.

argued, destroys the predictive value of rational choice models. For example, if someone decided not to go to college and I simply asserted "They must not like school" then critics would object that "preferences can explain everything, therefore they explain nothing." I think this is not a criticism of preferences at all. It is a criticism of post-hoc explanations based upon no data. It should be just as objectionable if I claimed without evidence that "Their net pecuniary gain must be low." The problem is dealt with by measuring preferences not by precluding the use of preferences because they seem common in post-hoc explanations.[8]

A second criticism is that troubling measurement issues cast doubt on the validity of self-reported preferences (Hechter 1992; Fischhoff 1991). Therefore, even when preferences are measured, it is argued, they often should not be used by researchers. Measuring preferences is difficult, but so is measuring any concept with self-reports. If we excluded all variables with considerable measurement error we would have to exclude a great many variables indeed. Included among them, I would imagine, would be many of the variables used with rational choice models that assume homogeneous utility functions. If preferences are measured as poorly as many suggest then they should have no predictive power, but this has not been shown. The value of measured preferences should be examined rather than dismissed before empirical inquiry.

I argue that self-reported preferences are valuable, but I concede that unconscious mechanisms sometimes shape self-reported preferences in such a way that they appear to have explanatory power when they in fact do not. Consider the case of interpersonal differences in preferences for different occupations. Someone who

[8] Based on my own reading of the literature I would add that the explanations based on unmeasured preferences that some criticize so harshly are rare, and explanations invoking interpersonal differences in preferences are typically made on the basis of some evidence or are merely presented as possibilities. Appeals to unmeasured costs are probably just as common.

initially wanted to become a physician may realize that they lack the ability or motivation to complete the training required to meet this goal. They may subsequently disparage the goal and argue that becoming a physician is actually an undesirable outcome that they do not want for themselves. This is the theory of adaptive preference formation of Rokeach (1973) or the "sour grapes" mechanism discussed by Elster (1983) in which values change to preserve a positive self-concept. I take this mechanism seriously and attempt to address it where I can. I generally cannot address it in a completely satisfactory manner, but I do discuss the direction of bias that would be expected if the sour grapes mechanism was operating.

Critics of "heterogeneous preferences" explanations also claim that the cure is worse than the disease because the disease is not as bad as it seems. Hechter (1994) distinguishes between "immanent values" and instrumental values." Immanent values are commodities that rational actors derive utility from. Instrumental values are the commodities that rational actors use to produce immanent values. Hechter argues that it is reasonable to assume that instrumental values (e.g., money) are important to everyone because they can be used in the pursuit of immanent values, including altruism. Conversely, the importance of many immanent values should be randomly distributed. Therefore, while they may be essential to understanding an individual's behavior, they will be unimportant in understanding the behavior of aggregates because they will tend to cancel out leaving group behavior explained strictly with instrumental values. This is the defense of the so-called "typical values" assumption: only those values that are typical in the population will predict the behavior of aggregates.

The argument that almost all people value money seems quite sensible to me, and it may be productive to make this assumption in many situations. I argue that college entry decisions are not one of those situations. I seek to understand why some

individuals enter college and others do not, and I need interpersonal variation in something to explain interpersonal variation in college entry. For reasons of their own, economists have traditionally focused on interpersonal variation in budget constraints and pecuniary costs and benefits, but these seem unable to explain a considerable portion of interpersonal differences in schooling decisions. We know that immanent values differ—both in kind and in intensity—and there is every possibility that these differences affect schooling decisions. Perhaps interpersonal variation in preferences can be ignored when trying to predict the effect of tuition changes on enrollment but not when trying to understand why some adolescents enter college and others do not.

PERCEPTIONS ARE PERMITTED. As discussed, traditional rational choice models typically assume complete information, but this assumption is dropped with increasing regularity in the literature (e.g., Morgan 2005; Rouse 2004; Dominitz and Manski 1996; Avery and Kane 2004; Wilson, Wolfe, and Haveman 2005). It is dropped here, and decisions are assumed to be based on *perceptions* (or equivalently on *beliefs*). For example, I look at students' perceptions of their ability to complete college rather than at more objective measures, such as grades, test scores, and so on. No notation is introduced to designate that perceptions are permitted, and it is to be understood that all costs and benefits are perceived.

In the college context much cannot be known with certainty because it is in the future. There is no way for an adolescent to determine, for example, what the returns to education will be over the course of their career, what their actual probability of future college completion is, and so on. Strictly speaking the distinction made here is not between perceptions and facts but between "rational forecasts" and "irrational forecasts." Rational forecasts are reasoned predictions of future outcomes based on available evidence about the past and present. Irrational forecasts ignore available

evidence or use it unwisely. Irrational forecasts are permitted here, and they are an important part of the empirical analyses.

SATISFICING BEHAVIOR. Sometimes the effect that perceptions have on college entry is straightforward. For example, higher perceived ability to complete college should increase the probability of college entry and higher perceived psychic costs should lower the probability of college entry. It seems almost universally to have been assumed that perceptions of the effect of education on labor-market outcomes are another straightforward case, and that adolescents who believe that postsecondary schooling's effects are high should be more likely to pursue postsecondary education because they are more apt to conclude that its benefits outweigh its costs (Becker 1993; Gambetta 1987; Morgan 2005).

This conclusion is based on the assumption that adolescents are maximizers or that they act like maximizers (such as would be the case if nonmaximizers imitated maximizers). Herbert Simon (1957) suggests that across a range of contexts actors are *satisficers* rather than maximizers, by which he meant that they set goals and devise and pursue strategies to meet them. Satisficers are satisfied if their goals are met even if maximization has not been achieved or if it is not known if maximization has been achieved.

I propose that satisficing models apply to schooling decisions. Adolescents form labor-market goals based on their preferences and then make postsecondary schooling decisions with the objective of meeting these goals. I propose that, in Simon's (1955) language, adolescents have mental *mapping functions* that relate educational attainment to occupational attainment. For example, an adolescent may perceive the mapping function presented in Table 1.1, which shows an adolescent who believes that with a high school diploma they can become a hospital orderly, with a

bachelor's degree they can become a registered nurse working in a hospital, and so on. Table 1.1 uses occupations, but it is possible to also think of adolescents' beliefs about more general occupational characteristics—such as earnings, authority, prestige, and so on—obtainable at different education levels. The approach taken here assumes that adolescents select an occupational goal and subsequently select educational attainment levels that will allow them to reach their occupational goals.

Table 1.1. Hypothetical Mapping Function Relating Educational Attainment to the Occupation it will Result In.

Educational Attainment		Occupational Attainment
High school dropout	→	Hospital custodian
High school graduate	→	Hospital orderly
Some college	→	Practical Nurse
Bachelor's degree	→	Registered Nurse in a hospital
Master's degree	→	Head Nurse at a hospital
PhD	→	Medical Researcher
Professional degree	→	Physician

While this way of modeling decisions seems sensible and realistic to many people, critics would object that it is not sensible to select an occupational goal without consideration of the schooling costs it entails. They would argue instead that educational and occupational goals develop simultaneously and that occupational goals are influenced by the type and amount of education an adolescent is willing to obtain. For example, an adolescent may ideally want to become a physician but may decide to set a different goal when they realize how much education is required for this occupation.

Furthermore, critics could object that the introduction of a satisficing model jeopardizes the logical coherence of my entire undertaking. The model is initially developed within a utility maximization framework, but then a satisficing decision rule is added. This is not an issue of doctrinal purity alone because it could be argued that if adolescents really are satisficers then the psychic costs of schooling should be

irrelevant to schooling decisions because occupational expectations must be met *at all costs*. As I have framed the decision, if an adolescent has decided that they want to become a registered nurse then nothing will stop them, including very high psychic costs of schooling and very low probabilities of college completion. This argument correctly accuses me of accusing adolescents of a degree of logical inconsistency. However, the empirical results presented in Chapter 2 through 5 support a model that blends utility maximizing and satisficing because they show that the perceived ability to complete college *does* increase the probability of entering college, the psychic costs of schooling *do* lower the expectation that college will be entered, and higher perceived education requirements *do* increase the probability of college entry.

SOURCES OF PREFERENCES AND PERCEPTIONS. The proximate causes of college entry are my primary interest, but I also engage in analyses that attempt to locate the sources of college-encouraging preferences and perceptions. These analyses focus on family background, cognitive skill, gender, and race and ethnicity. I also address the role of the structure of schools and the placement of adolescents in different schools.

ESTIMATING CAUSAL EFFECTS

Much of the empirical analysis in subsequent chapters involves estimating causal effects, such as the effect of the perceived ability to complete college on college entry, and matching estimators are used to estimate many of the effects. The logic and virtues of matching estimators are best expressed in the language and concepts of the counterfactual model of causality. I do not present a complete overview of the counterfactual model, which can be found elsewhere (Morgan and Winship 2007).

Instead, the presentation is stylized to convey my own understanding of the logic and value of matching estimators.

Consider estimating the causal effect of a binary variable *D* on an outcome variable *Y*. Individuals are either exposed to the causal variable (*D*=1) or are not exposed to it (*D*=0). Adopting the language of experiments, in the counterfactual model respondents who are exposed to the causal variable are said to be exposed to the "treatment" and belong to the treatment group; those not exposed to the causal variable are said to be in the control group and are called "the controls."

Suppose that the data on the relationship between *D* and *Y* were generated in an experiment using random treatment assignment. The average treatment effect of *D* on *Y*, which is denoted δ, could be estimated as the difference between the expected values of the outcome of the treatment and control groups:

$$\delta = E[Y \mid D = 1] - E[Y \mid D = 0]$$

Suppose now that the data are from an "observational study" in which data has been generated by something other than a randomized experiment, such as a survey. One obvious way to estimate the average treatment effect is with the same estimator used in experimental studies. When used with observational studies this estimator is often called the *naïve estimator*:

$$\delta_{NAIVE} = E[Y \mid D = 1] - E[Y \mid D = 0]$$

In observational studies the naïve estimator is subject to two potential sources of bias. First, naïve estimators ignore possible initial differences between the treatment and control groups on "pretreatment" variables that may affect the outcome. Morgan

and Winship (2007) refer to the bias that these initial differences cause as *baseline bias*. Second, naïve estimators ignore the possibility that *D* affects members of the treatment group differently than it affects members of the control group. Morgan and Winship (2007:46) call this *differential treatment effect bias*. If the treatment and control groups differed on neither baseline values nor on the effect of the treatment we would be unconcerned with these biases, and we could use the naïve estimator to produce unbiased estimates of the average treatment effect of the treatment *D*.

To avoid these two sources of bias, ideally we would observe the expected value of the outcome *Y* of the treatment group under the control state; in other words, we would like to know what the outcomes of the treatment group would have been *if it had not received the treatment*. This is a *counterfactual* or *potential* outcome that we cannot observe and does not actually exist. In the counterfactual model it is useful to conceive of such an average counterfactual outcome, which is denoted as:

$$E[Y^0 \mid D = 1]$$

Where the superscript "0" on the outcome *Y* indicates the control state. If we had this value, we could then estimate the average treatment effect for the treated:

$$\delta_{ATT} = E[Y^1 \mid D = 1] - E[Y^0 \mid D = 1]$$

Where the superscript "1" on *Y* indicates the treatment state. The subscript ATT on the treatment effect signifies that we are estimating the average treatment effect for the treated, which is commonly abbreviated as ATT. This notation is necessary because differential treatment effects permit the possibility that the treatment effect for the treated differs from the treatment effect for the controls and

necessitates that researchers specify which causal effect they seek to estimate.[9] I focus on the ATT in this overview because it facilitates the introduction of key concepts and terminology.

According to two of its proponents in sociology the counterfactual model is "valuable precisely because it helps researchers to stipulate assumptions, evaluate alternative data analysis techniques, and think carefully about the process of causal exposure" (Morgan and Winship 2007:7). From my perspective the counterfactual model is valuable because it makes researchers think carefully about who should be compared to whom to estimate a particular causal effect. I cannot compare the treated under the treatment state to the treated under the control state because the latter data do not exist. I thus seek a control group that I believe is a *good stand-in for the treatment group in the control state*. Specifically, I want a control group with the same expected value of the outcome that the treatment group would have in the control state. The principle aim of matching algorithms is the construction of control groups against which the treatment group can reasonably be compared to estimate the causal effect of D on Y.

When matching to estimate the ATT, observations in the control group are matched to observations in the treatment group on pretreatment variables believed to be important both in selection into the treatment and in determining the outcome. For each member of the treatment group, we search the control group for a person who has the same values for all of the pretreatment variables. In exact matching, cases that have no match are excluded from the analysis. More commonly some sort of a "nearest neighbor" algorithm, such as Mahalanobis matching or "calipers" (Althuauser

[9] As later chapters discuss, it is often difficult to decide which causal effect should be estimated. Nonetheless, it is better to realize that a multiplicity of causal effects exists and to sometimes make a questionable decision which effect to estimate than to always estimate a causal effect with no concrete meaning as has long been the common practice when modeling the outcome with regression.

and Rubin 1971) can be used to allow imperfect matches but ensure that matches are close. However, when the number of variables on which the match is to be made increases, satisfactory matches can become unlikely even when imperfect matches are allowed. The result is that many observations in the treatment group must be excluded from the analyses.

In their seminal article, Rosenbaum and Rubin (1983) proposed that matches could be made on a scalar summary of the covariates—the *propensity score*—instead of on the matching variables themselves. Again, imperfect matches are typically allowed. True propensity scores are unavailable in observational studies, but they can be estimated based on observed variables and an appropriate model of the treatment selection process, such as a logit or probit model, that predicts selection into the treatment group with the pretreatment variables.

Rather than trying to match each person in the treatment group to a particularly similar person from the control group, in propensity score matching the goal is to "balance" the samples on the pretreatment variables. Samples are said to be balanced when they have the same distributions of pretreatment variables. This is different than finding a perfect or near-perfect match for each member of the treatment group. Pairs of observations matched on propensity scores may not be particularly similar on the pretreatment variables because the same propensity score can arise from different combinations of values for the pretreatment variables. Indeed, the reason we use propensity scores is that we often cannot match individuals on the covariates. Thus, propensity score matching is much like randomization in experiments where the goal is to have similar control and treatment groups, not to have pairs of identical people split into treatment and control groups.

Balancing addresses baseline bias by ensuring that the treatment group is compared to a control group with the same baseline values on important pretreatment

variables. What about differential treatment effect bias? The balancing process is believed to deal with differential treatment effect bias as well because causal effect size is likely related to pretreatment variables. For example, the effect that education has on earnings may be related to cognitive skill, so Cunha, Heckman, and Navarro (2006) estimated the effect of education on earnings separately for those who completed college and those who did not because these two groups have somewhat different distributions of cognitive skill.

Many matching algorithms exist (see Morgan and Winship 2007:107–109). Morgan and Harding (2006) show that these various matching estimators can be thought of and generalized as *weighting estimators*, in which the matching algorithm generates a set of weights for the control group that makes the control group similar to the treatment group on the pretreatment variables. For example, in exact or nearest neighbor matching without replacement, observations from the control group that are matched to observations in the treatment group are given a weight of one; observations that are not matched to cases in the treatment group are given a weight of zero. In exact or nearest neighbor matching with replacement, observations from the control group are given weights according to how many times they are matched to observations in the treatment group.

I favor presentation and discussion using the logic of weighting because I think in terms of weighting, and working within a weighting framework facilitates introduction of an innovation I introduce to improve balance. In what follows, I present the weighting estimator I use in much of the empirical analyses in subsequent chapters as a series of steps in the context of a particular analysis. As an example, I look at the so-called "net-black advantage" in college entry (i.e., the finding that blacks have higher college entry rates than whites net of cognitive skill and family background) using data from *High School and Beyond*, which is described in greater

detail in Chapter 2. I begin by attempting to answer the counterfactual question "What would the black-white difference in college entry be if the cognitive skill, parental education, and family background of whites were similar to those of blacks?" Thus the treatment is being black, whites are the controls, and I seek to generate weights for whites that will result in whites having the same distribution of cognitive skill, parental education, and family income as blacks. Thinking of being black as a treatment that a person may or may not have been exposed to may seem unusual, but it is not unusual in the context of the counterfactual model (e.g., Morgan and McKerrow 2004), which sees all efforts to estimate causal effects as efforts to conceive of and estimate potential outcomes. Note that this is merely a demonstration of the procedure and that I pay little attention to the substantive issues involved.

Step one: Estimate the probability of selection into the treatment group. It is first necessary to model the treatment selection mechanism, which I do with a logistic regression model. Based on the results of a model that regresses black on cognitive skill, family income, and parental education I estimate the probability of selection into the treatment group (B=1) conditional on cognitive skill (*Cog*), parental education (*Epar*), and family income (*Inc*):[10]

$$\Pr(B = 1 \mid Cog, Epar, Inc)$$

[10] This is effective for balancing on means. To balance on higher moments of the distributions of the pretreatment variables quadratics and higher order functions of the pretreatment variables should be included in the model. Interaction terms can be included to balance also on the covariance structure of the treatment group. For example, if you want the correlation between cognitive skill and parental education for whites to be the same as it is for blacks, then a cognitive skill-by-parental education interaction term should be included in the model. I have typically found the inclusion of these higher order and interaction terms unnecessary for the analyses performed in this example or the other analyses performed in subsequent chapters. I therefore exclude interaction terms and higher-order terms.

The objective is to produce a set of weights that balance the control group to the treatment group. As will be shown, I generate several sets of these weights. It is useful to introduce notation to indicate which weights I use in particular steps. To begin, the HS&B data supplies sampling weights, which I have named *wgt*. To denote that I am using the variable *wgt* as a sampling weight I write:

$$\Pr(B = 1 \mid Cog, Epar, Inc)^{wgt}$$

It is not essential that the data initially be weighted. If the data are unweighted then the variable *wgt* is simply a column of ones.

Step two: Generate balancing weights. For each respondent *i* in the control group (whites), generate an "adjustment factor," f_1, which is the odds of that respondent being in the treatment group (i.e., being black):

$$f_1 = odds\left(B = 1 \mid Cog, Epar, Inc\right)^{wgt} = \frac{\Pr(B = 1 \mid Cog, Epar, Inc)^{wgt}}{1 - \Pr(B = 1 \mid Cog, Epar, Inc)^{wgt}}$$

These adjustment factors are then multiplied by the sampling weights *wgt* to generate a new set of weights, *wgt*1, that are intended to achieve balance across treatment and control groups:

$$wgt1 = wgt \cdot f_1$$

These new sampling weights are then used as sampling weights for whites. (The original sampling weights are used for blacks.) Because they are intended to achieve balance I refer to them as "balancing weights."

Step three: Check for balance. When the balancing weights are used as sampling weights for whites, the distributions of pretreatment variables for whites will be very similar to the corresponding distributions for blacks. However, steps one and two do not ensure that the samples are perfectly balanced on the matching variables, and it is advisable to examine the balance for each matching variable. There is no consensus on how balance should be assessed or on what level of balance is acceptable for a given method of assessment. A simple and common measure of balance is the *standardized bias*, which measures how much the samples differ on the pretreatment variables in standard deviations of the variable in question. For each pretreatment variable X the standardized bias SB is calculated as:

$$SB_X = \frac{\left| \overline{X}_{B=1} - \overline{X}_{B=0} \right|}{\sqrt{(S^2_{B=1} + S^2_{B=0})/2}}$$

Column 1 of Table 1.2 presents standardized bias values for the three pretreatment variables before steps one and two have been performed. The results show large differences between blacks and whites on all three measures. Column 2 shows standardized biases after steps one and two have been performed (i.e., the balancing weights are used in Column 2). The results show that the mean values for the matching variables for whites weighted to resemble blacks are similar to the mean values for blacks. Balance is poorest for family income, but even here blacks and whites are only about .06 standard deviations apart.

Step four: Iterate through steps one and two to improve balance. If the standardized biases that remain are of this magnitude analysis typically proceeds on the assumption

Table 1.2. Standardized Bias Values for Black-white differences in Pretreatment Variables. HS&B 1980.

	(1) Before balancing	(2) 1st Iteration	(3) 2nd Iteration	(4) 3rd Iteration	(5) 4th Iteration
Family income	.732	.059	.015	.004	.001
Parental Education	.468	.028	.006	.001	.000
Cognitive skill	1.235	.016	.005	.001	.000

that they are low enough. Suppose here that we find these remaining standardized biases unacceptably large. To attempt to improve balance, the standard approach is to respecify the treatment selection model in the hopes that the weights that the new model produces will improve balance. In other words, the strategy is to discard the original treatment selection model in the hopes that a new one will do better.[11] These new models often add higher-order terms of the pretreatment variables or other transformations. For example, one might introduce the logarithm of family income and/or family income squared to the model presented in step one.

I propose an innovation I believe to be superior to abandoning the initial treatment selection model. After the balancing weights are generated and used, the situation is that we have an unbalanced set of samples and we want to improve the balance. This is essentially the same scenario we started with before we generated the balancing weights. The difference is that before steps one and two the samples were badly unbalanced, but now they are only slightly unbalanced. To further improve balance, it thus seems logical to simply iterate through steps one and two each time using the newly created balancing weights when estimating probabilities in step one.

For example, if I am unsatisfied with the standardized biases in Column 2 of Table 1.2, I re-estimate the same treatment selection model but I use the balancing weight I created (*wgt*1) rather than the original sampling weight:

[11] Another strategy is to use the balancing weights in conjunction with regression analysis. For example, a regression model predicting the outcome is estimated using the balancing weights and including the pretreatment variables as regressors.

$$\Pr(B = 1 \mid Cog, Epar, Inc)^{wgt1}$$

Following through the steps, I create a new set of adjustment factors f_2 and a new set of balancing weights *wgt*2:

$$wgt2 = wgt1 \cdot f_2$$

Now *wgt*2 is used as a sampling weight to balance the control group to the treatment group. Column 3 shows that the new balancing weight reduces standardized biases even further. It is possible to iterate through steps one and two again and again to continue to improve balance. Columns 4 and 5 of Table 1.2 show the standardized biases that remain after a third and fourth iteration. The results show that the standardized bias is nearly zero after four iterations, although this cannot be generalized to all scenarios. In the analyses I perform in subsequent chapters I always perform 10 iterations, which I have found to be more than sufficient to attain essentially perfect balance.

Step five: Compare treated and weighted controls on outcomes. Estimates are based on these balanced samples. Table 1.3 presents estimates using the balancing weights generated in the 10th iteration. First, however, Column 1 of Table 1.3 considers unadjusted college entry rates for whites and blacks. Column 1 shows that by the 1986 interview about 58 percent of blacks have entered college and that about 65 percent of whites have entered college. The naïve estimate, which is about –.06, is reported below the entry rates in Column 1. This is simply the black college entry rate minus the white college entry rate. Column 2 presents results using the balancing weights to

make the sample of whites resemble the sample of blacks. The first entry for blacks is the same as the entry for blacks in Column 1. This illustrates the point that nothing has been done to the black sample. However, the entry rate for whites is reduced to 39 percent, so now blacks are almost 19 percent more likely than whites to enter college. This is the so-called net-black advantage in college entry. I have estimated the effect for the counterfactual condition in which whites have the same distribution of cognitive skill, family income, and parental education as blacks. However, I could just as easily have matched blacks to whites or have specified some other set of distributions and matched both blacks and whites to them. Indeed, I focus on average treatment effects, which are explained in Chapter 2 when they are first used, in my empirical analyses.

Table 1.3. The Proportion of Whites and Blacks Entering College. HS&B 1980.

	(1) Unadjusted results	(2) Matching results
	ENTRY RATES	
	Unadjusted	Matching
(1) Blacks	.580	.580
	(.011)	(.011)
(2) Whites	.646	.392
	(.008)	(.008)
	EFFECTS	
	Naïve estimate	Matching estimate
	δ_{NAIVE}	δ_{ATT}
(2) – (1)	–.066	.188
	(.019)	(.013)

Notes. N=5,900. Bootstrap standard errors in parentheses.

Estimates will be biased if variables related to both selection into the treatment group and the outcome are excluded from the pretreatment variables to be balanced (unless other pretreatment variables happen to completely capture their effects). Often this type of bias is referred to as "omitted variable bias" in regression, but slightly

different terms are used in the counterfactual model and with matching estimators. If a researcher believes that all of the systematic determinants of selection that are related to the outcome have been balanced they claim that treatment selection is "ignorable" or that "selection is on the observables." If they do not believe this they claim that treatment selection is "nonignorable" or that "selection is on the unobservables."

I believe that selection is on the unobservables; specifically, I believe that selection is also on college-encouraging preferences and perceptions. My efforts to explain the net-black advantage (Chapter 6) consist of adding measures of college-encouraging preferences and perceptions to the group of pretreatment variables to be balanced.

Step six: Variance estimation. There is little agreement on how best to estimate the variability of matching estimators (Morgan and Winship 2007:118–121), and I offer no insight about how standard errors should be estimated for the weighting estimator outlined in steps one through five. When using matching estimation I therefore use bootstrapped standard errors.[12] I have read claims that matching estimators are more efficient than regression estimators (Harding 2003), but this has not been my experience. When I have compared bootstrap standard errors from regression estimators to bootstrap standard errors from the weighting estimator I have described, the standard errors for the former are usually slightly lower.

Thus far, I have presented matching estimators as a natural solution to problems raised by the counterfactual model of causality. It is worthwhile also to compare matching estimators directly and explicitly to regression models of outcomes

[12] Specifically, using Stata's *bs* command I generate a bootstrap sample, and then perform steps 1 through 5 to generate an estimate of the effect or statistic of interest. I do this 1000 times and use the standard deviation of the 1000 estimates as the standard error of the original estimate based on the actual sample.

because to favor matching estimators we should surely want them to have advantages over the most widely used and understood body of approaches used in quantitative sociology, especially if they are less efficient. Unlike regression models of outcomes, matching estimators do not impose parametric restrictions, except in the process of attaining balance.[13] Traditional regression analysis also ignores differential treatment effect bias. Lastly, matching estimators are more intuitive than regression estimators. I concede that this last point is for me the greatest attraction of matching estimators. Matching estimators are a formalization of the way I think about estimating causal effects in a way that regression modeling of outcomes has never been.[14]

This is not to say that regression modeling of outcomes lacks attractive properties. A problem with matching methods vis-à-vis regression is that they are "data-hungry." Indeed, the turning away from matching techniques to regression was caused by data sparseness, although propensity score matching has helped tremendously with this issue. However, there are scenarios where even propensity scores seem incapable of dealing with sample size issues, such as when I attempt to estimate the effects of individual job values on educational expectations in Chapter 4. Here I turn to modeling the outcome with regression. The estimation of school effects is another case in point because school based surveys contain only a handful of students within each school. To estimate school effects I use multilevel regression models. Unlike matching estimators, multilevel models are widely used in sociology, and it is thus unnecessary to review them here.

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[13] Due to the flexibility of regression (e.g., entry of nonlinear transformations of regressors and multiplicative models) its parametric restrictions are not as limiting as many people believe. Nonetheless, there are often times when no such assumptions need to be made and therefore should not be made.

[14] The value of the intuitiveness of matching estimators need not be restricted to researchers. As Rosenbaum and Rubin (1985) have said: "One virtue, not the least important, of matched sampling is that the nontechnical audiences often find that matching, when successful, is a persuasive method of adjusting for imbalances in observed covariates."

SUMMARY OF THE SUCCEEDING CHAPTERS

The rational choice model outlined earlier represents an ambitious research agenda and a formidable operationalization challenge. Although I cannot be said to have a strictly nonpecuniary focus, I definitely do not have a narrowly pecuniary focus, and I ignore some of the more traditional foci like perceived tuition costs. I examine perceptions of the ability to complete college (Chapter 2); preferences for academic activities (Chapter 3); preferences relating to occupations (Chapter 4); and perceptions of the effects of schooling on occupational outcomes (Chapter 5).

Before outlining the chapters it is first necessary to make a few remarks about the selection of the data used in the empirical analyses. I use numerous datasets, sometimes more than one per chapter, because the best available measures of the preferences and perceptions I consider are not contained in a single dataset. I have chosen to favor better data over newer data. For example, I use the *National Longitudinal Survey of Young Men, 1966*—whose base year was some 42 years ago—to estimate a single model because it contains a combination of variables unavailable in any other dataset. Despite my best efforts, however, the measures I use are often far from ideal, and better (not only newer) data are desirable. The measures I use represent an improvement, however, over the conventional approaches to ignore interpersonal differences in preferences and perceptions or surmise that they are present and drive empirical results without any resort to measurement.

Chapters 2 through 5, which each focus on a specific perception or preference, follow the same basic format. I first document interpersonal variation in the preference or perception that is the chapter's focus. Some assert that there is little interpersonal variation in preferences and many act as though there is little interpersonal variation in preferences or perceptions, so this is an important first step. I then estimate the effect of the preference or perception on college entry. Sometimes I focus on the expectation

of a four-year degree because measures of college entry are unavailable. Lastly, I turn to estimation of the determinants of the preference or perception in question.

Chapter 2 examines the perceived ability to complete college using a question in the *High School & Beyond* data asking students directly how certain they are that they have the ability to complete college. Analysis shows that most adolescents are certain or fairly certain that they could complete college if they chose to, but a sizable minority is much less confident. Beliefs about the ability to complete college have strong effects on college entry. Results also show that the perceived ability to complete college is strongly related to cognitive skill, grades, and other performance measures. Conditional on cognitive skill and family background the perceived ability to complete college is much higher among blacks, Hispanics, and Asians than among whites.

Chapter 3 addresses the nonpecuniary costs of schooling, which are conceived as "psychic costs," using the *Educational Longitudinal Survey of 2002*. Unfortunately, the data contain no information on students' beliefs about the psychic costs of college. Only more general questions about preferences related to reading, solving problems, finding academic material interesting, and finding schoolwork satisfying are asked. Although the measures are thus somewhat unsatisfactory, they do permit estimation and examination of several conjectures made in the literature. Results show that psychic costs do reduce educational expectations, but the effect is much smaller than one might suspect and smaller than others have suggested. Results suggest that psychic costs are lower for females than for males, and that psychic costs are lower for blacks, Hispanics, and Asians than for whites. Unexpectedly, psychic costs are unrelated to family background.

Chapter 4 addresses preferences relating to labor-market outcomes. It uses data from *Monitoring the Future* to examine self-reported job values and occupational

expectations and data from the *National Longitudinal Survey of Youth, 1979* to examine occupational aspirations.

The results provide evidence of considerable interpersonal variation in occupational preferences. The results also show that preferences related to employment have fairly strong effects on college entry. Effects appear much stronger when measured as occupational expectations or aspirations than when measured as self-reported job values. Gender appears to be the strongest determinant of occupational preferences.

Chapter 5 examines adolescents' perceptions of the effects of education on occupational outcomes and how these perceptions influence college entry. The NELS88 is used to examine adolescents' beliefs about the schooling requirements necessary to obtain occupations they expect at age 30. Results show considerable variation in adolescents' beliefs about the education they will need and that these beliefs have fairly strong effects on college entry. I use the *National Longitudinal Survey of Young Men, 1966* to address the possibility of reverse causality (i.e., the possibility that educational decisions influence occupational expectation) and find evidence for only very weak effects of educational expectations on occupational expectations.

The results show that among respondents with the same occupational expectations, respondents with higher cognitive skill and more advantaged family backgrounds believe that the occupation they expect requires more education. Asians perceive higher requirements than whites, and blacks and Hispanics perceive higher educational requirements than whites conditional on cognitive skill and family background.

Chapter 6 estimates the extent to which the college-encouraging preferences and perceptions covered in Chapters 2 through 5 can help us understand the empirical

puzzles discussed earlier in this Chapter. These puzzles are minority-white and male-female differences in college entry, as well as the effects of cognitive skill and family background on college entry that exist net of family income.

Chapter 7 summarizes the empirical findings and concludes with directions for future research.

CHAPTER 2. THE PERCEIVED ABILITY TO COMPLETE COLLEGE

This chapter studies students' perceptions of their ability to complete college and the effect that these perceptions have on college entry. The perceived ability to complete college is almost certainly an important consideration when making the decision to enroll. Those estimating a low probability of college completion conditional on college entry—because they predict disliking the required schoolwork, they fear they are incapable of completing the required schoolwork, and so on—are probably less likely to enroll than those without similar misgivings. And yet, almost all investment models ignore the fact that graduation is uncertain at the time of enrollment and that adolescents making enrollment decisions are aware of this fact.

Perhaps many economists who study schooling decisions ignore the probability of graduation because they do not believe in "degree effects," which are the effects of obtaining academic credentials that exceed the effects of formal schooling not resulting in academic credentials. The importance of the perceived ability to complete college is largely dependent on the extent to which adolescents see college as a gamble. If adolescents believed that one, two, and three years of a four-year degree would have one-quarter, half, and three-quarters the effect on labor market outcomes as would a four-year degree, then they may be willing to enroll in college even if their subjective probability of completion is low. Conversely, if they believed that the effects of years of college completed had little effect on labor market outcomes if a degree is not obtained, then they would be less willing to enroll. Although some economists claim that degree effects are small, the best available evidence shows large degree effects for completion of a bachelor's degree (Kane and Rouse 1995). More limited evidence on nonpecuniary outcomes also suggests substantial degree effects on occupational prestige (Faia 1980).

There is little direct evidence on adolescents' *beliefs* about degree effects, which I argue are more important in understanding their schooling decisions. Dominitz and Manski (1996) and Rouse (2004) collect data that could be used to describe adolescents' beliefs about degree effects on earnings, but the information supplied in their papers is insufficient to determine if adolescents believe in these effects. I argue in Chapter 4 that education is an investment made largely for its effects on nonpecuniary labor-market outcomes, so beliefs about the types of jobs one can get with and without a degree may be more important than beliefs about earnings. However, I know of no data that could be used to describe these beliefs.

The lack of hard evidence on adolescents' beliefs notwithstanding, it seems reasonable to proceed on the assumption that adolescents believe in degree effects. They appear to actually exist, and my experience suggests that most adolescents believe that years of schooling that do not lead to educational credentials have small effects on labor-market outcomes. Even if they do not believe in degree effects, doubts about the ability to successfully conclude plans with uncertain outcomes often dissuade their initiation. Even without degree effects, many adolescents would consider failing to obtain a degree a type of failure, which they would want to avoid if it seemed highly probable. Consequently, adolescents' decisions of whether or not to enter college should depend on their beliefs about their probability of completion. If the perceived probability of graduation conditional on college entry is denoted π, the decision rule should be enroll in college if:

$$\pi\left(U(B_{BA}) - U(C_{BA})\right) + (1-\pi)\left(U(B_{SC}) - U(C_{SC})\right) > \left(U(B_{HS}) - U(C_{HS})\right)$$

Where the subscript *BA* indicates graduating college with a bachelor's degree or higher, *SC* ("Some College") indicates enrolling in college but failing to graduate,

and *HS* indicates not having enrolled in college (i.e., "High School only"). Naturally, "Some College" can mean different things ranging from withdrawing immediately upon enrollment to withdrawing immediately before graduation, but for my purposes these differences are unessential. All that is essential is that adolescents see the net utility of failing to complete college as lower than the utility of not entering college at all.

THE EFFECTS OF PERCEIVED ABILITY

Sociology has long stressed the importance of beliefs, perceptions, social constructions, and related concepts on the supposition that subjectivity is crucial to understanding human behavior. Yet despite the almost certain importance of beliefs about the ability to complete college we have no real evidence on the quantitative importance of these beliefs, what determines them, how they are related to similar concepts like expectations, and so on. Work on the importance of self-perceptions in quantitative research, even in the sociology of education, gives more attention to broader measures of perceived ability like self-efficacy. Although research on the perceived ability to complete college is lacking, two bodies of research are clearly relevant. One examines the probability of college completion; the other examines adolescents' academic self-concept.

Research on the probability of graduation is sparse. Much of the available work could be described as unempirical and develops models and speculates on the ways that the perceived ability to complete college may be important (Manski 1989; Breen and Goldthorpe 1997; Morgan 2005). Comay, Melnik, and Pollatschek (1973) were the first to systematically incorporate the importance of the probability of completing an educational stage into the decision of whether or not to commence that stage. They engage in some prescriptive empirical analysis that estimates the present

value of entering college for several groups when graduation is uncertain, but they lacked any measures the ability to complete college. In an Italian context, Gambetta (1987:116–124) argues that students look at their grades and whether or not they have repeated a grade at one level of schooling to judge their probability of success in subsequent levels. He found that both poor grades and repeating a grade were strong predictors of deciding against entering a subsequent level of education. However, Gambetta lacks a direct measure of *perceived* ability. This is important because the academic self-concept literature, which is discussed shortly, shows that performance and perceptions often differ and that these differences have consequences. Altonji (1993) uses a direct measure of students' perceptions of their ability to complete college contained in the *National Longitudinal Survey of the Class of 1972* data (the same measure that I use later in the *High School and Beyond* data). However, he combines it with SAT scores and high school grades to construct a composite ability measure. Consequently, it is not possible to discern the independent effects of perceived ability.

The second line of research on academic self-concept (and related constructs such as academic self-efficacy, academic self-image, and perceived intelligence) does deal specifically with adolescents' beliefs about themselves as students. For example, items from questionnaires measuring academic self-concept ask adolescents how much they agree with statements such as "I am hopeless in English class" and "I am too stupid at school to get into a good university" (Marsh 2006). Academic self-concept is strongly influenced by academic performance, such as grades, but academic self-concept also varies substantially across students with the same demonstrated ability (Marsh et. al. 2005). Research consistently shows that academic self-concept predicts positive academic outcomes (grades, educational attainment, high aspirations, and so on) conditional on prior academic outcomes. Most relevant here, research

shows that academic self-concept increases the probability that an adolescent will enroll in college (Adams 1970).

The literature on academic self-concept is certainly suggestive of the importance of the perceived ability to complete college. But it lacks "specificity matching," which is the matching of specific self-perceptions to specific outcomes. This is a problem because when predicting an outcome with self-concepts, self-concepts that closely relate to the outcome have much stronger effects than more general self-concepts (Swann et. al. 2007). For example, Hansford and Hattie (1982) found that self-concepts related to education were much better predictors of academic performance than global measures of self-esteem. Thus, a specific measure of the perceived ability to complete college may be a decidedly stronger predictor of college entry than more general measures of academic self-concept.

What is needed is a direct measure of the perceived ability to complete college uncombined with other measures. Academic self-concept may appear to possess specificity matching, but the literature on academic self-concept suffers from the fact that it focuses narrowly on perceived academic ability. It seems to be assumed that perceptions of academic ability alone determine the perceived ability to complete college, but the perceived ability to complete college should be determined jointly by perceptions of academic ability and *beliefs about the demands of college*. Some high school students likely think that college is "one big party" and that colleges award degrees to anyone willing to show up for exams and pay tuition for the required number of years. Consequently, some high school students will think that they have the ability to complete college because they think that college will be undemanding, not because they have positive academic self-concepts.[15] By focusing on direct and

[15] In the extreme case where an adolescent believes that college is just one big party, academic self-concept may play no role whatsoever because the adolescent believes that almost any level of ability is sufficient to complete college.

indirect measures of academic ability the measures used in the literature fail to capture the effects of these perceptions. A more direct measure of the perceived ability to complete college is desirable because it will capture both the effects of perceived academic ability and the perceived demands of college.

DETERMINANTS OF THE PERCEIVED ABILITY TO COMPLETE COLLEGE

Several branches of research suggest that a diverse range of factors influence adolescents' perceptions of their ability to complete college either by influencing their perceptions of their own academic ability or their perceptions of how challenging college will be. I begin by considering evidence available to adolescents that they might use to gauge their own ability.

PERFORMANCE MEASURES. Among measures of academic performance, grades have received the most attention. In the Wisconsin Model grades influence significant others' expectations: high grades lead significant others to expect higher educational attainment because high grades show that an adolescent has the ability and motivation to succeed in educational environments. However, students may also use grades to assess themselves. Regarding the relationship between grades and educational aspirations, Sewell, Haller, and Ohlendorf (1970) "assume that this is not only because the youth's grades in school impress other people…but also because the youth normally has a fairly adequate perception of the objective requirements for status attainment and to some extent independently gauges his ability to compete by assessing his grades relative to those of others" (p. 1024) Other perspectives, such as Gottfredson's (1981) circumscription and compromise theory of occupational aspirations, also assume that students "will judge how smart they are according to their school grades" (p. 562).

Grades are not the sole indicator of ability. As noted, Gambetta (1987) argues that repeating a grade is evidence that adolescents likely use to assess their own ability, which seems reasonable because repeating a grade is a concrete instance of academic failure. Similarly, some have commented that tracking may demoralize students (Oakes 1985), and placement in nonacademic tracks may lower perceived ability.

Measured cognitive skill is likely related to perceived ability. As will be discussed shortly, self-perceptions of cognitive skill can hardly be said to be accurate, but adolescents probably have some sense of their cognitive skill apart from school-based measures. Sewell, Haller, and Ohlendorf (1970) provide evidence suggesting that significant others use an adolescent's cognitive skill (instead of their grades alone) to develop their expectations for the adolescent. Just as was the case for grades, adolescents may reflect on their own cognitive skill to assess their ability to complete college.

In the Wisconsin Model adolescents' aspirations and expectations are formed by the expectations that others hold of them. If an adolescent's peers expect them to pursue higher education then the adolescent will aspire to higher education either because they adopt the expectation or because they use the expectation as a source of information about reasonable strategies and expectations that they should have for themselves. Morgan (2005) argues that adolescents may be more reflective and use the expectations of others as a source of information to assess their own ability.

Adolescents may also conceive of good study habits as a set of skills that will help them in college. If this is the case then those who have good study habits will have confidence that they can graduate, while those with poor study skills will be uncertain if they can increase their work intensity if necessary.

REFERENCE GROUPS AND RELATIVE STANDING. If one of the ways that grades, cognitive skill, and so on influence perceived ability is via relative standing then reference groups should be important because they also influence relative standing. An adolescent's rank in an ability hierarchy depends on the ability levels of their peers, and an adolescent will generally have a lower rank the higher the ability of their peers. (I say generally because it is possible to have the same rank in different groups with different mean ability.) Because academic self-concept is influenced by relative standing, associating with higher ability peers may lower academic self-concept. This "big-fish-little-pond effect" (BFLPE), as the phenomenon has become known, receives substantial empirical support. The average cognitive skill of the students within a school is found to depress the academic self-concept of its members and a range of other outcomes including college attendance and educational aspirations (Marsh 1991). Most of the work on the BFLPE deals with academic self-concept (Marsh and Hau 2003) and educational or occupational aspirations (Davis 1966; Meyer 1970), but it is easy to see how the BFLPE mechanism could operate on the perceived ability to complete college.

The composition of reference groups is a focal point in efforts to explain racial and ethnic differences in academic self-concept and self-concept more generally. The academic self-concept of blacks is similar to the academic self-concept of whites (Gray-Little and Hafdahl 2000), but this is surprising because blacks' academic self-concept would be expected to be lower than the academic self-concept of whites based on cognitive skill and other performance measures like grades. High schools are somewhat segregated. Blacks often attend schools with many blacks, Hispanics often attend schools with many Hispanics, and so on. Blacks will typically attend schools with lower mean cognitive skill than whites if blacks attend high schools with many blacks and blacks have low measured cognitive skill, grades, and so on. Consequently,

the standing of blacks relative to their peers will be higher than the standing of whites of equal cognitive skill relative to their peers.

This reasoning alone cannot explain a complete lack of black-white differences in academic self-concept because schools are not completely segregated. Some have suggested that blacks' reference groups may include only other blacks and that racial minorities may compare their outcomes only to other disadvantaged others (Broman, Neighbors, and Jackson 1988; Crocker and Major 1989; Major 1994; Major, Sciacchitano and Crocker 1993; Pettigrew 1967; Porter and Washington 1979; Simmons and Rosenberg 1971). If this were so, then blacks' perceived relative standing should be the same as whites' perceived relative standing. If a similar story held true for Hispanics, then we would expect Hispanics' relative standing also to be the same as whites' relative standing.

Why would blacks compare themselves primarily or exclusively to other blacks? One explanation, suggested by Hoetler (1982) and Kao and Tienda (1998), is that blacks are relatively "segregated" even within the same school or classroom and that blacks do not interact much with whites. It is almost impossible to test this theory; there is no way to know who is whose reference group because this is probably not something that people are consciously aware of. However, there is abundant evidence of racial and ethnic homophily in marriage, confiding, work relationships, and schoolmate friendships (for a review see McPherson, Smith-Lovin, and Cook 2001).

A second explanation is that blacks and other minorities may believe that whites' superior performance is not caused by superior ability. Minority students may believe that whites put forth greater effort in school, that high school teachers discriminate against minorities when assigning grades, or that standardized tests are racially biased and understate their true ability. Perhaps these issues should not matter if minorities will be tested and graded in college in much the same manner as they are

in high school. However, blacks and Hispanics may believe that college is a more enlightened atmosphere in which their grades will be unaffected by discrimination. They may therefore reason that the disparity in grades between themselves and whites will be eliminated at college and conclude that comparing themselves only with members of their own racial or ethnic group in high school is appropriate.

Jointly, the facts that (1) perceived ability is related to performance measures (e.g., grades and cognitive skill) and (2) blacks' perceived academic ability is roughly equal to whites' perceived academic ability, suggest that blacks' perceived ability will be higher than whites' perceived ability conditional on performance measures. Understanding this pattern is easiest within a matching framework. (The same reasoning applies in a regression framework, but it is less intuitive.) Suppose we have a group of white students whose cognitive skill is in the 50th percentile of all adolescents in the country. They will likely have about average perceived ability because they will likely stand at about the 50th percentile in their reference groups. Now consider that we find a group of black students whose cognitive skill is in the 50th percentile in the country to match to the white students. The black students are likely to have much higher than average perceived ability because they are likely to stand much higher than at the 50th percentile in their reference groups because their reference groups are likely to have below average measured cognitive skill. As a result, when we compare these matched groups of adolescents, the black group will have higher perceived ability than the white group. In other words, while there is little difference in perceived ability between blacks and whites, conditioning on performance measures should *induce* a relationship.

SCHOOLS. A large and growing body of research estimates "school effects," which are the effects that schools have on the members of their student bodies. There

is no school effects research on the perceived ability to complete college, but here too there is closely related work on academic self-concept, educational aspirations, and college enrollment. School-mean cognitive skill appears to depress academic self-concept and educational aspirations, as discussed earlier in connection with the BFLPE. The racial and ethnic composition of schools has also been found to affect some outcomes. Goldsmith (2004) examines the effects of racial composition on various school attitudes and found that black and Hispanic adolescents have more pro-school attitudes and higher aspirations in schools in which their own race or ethnicity is predominant. This finding lends itself to the BFLPE because blacks and Hispanics have lower measured cognitive skill and grades than whites, so the presence of many whites may lower the relative standing of blacks and Hispanics. However, Goldsmith proposes another set of explanations. First, schools with many minorities "may contain a relatively large number of students and parents who lack the adequate skills and resources for interpreting school feedback" (p. 141). Second, minority teachers and teachers from working-class backgrounds (who are more common in schools with many minorities) may raise minority students' interests in school with culturally relevant material and may have a greater connection with students. Goldsmith (2004) does find evidence that minority and working-class teachers raise the aspirations of minority students, but Frost (2007) fails to find any such evidence.

In addition to the research on academic self-concept and aspirations, the broader school-effects research finds that a host of school characteristics have small but substantively important effects on some outcomes. For example, small schools are argued to be more effective (Lee and Smith 1993, 1995; Meier 1995); the percentage of students in the academic track has been found to lead to greater increases in test scores (Chubb and Moe 1990); Catholic schools are associated with greater growths in learning; and so on. I lack theoretical justification for the inclusion of these variables

in models, but these school characteristics are the subject of policy debates so it is useful to know what effects they may have on college-encouraging perceptions.

THE PYCHOLOGY OF SELF-BELIEFS. The causes of the perceived ability to complete college presented thus far are rational in the sense that they deal with relevant information available to students. Even the BFLPE is subjectively rational in the sense that the effect is based upon available information. It appears, however, that a major portion of perceived ability is not based upon evidence. Studies consistently find that perceived ability is not strongly related to measured ability; for example, the correlation between self-reported and measured cognitive skill is only about 0.3 (for a review see Furnham and Chamorro-Premuzic 2004), although this value appears to vary somewhat across different types of skills (Gati, Fishman-Nadav, and Shiloh 2006).

Self-reported ability tends to be overstated. Psychologists study a phenomenon known as "self-enhancement," which is the tendency to evaluate oneself favorably the evidence notwithstanding (for a review see Leary 2007). Research that compares self-reported and measured ability finds that overestimation is far more common than underestimation. Overestimation is especially common among those with lower measured ability. Large majorities are found to report themselves as above average across a wide range of abilities, a phenomenon known as the "above-average effect." Several explanations have been offered, but the most widely accepted is that self-enhancement protects or builds self-esteem.

Because of interpersonal differences in self-enhancement and the general inability to effectively use available information to accurately assess ability, a large component of the perceived ability to graduate is likely not caused by any measures that an outside observer would consider reasonable foundations to construct beliefs

upon. Instead, a major portion of the perceived ability to graduate is probably a manifestation of personality. For example, those with high self-esteem, self-efficacy, and optimism probably have high perceived ability to complete college conditional on available evidence.

THE PERCEIVED DEMANDS OF COLLEGE. As discussed earlier, beliefs about the demands of college should also be strong determinants of the perceived ability to complete college. Family background should be related to these beliefs. Family income should be related to the perceived ability to complete college because is should be related to the perceived ability to finance college. Parental education may increase the perceived ability to complete college because adolescents are apt to believe that they can do whatever their parents can (and often quite a bit more).

After briefly describing adolescents' perceptions of their ability to complete college, in the empirical analysis that follows I estimate average treatment effects of the perceived ability to complete college on college entry using the propensity score weighting estimation strategy described in the Chapter 1. Following this, I examine the determinants of the perceived ability to complete college by estimating the relative weight that adolescents likely give various factors in assessing their ability to complete college.

DATA

Data are from *High School and Beyond* (hereafter, HS&B), a two-stage probability sample of 1,015 high schools in 1980, and a random selection of 36 sophomores and 36 seniors from each high school. (If there are less than 36 students all students are selected.) Students completed questionnaires and a set of standardized tests measuring a variety of cognitive skills. Some respondents' teachers and parents

were also asked to complete questionnaires. School questionnaires, which provide information on school characteristics, were completed for most schools. Respondents were resurveyed in 1982, 1984, and 1986. The sophomore cohort only was resurveyed in 1992. The base-year survey included N=58,270 student respondents.

Perceived ability to complete college is measured with the following question and response options:

"Whatever your plans, do you think you have the ability to complete college?"
Yes, definitely
Yes, probably
Not sure
I doubt it
Definitely not

Based on responses to this question I generate two measures of the perceived ability to complete college. The first is a straightforward collapsing of categories. Because few students selected either of the two categories representing low perceived ability ("Definitely not" and "I doubt it") these two categories are combined to form a single category in the analysis of the effects of the perceived ability to complete college on college entry.

For analysis of the determinants of the perceived ability to complete college I construct a continuous measure of students' subjective probability of completion conditional on entry by assigning the following probabilities, which I express as percentiles, to the 5 response categories: "Yes, definitely"→Pr=100; "Yes, probably"→Pr=75; "Not sure"→Pr=50; "I doubt it"→Pr=25; "Definitely not"→Pr=0). I construct this continuous measure because it provides an intuitive set of results, a benefit that I believe is too quickly disregarded when modeling

categorical outcomes. Preliminary analysis revealed that modeling the outcome as a set of ordered choices led to the same substantive results.

Despite the specificity of this question, several issues may limit the interpersonal comparability of responses. Different students likely interpret "college" differently: some will think of completing a two-year college degree while others will think of a four-year college degree; some will think of a challenging major while others will think of a comparatively easy one. Different students likely interpret "ability" differently. From my initial reading of the question I assumed that students were being asked about mental ability and/or the discipline to complete the requisite schoolwork, but some students may be thinking about the ability to finance college. Exploratory analysis showed that responses are only weakly related to the perceived costs of college (results not reported), but certainly some students could be thinking about the costs of college.[16] Different students may also be answering the question under different hypothetical effort levels. For example, some respondents' may take the question to mean "Do you have the ability to complete college if you spent 100 hours a week on schoolwork," whereas other students may be responding under more realistic hypothetical effort levels. The measure of probability, if it can be called that, is also coarse. The responses "Definitely not" and "Yes, definitely" may each mean the same thing to all who select them, but other responses may not. For example, the response "Yes, probably" could sensibly mean anything between a probability of .50 and .99, and we cannot determine precisely what different students responding "Yes, probably" mean.

Apart from the question itself, the data's age may be a problem. Comparison of *HS&B* data and data from the *National Longitudinal Study of the High School Class of*

[16] The HS&B asks seniors how much they think that several types of postsecondary schooling would cost. Responses to this question are essentially unrelated to the perceived ability to complete college.

1972 (*NLS72*) shows that the perceived ability to complete college increased substantially between 1972 and 1980. In 1972 (*NLS72*) only about 40 percent of seniors reported "Yes, definitely," whereas in 1980 (*HS&B*) almost 50 percent of seniors gave this response. This number may have grown since 1980, which potentially reduces the applicability of the results to current enrollment trends.[17]

Despite these shortcomings, I believe that *HS&B* is the best available dataset for examining the perceived ability to complete college because the ability question asks specifically about completing college (rather than about academic ability more generally). It is also asked before college entry.

The *HS&B* permits measurement of most of the concepts discussed in the preceding sections on the determinants of perceived ability to graduate, such as cognitive skill, parental education, family income, self-esteem, self-efficacy, race and ethnicity, grades, homework, track placement, and parent's aspirations. A description of the variables used in the analysis is presented in Table 2.1. Unfortunately, the perceived demands of college can be measured effectively with neither variables in the *HS&B* data nor with variables in any other datasets I am aware of. Grade retention is also not included in the analysis because it is unavailable for seniors. (Sophomores and seniors were given slightly different questionnaires.)

School characteristics are used to determine the characteristics of schools that influence the perceived ability to complete college. Some school characteristics are based on student-level variables. For example, school-level measures of cognitive skill, parental education, family income, and grades are all measured as their respective mean values for all HS&B respondents within the schools (sophomore and senior values are averaged). School-level variables of this type are referred to as

[17] It is possible to examine trends in self-perceived academic ability among high school seniors from 1976 onwards using data from *Monitoring the Future*, but no questions ask specifically about the perceived ability to complete college.

Table 2.1. Variables Used to Analyze the Perceived Ability to Complete College. HS&B 1980–1986.

Variable	Description	Mean	Stand. Dev.
INDIVIDUAL LEVEL			
Perceived ability to complete college (categorical)	Responses to the question "Whatever your plans, do you think you have the ability to complete college?"		
	"Definitely not" or "I doubt it"	.06	.24
	"Not sure"	.13	.34
	"Yes, probably"	.33	.47
	"Yes, definitely"	.48	.50
Probability of graduation (continuous)	A linear measure of students' perceived probability of college completion conditional on college entry measured as a percentage.	79.98	24.13
College entry	Entered a 2- or 4-year college as of the 3rd follow-up (1986)	.62	.50
Cognitive skill	The mean of the math and reading scores on standardized tests administered in 1980.	50.36	9.50
Self-esteem	Taken from self-concept composite scale score. Values reverse coded so that higher values indicate higher self-esteem. Based on 4 items: 1. I take a positive attitude toward myself 2. I feel I am a person of worth, on an equal plane with others 3. I am able to do things as well as most other people 4. On the whole I am satisfied with myself	.01	.66
Self-Efficacy	Composite measure based on 4 items. Values are reverse-coded so that higher values indicate higher self-efficacy: 1. Good luck is more important than hard work for success 2. Every time I try to get ahead, something or somebody stops me 3. Planning only makes a person unhappy, since plans hardly ever work out anyway 4. People who accept their condition in life are happier than those who try to change theirs	.00	.74
Grades	Students' average grades based on a categorical self-report. The variable I use converts responses to a continuous percentile variable.	81.34	7.75
Academic track	Placement in the academic track (yes=1) or any of the other tracks. Missing responses are coded as zero because values for	.38	.49

Table 2.1 (Continued)

	covariates, such as cognitive skill, strongly suggest that the majority of students with missing values are not in the academic track.		
Homework	Self-reported hours of homework per week. Midpoints of categories are used; zero is assigned to those who are not assigned homework	3.86	3.80
Mother's Aspirations	Years of education students' mothers would like them to get. Recoded from a categorical response variable.	15.34	2.24
Parental education	Years of education of the most-educated parent, or of either parent if the other parent's education is missing. Continuous recoded from categorical.	13.54	2.51
Family income	Income of students' family as reported by students. Recoded from a 7-category response variable. Midpoints used for categories and $75,000 is used for the category "$50,000 or more." Missing values are filled in with responses to another 3 category family income question.	23,528.98	14,475.91
Female	Respondent is female (yes=1)	.53	.50
White	Respondent is white (yes=1)	.71	.45
Black	Respondent is black (yes=1)	.11	.31
Hispanic	Respondent is Hispanic (yes=1)	.05	.22
Asian	Respondent is Asian (yes=1). Note that included in the category "Asian" are groups that do not correspond to the most common current colloquial use of the word Asian, and that those tracing their ancestry to India, Bangladesh, and Pakistan are coded as Asian.	.01	.12
American Indian	Respondent is American Indian (yes=1)	.01	.09
Other race/ethnicity	Other race/ethnicity, or race and ethnicity cannot be determined from responses (yes=1)	.10	.30
SCHOOL LEVEL	Statistics for school-level variables are based on the entire school-level sample, not only the senior cohort.		
Parental education	Mean parental education of students in the school.	13.38	1.15
Family income	Mean family income of students in the school.	22,226.32	6,058.44
Grades	Mean grades at the school.	79.82	2.35

Table 2.1 (Continued)

Cognitive skill	Mean cognitive skill in the school.	33.35	5.90
School size	Number of students in the school	1,315.88	815.58
% White	% of students who are white	71.87	31.4
% Black	% of students who are black	15.31	24.57
% Hispanic	% of students who are Hispanic	10.70	21.18
% Asian	% of students who are Asian	1.40	3.84
% American Indian	% of students who are American Indian	.70	4.42
% Academic track	% of students in the academic track	43.52	28.04

Notes. Data for individual-level statistics are weighted using the 3rd follow-up weight. Variable statistics include imputed values. N= 8,248.

"school-mean" variables (e.g., "school-mean cognitive skill") to distinguish them from the student-level measures. The school survey is used to measure school size (the number of students in the school); percentage of students in the academic track; percentage of students who are white, black, Hispanic, Asian, and American Indian.

Different samples are used for estimation of (1) the effects of perceived ability and (2) analysis of the determinants of perceived ability. Analysis of the determinants of perceived ability uses the base-year (1980) sophomores and seniors attending schools for which school surveys were completed; sample size is N=54,128 respondents, and N=988 schools. Analysis of the effects of perceived ability on college entry focuses on entry into a two- or four-year college as of the third follow up, and uses only seniors in the base-year survey who took part in all of the first three follow-ups; sample size is N=8,886 respondents. Respondents with invalid college entry data are dropped for analysis of the determinants of perceived ability to complete college on college. Missing values for all other variables are imputed using Stata's *impute* command. I imputed school-level variables using both items from the school survey and the school level variables created using items from the student surveys and

the test batteries. I adjusted some imputed values to fit within the 0 to 100 percent range for percent of students in the academic track and so on.

FINDINGS

DESCRIPTIVE RESULTS

I first examine the distribution of adolescents' perceptions. Figure 2.1 presents the percentage of seniors responding to each category of the question asking students if they thought they had the ability to complete college. It shows that almost 50 percent of respondents think that "Yes, definitely" they have the ability to complete college. Just over 30 percent respond "Yes, probably," meaning that roughly 80 percent of students are at least somewhat confident in their ability to complete college. About 13 percent are "Not sure," leaving only about 6 percent of students with serious doubts about their ability to complete college.

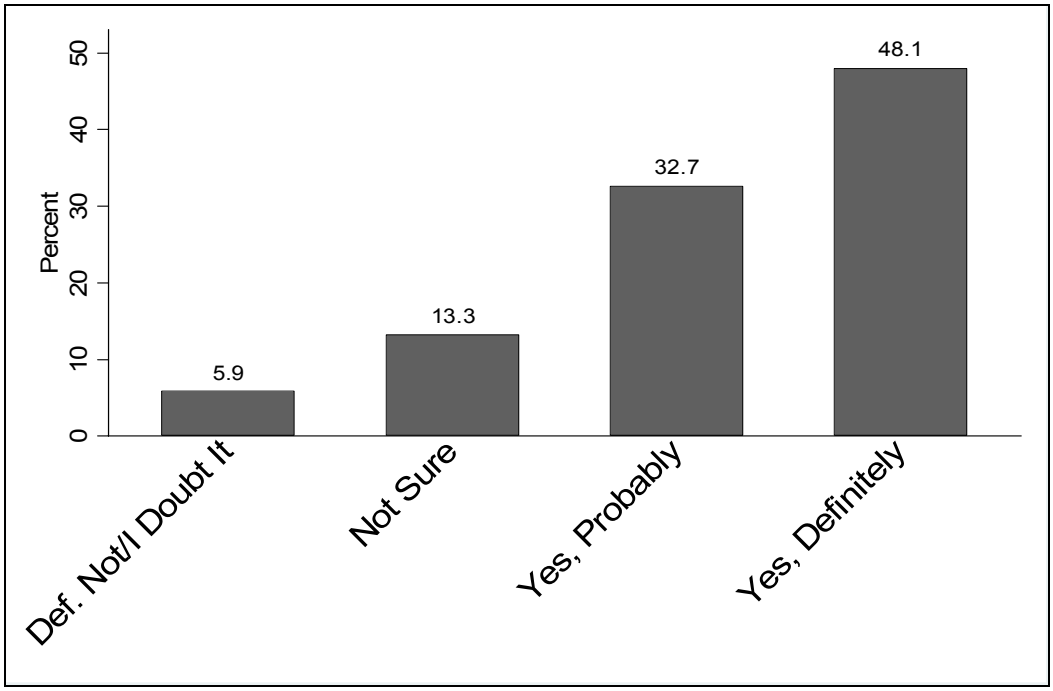

Figure 2.1. Responses to the Question "Whatever your plans, do you think you have the ability to complete college?" HS&B, 1980 Senior Cohort.

These students seem overly optimistic, since far fewer than 80 percent of college entrants obtain college degrees. This may reflect students answering the question under the hypothetical "If I do 100 hours of schoolwork per week" condition, but likely to some extent it represents unrealistic confidence, like that observed in educational expectations and studies of self-assessed intelligence.

THE EFFECTS OF THE PERCEIVED ABILITY TO COMPLETE COLLEGE

It may seem most natural to begin with analysis of the determinants of perceived ability and follow through the temporal sequence to subsequently address the effects of the perceived ability to complete college on college entry. I prefer to begin with analysis of the effects of perceived ability because if their effects are weak then their origin is of considerably less interest.

First consider the unadjusted relationship between the perceived ability to complete college and college entry, which is presented in Column 1 of Table 2.2. As in the Chapter 1 example, I present estimates of entry rates in the upper portion of the columns and estimates of effects below them in the same column. Results show that the perceived ability to complete college is strongly related to college entry. Only about 12 percent of students with serious doubts about their ability enter college, whereas about 81 percent of students who are certain of their ability enter college. Effects are presented as the effect of moving up from one perceived ability level to the next higher level. (Although I will shortly argue that unadjusted differences are poor estimates of effects, following common practice I use the term "effect" somewhat loosely to refer to differences that exist when ignorability cannot be maintained.) They show that effects are fairly large for all three transitions, but they are somewhat larger for the latter two transitions.

Table 2.2. College Entry Rates for Students at Each Level of Perceived Ability to Complete College. HS&B 1980–86, Senior Cohort.

Response to the question: *Whatever your plans, do you think you have the ability to complete college?*	(1) Unadjusted	(2) Matched*
	ENTRY RATES	
	Unadjusted entry rates	Matched entry rates
(1) "Definitely not" or "I doubt it"	.124	.361
	(.023)	(.072)
(2) "Not sure"	.292	.455
	(.020)	(.042)
(3) "Yes, probably"	.576	.633
	(.013)	(.013)
(4) "Yes, definitely"	.809	.703
	(.009)	(.012)
	EFFECTS	
	Naïve estimates	Matching Estimates
	δ_{NAIVE}	δ_{ATE}
From (1) to (2)	.166	.108
	(.032)	(.091)
From (2) to (3)	.280	.175
	(.024)	(.045)
From (3) to (4)	.237	.071
	(.016)	(.016)

Notes. N=8,886. Bootstrap standard errors in parentheses.
*Response groups are balanced on cognitive skill, grades, time spent on homework, mother's aspirations, track placement, family income, parental education, gender, and race and ethnicity.

As will be discussed more fully in the next section on the determinants of perceived ability, students with less confidence in their ability to complete college tend to have lower grades, lower cognitive skill, and so on. I apply the matching algorithm outlined in Chapter 1 to reduce differences in these pretreatment variables to better isolate the effects of perceived ability.

The counterfactual model alerts us to the fact that there are potentially numerous causal effects, such as the average treatment effect for the treated and the average treatment effect for the controls. Typically, theory or the motivation of the research suggests what effect is of most interest. For example, Harding's (2003) research on neighborhood effects estimates in the effects of moving families from high

poverty neighborhoods to lower poverty or nonpoverty neighborhoods, which he defines as the treatment effect on the treated, because any conceivable social policy would seek to move households that are actually in high poverty neighborhoods into lower poverty neighborhoods.

In the current context I see no clear choice of causal effect to estimate. Education policy usually seeks to increase educational attainment, especially among groups with historically low levels of attainment. An argument can thus be made that I should estimate the effect of increasing perceived ability among students with backgrounds that could be characterized as disadvantaged with respect to college entry. It could also be argued that—because a policy's effect is likely greatest on adolescents seriously considering both enrolling and not enrolling—I should estimate the effects of increasing perceived ability among these types of "marginal students." For example, I could examine students whose propensity scores were between .4 and .6 in the treatment selection model.

Because it is unclear what effects are of greatest interest in the context of the perceived ability to complete college, I choose to estimate average treatment effects. These seem a logical choice of initial estimates in an area lacking estimates of any type. As the name suggests, average treatment effects are the average effect of the treatment for all members of the population (be they in the treatment group or the control group). One way to think of the average treatment effects is the difference in outcomes if *no one* received the treatment and if *everyone* received the treatment.

I do not match one group to another to estimate average treatment effects. Instead I generate balancing weights for each of the four response categories that results in each response category having the same distribution of pretreatment variables as the entire sample. For example, the mean cognitive skill of adolescents reporting "Definitely not/Not likely" is 42.07, while the corresponding value for

adolescents reporting "Yes, definitely" is 53.56. I want to generate balancing weights for each response group so that they have the same mean cognitive skill as the entire sample, which is 50.31. I want these balancing weights to balance each group to the entire sample on other important determinants of college entry as well.

Specifically, I balance the four response groups on sex, race and ethnicity, cognitive skill, parental education, family income, grades, and track placement. The steps to achieve balance are very similar to those outlined in Chapter 1, so I do not present them here. They are presented, however, in Appendix A for interested readers. The results, which are presented in Column 2 of Table 2.2, show that the perceived ability to complete college has fairly strong effects even in the balanced samples. First consider entry rates. The first row of Column 2 shows that even if they had the same cognitive skill, parental education, and so forth, of the overall population, only about 36 percent of students with serious doubts about their ability to complete college would enter college. Balancing to the population also increases college entry rates substantially among students selecting "Not sure," and "Yes, probably," and decreases the entry rate among students selecting "Yes, definitely."

Estimates of effects are presented below entry rates in Column 2, which are again the effect of moving from one perceived ability level to the next higher level. The results show that the matching estimates are much lower than the naïve estimates, but remain sizable. For example, the matching estimates suggest that moving from "Definitely Not/I Doubt it" to "Not sure" increases college entry rates by almost 11 percent, that moving from "Not sure" to "Yes, probably" increases college entry rates by over 17 percent, and that moving from "Yes, probably" to "Yes, definitely" increases college entry rates by about 7 percent.

These results are strong evidence of the importance of the perceived ability to complete college. To use the most dramatic characterization, the model predicts that

moving from the lowest to the highest perceived ability category increases the probability of college entry by 34 percent.[18]

DETERMINANTS OF PERCEIVED ABILITY

In this section I estimate the relative importance of likely determinants of the perceived ability to complete college within a regression framework. I regress the continuous perceived ability to graduate measure, which was discussed earlier in the data section and in Table 2.1, on the various proposed determinants of perceived ability. I use regression instead of matching because this allows me to estimate school-level effects, which I estimate shortly in Model 5. A problem with the types of proposed mechanisms discussed earlier in the review of literature is that reasonable arguments can be made for reverse causality. For example, I assume that parental aspirations influence students' perceptions of their ability to complete college, but causality could easily run in the opposite direction with students' demonstrated ability affecting parental expectations. The data do not permit careful examination of reverse causality so—despite the likely importance of reciprocal effects—I proceed with the empirical analysis by specifying a priori that the perceived ability to complete college is caused by the variables considered here. Thus the results should be seen as preliminary and suggestive.[19]

Model 1 regresses the perceived probability of college completion on dummy variables for gender and race and ethnicity. The results (Table 2.3, Column 1) show

[18] A statement like this based on a comparison on nonadjacent categories of perceived ability is possible because average treatment effects have been estimated and all of the categories of perceived ability to graduate have been balanced to the same distribution of cognitive skill, family income, and so on.
[19] Members of the sophomore cohort are asked about their ability to complete college in the first and second round, making it possible to model changes in the perceived ability to complete college from the first to second round. This does not get at the heart of the issue because we will not know if changes in independent variables caused changes in perceived ability or the other way around. For example, if perceived ability increased among students whose grades also increased, we would not know if the grades caused the change in perceptions or if the change in perceptions caused the change in grades.

essentially no gender effects, but race and ethnicity differences are present. Blacks' perceived probability of completion is about 1.5 percent higher than whites', and Asians perceived probability of completion is slightly over 5 percent higher than whites.' Hispanics' perceived probability is almost 4 percent lower than whites.' Variables for American Indian and "other" race or ethnicity are also included in the model, but results are suppressed in the table because there are too few of the former, and the composition of the latter is unknown.

Model 2 (Column 2) adds family income, parental education, and cognitive skill, which have been converted to z-scores to facilitate comparisons among them. The results show that cognitive skill is fairly strongly related to the perceived ability to complete college. Both measures of family background are related to perceived ability, although not as strongly as cognitive skill. The coefficient for female is now positive and statistically-discernable from zero at the $p<.05$ level. The coefficient for Hispanic is positive and fairly strong, and the coefficient for black is positive and quite large. Here is an example where conditioning on cognitive skill and family background induces relationships between race and ethnicity on the one hand and college-encouraging perceptions on the other.

Model 3 adds grades, mothers' educational aspirations, hours of homework per week, self-esteem, self-efficacy, and a dummy variable for academic track. The results (Column 3) show that all of the added variables predict perceived ability. The coefficient for mother's aspiration and homework are fairly small, but coefficients for academic track and grades are large. The coefficients for self-efficacy and self-esteem are in the expected direction; however, their somewhat modest effects indicate that they are empirically quite distinct from the perceived ability to complete college, despite their apparent conceptual similarity. Indeed, a model that regressed the

Table 2.3. Coefficients from Models Predicting Perceived Ability. HS&B, 1980.

	(1)	(2)	(3)	(4)	(5)
Intercept	76.953***	76.953***	76.953***	76.981***	77.023***
	(.237)	(.156)	(.121)	(.124)	(.116)
SCHOOL LEVEL					
School-Mean Parental					1.168***
Education					(.281)
School-Mean Family					.261
Income					(.268)
School-Mean Cognitive					–.470
Skill					(.246)
School-Mean Grades					–.410**
					(.139)
School Size					.724***
					(.125)
% Asian					.141
					(.118)
% Hispanic					.752***
					(.171)
% Black					.538***
					(.178)
% Academic Track					.139
					(.151)
INDIVIDUAL LEVEL					
Female	.530	2.443***	–.180	–.215	–.261
	(.303)	(.229)	(.192)	(.191)	(.190)
Black	1.488***	11.135***	5.007***	4.625***	3.842***
	(.486)	(.438)	(.340)	(.342)	(.409)
Hispanic	–3.872***	4.890***	1.750***	1.059***	.147
	(.611)	(.476)	(.382)	(.370)	(.430)
Asian	5.276***	4.457***	.136	–.588	–1.434
	(.798)	(.765)	(.713)	(.718)	(.754)
Family Income		2.064***	.981***	.909***	.818***
		(.112)	(.098)	(.098)	(.101)
Parental Education		3.610***	1.276***	1.178***	1.039***
		(.005)	(.097)	(.098)	(.102)
Cognitive Skill		8.530***	2.139***	2.143***	2.116***
		(.190)	(.139)	(.132)	(.135)
Grades			5.876***	6.009***	6.160***
			(.142)	(.007)	(.144)
Academic track			4.206***	4.212***	4.078***
			(.219)	(.218)	(.218)
Homework			1.017***	1.002***	.941***
			(.095)	(.095)	(.097)
Mother's Educational			4.481***	4.312***	4.232***
Aspiration			(.113)	(.112)	(.111)
Self-Efficacy			2.541***	2.485***	2.468***
			(.109)	(.108)	(.108)
Self-Esteem			3.437***	3.407***	3.385***
			(.103)	(.103)	(.103)
τ_{00}	NA	NA	NA	2.709****	2.352***

Notes. N=54,128. Heteroskedastic-robust standard errors in parentheses. * p<.05; **p<.01; ***p<.001

perceived ability to complete college on only self-efficacy and self-esteem showed that these two variables account for only about 15 percent of the variance in the perceived ability to complete college (results not shown).

A comparison of Models 2 and 3 reveals that introducing the academic measures reduces all of the estimates (except the intercept). The coefficient for cognitive skill is reduced by 75 percent. It seems likely that the effect of cognitive skill is largely mediated by these other variables, much in the same way that the Wisconsin Model suggests. Supplementary analysis (results not shown) revealed that the addition of grades had the greatest effect on the coefficients for cognitive skill, which is also consistent with the claims of the Wisconsin Model.

The coefficients for black and Hispanic are also reduced due to the fact that—relative to whites with comparable cognitive skill and family background—blacks and Hispanics have higher grades, are more likely to be in the academic track, and their parents have much higher aspirations for them. The coefficient for Asian has declined to essentially zero for the same reasons. The female coefficient is now negative, which is due to females' superior academic performance.

As discussed, no measures are available for the perceived demands of college so their effects cannot be effectively estimated. However, the possibility that perceived ability to graduate is at least partially a function of the perceived demands of college suggests alternate interpretations to those previously offered for several effects long observed in the literature. For example, Haller (1982) claims that significant others' expectations influence students' expectations and attainment because students adopt them. Morgan (2005) speculates that students use others' expectations as a source of information about their own ability. However, students may also be using the expectations of others as a source of information about the demands of college.

Adolescents whose significant others expect them to complete college may conclude "If everyone thinks I should go to college, then college must not be that demanding." Similarly, beliefs about the demands of college could explain the apparent independent effect of parents' education. Students with highly-educated parents may think "If my parents can do it, then how hard can it be?" A similar story may apply to the educational attainment of older siblings and peers' educational plans. These interpretations are somewhat speculative, but so is the traditional socialization explanation in the Wisconsin Model. Certainly, their plausibility is warrant for inclusion of questions about the demands of college in surveys administered to high school students.

Model 4 (Column 4) is a "random intercept" multilevel model that allows the mean value of the perceived ability to complete college to vary across schools. First note that the variance of the intercepts, which is denoted τ_{00}, is 2.709 and is statistically-discernable from zero at the $p<.001$ level. This means that mean perceived ability does vary across schools conditional on cognitive skill, family background, and the other student-level characteristics included in the model. A comparison of Columns 3 and 4 shows that allowing the intercepts to vary has little effect on the estimates for cognitive skill, grades, academic track, and homework. However, coefficients for black, Hispanic, and Asian are lower indicating that blacks, Hispanics, and Asians tend to attend high schools that increase the perceived ability to complete college.

What characteristics of schools account for differences in the perceived ability to complete college? Model 5 explores this issue by introducing school-level measures as predictors of the intercept. The variables considered here include school-mean parental education; school-mean family income; school-mean cognitive skill; school-mean grades; school size; the percentage of students who are in the academic track;

and the percentage of students who are Asian, Hispanic, and black. The percentage of students who are American Indian is also included, but results are suppressed because there are so few American Indian students. The addition of these level-two predictors reduced τ_{00} only by about 25 percent (Column 5), which means that about 75 percent of the variability across schools in their mean level of perceived ability is not caused by these level-two predictors. The results also show that, consistent with the literature on relative position, school-mean cognitive skill decreases the perceived ability of students, although the effect is not statistically-discernable from zero. It is surprising that this effect is not larger. Examination revealed that school-mean cognitive skill and school-mean grades are positively related, and if grades are excluded from the model the negative effect of school-mean cognitive skill is larger and statistically discernable from zero.

Higher grades also appear to depress perceived ability. This does not mean that schools aiming to enhance their students' perceived ability should lower the grades given in their school. The finding only shows that for a given student with a given grade, being in a school with lower average grades tends to increase perceived ability. In fact, if grades are excluded in the level-one model, then higher grades at the school level are associated with higher perceived ability even conditional on cognitive skill. This suggests that schools can engage in grade inflation to increase their students' perceived ability to complete college.

Also consistent with the findings for educational expectations, the percentage of blacks and Hispanics in a school tends to increase the perceived ability to complete college. It is difficult to determine why this would be the case with the data at hand given that school-mean cognitive skill is already in the model. As discussed earlier in the chapter, Goldsmith (2004) suggests reasons why the concentration of blacks and Hispanics would increase aspirations among blacks and Hispanics in particular, and

these can be applied to perceived ability. Yet supplementary analysis reveals that the concentration of blacks and Hispanics raises whites' perceived ability by roughly the same amount as it raises blacks' and Hispanics' perceived ability, and this is not predicted by Goldsmith's explanations. School-mean parental education also increases perceived ability, but school-mean family income does not. Lastly, contrary to expectations, the percentage of students in the academic track does not increase school-mean levels of perceived ability, and school size is positively related to school-mean levels of perceived ability. It is unclear why school size would matter, but the findings do call into question some of the praise given to smaller high schools (Lee and Smith 1993, 1995; Meier 1995).

CONCLUSIONS

This chapter examined determinants and consequences of the perceived ability to complete college. The perceived ability to complete college appears to be determined in large part by school-related evidence about academic ability; grades, test scores, and academic track placement are all strong predictors of perceived ability. Time spent on homework is a weak predictor. Mother's educational aspiration, which adolescents may also use to gauge their ability to complete college, is a weak predictor. Self-efficacy and self-esteem also appear to increase perceived ability, but their relationship with perceived ability is surprisingly weak, and estimates of their effects on perceived ability are small in models including a range of covariates.

Conditional on cognitive skill, grades, track placement, and other academic measures blacks, Hispanics, and Asians are more confident than whites in their ability to complete college. For Hispanics and Asians the net-advantage in perceived ability is largely caused by a combination of academic performance and the fact that Hispanics and Asians tend to be in high schools that increase perceived ability. These factors

appear to contribute to the net-black advantage in perceived ability, but blacks have considerably higher perceived ability than whites even within the same school and conditional on academic performance measures.

High schools appear to affect their students' perceived ability to complete college. School size, the percentage of students who are black or Hispanic, and school-mean parental education all increase the perceived ability to complete college. School-mean family income appears to have no effect. School-mean grades and school-mean cognitive skill appear to lower adolescents' perceived ability to complete college conditional on their own grades and cognitive skill. However, most of the variation across schools cannot be explained with any of these school-level variables.

The perceived ability to complete college has strong effects on college entry conditional on grades, test scores, track placement, family income, parental education, and several other predictors of college entry. Consistent with the literature on academic self-concept, this suggests that perceptions have consequences and that increasing the perceived ability to complete college increases the probability of college entry.

These findings contribute to the literature on the perceived ability to complete college, which has lacked sufficient empirical content. The results provide qualified support for many assertions, and they point to a middle ground between various positions taken in the literature. Several examples are in order. Breen and Goldthorpe (1997) assert that family background is related to the perceived ability to graduate. The findings presented here show that the perceived ability to graduate related to family background; however, the relationship is weak. Morgan (2005) suggests that significant others' influence increase adolescents' expectations by increasing their perceived ability. The results presented here suggest that significant others' expectations increase adolescents' perceptions of their ability, but by only a small

amount. Also, supplementary analysis shows that significant others' expectations have fairly large effects on college entry independent of their relationship with perceived ability (results not shown), so it seems unlikely that the effects of significant others' influence capture *only* perceived ability. Hoelter (1982) and Kao and Tienda (1998) suggest that blacks' expectations may be as high as whites' expectations despite large black-white differences in ability measures (such as grades) because minorities compare themselves only to one another. This is likely true to some extent. Blacks and Hispanics tend to have overly optimistic perceptions of their ability to complete college, and this tendency is less pronounced in schools containing a high proportion of white students.

Following Rosenbaum (2001), the results might be used to inform adolescents of their undue optimism and give them information upon which to make more realistic assessments of their ability. These realistic assessments would in turn be used to make sensible college entry decisions. For example, students might be told that those not in the academic track are much less likely to complete college than those who are. Telling students to be more realistic is not without its price, however. To some extent college is an experiment (Manski 1989), and it is not possible predict prior to matriculation who will graduate and who not.

CHAPTER 3. THE PSYCHIC COSTS OF EDUCATION

Education can be said to impose *psychic costs*—various frustrations and irritations associated with learning in an academic setting—because learning is sometimes tedious and difficult. It is natural to suppose that psychic costs affect schooling decisions, but the literature on psychic costs and their effects is poorly developed. When psychic costs are discussed, they are typically not measured. Collins simply denies that psychic costs exist at the postsecondary level and claims that because of the sociable culture of college that developed after World War II, college became "an interlude of fun" and the "main appeal of the revitalized university for large groups of students was not the training it offered but the social experience of attending it" (Collins 1979:124). Others agree that schooling has consumption benefits, such as when a student enjoys their courses or the college lifestyle, but they give the matter little attention (Ehrenberg and Smith 2000:296). It is probably unreasonable to think that college has no net psychic costs, but even if it is conceded that schooling is enjoyable, interpersonal variation in how much it is enjoyed may still be important.

Others incorporate psychic costs into models of schooling decisions without measuring them (e.g., Charles and Luoh 2003; Garen 1985; Frazis 2002) or point out that psychic costs might be related to variables included in empirical analysis, such as family background and school related behaviors (e.g., Belzil and Hansen 2003; Jacob 2002). Several economists infer psychic costs from adolescents' educational decisions (Lazear 1977; Cunha, Heckman, and Navarro 2006) by determining how much education adolescents *should* obtain to maximize lifetime earnings and assuming that psychic costs alone cause adolescents to invest below this level. Cunha, Heckman, and Navarro (2006) apply this logic to the NLSY79 data and estimate that the mean

psychic cost of obtaining a bachelor's degree among high school graduates is roughly $488,000 in lifetime earnings.

This "revealed preferences" approach assumes that adolescents know the returns to education, but this is hardly uncontroversial when decades of study on the returns to education have failed to generate a consensus among labor economists. The revealed preferences approach also assumes that psychic and money costs are the only reasons adolescents do not pursue postsecondary schooling. Adolescents' self-reported reasons for not pursuing postsecondary schooling suggest alternate explanations. Students in the *Educational Longitudinal Study, 2002* (which is used in my empirical analysis and will be discussed in more detail shortly) who are not planning to pursue postsecondary schooling are asked *"Which of the following are reasons why you have decided NOT to continue your education after high school?"* and then select from a list of reasons all that apply to them.[20] The results, which are presented in Figure 3.1, show that only slightly over half of the students select "I dislike school" even though they may choose as many of the reasons as they like. This seems like strong evidence that psychic costs are not always the reason for failing to pursue postsecondary schooling.

The most common selection was "Rather work and make money." Adolescents eager to assume adult roles may forgo postsecondary schooling if they see it as a continuation of adolescence. This could be conceived of as a type psychic cost (e.g., "the psychic cost of not pursuing adult roles"), but this is not the conventional meaning of the expression "psychic costs of schooling." Because the revealed

[20] Strictly speaking, the question asks students who are not planning to continue their education *immediately after high school* "Which of the following are reasons why you have decided not to continue your education *right* after high school?" Because I have limited the sample to students not expecting postsecondary schooling at any time in the future responses should be the same as they would be if the question asked "Which of the following are reasons why you have decided not to continue your education *at all*?"

preferences approach offers no way to distinguish among different facets of psychic costs it is useful to look at more direct measures that capture more traditional definitions of psychic costs.

Figure 3.1 also shows that almost 40 percent of adolescents not planning to pursue postsecondary schooling select "Not needed for my career." Thus, adolescents

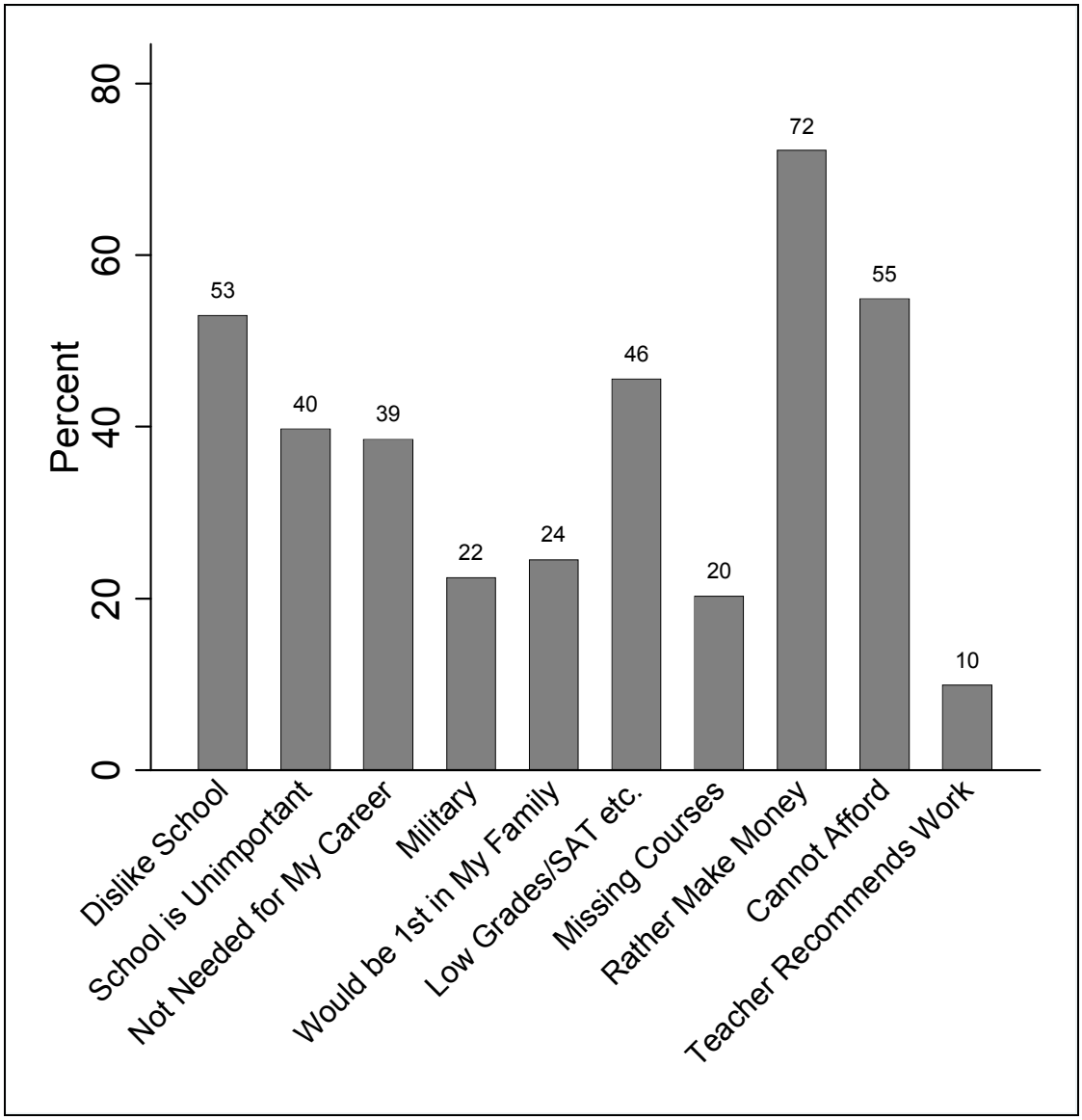

Figure 3.1. Reasons for Not Continuing Education after High School. ELS02, 2004.
Notes. N=359. The sample is limited to respondents who reported in the 2004 round that they expected no postsecondary schooling.

not pursuing postsecondary schooling may not want the types of jobs commonly held by Baccalaureates. Rather than being deterred by schoolings' costs, it appears that some adolescents are unattracted by its benefits.

CONCEPTUALIZING AND MEASURING THE PSYCHIC COSTS OF SCHOOLING

This discussion indicates that psychic costs can be quite broadly conceived. Postponing adult roles may impose psychic costs, moving away from one's friends and family may impose psychic costs, immersion in college culture may impose psychic costs, and so on.[21] The approach taken here is to focus on the psychic costs associated with academic activities. Thus the costs I refer to could be considered the "psychic costs of academic activities" rather than a broader conception that includes all nonmonetary costs.

The costs associated with academic activities can be broken down into several components. The first is the *pleasure or displeasure associated with engagement in academic tasks*. Some enjoy reading, writing, solving math problems, and listening to lectures; others despise these same activities. There are some activities, such as studying and test-taking, that very few adolescents enjoy. But we should still expect interpersonal variation in how much they are disliked. Naturally, the more these tasks are disliked the greater are the psychic costs of schooling. The second component is *interest in academic material*. Some adolescents are interested in abstract academic material, but others find it boring and are annoyed by its irrelevance to employment and everyday life. A third component is *the satisfaction that academic*

[21] College culture is secular. Research finds that Fundamentalist Protestants are less apt to pursue postsecondary schooling (Lehrer 2004) and numerous researchers have suggested that this is caused by the lack of acceptance of their values and beliefs. College culture is also "liberal," and those with a conservative outlook may experience psychic costs through interaction with faculty and students who generally do not support their views. Vella (1994) finds, for example, that those holding traditional gender roles invest in less education.

work brings. One typically experiences a sense of accomplishment after mastering complex material or completing tasks. The level of enjoyment of this experience doubtlessly varies interpersonally; some adolescents likely do not enjoy this experience at all.

DETERMINANTS OF PSYCHIC COSTS

Speculation on the determinants of psychic costs has focused on cognitive skill and family background.[22] Cognitive skill, which has received the most attention (Cunha, Heckman, and Navarro 2006; Garen 1985), should be closely tied to psychic costs because it reduces the time required for comprehension of material and acceptable performance. Cognitive skill is also strongly related to "investigative interests" (Holland 1997), which include interests in activities of an academic nature, such as abstract problem solving.

Belzil and Hansen (2003) suggest that family background is correlated with psychic costs. Bourdieu (1973) makes a similar claim when he proposes that adolescents with advantaged backgrounds receive more encouragement for engaging in the intellectual aspects of schooling. Class differences in parenting, especially practices related to reading (Bus, van Ijzendoorn, and Pellegrini 1995), may develop stronger preferences for academic activities among middle- and upper-classes than among lower-classes. Ethnographic studies depict class based oppositional cultures that may increase psychic costs among lower-class students by defining school as irrelevant to future employment (Willis 1977). Similarly, oppositional cultures that define academic engagement as "acting white" (Fordham and Ogbu 1986) may

[22] Although perhaps the most commonly cited determinant of psychic costs, the case of cognitive skill is revealing of the extent to which psychic costs are ignored in empirical research. Cognitive skill is used as an explanatory variable in the majority of studies of educational plans and attainment, but that it might lower psychic costs is rarely mentioned.

increase psychic costs among blacks or other racial or ethnic groups. Jacobs (2002) taps into a common stereotype when he proposes that psychic costs are lower for females than for males.

Schools and students' placement within them may also influence psychic costs. Track placement may affect psychic costs because college preparatory tracks have more effective teachers and more interesting assignments than general or vocational tracks (Gamoran and Mare 1989). Some suggest that general or vocational tracks may demoralize students (Oakes 1985), which could also lead to higher psychic costs. Schools differ in the proportion of students in the college preparatory track, and this could lead to inter-school variation in psychic costs. Psychic costs may be lower in smaller schools because they create an inviting atmosphere and induce participation (Meier 1995; Wicker 1969). Teachers almost certainly affect psychic costs. Some are boring, amicable, and encouraging; others are uninteresting, distant, and intimidating. Unfortunately, meaningful analysis of teacher effects is not possible with the data used here.

This chapter represents the first attempt to directly measure the psychic costs of schooling and estimate their effects on educational outcomes. The measures of psychic costs are somewhat crude, but the use of direct measures represents a much needed supplement to (and possibly alternative to) the revealed preferences approach. I first present the distribution of measured psychic costs to get a sense of the level of interpersonal variation in psychic costs that exists. I then estimate the effects of psychic costs on educational expectations. Lastly, I examine the determinants of psychic costs to see if the conjectures made in the literature are supported by the data and approach I use.

DATA

Data are from the *Educational Longitudinal Study of 2002* (hereafter, ELS02), which is a nationally-representative sample of U.S. students in the 10th grade in 2002. In total, 752 schools are included and 15,326 students completed base-year questionnaires. Asian and Hispanic students are oversampled. Parents, teachers, principals, and librarians also completed questionnaires. A second follow-up was conducted in 2004 when most respondents were in the spring semester of their senior year of high school.

The ELS02 offers the best opportunity to measure the psychic costs of schooling because it contains questions tapping into the three facets of psychic costs discussed earlier. Two items measure the like or dislike of academic tasks. Respondents read the statements "Because reading is fun, I wouldn't want to give it up" and "Because doing mathematics is fun, I wouldn't want to give it up" and report how much they agree or disagree on a four-point scale. These measures do not distinguish between nonacademic and academic contexts, which is unfortunate because some adolescents likely enjoy reading for pleasure but not for school.[23]

The extent to which respondents are interested in academic material is measured with their level of agreement with the statement "I go to school because I think the subjects I'm taking are interesting and challenging." The extent to which respondents find academic work satisfying is measured with their level of agreement with the statement "I go to school because I get a feeling of satisfaction from doing what I'm supposed to do in class."

[23] Ideally, questions would inquire directly about academic activities like homework, studying, attending lectures, and so on. Actual time spent on homework and study practices are available in the ELS02, and these could be used as proxies for preferences. However, homework and study practices will often reflect parental preferences and the enforcement of rules rather than adolescents' preferences.

A composite psychic costs variable is created by summing responses to these four questions after each has been converted to a z-score and reverse coded so that higher values indicate higher psychic costs. Because they tap into the same concept, finding math and reading fun are each given a weight of 0.5.

Educational expectations are taken from the first follow-up when most students were in the 12th grade and indicate if respondents expect less than a four-year degree or if they expect a four-year degree or higher. Students responding "Don't know" are excluded from the analysis.

Additional independent variables include family income; parental education, which is the highest grade completed by the most-educated parent or guardian; cognitive skill, which is measured with the base-year standardized test composite score; and academic track placement, which is measured in the base year because it is unavailable in the first follow-up. More detail on these and other variables used in the analysis is included in Table 3.1. There is no measure of respondents' perceived ability to complete college in the ELS02, which Chapter 2 showed was a strong determinant of postsecondary schooling choices. Academic self-concept is used in its place as a control variable. Academic self-concept is measured as the sum of responses to 14 questions in the base-year student questionnaire asking respondents how they feel about their academic ability and performance. Chapter 4 shows that preferences relating to employment also predict educational attainment, and I adjust for these preferences to better isolate the effects of psychic costs. Specifically, the importance students attach to "Being successful in your line of work," "Becoming an expert in your line of work," "Getting a good job," and "Having lots of money" are used as measures of job values.

School characteristics are used to explain school variation in psychic costs. Student-level variables are used to estimate values for school-mean family income,

Table 3.1. Variables Used to Analyze Psychic Costs. ELS02, 2002–2004.

Variable	Description	Mean	Stand. Dev.	Section
INDIVIDUAL LEVEL	(N=10,787 Students)			
Psychic costs	Psychic costs are measured as the weighted sum of 4 variables. The questions, and the weights they are given are: "How much do you agree or disagree with the following statements about why you go to school?" 1. I go to school because I get a feeling of satisfaction from doing what I'm supposed to do in class. (1) 2. I go to school because I think the subjects I'm taking are interesting and challenging. (1) 3. Because doing mathematics is fun, I wouldn't want to give it up (.5) 4. Because reading is fun, I wouldn't want to give it up (.5)	7.64	1.70	BY Student
Expect a 4-year degree or higher	The student expects a 4-year degree or higher (i.e., Graduate from college (4- or 5-year degree); master's degree or equivalent; PhD, MD, or other advanced degree)	.70	.46	F1 Student
Cognitive skill	Base-year standardized test composite score, which is the sum of the standardized scores from the math and reading tests. If respondents had a score for only one of the two tests, a single score was used.	51.5	9.86	BY Test Battery
Family income	Reported categorically with ranges (by parents/guardians) but converted to a continuous variable using category range midpoints and $250,000 for the highest category "$200,001 or more."	64,926.44	51,021.02	BY Parent
Parental education	Highest grade completed by the most-educated parent (or guardian), or of either parent if education is missing for the other parent. Parents' self-reported education is used, and missing values are filled in with students' reports of their parents' education where available. Parental education is reported categorically, but responses are recoded as a continuous highest grade completed variable using the following crosswalk: Did not finish high school=10 Graduated from high school or equivalent=12	14.58	2.49	BY Parent and BY Student

Table 3.1 (Continued)

	Graduated from high school and attended a two-year school (such as a vocational or technical school, a junior college, or a community college), but did not complete a degree=13 Graduated from a two-year school (such as a vocational or technical school, junior college, or a community college)=14 Graduated from high school and went to college, but did not complete a four-year degree=14; Graduated from college"=16 Completed a master's degree or equivalent=18 Completed a PhD, MD, or other advanced professional degree=20			
Academic Self-Concept	Academic self-concept is measured as the sum of responses to 14 questions asking students "How often do these things apply to you?" (1=Almost never; 2=Sometimes; 3=Often; 4=Almost always). The 14 statements are: I'm confident that I can do an excellent job on my math tests I'm certain I can understand the most difficult material presented in math texts I'm certain I can understand the most difficult material presented in English texts When I sit myself down to learn something really hard, I can learn it I'm confident I can understand the most complex material presented by my English teacher I'm confident I can do an excellent job on my English assignments I'm confident I can do an excellent job on my English tests I'm confident I can understand the most complex material presented by my math teacher I'm certain I can master the skills being taught in my English class If I decide not to get any bad grades, I can really do it If I decide not to get any problems wrong, I can really do it I'm confident I can do an excellent job on my math assignments If I want to learn something well, I can I'm certain I can master the skills being taught in my math class	37.51	8.46	BY Student

Table 3.1 (Continued)

Importance of work success	The subjective importance of "Being successful in your line of work" (1=Not Important; 2=Somewhat Important; 3=Very Important). Treated as a continuous measure.	2.91	.30	F1 Student
Importance of money	The subjective importance of "Having lots of money" (1=Not Important; 2=Somewhat Important; 3=Very Important) Treated as a continuous measure.	2.24	.62	F1 Student
Importance of being an expert at work	The subjective importance of "Becoming an expert in your field of work" (1=Not Important; 2=Somewhat Important; 3=Very Important) Treated as a continuous measure.	2.71	.51	F1 Student
Importance of getting a good job	The subjective importance of "Getting a good job" (1=Not Important; 2=Somewhat Important; 3=Very Important) Treated as a continuous measure.	2.93	.27	F1 Student
White	Student is white (yes=1).	.65	.48	BY Student
Black	Student is black (yes=1).	.12	.33	BY Student
Hispanic	Student is Hispanic (yes=1).	.14	.34	BY Student
Asian	Student is Asian (yes=1). Included in the category "Asian" are groups that do not correspond to the current colloquial use of the word Asian, such as those tracing their ancestry to India, Bangladesh, and Pakistan are coded as Asian.	.04	.20	BY Student
American Indian	Student is American Indian (yes=1)	.01	.09	
Missing Race/ ethnicity	Student's race/ethnicity is missing (yes=1)	.04	.19	
Female	Student is female (yes=1).	.51	.50	BY Student
Academic track	Placement in the academic or college preparatory track (yes=1). Missing values are coded as zero because students with missing data have characteristics (e.g., cognitive skill) quite unlike those in the academic track.	.54	.50	BY Student
Sampling weight	Weight for students in both the base-year and 1st follow-up (F1PNLWT)			
SCHOOL-LEVEL	(N=735 Schools) School-level variables based on student-level variables are			

Table 3.1 (Continued)

	Calculated using all students with valid responses, not only the students in the samples used in the analysis in this paper.			
Family income	Mean family income of students in the school.	66,652.13	30,742.80	BY Parent
Parental education	Mean parental education of students in the school.	14.70	1.38	BY Parent & BY Student
Cognitive skill	Mean cognitive skill of students in the school.	51.53	5.84	BY Test Battery
Size	Total enrollment at the school. Midpoints are used for school size categories; 2,750 is used for the highest category (2500+ students).	1,157.67	698.48	BY Admin.
Public	Public school (1=yes)	.78	.42	BY Admin.
Catholic	Catholic school (1=yes)	.13	.33	BY Admin.
Private	Non-Catholic private school (1=yes)	.10	.30	BY Admin.
% Academic track	Percentage of 10th grade students in academic, college preparatory, or specialized academic programs	59.87	31.71	BY Admin.

Notes. Data are weighted using the panel weight for students in both the base-year and 2nd follow-up. Variable statistics include imputed values.

parental education, and cognitive skill. Variables measuring school size, percentage of students in the academic track, and sector (public, Catholic, non-Catholic private) are drawn from the base-year School Administrator Questionnaire.

The sample is limited to respondents in both the base-year and first-follow up rounds with valid responses to the educational expectation question. Missing values for all other variables are imputed using Stata's best-subset regression command "*impute*."[24,25] The resulting sample size is N=10,328. Sampling weights designed for

[24] For composite measures—such as academic self-concept—individual variables used to create the composite measure are imputed separately first.
[25] Psychic costs must be imputed for many adolescents. However, in most instances this means imputing psychic costs for respondents with valid responses to the "school satisfying" and "courses interesting" questions and with missing values for the questions on finding reading and math fun.

longitudinal analysis of respondents in both the base-year and first follow-up are used throughout.

RESULTS

DESCRIPTIVE ANALYSIS

I first present frequencies of responses to the four items in the ELS02 that are used to measure psychic costs. Having never been examined, we do not know if psychic costs vary substantially interpersonally or if all adolescents' preferences are roughly the same (such as would be the case if the popular notion that all adolescents dislike school is approximately true). Examining responses to individual items is also useful to see if self-reports support the suggestion that education delivers psychic benefits to some students.

Figure 3.2A presents responses to the questions used to construct the psychic costs variable. Regarding thinking that reading and math are fun, 14 percent and 20 percent of respondents respectively report that they "Strongly disagree," which can reasonably be interpreted to mean that they rather dislike these activities. Conversely, 14 percent and 7 percent report that they "Strongly agree," which suggests that they enjoy these activities. This is consistent with the claim of Cunha, Heckman, and Navarro (2006) that education provides psychic benefits for some adolescents. The majority of respondents choose one of the intermediate categories, but responses are reasonably spread out across the four categories. With roughly 50 percent of students choosing to "Agree" that courses are interesting and that schoolwork is satisfying, there is less variation in these aspects of psychic costs, but responses are again not clustered on one choice.

Questions on finding math and reading fun appear near the end of the questionnaire, and many students failed to respond to any of the questions near the end of the questionnaire.

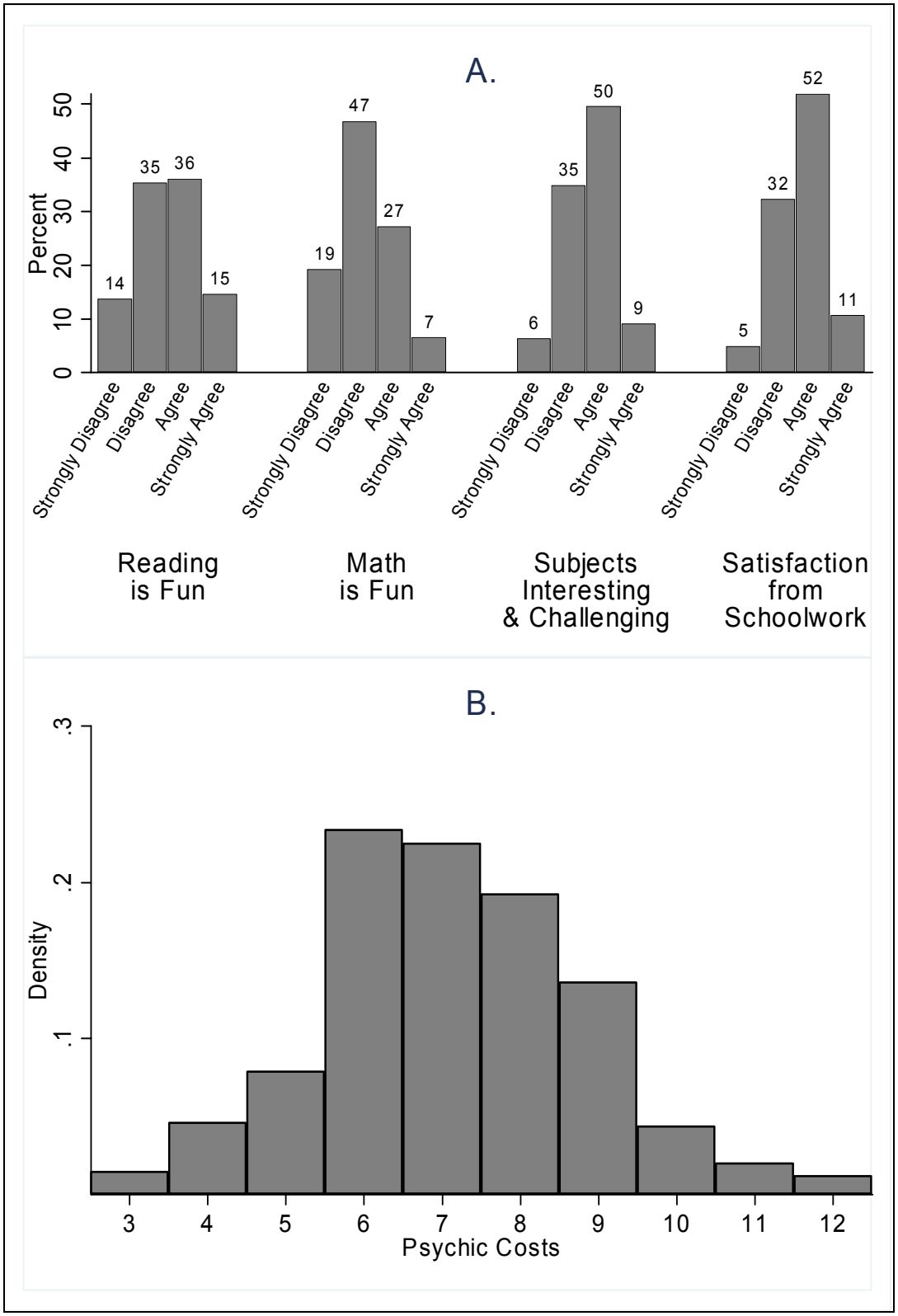

Figure 3.2. Distribution of Responses to the Psychic Costs Questions, and the Psychic Costs Measure. ELS02, 2002.

Figure 3.2B presents the distribution of psychic costs (the composite variable constructed from the variables in Figure 3.2A) and serves as further evidence of substantial interpersonal variation in psychic costs. Note that the items used to construct the composite psychic costs measure have been reverse-coded and that higher values indicate higher psychic costs.[26]

THE EFFECTS OF PSYCHIC COSTS ON EDUCATIONAL EXPECTATIONS

As was the case with the perceived ability to complete college, there is no clear choice of causal effect to estimate. I therefore estimate average treatment effects in the same way as I did I Chapter 2. Unlike the perceived ability to complete college, however, there is no natural way to separate psychic costs into discrete treatment states. I therefore, somewhat arbitrarily, cut psychic costs into fourths, and I estimate the average treatment effect of moving from the lowest fourth to the next lowest fourth, and so on.

Table 3.2 presents the results. Column 1 first presents the expectation of a four-year degree for each fourth of psychic costs. Some people would call the fourths "quartiles"; however, quartiles are actually the name for the break points between the fourths. This provides a useful terminology for effects, however, because we can say "first quartile effects" to refer to the effect of moving from the first fourth to the second fourth, and so on. Predictably, the results show that educational expectations decrease with higher psychic costs. Below the expectations in Column 1 are the naïve estimates of the treatment effects, which are the unadjusted differences in expectations

[26] To be consistent with the other chapters (in which higher values indicate more college-encouraging preferences and perceptions) I could have reverse-coded this variable to make an "intrinsic value of schooling" variable. I chose to retain the concept and expression "psychic costs" because it has gained wide currency in the context of schooling decisions.

across adjacent fourths. At .077 and .065, the effects for the first and third quartiles are considerably larger than for the effect for the second quartile, which is only .029.

Table 3.2. Proportion of Students at Each Fourth of Psychic Costs Expecting a 4-year College Degree or Higher. ELS02 2002-2004.

Psychic costs (higher values indicate a greater dislike for academic activities)	(1) Unadjusted Results	(2) Matching Results*
	ENTRY RATES	
	Unadjusted Entry Rates	Matched Entry Rates
1st Fourth	.845	.807
	(.008)	(.010)
2nd Fourth	.780	.788
	(.013)	(.012)
3rd Fourth	.751	.757
	(.008)	(.008)
4th Fourth	.674	.709
	(.010)	(.011)
	EFFECTS	
	Naïve Estimates	Matching Estimates
	δ_{NAIVE}	δ_{ATE}
1st Quartile Effect	.065	.019
	(.016)	(.016)
2nd Quartile Effect	.029	.031
	(.015)	(.014)
3rd Quartile Effect	.077	.048
	(.014)	(.013)

Notes. N=10,787. Bootstrap standard errors in parentheses. *Response groups are balanced on cognitive skill, grades, track placement, race and ethnicity, sex, family income and parental education.

Column 2 presents results when each of the fourths have been balanced to the population on cognitive skill, family income, parental education, academic self-concept, sex, and race and ethnicity. The third quartile effect is reduced by about 40 percent to .048. Balancing reduces the first quartile effect to .019, which suggests that further reducing already low psychic costs has little effect on the expectation of a four-year college degree. The effect for the second quartile is increased slightly, but it remains fairly low and is not statistically-discernable from zero at the $p<.05$ level.

To characterize the effect most dramatically, the effect of moving from the highest fourth of psychic costs to the lowest fourth increases the probability of expecting a four-year degree or higher by about 0.1.

THE DETERMINANTS OF PSYCHIC COSTS

Table 3.3 examines the determinants of psychic costs with a series of regression models. Model 1 (Column 1) regresses psychic costs on dummy variables for female, black, Hispanic, and Asian. Consistent with the suggestion of Jacob (2002), the results show that psychic costs are lower for females than for males. Surprisingly, psychic costs are also lower for blacks, Hispanics, and Asians than they are for whites.[27] Note that cognitive skill, family income, and parental education are excluded from the model, so this is surprisingly not a case of blacks and Hispanics having more college-encouraging preferences than whites only conditional upon these factors. This is consistent with the finding that blacks have slightly more "pro-school" attitudes than whites (Cook and Ludwig 1997), but I offer no explanation for this unexpected finding.

Model 2 (Column 2) adds family income, parental education, and cognitive skill. Cognitive skill is negatively related to psychic costs. Contrary to expectations, both family income and parental education are essentially unrelated to psychic costs. Introducing cognitive skill has increased black-white and Hispanic-white differences in psychic costs. Asian-white differences are slightly reduced because Asians have higher cognitive skill than whites in the ELS02. Academic track is strongly negatively related to psychic costs, although it is particularly easy in this case to see how causality could run in both directions.

[27] Separate analyses that examined males and females separately demonstrated that the black-white differences are largest among males.

Table 3.3. Coefficients from Regression Models Predicting the Psychic Costs of Schooling. ELS02, 2002.

Outcome=Psychic costs of schooling	(1)	(2)	(3)	(4)
Intercept	–.022	–.022	.025	.025
	(.014)	(.013)	(.038)	(.040)
School-Level				
Mean Family Income				–.005
				(.023)
Mean Parental Education				.018
				(.024)
Mean Cognitive Skill				.060*
				(.022)
Size				–.040*
				(.017)
Private				–.083
				(.058)
Catholic				–.166***
				(.045)
% in College Prep.				.051*
				(.017)
Student-Level				
Female	–.203***	–.216***	–.220***	–.223***
	(.021)	(.026)	(.026)	(.026)
Black	–.316***	–.470***	–.452***	–.426***
	(.045)	(.047)	(.046)	(.046)
Hispanic	–.234***	–.311**	–.300***	–.266***
	(.037)	(.039)	(.040)	(.041)
Asian	–.360***	–.349***	–.355***	–.344***
	(.046)	(.049)	(.046)	(.043)
Family Income		.026*	.025	.021
		(.013)	(.013)	(.014)
Parental Education		–.006	.008	.019
		(.014)	(.013)	(.014)
Cognitive Skill		–.139**	–.143**	–.161***
		(.015)	(.015)	(.016)
College Prep. Track		–.301**	–.310**	–.310**
		(.025)	(.025)	(.027)
τ_{00}			.168***	.159***

Notes. N=10,787 level-one units (students); N=735 level-two units (schools). Heteroskedastic-robust standard errors in parentheses. * p<.05, **p<.01; *** p<.001.

Model 3 (Column 3) is a multilevel model that models the nested structure of the data. It is a random-intercept model that allows the mean level of psychic costs to vary across high schools. Inter-school variation in psychic costs is measured with the τ_{00} term. The results (τ_{00}=.168) show statistically-discernable and substantively-

significant variation across schools. But note that allowing variation across schools has done little to change to coefficients for the level-one regressors. Therefore, while psychic costs vary across schools this does little to explain, for example, why psychic costs are lower for blacks and Hispanics than for whites.

In an effort to explain inter-school variation in psychic costs, Model 4 (Column 4) introduces the school-level variables school size, percentage of students in the academic track, school-mean family income, school-mean parental education, school-mean cognitive skill, and dummy variables for Catholic school and nonCatholic private school as predictors of school-mean levels of psychic costs. Neither school-mean family income nor school-mean parental education appears to influence psychic costs. School-mean cognitive skill appears to increase psychic costs, albeit modestly. School size seems to lower psychic costs, but the effect is quite modest. Psychic costs appear to be substantially lower in Catholic schools than in public schools. The percentage of students in the college preparatory track seems to increase psychic costs, which is surprising in light of the earlier finding that psychic costs are much lower for individuals in the academic track.

Note also that these school-level variables can account for only about 5 percent of the variation in psychic costs that exists across schools. I find this unsurprising because reading, solving math problems, and finding school satisfying all seem like components of personality that are not easily influenced by school characteristics. I do not rule out school effects, but I could easily imagine that selection bias (or "baseline bias") is responsible for the inter-school variation in psychic costs.

CONCLUSIONS

To my knowledge, the research undertaken here is the first effort to directly measure psychic costs and estimate their effects on educational outcomes in the

United States. Results show considerable interpersonal variation in psychic costs, with some students seeing high psychic costs in schooling and others seeing considerable intrinsic value. Psychic costs appear to influence educational expectations. For example, moving from the highest fourth of psychic costs to the lowest fourth increases the probability of expecting a four-year degree by almost 0.1. It is difficult to draw firm conclusions about the importance of psychic costs from the results presented here because psychic costs are only crudely measured. What the results do provide is a general sense of the importance of psychic costs: they are not unimportant, but nor are they of overwhelming importance. For example, they appear to have a much weaker effect on expectations than the perceived ability to complete college (Chapter 2).[28]

Psychic costs are lower for females than for males and lower for blacks, Hispanics, and Asians than for whites. Psychic costs are negatively related to cognitive skill, but the relationship is somewhat weak. Psychic costs are unrelated to parental education and family income. Psychic costs vary across schools, with Catholic schools, small schools, schools with a lower proportion of students in the college preparatory track, and schools with low mean levels of cognitive school having lower psychic costs. This being said, the majority of the school variation in psychic costs that exists conditional on students' characteristics cannot be accounted for with the school-level variables considered here.

These results bear directly on numerous claims and suggestions in the literature. Collins argues that schooling entails no meaningful psychic costs (Collins 1979:124), while Cunha, Heckman, and Navarro (2006) argue that psychic costs are extremely high and are the main cause of adolescents' decisions to forgo

[28] Chapter 2 actually looked at college entry, but unreported results on expectations show that the perceived ability to complete college has an even stronger effect on expectations than on college entry.

postsecondary schooling. The results presented here suggest that a more reasonable conclusion lies somewhere between these two extremes. The findings also fail to support the suggestions that psychic costs are lower for adolescents with advantaged backgrounds (Belzil and Hansen 2003) and that whites have more "pro-school" attitudes than blacks (Fordham and Ogbu 1986).

If psychic costs reduce educational expectations and presumably attainment, then policy directed at increasing educational attainment could aim to lower psychic costs. Naturally we want to lower psychic costs—to improve students' lives if for no other reason—but it is unknown the extent to which lowering psychic costs comes at the price of reducing academic rigor.

CHAPTER 4. OCCUPATIONAL PREFERENCES

Empirical analysis in the "schooling as investment" tradition has taken too narrow a conception of utility functions by looking at earnings in particular as the motivation for postsecondary education. This chapter takes what I call an "occupational preference" perspective in which adolescents enter college to obtain occupations with the characteristics—pecuniary and nonpecuniary—that they want. From this perspective, interpersonal differences in schooling decisions are seen to arise, in part, from interpersonal differences in occupational preferences.

Economic models of schooling decisions assume that schooling is motivated by the desire to maximize utility and often explicitly assume that maximizing lifetime earnings maximizes utility. Typically, researchers do not justify the assumption, but the unstated argument is roughly: people want high earnings; schooling increases earnings; therefore, people go to school to increase their earnings.

Should this argument be accepted? Evidence seems unnecessary for the claim that people want high earnings if the claim is limited to ceteris paribus conditions. The evidence for the claim that schooling increases earnings is very strong (for a review see Card 1998), although the precise magnitude of the effect and the mechanisms that bring it about are both disputed. This argument also assumes that people are aware of the causal effect of schooling. Research that surveys high school students' beliefs finds that students generally believe that college will increase their earnings (Dominitz and Manski 1996; Avery and Kane 2004; Rouse 2004).

As for the conclusion that adolescents enter college to increase their earnings, it appears to be just that: a conclusion based upon the first two claims. There is essentially no direct evidence. The only real evidence that has been offered is a degree of correspondence in trends over time in returns to education and college enrollment.

These trends were reviewed in Chapter 1 and were shown to be less than compelling evidence that earnings in particular motivate postsecondary schooling.

The same arguments and evidence offered in support of the assumption that schooling is primarily about earnings can also be offered for the importance of nonpecuniary labor-market outcomes. People care about nonpecuniary labor market outcomes. Studies find that job satisfaction is only weakly affected by earnings (Gruenberg 1980). Research on compensating differentials shows that workers forgo higher earnings for more pleasant and safer jobs (Viscusi 2004; Moretti 2000; Feinberg 1981; Kostiuk 1990). Using the rankings people gave of their own jobs in conjunction with their descriptions of their own jobs, Jencks, Perman, and Rainwater (1988) found that earnings was the single strongest determinant of a job's desirability but that other factors (such as autonomy, full-time employment, vacation time, on-the-job training, job security, variety, cleanliness, and unionization) were collectively twice as important as earnings. This led them to conclude that nonpecuniary job characteristics are probably "far more important to workers than most of us ordinarily assume" (1343).[29] Most directly, tabulations based on data from *Monitoring the Future*, which is described more fully shortly, show that adolescents report that nonpecuniary outcomes are very important to them. In fact, results show that over 35 percent of respondents report that it is more important to them to have interesting work than to have high-paying work; only 8 percent report that high earnings are more important than interesting work. (The remaining 57 percent are ties.)

Although the literature is neither as extensive nor as sophisticated as the research on the effect of education on earnings, research on nonpecuniary outcomes also consistently shows that education has strong effects on desirable nonpecuniary

[29] As an example, based on the parameters they estimate, they calculate that "workers rate a clean job paying $10,000 a year about the same as a dirty job paying $23,000 a year" (1339), which even I find hard to believe.

outcomes as well, such as working conditions and autonomy (Jencks, Perman, and Rainwater 1988; Duncan 1976). It would thus be sensible for adolescents to pursue college to improve the nonpecuniary aspects of their employment.

Typically well disposed to seeing structure in the labor market, sociologists have long targeted occupations as important determinants of labor-market outcomes. Occupations have meaningful effects on the earnings of their incumbents with various mechanisms—such as "occupational closure" strategies (Weeden 2002) and sex composition (Kilbourne et al. 1994)—offered as explanations for the effects. The tasks associated with occupations also appear to have important effects on job satisfaction (Kalleberg 1977), personality, and cognitive functioning (Kohn and Schooler 1982). These effects have motivated research seeking to understand the processes that result in incumbency in different occupations.

Some of the research on occupational incumbency focuses on discrimination and other barriers to entry into desirable occupations. Other research focuses on preferences that lead different people to want different occupations (Filer 1983). I work within this latter preferences tradition. I argue, as have others, that it is sensible to think that the effect that education has on occupational attainment motivates schooling decisions (Morgan 2005; Powers and Wojtkiewicz 2004; Xie and Goyette 2003:474–476; Mare 1995; Jencks 1972) and that interpersonal differences in preferences relating to labor-market outcomes can explain interpersonal differences in postsecondary schooling decisions. This could be called an "occupational preference" perspective that sees postsecondary education as a means to an end, where the end is an occupation or a general type of occupation with certain characteristics.

Orthodox status attainment models assume that the effects of education on occupational outcomes do *not* act as incentives to continue schooling (e.g., Sewell, Haller, and Portes 1969), but this seems unreasonable. Early work by Kahl (1953:196)

showed that adolescents see education as a means to occupations or types of occupations, and I believe that the assumption that they still do is reasonable and uncontroversial.

INTERPERSONAL VARIATION IN OCCUPATIONAL PREFERENCES

Preferences can vary both in strength and in kind. The distinction I make is between *preferences for different types of outcomes* and *strengths of preferences for the same types of outcomes*. This distinction is captured by the commonsense notion that people can have "different standards" than others for evaluating occupations and that people can have "higher standards" than others for evaluating occupations.

First consider preferences for different types of outcomes, which I also refer to as different standards. Some occupational characteristics are liked by some and disliked by others. For example, some people find abstract problem solving interesting and satisfying, while others find it boring and frustrating. Some people like leadership roles and others are highly uncomfortable in them. Interpersonal variation in types of preferences is at the heart of the field known as *vocational psychology*. In John L. Holland's (1997) widely used system people are classified with six personality types. Each personality type has activities that they like and dislike and goals that they value and do not value. *Realistic* types like activities involving machines and tools, and they dislike educational activities. *Investigative* types prefer activities involving exploration and understanding. *Artistic* types prefer creative, musical, and artistic activities. *Enterprising* types like to lead, especially toward personal goals and the goals of organizations they are associated with. *Conventional* types like structured activities and routines, and they value material accomplishments. There are also six corresponding environments in Holland's framework, and people seek out the environments fitting their personality to achieve "person-environment congruence."

There is considerable evidence of the effect of interests on occupational choice (see Holland 1997 and the references therein).

Next consider differences in strengths of preferences. By their very nature, some tasks are undesirable to almost everyone. For example, some tasks are dangerous, exhausting, or involve environmental discomforts such as heat and cold. While these tasks are undesirable to almost everyone, there is almost certainly interpersonal variation in the extent to which they are considered undesirable. Similarly, some tasks and extrinsic rewards are desirable to almost everyone. For example, some jobs have high earnings and involve tasks that allow people to see the results of their work. Here too, while these features of a job are desirable to almost everyone, there is almost certainly interpersonal variation in the extent to which they are desired. Those who value a certain occupational characteristic highly could be said to have "higher standards" than others who value them but value them less.

Vocational psychology is interested in differences in strengths of preferences as well, but they are somewhat downplayed. Most of the research on strengths of preferences is conduced by sociologists who study *job values* (also known as "work values") to examine individual and group differences in the strength of various occupational preferences.

It is useful here to clarify some of my terminology. *Occupational preferences* are preferences that adolescents and others have for various aspects of their employment. These are preferences for both pecuniary and nonpecuniary aspects of employment and for both intrinsic and extrinsic aspects of employment. There are several ways to measure occupational preferences. Two have already been touched upon. Adolescents can be given an "interest inventory." A second similar way to measure occupational preferences is with a job values battery. Typical items in job values batteries ask respondents how important "working with ideas," "working with

people," "working at a slow pace," and so on are in selecting a job. The job values literature confirms considerable interpersonal variation in job values and that job values influence occupational choice (Mortimer 1996).

THE EFFECTS OF OCCUPATIONAL PREFERENCES ON EDUCATION

What relationships should we expect between occupational preferences and college entry? Naturally, a rational choice perspective predicts that adolescents with preferences for the types of outcomes that education increases will be more likely to pursue college than those whose preferences lead them to dislike them. For example, education likely increases the probability of future work tasks that involve abstract problem solving; therefore, those enjoying abstract problem solving should expect and attain more education than those who dislike it. Limited research in vocational psychology supports this logic. Rottinghaus et al. (2002) and Gasser, Larson, and Borgen (2004) find that interest in *investigative* themes (which include abstract thinking, exploration, and understanding) predicts educational aspirations among college undergraduates.

A similar logic applies to the strength of preferences. For example, education appears to increase earnings and occupational prestige, so strong preferences for earnings and status should increase the probability of college entry. This is essentially a job satisfaction explanation drawing on Kalleberg's (1977) job values model. Kalleberg (1977) finds that those with lower scores on self-reported job values have higher job satisfaction conditional on the actual rewards of their jobs. For example, if two people have jobs with the same level of autonomy, the person who values autonomy more will have lower job satisfaction. Using my terminology, Kalleberg reasons that those with higher standards are less apt to meet their standards and are consequently more apt to be dissatisfied with their outcomes. Applying this reasoning

to the analysis of schooling decisions, if schooling increases rewards (e.g., autonomy), then those who most value these rewards should be the most likely to pursue postsecondary schooling for fear that their standards will go unmet if they do not. Those with lower standards will be less likely to pursue postsecondary schooling because they are more likely to be satisfied with the type of job they could obtain without it.

Support for this reasoning dates back at least to the work of Kahl (1953) who examined academically able adolescents with modest family backgrounds and found that half of the boys chose not to strive for success as the term is conventionally defined. Instead, they planned little or no postsecondary schooling because "they would be content with the lesser jobs that would likely be open to them" (p. 186) and reported that for them "the competitive game to rise higher was not worth the candle" (p. 192).

Limited research on job values provides only mixed support for the idea that high standards increase educational attainment. Lindsay and Knox (1984) find that the importance of intrinsic values, such as interesting work and autonomy, is positively related to subsequent educational attainment, and the more recent work of Johnson and Elder (2002) finds that those who attend postsecondary institutions place greater emphasis on authority and challenge. However, both studies find that those who pursue postsecondary education place less emphasis on extrinsic values, such as earnings and social status, than those who do not.

Halaby (2003) argues against the intrinsic-extrinsic dichotomy and proposes that job values can more meaningfully be grouped into "entrepreneurial" job values (which include a preference for risk-taking and autonomy) and "bureaucratic" job values (which include preferences for job security, pensions, and so forth). Halaby (2003) found that respondents expecting to enter college had stronger preferences for

entrepreneurial job values (especially autonomy) than for bureaucratic job values, whereas those not expecting to enter college had stronger preferences for bureaucratic values.

Halaby (2003) also shows that many job values are somewhat strongly related to cognitive skill and that cognitive skill is positively related to most aspects of entrepreneurial job values and negatively related to bureaucratic values.

I have thus far examined occupational preferences measured as job values and self-reported interests. Occupational preferences have also been measured using occupational expectations and aspirations. Xie and Goyette (2003) use occupational expectations to explain in part why Asians have higher educational attainment than whites. Using NELS88 data, they map scores from a socioeconomic index onto the occupational expectations of whites and Asians to get a measure of the socioeconomic status of the occupations they expect. They found that Asians expect occupations with higher socioeconomic status than whites and that this can explain part of the higher college entry of Asians. Although they do not use the explanation themselves, this can be seen as a "higher standards" phenomenon.

Powers and Wojtkiewicz (2004) use occupational aspirations to explain why females have higher educational attainment than males. Using the *National Longitudinal Survey of Youth, 1979*, they find that occupational aspirations explain the female advantage in high school graduation. Having found that the occupations females wanted did not have higher prestige than the occupations males wanted, they proposed what I term a "different standards" explanation. They found, for example, that females are more apt to want clerical occupations than skilled manual occupations and noted that these preferences would lead to higher educational attainment among females even though clerical occupations cannot be said to assume higher positions in the occupational hierarchy than skilled manual occupations. Powers and Wojtkiewicz

also found that introducing occupational aspirations into models of college graduation has only small effects on estimates of female-male differences, but their data is from 1979 so it is difficult to determine if occupational aspirations are important in explaining the current female advantage, which had not clearly emerged in this cohort.

Using occupational aspirations and expectations to measure occupational preferences is useful because more datasets include aspirations or expectations than job values. Occupational expectations and aspirations probably also do a better job at capturing occupational preferences than job values. For example, if someone reports wanting a clerical occupation this likely tells us more about the type of work they want than responses to even an entire job values battery, which has problems of interpersonal consistency of meaning (such as when "A lot of money" means different things to different people and when "Very important" means to one person what "Somewhat important" means to another). Job values batteries also fail to inquire about important occupational characteristics like working conditions, safety, and so on, which are implicitly contained in occupational expectations and aspirations.

However, adolescents' occupational expectations and aspirations are likely not determined by occupational preferences alone. Instead, they are likely caused jointly by adolescents' occupational preferences and perceptions of what occupations are available to them. In the terminology of Gottfredson's (1981) "circumscription and compromise" theory of occupational aspirations, the occupations adolescents report as the one they would like to have as adults are the product of occupational preferences and *perceived accessibility*, which are perceptions of the types of occupations they have the ability to enter. Perceived accessibility is determined largely by adolescents' inclination and self-assessed ability to complete the required training (including education) and perform the relevant occupational tasks.

Perceived accessibility often leads adolescents to engage in *anticipatory compromise*, which results in the reporting of occupations not completely in line with one's occupational preferences but perceived to be attainable. For example, a respondent may report wanting to be a health technician when ideally they would be a physician. This thinking is not in keeping with the interpretation of aspirations as statements of preferences,[30] but evidence strongly suggests that aspirations—not just expectations—are influenced by perceived accessibility.[31] This issue, ignored by Powers and Wojtkiewicz (2004) and Xie and Goyette (2003), is important here because my interest is in occupational preferences per se, not perceived accessibility.

This being said, differences in the "level" of occupational expectations and aspirations are probably not caused solely by perceived accessibility. Some adolescents will have preferences for being challenged, such as by challenging occupational tasks like abstract problem solving or by demanding entry requirements like a professional degree. Adolescents who want to be challenged will have higher occupational goals than similar adolescents lacking this preference. Differences in preferences for status could also lead some adolescents to want and expect occupations with higher status, which typically have more demanding entry

[30] Gottfredson uses the term preferences in the way that some people use the term aspirations: "Preferences are the 'wish' rather than the 'reality' component of aspirations or goals" (Gottfredson 1981:548).

[31] Occupations become more realistic as respondents age, which strongly suggests that their aspirations are influenced by perceived accessibility. The NLSY79 data, described in more detail below, also suggest that perceived accessibility influences occupational aspirations. Following the occupational aspirations questions respondents are asked "What do you think your chances are of getting into this type of work?" with respondents choosing either "Excellent," "Good," "Fair," or "Poor." Only 3 percent of respondents think that their chances of getting the occupation they report are "Poor," which suggests that respondents do not report the occupation they would ideally have without consideration of potential barriers (22, 50, and 25 percent choose "Fair," "Good," and "Excellent," respectively). Tabulations of occupational aspirations (results not shown) also reveal that those reporting that their chances of getting their occupation are "Poor" are much less likely to report occupations with low entry requirements – such as manual work – and are much more likely to report occupations with challenging entry requirements – such as athlete and (especially) writer or entertainer. More generally, the accessibility of occupations tends to increase as responses move from "Poor" to "Excellent." Those with lower cognitive skill report occupations requiring lower cognitive skill, and this too has been interpreted as the effects of perceived accessibility, but this could also reflect preferences.

requirements. In a similar vein, occupational expectations may to some extent be a statement of where an adolescent thinks they belong in the occupational hierarchy. Thus it is important to take perceived accessibility into consideration, but it is also important to remember that differences in occupational level can result from preferences as well.

DETERMINANTS OF OCCUPATIONAL PREFERENCES

The literature shows that lower-class background is associated with valuing security and earnings and higher-class background is associated valuing autonomy and intrinsic rewards, such as interesting work (Pearlin and Kohn 1966; Kohn and Schooler 1969; Kohn and Schooler 1983; Johnson and Elder 2002; Halaby 2003). In Halaby's (2003) job values dichotomy, more advantaged family backgrounds are associated with entrepreneurial job values. As discussed, Halaby (2003) also finds that cognitive skill is positively related to bureaucratic job values such as risk-taking for high rewards.

Research on gender differences in job values finds that females have a greater concern for social rewards (e.g., "a job that gives you a chance to make friends"), altruistic rewards (e.g., "a job that is worthwhile to society"), and intrinsic rewards (Marini, et al. 1996).[32] Research on gender differences in occupational aspirations and expectations finds very strong gender effects. Females are more likely to want or expect clerical occupations or health related occupations; males are more likely to want or expect managerial and engineering occupations.

No literature exists on school-effects on job values, but some of the broader school-effects literature is suggestive of relationships. As I argued earlier,

[32] Data prior the 1980s shows the females have less concern than males for extrinsic rewards, but Marini et al. (1996) shows that this is no longer the case.

occupational aspirations and expectations almost certainly represent occupational preferences to some extent, and research suggests that there are school effects on occupational expectations. Goldsmith (2004) finds that a school's racial mix affects occupational aspirations; specifically, occupational expectations increase as the proportion of students who are either black or Hispanic increases. Marsh (1991) finds that the mean level of cognitive skill at a school lowers occupational aspirations, and he attributes this finding to the big-fish-little-pond effect (see Chapter 2).

The job values and status attainment traditions have largely developed in isolation of one another (Halaby 2003), and the possibility that occupational preferences affect schooling decisions has been the subject of surprisingly little research. This chapter contributes to the literature by providing a more complete picture of the links between occupational preferences and educational attainment than currently exists. I measure occupational preferences as (1) self-reported job values, (2) occupational expectations, and (3) implied preferences for occupational characteristics by mapping occupational characteristics onto the occupations adolescents want. I also directly compare the use of job values and occupational expectations as measures of occupational preferences by using data containing both types of measures.

The empirical analysis consists of three major sections. The first section describes the relationship between occupational preferences and educational expectations. This is done using job values, occupational aspirations, and with "implied preferences" based on occupational aspirations. The second section estimates the causal effect of occupational preferences on educational expectations and college entry. The third section briefly addresses the determinants of occupational preferences.

DATA

Two datasets are used. *Monitoring the Future* is used to measure occupational preferences using both self-reported job values and occupational expectations. The *National Longitudinal Survey of Youth, 1979* is used to examine occupational preferences using occupational aspirations. This dataset is ideal because occupational aspirations are coded into a standard occupational classification system, and occupational characteristics can be mapped onto the occupations adolescents want.

MONITORING THE FUTURE, 1990 to 2005. *Monitoring the Future* (hereafter, MTF) is a nationally-representative, cross-sectional survey of high school seniors in approximately 130 public and private high schools in the United States. It has been conducted annually since 1976. It is a three-stage sample: the first stage is geographical areas; the second stage is one or more high schools within the geographical areas; the third stage is high school seniors within the high schools. Sampling weights are used to adjust for unequal probabilities of selection resulting from the sampling procedures. The sample used here was constructed by pooling data from the 1990 to 2005 surveys.

Occupational expectations are measured with a 16-category classification, which is presented in Table 4.1 along with descriptions, means, and standard deviations of all of the variables used in the analysis. Job values are measured with a battery of questions asked of a subset of all MTF respondents. Respondents are told that "Different people may look for different things in their work," and they are asked how important each of 23 characteristics is to them in their work. Full wording for all 23 characteristics is presented in Table 4.1, which also includes descriptive names I have given the job values that I use throughout the remainder of the Chapter. The same subset of respondents is asked both the job values and occupational expectations

questions, so these two methods of measuring occupational preferences can be compared.

Respondents are asked how likely it is that they will obtain a four-year degree and are allowed to report that they "Definitely will," "Probably will," "Probably won't," or "Definitely won't" obtain one. I generate a dichotomous variable that equals one if respondents think they "Definitely will" obtain a four-year degree and equals zero if they select any of the other three response options. I refer to those who report that they "Definitely will" graduate as expecting four-year degrees and the others as expecting less, although this is not completely accurate because many of them think that they "Probably will" get bachelor's degrees.[33]

Parental education is measured as the educational attainment of the most educated parent or whichever parent's education is available if the other parent's education is missing. There is no measure of the perceived ability to complete college, but I measure perceived ability with both self-assessed intelligence and self-assessed academic ability. Measures of self-assessed ability are also valuable also because they can be used to control for the perceived accessibility of occupations.

The MTF was chosen for its job values battery, but it has several shortcomings for other measures that hinder my ability to present results for the MTF that are comparable to results based upon other datasets. There are no school identifiers in the public release data, so multilevel models are not possible. Race and ethnicity can only be coded in the three categories white, black, and "other." There is neither a family income question nor a question on parents' occupation, which could be used as a proxy. MTF also lacks a measure of cognitive skill. Because cognitive skill is so central to the analysis, I include grade point average (hereafter, GPA) and a dummy

[33] Other codings of educational expectations were experimented with. All yielded largely similar results.

Table 4.1. Variables Used to Analyze Occupational Preferences.
(A) MTF, 1990–2005; (B) NLSY79, 1979–1990; (C) O*NET98.

PANEL A. MONITORING THE FUTURE (N=36,920)			
Variable	Description	Mean	Stand. Dev.
Expects a 4-year degree	Student is certain they will obtain a 4-year degree (yes=1). Coded from a question asking "How likely is it that you will do each of the following things after high school?...Graduate from college (four-year program)" (Response options: 1=Definitely Won't; 2=Probably Won't; 3=Probably Will; 4=Definitely Will). Only students responding that they "Definitely will" are coded as expecting a 4-year degree.	.54	.50
Occupational expectations	The kind of work students think they will be doing when they are 30 years old; chosen from the following 16 categories:		
	Laborer	.00	.05
	Service worker	.02	.13
	Operative	.01	.10
	Sales clerk	.00	.06
	Clerical or office worker	.03	.18
	Protective service	.04	.19
	Military service	.03	.16
	Craftsman or skilled worker	.05	.23
	Farm owner, farm manager	.01	.09
	Owner of a small business	.06	.23
	Sales representative	.02	.12
	Manager or administrator	.06	.23
	Professional I	.35	.48
	Professional II	.19	.39
	Homemaker	.01	.10
	Don't know	.02	.13
	Missing occupational expectation	.10	.31
Job values	How much respondents value various aspects of jobs in assessing their desirability. Based on responses to "Different people may look for different things in their work. Below is a list of some of these things. Please read each one, then indicate how important this thing is to you." (Response options: 1=Not important; 2=A little important; 3=Pretty		

Table 4.1 (Continued)

	important; 4=Very important)		
Advancement	A job where the chances for advancement and promotion are good	3.49	.72
Income	A job which provides you with a chance to earn a good deal of money	3.41	.78
Respect	A job that most people look up to and respect	3.17	.89
Prestige	A job that has high status and prestige	2.85	.94
Secure Future	A job that offers a reasonably predictable, secure future	3.52	.70
No Relocating	A job which allows you to establish roots in a community and not have to move from place to place	3.05	.96
Decision-Making	A job where you get a chance to participate in decision making	3.10	.82
Challenging Problems	A job where most problems are quite difficult and challenging	2.36	.93
Interesting	A job which is interesting to do	3.81	.48
Can Be Yourself	A job where you do not have to pretend to be a type of person that you are not	3.56	.80
Uses Your Skills	A job which uses your skills and abilities – lets you do things you can do best	3.64	.60
See Results of Work	A job where you can see the results of what you do	3.39	.72
Skills Remain Useful	A job where the skills you learn will not go out of date	3.27	.86
Learn New Things	A job where you can learn new things, learn new skills	3.24	.77
Creativity	A job where you have the chance to be creative	3.09	.89
You Help Others	A job that gives you an opportunity to be directly helpful to others	3.23	.84
Benefit to Society	A job that is worthwhile to society	3.17	.87
Make Friends	A job that gives you a chance to make friends	3.19	.85
Interpersonal	A job that permits contact with a lot of people	2.90	.97
Free Time	A job which leaves a lot of time for other things in your life	3.24	.78
Unsupervised	A job which leaves you mostly free of supervision by others	2.88	.91
Vacations	A job where you have more than two weeks vacation	2.67	1.03

Table 4.1 (Continued)

Slow Pace	A job with an easy pace that lets you work slowly	2.32	.97
White	Student is white (yes=1).	.64	.48
Black	Student is black (yes=1).	.11	.32
Other race/ethnicity	Student is a race or ethnicity other than white or black (yes=1).	.19	.40
Female	Student is female (yes=1).	.52	.49
Parental education	Highest grade completed by the most educated parent, or whichever parent's education is available if the other's is missing.	14.51	2.50
Perceived school ability	Students' perceived "school ability" relative to others their age throughout the country. Measured with responses to: "Compared with others your age throughout the country, how do you rate yourself on school ability?" (Response categories: 1=Far below average; 2=Below average; 3=Slightly below average; 4=Average; 5=Slightly above average; 6=Above average; 7=Far above average)	4.89	1.17
Perceived Intelligence	Students' perceived intelligence relative to others their age throughout the country. Measured with responses to: "How intelligent do you think you are compared with others your age?" (Response categories: 1=Far below average; 2=Below average; 3=Slightly below average; 4=Average; 5=Slightly above average; 6=Above average; 7=Far above average)	4.98	1.16
Academic track	Student is in the academic or college preparatory track (yes=1)	.55	.50
Grade point average (GPA)	Which of the following best describes your average grade so far in high school? Response categories: A; A–; B+; B; B–; C+; C; C–; D Response categories are converted to a GPA as follows: A = 4.0; A– =3.7; B+ = 3.3; B = 3.0; B– =2.7; C+=2.3; C = 2.0; C– = 1.7; D = 1.0; F = 0	3.06	.67

Table 4.1 (Continued)

PANEL B. NLSY79 1979–1990 (N=4,066)			
Variable	Description	Mean	Stand. Dev.
Expects a 4-year degree	Adolescent expects a 4-year degree or higher (yes=1).	.47	.50
College entry	Adolescent has entered a 2- or 4-year college by the 1990 round	.64	.48
Parental education	Highest grade completed of the most educated parent, or whichever parent's education is available if the other parent's education is missing.	12.8	2.89
Family income	Family income from all sources in 1979.	20,367.31	12,861.38
Cognitive skill	Score on the Armed Forces Qualifying Test (AFQT)	199.34	33.65
Female	Student is female (yes=1)	.51	.50
White	Student is white (yes=1)	.79	.41
Black	Student is black (yes=1)	.14	.35
Hispanic	Student is Hispanic (yes=1)	.05	.23
Other race/ethnicity	Student is a race or ethnicity other than white, black, or Hispanic (yes=1)	.01	.10

PANEL C. O*NET98			
Variable	Description		
INTERESTS			
Realistic	Realistic occupations frequently involve work activities that include practical, hands on problems and solutions. They often deal with plants, animals, and real world materials like wood, tools, and machinery. Many of the occupations require working outside and do not involve a lot of paperwork or working closely with others.	.00	1.00
Investigative	Investigative occupations frequently involve working with ideas and require an extensive amount of thinking. These occupations can involve searching for facts and figuring out problems mentally.	.00	1.00
Artistic	Artistic occupations frequently involve working with forms, designs, and patterns. They often require self-	.00	1.00

Table 4.1 (Continued)

	expression and the work can be done without following out a clear set of rules.		
Social	Social occupations frequently involve working with, communicating with, and teaching people. These occupations often involve helping or providing service to others.	.00	1.00
Enterprising	Conventional occupations frequently involve starting up and carrying out projects. These occupations can involve leading people and making many decisions. Sometimes they require risk taking and involve business.	.00	1.00
Conventional	Conventional occupations frequently involve following set procedures and routines. These occupations can include working with data and details more than with ideas. Usually there is a clear line of authority to follow.	.00	1.00
OTHER INTRINSIC			
Creativity	Workers on this job try out their own ideas.	.00	1.00
Variety	Workers on this job have something different to do each day.	.00	1.00
Achievement	Workers on this job get a feeling of accomplishment.	.00	1.00
Responsibility	Workers on this job make decisions on their own.	.00	1.00
Frustrating Circumstances	To what extent do "frustrating circumstances" ("roadblocks" to work that are beyond the worker's control) hinder the accomplishment of this job?	.00	1.00
Activity	Workers on this job are busy all the time.	.00	1.00
EXTRINSIC			
Compensation	Workers on this job are paid well in comparison with other workers.	.00	1.00
Security	Workers on this job have steady employment.	.00	1.00
Social Status	Workers on this job are looked up to by others in their company and community.	.00	1.00
Advancement	Workers on this job have opportunities for advancement.	.00	1.00

Table 4.1 (Continued)

ALTRUISTIC			
Moral Values	Workers on this job are never pressured to do things that go against their sense of right and wrong.	.00	1.00
Assist & Care for Others	Providing assistance or personal care for others.	.00	1.00
Presumed Good of the People	A preference for working for the presumed good of the people. (This is a DOT variable.)	.00	1.00
INTERPERSONAL RELATIONS			
Authority	Workers on this job give directions and instructions to others.	.00	1.00
Autonomy	Workers on this job plan their work with little supervision.	.00	1.00
Independence	Workers on this job do their work alone.	.00	1.00
Conflict Situations	How frequently do the job requirements place the worker in conflict situations?	.00	1.00
Deal with Unpleasant/ Angry People	How frequently does the worker have to deal with unpleasant, angry, or discourteous individuals as part of the job requirements?	.00	1.00
Coworkers	Workers on this job have coworkers who are easy to get along with.	.00	1.00
WORK ENVIRONMENT			
Working Conditions	Occupations that satisfy this work value offer job security and good working conditions.	.00	1.00
Radiation-Injury Likelihood	What is the likelihood that the worker would be injured as a result of being exposed to radiation while performing this job?	.00	1.00
Disease- Injury Likelihood	What is the likelihood that the worker would be injured as a result of being exposed to diseases/infections while performing this job?	.00	1.00
Hazardous Conditions-Injury Likelihood	What is the likelihood that the worker would be injured as a result of being exposed to hazardous situations while performing this job?	.00	1.00
ABILITIES/SKILLS			
Deductive Reasoning	The ability to apply general rules to specific problems to come up with logical answers. It involves deciding if an answer makes sense.	.00	1.00

Table 4.1 (Continued)

Social Perceptiveness	Being aware of other's reactions and understanding why they react the way they do.	.00	1.00
Manual Dexterity	The ability to make coordinated movements with one hand, a hand together with its arm, or two hands to grasp, manipulate, or assemble objects.	.00	1.00

Notes. Data are weighted. Variable statistics include imputed values.

variable for academic track (both of which are strongly related to cognitive skill) in models in an effort to control for the effects of cognitive skill. GPA and track placement will fail to capture the total effects of cognitive skill and will likely capture other effects such as effort. However, these variables—in conjunction with self-assessed intelligence and self-assessed academic ability—should collectively control for most of the effects of cognitive skill.

The sample is limited to respondents with valid responses to the educational expectation question; sample size is N=36,920. Missing values for all other variables are imputed using Stata's best subset imputation command "impute." Missing values for job values have been rounded to the nearest integer for Figures 4.2A and 4.2B. A dummy variable for missing occupational expectations is used for missing occupational expectations. This is not in keeping with current imputation practice; however, there are so many respondents with missing occupational expectations (and they are virtually all imputed as "Professional II" if they are imputed) that a separate category seems appropriate.

NATIONAL LONGITUDINAL SURVEY OF YOUTH, 1979. The *National Longitudinal Survey of Youth, 1979* (hereafter, NLSY79) is a sample of 12,686 youth born between 1957 and 1964 living in the United States in 1979. Respondents were interviewed annually from 1979 to 1994 and biennially from in 1994 to the present.

Sampling weights are used to adjust for unequal probabilities of selection resulting from the sampling procedures.

Educational expectations come from the 1979 round when respondents were asked the highest grade of formal schooling they expect to complete. Expectations are measured as a dichotomy equaling one if respondents expect a four-year degree or higher and zero if they expect less education. Ever attended college indicates if the respondent has attended a two- or four-year college as of the 1990 round (when respondents were aged 25 to 33).

Race and ethnicity are coded with the mutually-exclusive categories white, black, Hispanic, and "Other."[34] Cognitive skill is measured with the "1989" version of AFQT supplied with the data.[35] Family income is taken from the Household Screener; missing values are filled in with responses to the family income question in the 1979 survey. Parental education is measured as the highest grade completed by the most educated parent or guardian as reported by the respondent or with whichever parent's education is available is the other parent's education is missing.

Occupational aspirations are based on a series of questions in 1979 asking respondents what kind of work they would like to be doing when they are 35 years old. Verbatim responses were coded in the 1970 Census Occupation Code (COC).

There is a long tradition in quantitative social stratification research of treating occupations as measures of labor-market outcomes, especially using prestige scores or

[34] The racial/ethnic cohort from the screener was the primary variable used to code race and ethnicity. It has three categories: 1) Hispanic, 2) black, and 3) nonblack, nonHispanic. The first two categories are used to code Hispanic and black. White was coded by isolating respondents from the third category that are White using sequentially the 1979-1981 interviewer remarks. A respondent was coded as white if the interviewer said they were "white" and not white if they said they were "black" or "other."

[35] Controversy surrounds the use of the AFQT because respondents took the test at different ages and with different levels of education and it is not clear how best to adjust the AFQT scores. I have simply included a measure for age in 1979, which should absorb differences owing to age. I am reluctant to adjust for schooling differences because with the young sample I have, which is limited to respondents who were in high school in 1979, most education differences could be due to grade retention, which will be largely a consequence of differences in cognitive skill.

socioeconomic scores. Rather than using a single measure, such as a socioeconomic score, a range of occupational characteristics can be mapped onto the occupations adolescents want to provide a more complete picture of the differences in occupational preferences between the more- and less-educated.[36] Doing so allows for occupations to be different from one another though not necessarily better or worse. It also allows an occupation to be better than another occupation in some ways and worse in others. *Occupational characteristics* that are mapped onto the occupations respondents aspire to are drawn primarily from the *Occupational Information Network* (hereafter, O*NET), which is a database system for collecting, organizing, and describing the characteristics of occupations and their incumbents. O*NET replaces the *Dictionary of Occupational Titles* (hereafter, DOT). It is preferable to the DOT because it contains more measures (including Holland's six interest types) and measures that are more finely-grained than those found in the DOT.[37] The first version of O*NET (which is commonly referred to as O*NET98) is used because—unlike later releases—it contains a crosswalk that can be used to generate values for the 1990 COC, which is easily converted into 1980 COC. Unfortunately, there is no crosswalk from O*NET98 to the 1970 COC, which is the classification system used to code occupational aspirations in the NLSY79. To generate values for the 1970 COC a probabilistic crosswalk known as the "Treiman File" (U.S. Bureau of the Census 1985), which is a portion of the 1970 Census with respondents' occupations coded in both the 1970 and 1980 COC, is used.

[36] Recent decades have seen a shift away from occupations and towards earnings. The shift to earnings is understandable because earnings are a better measure of material well-being, occupational measures have considerable measurement error due to the heterogeneity of jobs (the combination of work duties and employer) within an occupational title and due to the coding process in which verbatim responses are categorized into one of a group of occupational titles. Nonetheless, occupational measures are probably the best way to get a more complete picture of the types of work people want and get in the context of large sample surveys.

[37] In the DOT, measures often only indicate the presence or absence of a characteristic, while O*NET measures are typically on a multiple-point scale.

One measure—working for the presumed good of the people—is drawn from the DOT, Fourth Edition because a similar measure is lacking in O*NET98. Table 4.1 gives more detail on the occupational characteristics considered here and descriptive names used throughout the chapter.

The sample is limited to respondents in the cross-sectional sample, the oversample of blacks and Hispanics, and the oversample of disadvantaged whites (i.e., it excludes the supplemental sample of military personnel); who were living with their parents or adult guardians in the 1979 round (to ensure that family income represents a family background measure); with valid educational expectations and college entry data; and to respondents who were still enrolled in high school in 1979 when the educational expectations and occupational aspiration questions were asked (to reduce the effects of full-time labor-force participation on expectations and aspirations). Sample size is N=4,066.

RESULTS

DO ADOLESCENTS EXPECTING COLLEGE DEGREES HAVE DIFFERENT OCCUPATIONAL PREFERENCES THAN THOSE EXPECTING LESS EDUCATION?

The first set of analyses seeks to show that (1) occupational preferences vary substantially interpersonally, (2) those who expect college degrees want different things from their employment than those expecting less education, and (3) interpersonal variation in occupational preferences is not caused solely by the perceived accessibility of occupations. I attempt to show these points by measuring occupational preferences in several ways and by attempting to adjust for perceived accessibility in several ways.

USING JOB VALUES TO MEASURE OCCUPATIONAL PREFERENCES. Both Lindsay and Knox (1984) and Johnson and Elder (2002) report that the college educated have stronger preferences for intrinsic values and weaker preferences for extrinsic values. However, both engage in data reduction by generating composite measures, which precludes the possibility of discerning which specific job values are important and which are not. For example, it is not possible to determine if preferences for status influence educational outcomes because status and earnings are combined to create a single variable measuring the importance of extrinsic values. This is especially important when seemingly different job values are used to construct a single composite variable.[38] I first examine each of the job values in the MTF separately and the relationships that they have with the expectation of a four-year degree.

Figure 4.1A presents the distribution of responses for each job value by educational expectations. A cursory examination of Figure 4.1A reveals that, while most adolescents select "Very Important" for numerous job values (e.g., *Advancement*, *Income*, *Interesting*), there is considerable variation in job values in the sense that responses are not clustered around a single response category.

Figure 4.1A also suggests that most of the variation in preferences is variation in *strengths* of preferences not variation in *types* of preferences. If a job value was unimportant to an adolescent or if they had a distaste for the occupational characteristic the job value inquired about, then they should respond "Not important."

[38] For example, guided by factor analysis Johnson and Elder (2002) use both the values "a job which leaves a lot of free time for other things in your life" and "a job which leaves you mostly free of supervision of others" to construct a composite variable *leisure*. Similarly, a composite variable measuring the *influence* someone has at work is generated with responses to the disparate job values "a job where you get a chance to participate in decision making" and "a job where most problems are quite difficult and challenging." These are surely related in a correlational sense, but they tap into distinct concepts, and they could have different effects on education.

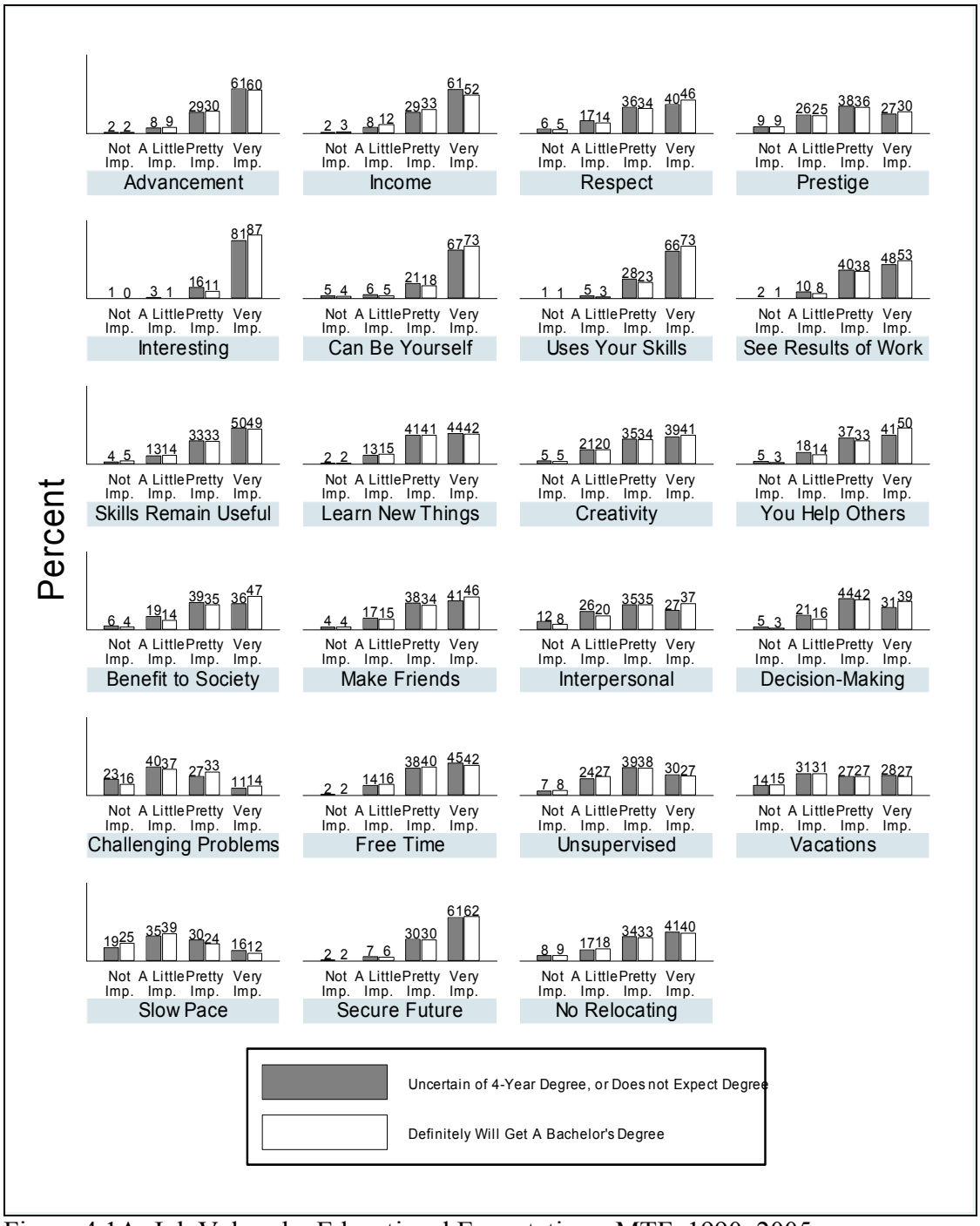

Figure 4.1A. Job Values by Educational Expectations. MTF, 1990–2005.

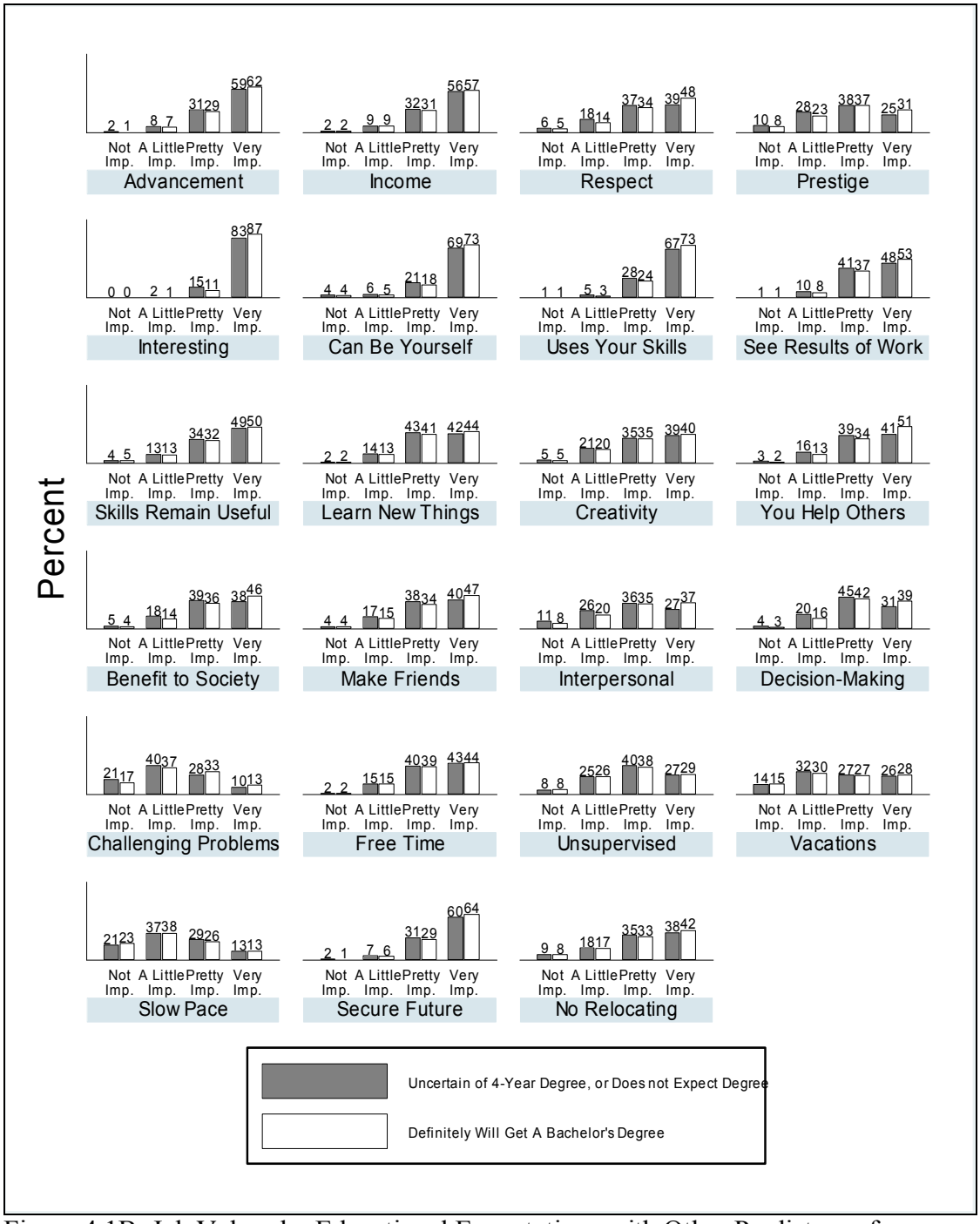

Figure 4.1B. Job Values by Educational Expectations with Other Predictors of Educational Expectations set to their Means. MTF, 1990–2005.

Notes. Results were generated based on parameter estimates from a multinomial regression. Gender, race and ethnicity, GPA, academic track, perceived intelligence, and perceived school ability have been set to their means.

Examination of Figure 4.1 shows that very few adolescents select "Not important" for most of the job values. For example, "Not important" is reported by only about 2 percent of respondents for the job values *Advancement*, *Income*, *Interesting*, *Uses Your Skills*, *See Results of Work*, *Learn New Things*, *Free Time*, and *Secure Future*. Only about 5 percent of respondents report "Not important" for the job values *Respect*, *Be Yourself*, *Skills Remain Useful*, *Creativity*, *Help Others*, *Benefit to Society*, *Make Friends*, and *Decision-Making*. Only for the job values *Slow Pace*, *Challenging Problems*, and *Vacations* do substantial proportions report "Not important."

Do adolescents expecting four-year degrees have different job values than those expecting less education? First consider the five job values typically considered together as "extrinsic rewards." Figure 4.1A shows that two of the five extrinsic values—*Respect* and *Prestige*—are of greater importance to those expecting bachelor's degrees. *Income* is less important to those expecting four-year degrees, and *Secure Future* and *Advancement* are essentially unrelated to expectations.

Intrinsic values are generally, but not always, more important to those expecting bachelor's degrees. For example, it is more important to those expecting bachelor's degrees to have work that is *Interesting*, allows them to *Be Yourself*, lets them *Use Your Skills*, and allows them to *See Results of Work*. However, having *Skills Remain Useful*, *Learn New Things*, and being *Creative* are of roughly equal importance to both groups.

Both types of altruistic rewards (*You Help Others* and *Benefits to Society*), both types of social rewards (*Make Friends* and *Interpersonal*), and *Decision-Making* are more important to those expecting bachelor's degrees. Leisure reward differences are small, although a *Slow Pace* is less important to those expecting bachelor's degrees.

Perhaps these differences reflect differences in perceived accessibility. For example, adolescents who believe that they cannot become physicians may begin to believe that *Income* and *Respect* are unimportant to them, such as might happen if a sour grapes mechanism (Elster 1983) was operating. It is therefore useful to look at job values conditional on perceived accessibility. Because I lack a direct measure of perceived accessibility, I use variables for both measured ability and perceived ability. Specifically, I model job values determination with a multinomial logit model, and I regress each job value on GPA, academic track, perceived intelligence, and perceived school ability. I also include gender and race, which also predict educational expectations, as regressors. I then set all of these regressors to their mean to predict job values. Figure 4.1B presents the results.

A comparison of Figures 4.1A and 4.1B shows that conditioning on variables intended to measure perceived and actual ability has increased differences between educational expectation groups for some job values, reduced them for some job values, reversed them for some job values, and has left some differences unchanged. For example, adolescents expecting four-year degrees had weaker preferences for *Advancement* and *Income* before conditioning, but they have slightly stronger preferences conditional on perceived accessibility. The changes in intrinsic values are especially mixed. For example, differences in *Interesting* have shrunk, differences in *Creativity* have grown, differences in *Interpersonal* have remained the same, and differences in *Learn New Things* have reversed direction.

It is thus difficult to say if conditioning on perceived ability has increased or decreased differences in job values. More generally, however, it could be said that differences between the educational expectation groups exist, it is unlikely that these differences are due solely to perceived accessibility, and the differences are not of an overwhelming magnitude.

USING OCCUPATIONAL ASPIRATIONS TO MEASURE OCCUPATIONAL PREFERENCES. I next explore occupational preferences by looking at the occupations adolescents want in the NLSY79, which codes occupational aspirations in the 1970 COC. Figure 4.6 presents the distributions of occupational aspirations by educational expectations as a first overview of results. It shows that respondents expecting four-year degrees are far more likely than those expecting less education to want to be professionals, and the reverse is true for blue-collar occupations.

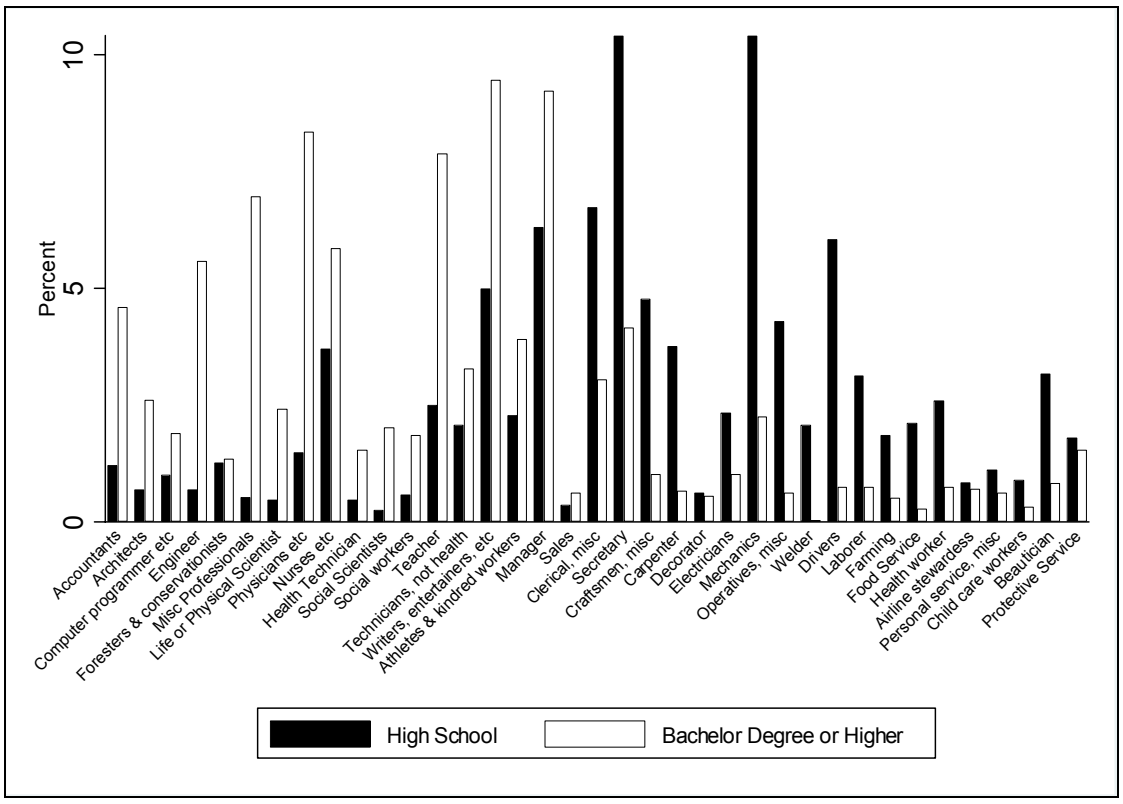

Figure 4.2. Distribution of Occupations Wanted by Educational Aspiration Group. NLSY79, 1979.

Distributions of occupations are informative and useful for providing an intuitive demonstration of differences in occupational preferences. More informative of the specific preferences that might motivate these choices is an examination of the

multiple measures from O*NET98 that characterize the occupations aspired to. The first set of results, which are presented in Column 1 of Table 4.4, report differences between those expecting bachelor's degrees and those expecting less education. Specifically, Column 1 reports the parameter estimates α_{BA} from regression models in which an occupational characteristic (O) is regressed on a dummy variable for expecting a bachelor's degree or higher (BA); controls also include a dummy variable for female (F), and age measured in years (A):

$$E(O_i) = \alpha_0 + \alpha_{BA} BA_i + \alpha_F F_i + \alpha_A A_i$$

Occupational characteristics are converted to z-scores to facilitate comparisons among them. For example, the coefficient –.428 in the first row of Column 1 indicates that the importance of *Realistic* interests in the occupations wanted by those expecting a bachelor's degree is .428 standard deviations lower than the importance of *Realistic* interests in the occupations wanted by those expecting less education. (Note that sex and age are included only as control variables, and the parameter estimates α_F and α_A are not presented in Table 4.4.)

Table 4.4 does not include all O*NET98 variables, of which there are hundreds. Instead, it contains groups of variables that are illustrative of more general patterns found across the broader range of O*NET98 variables. To give some structure to the discussion I have classified the occupational characteristics into the seven categories interests, other intrinsic, extrinsic, altruistic, interpersonal relations, work environment, and abilities/skills. Despite my efforts to keep the occupational characteristics to a minimum, it is best to make somewhat cursory observations leaving detailed examination to readers.

Table 4.2. Coefficients from Regressions Predicting the Characteristics of Occupations Wanted at Age 35. NLSY79, 1979.

	(1) α_{BA}	(2) β_{BA}	(3) γ_{BA}
INTERESTS			
Realistic	–.428**	–.287**	.038
	(.036)	(.042)	(.028)
Investigative	.838**	.617**	.156**
	(.035)	(.041)	(.028)
Artistic	.528**	.436**	.254**
	(.037)	(.046)	(.048)
Social	.469**	.465**	.039
	(.034)	(.041)	(.020)
Enterprising	.342**	.193**	–.072
	(.039)	(.046)	(.040)
Conventional	–.020	–.092	–.145**
	(.040)	(.050)	(.049)
OTHER INTRINSIC			
Creativity	.868**	.662**	.184**
	(.036)	(.045)	(.037)
Variety	.883**	.710**	.172**
	(.037)	(.045)	(.034)
Achievement	.960**	.800**	.277**
	(.036)	(.044)	(.035)
Responsibility	.960**	.739**	.223**
	(.035)	(.043)	(.033)
Frustrating Circumstances	.429**	.382**	–.126**
	(.038)	(.046)	(.038)
Activity	.314**	.252**	–.146**
	(.038)	(.047)	(.045)
EXTRINSIC			
Compensation	.541**	.369**	.074*
	(.036)	(.042)	(.037)
Security	.672**	.531**	–.027
	(.036)	(.044)	(.035)
Social Status	1.025**	.827**	.254**
	(.035)	(.043)	(.028)
Advancement	.491**	.301**	–.031
	(.039)	(.046)	(.038)
ALTRUISTIC			
Moral Values	–.668**	–.548**	.017
	(.037)	(.044)	(.033)
Assist & Care for Others-Lev	.455**	.434**	–.043
	(.034)	(.041)	(.026)
Presumed Good of the People	.445**	.510**	.152**
	(.034)	(.042)	(.032)
INTERPERSONAL RELATIONS			
Authority	.907**	.748**	.127**
	(.036)	(.043)	(.027)
Autonomy	.920**	.656**	.171**
	(.035)	(.044)	(.034)
Independence	–.327**	–.358**	.031

Table 4.2 (Continued)

	(.037)	(.044)	(.034)
Conflict Situations	.604**	.520**	–.102**
	(.036)	(.042)	(.029)
Deal w/Unpleasant/Angry People	.339**	.387**	–.108**
	(.036)	(.042)	(.032)
Coworkers	.513**	.468**	.054
	(.037)	(.045)	(.036)
WORK ENVIRONMENT			
Working Conditions	.638**	.369**	.121**
	(.037)	(.045)	(.036)
Radiation- Injury Likelihood	.258**	.251**	.143**
	(.036)	(.044)	(.041)
Disease- Injury Likelihood	.304**	.322**	.060*
	(0.034)	(.042)	(.028)
Hazardous Conditions-Injury Likelihood	–.368**	–.265**	–.093**
	(.038)	(.043)	(.032)
ABILITIES/SKILLS			
Deductive Reasoning-Lev	.861**	.637**	--
	(.035)	(.042)	--
Social Perceptiveness	.782**	.679**	--
	(.035)	(.041)	--
Manual Dexterity	–.420**	–.259**	--
	(.037)	(.043)	--

Notes. N=4,066. Heteroskedastic-robust standard errors in parentheses.

As discussed, *Realistic* interests are negatively related to educational expectations. *Investigative*, *Artistic*, *Social*, and *Enterprising* interests are positively related to educational expectations.

Turning to the other intrinsic characteristics, *Creativity* and *Variety* are strongly positively related to educational expectations. *Achievement*, which measures the use of one's skills and the feeling of satisfaction that this use brings, and *Responsibility*, which indicates that incumbents make decisions on their own, are also strongly related to educational expectations.

All extrinsic occupational characteristics—*Compensation*, *Security*, *Social Status*, and *Advancement*—are positively related to the expectation of a four-year degree. The findings for earnings and security are at odds with findings based on job values, but the findings based on occupational characteristics cannot overturn findings

based on job values because we do not know if earnings and security in particular draw adolescents expecting four-year degrees to the occupations they want. This is the important shortcoming of using occupational aspirations: it is not possible to know if a specific occupational characteristic motivates schooling decisions or if the characteristic in question is merely related to another characteristic that adolescents are attracted to.

Regarding altruistic aspects of jobs, the results show that those expecting four-year degrees want occupations *Assisting or Caring for Others* and occupations in which workers have a preference for working for the *Presumed Good of the People*. At the same time, however, they are less likely to want jobs in which workers "are never pressured to do things that go against their sense of right and wrong" (*Moral Values*). This finding seems in large measure caused by the fact that *Moral Values* are negatively related to authority.

Regarding interpersonal relations, those expecting four-year degrees are more likely to want occupations involving interaction with others (i.e., they have lower values for *Independence*: "Workers on this job do their work alone") and interacting with pleasant coworkers (i.e., they have higher values for *Coworkers*: "Workers on this job have co-workers who are easy to get along with"). Those expecting bachelor's degrees are more likely to want higher positions in hierarchies. For example they want to have *Authority* ("Workers on this job give directions and instructions to others"), and they also want *Autonomy* ("Workers on this job plan their work with little supervision"). However, higher educational expectations are also associated with some undesirable social interaction including *Conflict Situations* and *Dealing with Unpleasant/Angry People*.

The main finding for work environment, which is not dealt with in the job values literature, is that those expecting bachelor's degrees want occupations with

better *Working Conditions*. More concretely, they want occupations with "white-collar" working conditions. For example, low values of *Working Conditions* are associated with extreme heat and cold, bothersome noises, poor lighting, operation of vibrating machinery, and so on. The narrower preference for safety is difficult to characterize because the occupations wanted by those expecting less than a four-year degree are more likely to have *Hazardous Conditions*, but they involve less exposure to *Disease* and *Radiation*, owing primarily to health related occupations.

Educational expectations are strongly positively related to the level of *Deductive Reasoning* and *Social Perceptiveness* ("Being aware of others' reactions and understanding why they react the way they do") required for the occupations they want, which are used to measure cognitive and social skill requirements, respectively. Expectations are negatively related to *Manual Dexterity*, which is used to measure manual skill requirements.

The differences in occupational characteristics revealed in Column 1 could arise in part from differences in perceived accessibility. It is thus useful to examine these relationships conditional on cognitive skill and family background measures (which are likely related to perceived accessibility) to better isolate differences in occupational preferences. Column 2 addresses the relationship between educational expectations and the characteristics of the occupations adolescents want conditional on cognitive skill, parental education, and family income. Column 2 is thus analogous to Column 1, except that now the coefficients β_{BA} are reported from models that include cognitive skill (C), parental education (PE), and family income (FI):

$$E(O_i) = \beta_0 + \beta_{BA} BA_i + \beta_F F_i + \beta_A A_i + \beta_C C_i + \beta_{PE} PE_i + \beta_{FI} FI_i$$

The results for some occupational characteristics, such as *Moral Values* and *Assist or Care for Others*, are little influenced by the introduction of cognitive skill and family background. Several others, such as *Presumed Good of the People* and *Deal with Unpleasant or Angry People*, are slightly increased. However, adding the controls attenuates the majority of coefficients. The degree of attenuation varies considerably, with some occupational characteristics—such as *Investigative* interests, *Creativity*, *Variety*, and the three skill requirements—declining by about 25 percent, while others are reduced much less. Despite the general trend of attenuation, fairly large differences in occupational characteristics remain, which suggests that those expecting bachelor's degrees want quite different jobs than those expecting less education.

A critic could respond that the addition of cognitive skill and family background doubtless captures a good deal of the effects of perceived accessibility, but actual and perceived ability are not at all the same thing. Thus, perceived accessibility could still be driving the relationship between educational expectations and the occupational characteristics observed in Column 2. Ideally I would control for perceived accessibility by controlling for perceived ability. The NLSY79 lacks a measure of respondents' perceived ability, so no such measure can be added as a control variable to isolate differences in occupational preferences. However, controls can be used for skills and abilities that tap into the *actual* accessibility of the occupation. Conditional on these measures, differences between educational expectation groups should be largely due to preferences.

Occupations' skill requirements probably do the most to reduce their accessibility. A virtue of using occupational characteristics mapped onto occupations (rather than using dummy variables for the occupations themselves) is that it allows me to condition on specific occupational characteristics, such as skill requirements. In

an effort to control for perceived accessibility, I estimate another series of regression models with *Deductive Reasoning* requirements (*R*), *Social Perceptiveness* requirements (*S*), and *Manual Dexterity* requirements (*M*) added to the model as regressors:

$$E(O_i) = \gamma_0 + \gamma_{BA}BA_i + \gamma_F F_i + \gamma_A A_i + \gamma_C C_i + \gamma_{PE}PE_i + \gamma_{FI}FI_i + \gamma_R R_i + \gamma_S S_i + \gamma_M M_i$$

The estimates γ_{BA} are presented in Column 3 of Table 4.4. Adding skill requirements further attenuates many of the coefficients, and numerous sizable coefficients in Column 2—such as *Compensation*, *Advancement*, and *Frustrating Circumstances*—are negligible in Column 3. Often when a coefficient was reduced substantially with the introduction of cognitive skill and family background, it is again reduced substantially upon the introduction of skill requirements. For example, the coefficients for *Investigative* interests, *Creativity*, and *Variety* were much lower in Column 2 than they were in Column 1, and they are much lower in Column 3 than they were in Column 2. Again, however, although many of the coefficients are attenuated considerably, most are far from zero. This suggests that—consistent with findings based on job values—those expecting bachelor's degrees or higher do have different occupational preferences than those expecting less education.

THE EFFECT OF OCCUPATIONAL PREFERENCES ON SCHOOLING DECISIONS

JOB VALUES AND OCCUPATIONAL EXPECTATIONS. I first estimate the effect occupational preferences on educational expectations using self-reported job values in MTF. In Chapters 2 and 3 I estimated the causal effects of perceptions and preferences with the propensity score matching approach I introduced in Chapter 1. I would have used the same approach here, but considerable preliminary analysis revealed that this

approach is unsuitable for estimating the effects of individual job values conditional on other job values, which is my objective. The problem is that when I want to estimate the effect of a job value, for example *Income*, I want to balance each of the four categories of valuing earnings (i.e., "Not important," "A little important," "Pretty important," and "Very important") on the various determinants of college expectations discussed in the previous chapters and on all of the other job values. The result is very large balancing weights (some run literally in the millions) which lead to very large standard errors. I therefore model the outcome—the expectation of a four-year degree—with regression. Typically, logistic regression would be used to predict the binary outcome "expects a four-year degree," but preliminary analysis revealed that linear probability models produce the same basic results, and I favor a linear probability model because results are more intuitive.

Model 1 (Column 1 of Table 4.5) regresses expecting a bachelor's degree on separate measures for 22 job values, parental education, GPA, perceived intelligence, perceived school ability, and dummy variables for academic track, female, black, and "other" race and ethnicity.[39] I have converted all of the job values to z-scores to facilitate comparisons of effect sizes. GPA, perceived intelligence, perceived ability, and parental education have been converted to z-scores for the same reason.

A problem with the disaggregate approach that estimates the effects of all of the individual job values is that we are likely to have some statistically-significant results for some job values from chance alone. Naturally, I cannot determine which significant effects represent chance, but it should be noted that coefficients are statistically-discernable from zero at the $p<.05$ level for 10 of the 22 job values; we

[39] Note that, although one of my objectives is to estimate the effects of job values separately, it seems unreasonable to include both *Prestige* and *Respect* because they tap into the same concept. I have chosen therefore to include only *Respect*. Results are very similar if *Prestige* is used in the place of *Respect*.

Table 4.3. Odds-Ratios from Logistic Regressions Predicting the Expectation of a 4-year College Degree. MTF 1990–2005.

Outcome=Expects a 4-year degree or higher	(1)	(2)
Female	.064**	.044**
	(.006)	(.006)
Black	.055**	.039**
	(.010)	(.009)
Other race/ethnicity	.039**	.023**
	(.007)	(.007)
Parental education	.070**	.059**
	(.003)	(.003)
GPA	.077**	.065**
	(.004)	(.004)
Academic track	.121**	.098**
	(.003)	(.003)
Perceived intelligence	.028**	.020**
	(.004)	(.004)
Perceived academic ability	.042**	.037**
	(.005)	(.005)
JOB VALUES		
Income	–.010**	
	(.004)	
Advancement	.000	
	(.003)	
Security	.004	
	(.003)	
Prestige	.026**	
	(.004)	
Interesting	.011**	
	(.003)	
Creative	–.006	
	(.003)	
See Results	–.003	
	(.003)	
By Yourself	.002	
	(.003)	
Help Others	.014**	
	(.004)	
Benefit to Society	.006	
	(.003)	
Skills Last	–.010**	
	(.003)	
Ability Util.	.007*	
	(.003)	
New Learning	–.024**	
	(0.003)	
Challenging	.018**	
	(.003)	
Decision Making	.019**	
	(.003)	
Unsupervised	–.005	

Table 4.3 (Continued)

	(.003)	
Vacations	.004	
	(.003)	
Short Hours	–.002	
	(.003)	
Slow Pace	–.019**	
	(.003)	
No Relocating	–.002	
	(.003)	
Interpersonal	.029**	
	(.003)	
Make Friends	–.003	
	(.003)	
OCCUPATIONAL EXPECTATIONS		
Professional II		.118**
		(.007)
Business Owner		–.120**
		(.012)
Manager		.021
		(.012)
Skilled Manual		–.287**
		(.011)
Sales		.011
		(.021)
Farming		–.198**
		(.029)
Military		–.173**
		(.016)
Protective Ser.		–.117**
		(.015)
Retail Worker		–.269**
		(.033)
Semiskilled Worker		–.299**
		(.018)
Service		–.266**
		(.018)
Laborer		–.242**
		(.034)
Clerical		–.265**
		(.015)
Homemaker		–.196**
		(.026)
Don't Know		–.053**
		(.020)
Constant	.510**	.560**
R^2	.280	.310
Sheaf variable for occupational preferences	.067** (.003)	.125** (.003)

Notes. N=36,920. Heteroskedastic-robust standard errors in parentheses.

would expect only one to be statistically-discernable from zero by chance.

First consider extrinsic rewards. The preference for *Income* is negatively related to expectations. This finding is contrary to the predictions of my "high standards" reasoning, but it is consistent with previous findings (Knox and Lindsay 1984; Johnson and Elder 2002). However, preferences for *Advancement* and *Security* are unrelated to expectations, and a preference for *Respect* is relatively strongly related to expectations, which is inconsistent with past research that finds that extrinsic rewards are negatively related to educational outcomes.

A preference for *Challenging Problems* increases the probability of expecting a four-year degree. A preference for a *Slow Pace* reduces this probability. This suggests that those who want to "take it easy" at work are less apt to expect four-year degrees. A preference for *Skills Last* is negatively related to expecting a four-year degree, which could also be interpreted as a desire to not expend effort at work (because if skills last then future training is unnecessary). However, a preference for *Learn New Things* is negatively related to expecting a four-year degree, and other related measures like *Vacations* and *Free Time* are unrelated to the expectation of a four-year degree.

Otherwise, consistent with past research, the results show that preferences for intrinsic rewards are positively related to expecting a four-year degree. Specifically, preferences for *Interpersonal*, making your *Own Decisions*, and work that *Helps Others* all predict expecting a four-year degree or higher.

I have argued that it is useful to estimate the effects of individual job values, but doing so makes it is difficult to assess the total effects of job values. A convenient way to summarize the total effects of job values is with Heise's "sheaf variable" (Heise 1972). A sheaf variable for a group of variables is created using the parameter estimates from a model in which they were all included. In Model 1 the expectation of

a four-year degree (*Y*) is regressed on GPA (*G*), perceived intelligence (*C*), perceived school ability (*S*), and dummy variables for black (*B*), other race or ethnicity (*O*), academic track (*A*), female (*F*), and the 22 job values (J_1 to J_{22}):

$$E(Y_i) = \beta_0 + \beta_B B_i + \beta_O O_i + \beta_F F_i + \beta_A A_i + \beta_C C_i + \beta_S S_i + \beta_1 J_{1i} \ldots \beta_{22} J_{22i}$$

A sheaf variable *J* for the total effects of the job values is most easily constructed by summing the products of the *k* job values and their coefficients (Whitt 1986):

$$J_i = \sum_{k=1}^{22} J_{ki} \beta_k$$

Sheaf variables constructed in this way always have coefficients of one because they are measured in the units of the outcome. To get a sense of the importance of the total effect of sheaf variables, they are typically converted to z-scores, which I do here. Using a sheaf variable methodology reveals that the total effect of the job values in Model 1 is .067 (see the last row in Column 1), which means that an increase in one standard deviation of job values—weighted as described—increases the probability of expecting a four-year degree by .067.

Model 2 (Column 2) estimates the effect of occupational preferences using occupational expectations instead of job values by adding dummy variables for occupational expectations in the place of job values. Recall that the same respondents in the MTF are asked about their job values and the occupation they expect, so results based on these two approaches to measuring occupational preferences can be directly compared.

Professional I is the excluded category. As would be expected when *Professional I* is the excluded category, the estimates for the occupational dummy variables are negative, except for *Manager*, *Professional II*, and, surprisingly, *Sales*. Estimates are generally what we would expect; expecting an occupation with low educational requirements, such as *Laborer* and *Semi-skilled*, reduces the probability of college entry.

Just as I did for job values, I estimate the effect of a sheaf variable that captures the effects of the occupational expectation dummy variables. The total effect is .125, which is almost twice the effect estimated for job values.

Two reasons were offered earlier to explain why occupational aspirations would suggest stronger effects than job values. One was that the occupations (or more precisely in this case, occupational categories) contain more information than job values. The other was that occupational expectations—probably more so than job values—represent a mix of preferences and perceived accessibility. Perceived intelligence and academic ability are included in the model, but surely they control for perceived accessibility only imperfectly.

One way to get a sense for the magnitude of the problem of perceived accessibility is to compare the results of Model 2 in Table 4.5 to a model excluding both perceived intelligence and academic ability. Results from such a model produces a sheaf variable with a coefficient of .131, which is only about 5 percent higher than the estimate of .125 presented in Table 4.5. If perceived accessibility was a serious issue then we would expect this number to be much larger.[40]

[40] Other approaches also suggest that perceived accessibility does not seriously bias results. After reporting their occupational expectations, respondents were asked to report "How likely do you think it is that you will actually get to do this kind of work?" Perceived accessibility should play a smaller role among those who are less certain that they will actually enter their expected occupation, so the occupations expected by respondents who are less certain should be purer measures of occupational preferences. Examination (results not shown) revealed that the total effects of occupational expectations on educational expectations is weaker among those who are less certain that they will enter the

What is more, while the estimates of the total effects of occupational preferences may be biased upwards because occupational expectations represent both perceived accessibility and occupational preferences, they are also likely biased downwards because expectations are measured with somewhat coarse occupational categories. Separate analysis of the NLSY79 (results not shown) suggests that coarse occupation categories understate the effect of occupational expectations on educational attainment by roughly 25 percent.[41] In other words, with a more detailed measure of occupational expectations, such as one based on the COC or the SOC, the estimated effect of occupational expectations on educational expectations would be much higher.

CHARACTERISTICS OF OCCUPATIONS ASPIRED TO. I next employ my hybrid approach of measuring occupational preferences using occupational aspirations in the NLSY79 as sources of implied occupational characteristics that adolescents want. Model 1 regresses the expectation of a four-year degree on cognitive skill, parental

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occupation they expect, which suggests that perceived accessibility does play a role and that estimates of the effects of occupational preferences based on occupational aspirations are biased upwards. However, total effects were roughly .107 even for those responding "Somewhat likely," which was the lowest category with sufficient sample size for estimation.

Respondents are also asked "How satisfying do you think this kind of work will be for you?" and respond on a 5-point scale from "Not satisfying" to "Extremely satisfying." Respondents whose expectations are compromised by perceived accessibility should be less optimistic about the satisfaction the occupation will deliver because they have reported a less-than-ideal occupation. Conversely, perceived accessibility should play a relatively minor role among those who expect that the occupation they reported would be "Extremely satisfying," because presumably they reported the occupation they actually want, not a second choice that would lead them to be less optimistic about their future job satisfaction. Examination (results not shown) again suggest that perceived accessibility plays only a minor role in the occupations selected, and that estimates of the effect of occupational preferences based on occupational expectations are biased upwards by about 10-20 percent.

[41] In the NLSY79 occupational aspirations are coded in the 1970 COC. I estimated two models. In the first I used separate dummy variables for all of the 1970 COC variables (about 250 occupations). In the second I collapsed the separate 1970 COC occupations into coarser occupational categories like the ones in MTF, and included these dummy variables (15 of them) in the place of the coarser ones. I found that the estimate of the effect of the sheaf variable calculated using the 1970 COC categories was roughly 25 percent higher than the effect of the sheaf variable calculated using the coarser 15 categories.

Table 4.4. Odds Ratios from Logistic Regressions Predicting Educational Expectations And College Entry. NLSY79, 1979.

	Expects a 4-year degree		College entry	
	(1)	(2)	(3)	(4)
ADOLESCENTS' CHARACTERISTICS				
Female	–.015	–.009	.041*	.042*
	(.020)	(.020)	(.018)	(.018)
Black	.216**	.216**	.188**	.188**
	(.020)	(.020)	(.021)	(.021)
Hispanic	.202**	.202**	.163**	.163**
	(.022)	(.022)	(.023)	(.023)
Cognitive Skill	.128**	.128**	.154**	.154**
	(.010)	(.010)	(.010)	(.010)
Parental Education	.085**	.086**	.089**	.089**
	(.008)	(.008)	(.009)	(.009)
Family Income	.028**	.028**	.010	.009
	(.008)	(.008)	(.008)	(.008)
CHARACTERISTICS OF OCCUPATIONS ASPIRED TO				
Realistic	.002	.013	.016	.020
	(.023)	(.023)	(.021)	(.022)
Investigative	.038*	.026	.011	.002
	(.018)	(.023)	(.019)	(.025)
Artistic	.015	.014	.028	.026
	(.017)	(.017)	(.016)	(.016)
Social	.034	.022	.013	.005
	(.026)	(.029)	(.026)	(.028)
Enterprising	–.026	–.013	.000	.001
	(.019)	(.020)	(.020)	(.021)
Conventional	.016	.017	.021	.022
	(.019)	(.019)	(.020)	(.020)
Authority	.018	.012	.001	–.004
	(.022)	(.022)	(.021)	(.021)
Responsibility	.069**	.077**	.009	.013
	(.024)	(.024)	(.024)	(.024)
Variety	–.029	–.036*	.021	.018
	(.016)	(.016)	(.019)	(.020)
Activity	–.080*	–.068*	–.013	–.011
	(.033)	(.034)	(.035)	(.037)
Assist & Care for Others	.009	.009	.009	.010
	(.015)	(.015)	(.015)	(.015)
Moral Values	–.045**	–.018	–.017	–.005
	(.014)	(.017)	(.015)	(.018)
Worthwhile to society	.022	.042	–.013	–.010
	(.020)	(.022)	(.019)	(.021)
Working Conditions	.004	–.034	.022	.016
	(.023)	(.026)	(.023)	(.027)
Social Status	.059*	.071**	.031	.033
	(.023)	(.023)	(.023)	(.024)
Compensation	.038	.066*	–.007	.000
	(.028)	(.029)	(.031)	(.032)
Security	–.028	–.020	.002	.000

Table 4.4 (Continued)

	(.021)	(.022)	(.020)	(.022)
Advancement	.073*	.047	.032	.019
	(.030)	(.034)	(.030)	(.034)
Deductive Reasoning-Lev		.008		.010
		(.020)		(.021)
Social Perceptiveness-Lev		–.000		.015
		(.026)		(.027)
Manual Dexterity-Lev		–.058**		–.011
		(.017)		(.018)
Sheaf Variable for Occupational Preferences	.190***	.173***	.100***	.079***
	(.008)	(.014)	(.009)	(.013)

Notes. N=4,066. Heteroskedastic-robust standard errors are in parentheses.

education, family income, age at the time of the interview, and dummy variables for female, black, Hispanic, and other race or ethnicity. Also included are a range of occupational characteristics derived from the occupations respondents want. Many theoretically defensible occupational characteristics could be included in the model, but O*NET98 contains hundreds of variables so it is desirable to limit the number of regressors. The decisions that led to the specification in Model 1 were based on prior research in job values, vocational psychology, job satisfaction, and job desirability. The occupational characteristics included as regressors are *Responsibility*, *Variety*, *Activity*, *Assist or Care for Others*, working for the *Presumed Good of the People*, *Moral Values*, *Working Conditions*, *Social Status*, *Compensation*, *Job Security*, and the six Holland Interest variables (*Realistic*, *Investigative*, *Artistic*, *Social*, *Enterprising*, and *Conventional*). The results of Model 1 are presented in Column 1 of Table 4.4.

Inferring causality to this or that specific occupational characteristic is difficult because we do not know which characteristic or characteristics adolescents are drawn to or even which ones they have accurate knowledge of. I am therefore primarily interested in the sheaf variable, which has a coefficient of .190.

Apart from the role of respondents' cognitive skill and family background, Model 1 ignores the issue of perceived accessibility. Model 2 (Column 2) introduces *Deductive Reasoning*, *Social Perceptiveness*, and *Manual Dexterity* as measures of skill requirements in an effort to estimate the effects of occupational preferences conditional on accessibility. The coefficient for the sheaf variable—which is generated using the same regressors as in Model 1 and excludes the effects skill requirements—is reduced to .173, a reduction of less than 10 percent.

The NLSY79 permits analysis of college entry, and Columns 3 and 4 of Table 4.4 present results from models predicting college entry. Results for the sheaf variable in Column 3 show that occupational preferences have much weaker effects on college entry than on expectations. (This is also true when effects are characterized as odds-ratios.) A comparison of the sheaf variables in Columns 3 and 4 shows again that introducing measures of skill requirements reduces the effect of occupational preferences by about 20 percent. Again, however, the majority of the effect remains.

THE DETERMINANTS OF OCCUPATIONAL PREFERENCES

I turn now to a brief analysis of the determinants of occupational preferences. I use the MTF because it allows a comparison of job values and occupational expectations. As discussed, estimation of school effects is not possible with the MTF because school identifiers are unavailable in the public release data.[42]

Although they may be of interest elsewhere for a variety of reasons, job values are of interest here because they affect educational decisions. I therefore do not attempt to estimate the determinants of specific job values, such as *You Help Others* or

[42] Analysis of job values using the *National Longitudinal Study of Youth, 1972* shows considerable inter-school variation in job values. However, the results also show that permitting random intercepts had little effect on any of the level-one estimates and that school characteristics did a poor job predicting why job values are different in one school than in another.

Challenging Problems. Instead, I estimate the determinants of the sheaf variable constructed earlier for models of educational expectations, which is tailor-made as a measure of the effect of job values on schooling decisions. Specifically, I use the sheaf variable constructed in Column 1 of Table 4.3 as the outcome. However, I use the sheaf variable before converting it into a z-score; this way, the coefficient for the sheaf variable will be in the metric of educational expectations.

Model 1 regresses the job values sheaf variable on dummy variables for female, black, and other race or ethnicity (white is the omitted race and ethnicity category). The results, which are presented in Column 1 of Table 4.5, show that the estimate for female is .023, which means that females have job values associated with an increase in the probability of expecting a bachelor's degree of .023. Estimates for the race and ethnicity categories are near zero.

Model 2 adds parental education, GPA, academic track, perceived intelligence, and perceived school ability, which have all been converted to z-scores so that their relative strength can be more easily assessed. Parental education, academic track, self-assessed intelligence, and self-assessed school ability are positively related to college-encouraging job values, but their effects are surprisingly weak.

Occupational expectations are considered in Columns 3 and 4. Now the sheaf variable from Column 2 of Table 4.3 is the outcome, and the specifications in Columns 3 and 4 are otherwise the same as those in Columns 1 and 2 to permit comparison of results based on job values and occupational expectations. The estimates for Model 3 (Column 3) show that females' occupational expectations make them more likely than males to expect four-year degrees and that estimates for the race and ethnicity dummy variables are again close to zero. Note, however, that using occupational expectations leads to a female-male difference twice the size of the difference estimated using job values.

Table 4.5. Regression Coefficients from Models Predicting Sheaf Variables for Job Values and Occupational Expectations. MTF, 1990–2005.

	Outcome=Job Values Sheaf Variable[a]		Outcome=Occupational Expectations Sheaf Variable[b]	
	(1)	(2)	(3)	(4)
Female	.023**	.023**	.046**	.042**
	(.001)	(.001)	(.002)	(.002)
Black	–.002	.001	–.000	.016**
	(.001)	(.001)	(.002)	(.002)
Nonblack, nonwhite	.002*	.006**	.006**	.022**
	(.001)	(.001)	(.002)	(.002)
Parental Education		.003**		.015**
		(.000)		(.001)
GPA		.001		.012**
		(.001)		(.001)
Academic track		.006**		.029**
		(.000)		(.001)
Perceived Intelligence		.003**		.010**
		(.001)		(.001)
Perceived school ability		.005**		.010**
		(.001)		(.001)
Constant	–.012**	–.014**	–.060**	–.063**
	(.001)	(.001)	(.001)	(.001)
R^2	.03	.06	.03	.21

Notes. N=36,920. [a]Job values sheaf variable is taken from Column 1 of Table 4.3. [b]Occupational expectations sheaf variable taken from Column 2 of Table 4.3.

The estimates for Model 4 reveal some different results than the corresponding job values model. Generally, occupational expectations are more strongly related to the regressors than are job values. Now there appears to be a net-black advantage in occupational expectations and positive effects for parental education, GPA, and academic track. Perceived intelligence and perceived school ability are also more strongly related to occupational expectations, suggesting that occupational expectations capture either more perceived accessibility effects or more "preference for challenge effects" than job values.

CONCLUSIONS

Adolescents' motivation for acquiring postsecondary schooling is the subject of little research. Most relevant research concedes that nonpecuniary rewards are probably important but ignores them empirically or assumes, often implicitly, that students are motivated by the expectation of higher future earnings. By taking a broader "occupational preferences" perspective that considers both pecuniary and nonpecuniary motives, this chapter tries to deepen our understanding of why some adolescents enter college and some do not.

I measure occupational preferences both with self-reported job values and as occupational expectations. Examination of self-reported job values revealed that those expecting bachelor's degrees or higher have different occupational preferences than those who expect less education. Those expecting bachelor's degrees are more likely to value work that is interesting, is helpful to others, and involves decision-making. I found similar results using the characteristics of the occupations adolescents wanted at age 35 and also that those expecting bachelor's degrees also wanted more variety and better working conditions.

Multivariate analysis of self-reported job values suggests that job values influence educational expectations. Past research found that preferences for extrinsic rewards predicted lower educational attainment (Knox and Lindsay 1984; Johnson and Elder 2002). My results do not represent a reversal of these findings, but they do call for a more refined presentation of results and some skepticism. I find that individual extrinsic rewards have different relationships with education outcomes, so it is not reasonable to generalize about all extrinsic rewards. For example, a preference for earnings is negatively related to the expectation of a four-year degree, a preference for status is positively related, and preferences for advancement and job security are unrelated to expecting a four-year degree. Generally consistent with past research, I

found that wanting work that is interesting and involves helping others, working with others, and decision-making increases the probability that a respondent expects a bachelor's degree. The effects of individual job values are modest, but the total effect of all of the job values is fairly large.

Analysis of the determinants of occupational preferences revealed that when occupational preferences are measured with occupational expectations, females, blacks, those in the academic track, and those with good grades tend to have more college-encouraging occupational preferences. When occupational preferences are measured with self-reported job values these effects are attenuated considerably.

A good deal of research is explicitly or implicitly guided by the advocacy for ever more education. This research attempts to answer questions such as "How can we increase educational attainment generally?" and "How can we get group *A* to get more education to reduce educational disparities between group *A* and group *B*?" The results presented here suggest that educational attainment can be increased by manipulating preferences, such as the preference for challenging work or helping others. Preferences such as these may seem to be elements of personality not easily manipulated, but panel studies show that job values and interests change substantially during adolescence (Tracey, Robbins, and Hofsess 2005) and that postsecondary schooling affects job values (Johnson and Elder 2002). These findings suggest the possibility that occupational preferences can be intentionally influenced in elementary and high school settings to increase postsecondary expectations and attainment.

CHAPTER 5. BELIEFS ABOUT THE RELATIONSHIP BETWEEN EDUCATIONAL AND OCCUPATIONAL ATTAINMENT

Knowledge of the relationship between educational and occupational attainment is critical in the development of sensible plans to reach career goals, yet research finds that adolescents know little about this relationship. Many adolescents lack knowledge of the training requirements of common occupations, including occupations they are planning to pursue (DeFleur and Menke, 1975; Grotevant and Durrett 1980; Ludwig 1999; Schneider and Stevenson 1999). For example, Grotevant and Durrett (1980) found that the correlation between perceived and actual educational requirements was only r=.41 for adolescents' most preferred occupation. Correlations were much lower for less preferred occupations. Schneider and Stevenson (1999) find that only 44 percent of adolescents have "aligned ambitions," which means that their educational expectations are consistent with the mean educational attainment of the incumbents of the occupations they expect.

Research finds that adolescents' understanding of the relationship between educational and occupational attainment influences their educational decisions. Ludwig (1999) finds that more accurate knowledge of educational requirements of expected occupations predicts greater educational attainment. Schneider and Stevenson (1999) find that high school students with aligned ambitions have more realistic plans and engage in appropriate preparatory behaviors such as preparing for college entrance exams and taking courses required for future requisite schooling. These are the only studies I am aware of that examine the effects of perceived educational requirements on educational plans and attainment. Other research that constructs more general measures of occupational knowledge by combining these perceptions with other beliefs, such as beliefs about the duties and earnings of

occupations, also shows that accurate knowledge predicts educational attainment (Parnes and Kohen 1975; Howell 1978).

It seems clear that perceptions of the education-occupation nexus should be important. The limited body of research linking adolescents' perceptions of the relationship between educational and occupational attainment focuses on the *accuracy* of perceptions, but researchers generally fail to justify this approach theoretically (e.g., Ludwig 1999; Schneider and Stevenson 1999), and it is not clear why accuracy as such should be related to educational attainment.[43] Theories of the relationship between occupational knowledge and schooling decisions focus on beliefs about the *effects* of education on outcomes, not on the accuracy of beliefs. In the next section I outline three theories that link beliefs about the effects of education to educational decisions.

HOW SHOULD PERCEPTIONS AFFECT SCHOOLING DECISIONS?

HUMAN CAPITAL. Human capital theory predicts that beliefs about the *returns* to education should influence schooling decisions. Researchers have traditionally assumed that adolescents are aware of the actual returns to schooling, but beliefs about returns should influence decisions whether they are accurate or not (Rouse 2004; Avery and Kane 2004). Human capital theory predicts that adolescents who believe that the returns to education are the highest should invest in the most education because they will believe that the costs of more education will be offset by its effects on earnings. As an example, Figure 5.1 shows two hypothetical high school seniors *A*

[43] Certainly a theoretical justification is desirable here because measures of the accuracy of occupational knowledge may tap into aspects of cognitive skill not captured in conventional test batteries, and the apparent effects of occupational knowledge may actually be the effects of cognitive skill. Indeed, Bachman (1970, cited in Parnes and Kohen 1975), upon finding a very high correlation between occupational knowledge and cognitive skill, questions whether occupational knowledge "measures anything independent of general intelligence."

and *B* who have different beliefs about the effects of education on utility. Human capital theory typically deals with the multiplicative effect of education on wages in empirical research, but human capital theory is fundamentally about utility maximization. I use the abstraction utility because it allows easier comparison of human capital theory and another perspective I discuss shortly. Human capital theory predicts that, ceteris paribus, *B* will get more education than *A*.

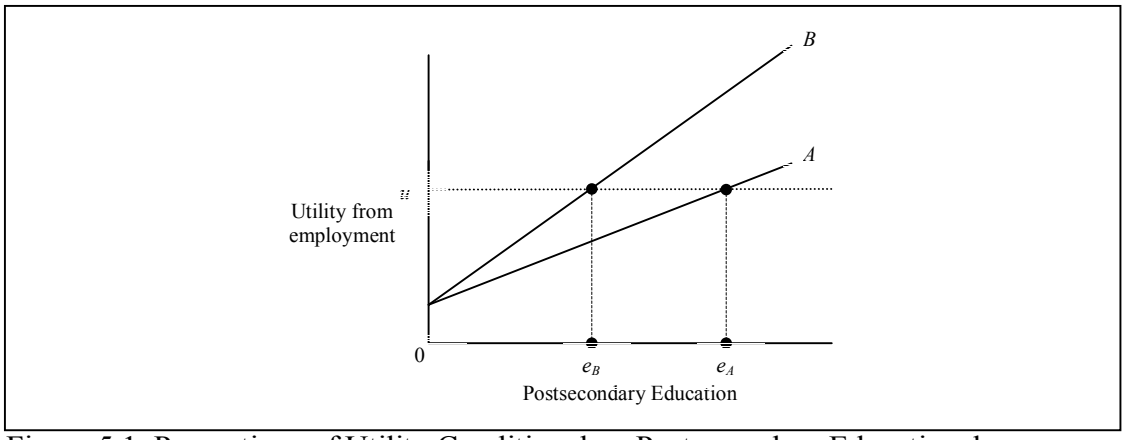

Figure 5.1. Perceptions of Utility Conditional on Postsecondary Educational Attainment.

SATISFICING. Despite the sound logic and plausibility of human capital theory, I offer an alternative and competing account of how adolescents' beliefs about the relationship between educational and occupational attainment influences their educational decisions. I proposed in Chapter 4 that adolescents have occupational preferences and that education can be seen as a means of satisfying these preferences. One way I operationalized preferences was as occupational expectations, and I argued that adolescents select occupations and make subsequent education decisions that allow them to enter their chosen occupation. If this causal ordering is accepted, it follows that conditional on occupational expectations higher perceived educational requirements should lead to higher educational expectations and attainment and that

lower perceived educational requirements should lead to lower educational expectations and attainment. For example, if two high school seniors want to become engineers and one believes that this is possible with an Associate's degree while the other believes that a bachelor's degree is necessary, the latter will expect and obtain more education.

Despite its simplicity, the commonsensical notion that higher perceived educational requirements lead to higher educational expectations and attainment is not clearly consistent with human capital theory, which assumes that actors plan and pursue courses of action that *maximize* utility. Herbert Simon (1957) has suggested that across a range of contexts actors are *satisficers* rather than maximizers, by which he meant that they set goals and plan and pursue strategies to meet them.[44] Satisficers are satisfied if their goals are met even if maximization has not been achieved or if it is not known if maximization has been achieved.

I propose that adolescents are satisficers when making their educational decisions. Adolescents' occupational expectations represent their goals and education is the means used to meet their goals. I refer to this model as "occupation-first" satisficing because occupational decisions are made first and education decisions are made second in an effort to meet occupational goals.

The satisficing-maximizing distinction is not trivial in the education context. Reconsider the example in Figure 5.1 if A and B are satisficers, and their occupational goals are u. In other words, both A and B will be satisfied with a utility of u, and both will terminate their education when they expect that it will permit them to gain employment providing utility equal to u. A will acquire education e_A, and B will acquire education e_B. Thus, A will acquire more education than B, which is reverse to

[44] Simon actually used the expression "aspiration levels" for what I am calling goals. However, this is at variance with the meaning of the expression "aspiration" in the sociology of education (and elsewhere) so I use the term goals.

the prediction made by human capital theory.[45] This logic also applies to the context in which occupational expectations are goals. For example, *u* in Figure 5.1 could be the occupation "engineer."

"EDUCATION-FIRST" SATISFICING. The previous model assumes that adolescents set occupational goals first and make educational decisions second, but a reverse "education-first" satisficing model could be more appropriate. For example, an adolescent may have decided upon a bachelor's degree (perhaps because all of their friends have decided similarly, their parents want them to obtain a bachelor's degree, and so on) and then choose as their occupational goal their most preferred occupation among those occupations they believe are accessible to them with a bachelor's degree.

To illustrate education-first satisficing and an important prediction that it makes, Figure 5.2 again shows *A* and *B*. In this example labor-market outcomes are operationalized as occupations. Both *A* and *B* have the same occupational preferences: they would ideally both like to become engineers. In education-first satisficing educational goals are decided first. In Figure 5.2 this is represented as the vertical dotted line intersecting the *X*-axis at education equal to e_{att}, which indicates that both *A* and *B* have decided that they will obtain education equal to e_{att}. When asked to report their occupational goal, *B* will report "engineer"; *A* will not because *A* believes that becoming an engineer is not possible at their chosen education level. Instead, *A* will report an occupation that they believe requires less education than an engineer. For example, they may report "technician," which is also depicted in Figure 5.2.

[45] For the purposes of this example it is convenient to set aspiration levels at *u* and construct the mapping functions as they have been. However, the location of *u* is consequential for predicting educational decisions. For example, if *u* is set at the intersection of *A's* and *B*'s beliefs, *A* and *B* will make the same decision. These simple figures and those that follow ignore some complications, such as crossing mapping functions. However, for an initial application of a satisficing model to education decisions these complications are most usefully acknowledged but ignored.

Therefore, while occupation-first satisficing predicts that higher perceived educational requirements increase educational plans and attainment, education-first satisficing predicts that higher perceived educational requirements lower occupational goals. Specifically, higher perceived education requirements should lead adolescents to select occupations that they believe have lower educational requirements than their ideal occupation.

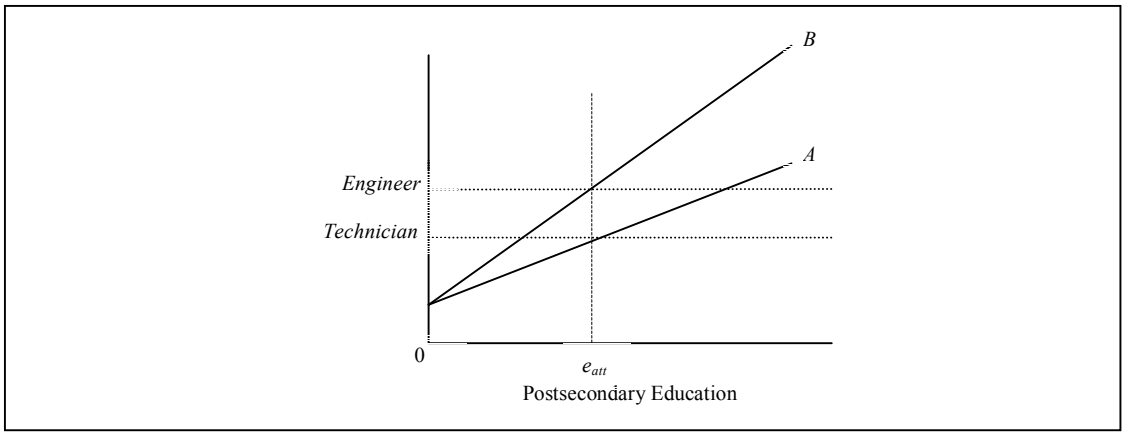

Figure 5.2. Hypothetical Beliefs of Two Adolescents with Predetermined Educational Goals.

Because education-first satisficing begins with schooling decisions having already been made it cannot explain schooling decisions. I therefore focus on occupation-first satisficing in the empirical analysis because it can potentially explain education decisions. However, it is important to consider both occupation-first and education-first satisficing because, as will be explained in greater detail later in the analysis, they make some of the same predictions and it is sometimes difficult to determine which of the two is operating.

DETERMINANTS OF PERCEIVED EDUCATION REQUIREMENTS

Adolescents' knowledge of the educational requirements of occupations is often poor. Why would beliefs be so inaccurate? Satisficing is important here as well, but it is important in a different way. Satisficing behavior is associated with certain conditions, such as when information is unavailable or available only at prohibitive costs.[46] Acquiring information on educational requirements may not appear to satisfy these conditions because the planning of one's career seems sufficiently important to justify the time and effort associated with obtaining this type of information. However, casual observation of human behavior suggests that collecting information from reliable sources is an activity with surprisingly high psychic costs for many people. Many adolescents may prefer a more passive route to information collection in which they rely on information that comes to them during their daily lives rather than actively seeking out information. Aside from considerations of the costs of collecting reliable information, some adolescents may not seek out reliable information because they mistakenly believe that they already possess it. Grotevant and Durrett (1980) found that many students who reported that they had "considerable knowledge" of the occupations they wanted either underestimated or overestimated the educational requirements of these occupations. It may also not have occurred to many adolescents that sources providing information on the educational requirements of occupations exists.

If not from reliable sources, where do adolescents obtain information about the educational requirements of occupations? Research on the determinants of adolescents' occupational knowledge focuses on parents, educational institutions, part-time job experiences, friends, and mass media (Levine and Hoffner 2006). Levine and

[46] As Simon points out, information may be so costly that collecting it is irrational from a cost-benefit perspective because the costs of collecting it may outweigh the expected benefits of possessing it.

Hoffner (2006) asked a small sample of high school students where they had obtained information about various aspects of occupations. Respondents reported receiving little information on educational requirements from any sources; 14.1, 6.3, 3.1, 0, and 1.6 percent of respondents reported that they received information about educational requirements of occupations from schools, parents, their own jobs, friends, and mass media, respectively. This means that at least 75 percent of adolescents have received information on educational requirements from none of these sources.[47]

These numbers may reflect only explicit and direct information about occupations, such as when a parent, friend, or teacher says "You need a four-year college degree to become an engineer." Information about educational requirements may also be obtained by observing the relationship between educational and occupational attainment among adults. For example, if an adolescent knows four adult engineers and knows that they all have four-year college degrees, they may infer that a four-year college degree is required to become an engineer.

Different social networks will provide different information on the education-occupation relationship. This is an important theme in Wilson's (1987) work on class-based disadvantages associated with very poor neighborhoods. Wilson argues that adolescents in high poverty urban communities fail to see the connection between education and meaningful employment because these communities are socially isolated. Wilson reasons that because few adult residents of very poor neighborhoods have desirable occupations and commensurate education, adolescent residents lack first-hand exposure to the relationship between education and occupation, especially between higher education and desirable occupations. Ludwig's (1999) research, which

[47] The results presented in Levine and Hoffner (2006) show what percentage of adolescents reported that they received information from each of the sources, so a single respondent could report more than one source. If some adolescents reported receiving information from more than one source, then more than 75 percent would have received information from none of these sources.

finds that adolescents from poor neighborhoods have less accurate occupational knowledge, provides some supporting evidence.

Educational requirements may also be inferred from more general statements about the importance of education. Other than to not take illicit drugs, of the messages adults direct at adolescents perhaps none is more common than that adolescents should get as much education as they can. Adolescents may infer from these messages that they need more education than they actually do for the occupations of their choice. After repeatedly being told to stay in school, for example, an adolescent wanting to be an engineering technician may assume that a bachelor's degree is required to enter this occupation. Indeed, Schneider and Stevenson (1999) find that many students believe that a bachelor's degree is required even for jobs such as security guard. Different adolescents may receive different messages about the importance of postsecondary schooling, and this could lead to variation in perceived educational requirements.

Deducing educational requirements from college-encouraging messages may lead to school-effects. There are important differences across schools in the extent to which they have a "college focus" or a "work focus" (Rosenbaum 2001; Schneider and Stevenson 1999). Some schools offer a variety of services to their students that might seem to promote postsecondary attendance, such as SAT courses and college fairs, while they fail to offer services that would assist students in making the transition from high school directly into the labor market, such as referring students to employers and conducting practice job interviews. These differences could generate differences across schools in the perceived educational requirements of occupations because a college focus may lead students to believe that postsecondary schooling is necessary for almost all occupations, whereas a work focus may lead students to believe that this is not the case.

Cognitive skill has been found to be positively related to occupational knowledge (Parnes and Kohen 1975; Ludwig 1999), although the relationship is poorly understood. Cognitive skill is strongly related to interests. In particular, cognitive skill is positively related to investigative interests (Holland 1997); therefore, cognitive skill may be related to the inclination to draw upon reliable information outside of one's own network. Cognitive skill may also be related to knowledge because deducing perceived requirements from relevant information involves reasoning. For example, two adolescents may know a retired engineer without an engineering degree, but only one may conclude that educational requirements for entrants into the occupation engineer are now higher than they once were.

Perceptions of the educational attainment of typical incumbents are important, but other factors may determine how much education adolescents believe *they* will need to enter the occupation they expect. As alluded to, adolescents may make different forecasts of the level of education that will be required in the future when they attempt to enter the occupation. Also, some adolescents may think that they will need more or less education than the typical incumbent because they will face atypical barriers or will not face typical ones. Some adolescents may think that discrimination puts them at a disadvantage relative to typical aspirants, and they may conclude that to enter the occupation they expect they must acquire educational credentials superior to those of typical aspirants.[48] Conversely, some adolescents may believe that their personal connections or personal characteristics (e.g., impression management skills) may gain them access to desirable occupations without the typical educational qualifications.

[48] Xie and Goyette (2003) suggest that anticipation of labor-market discrimination shapes career choice itself and that anticipated discrimination leads Asian-Americans to pursue careers (and corresponding college majors) in which they think success is based on objective indicators of skill. What I propose is a similar strategy that disadvantaged groups may employ conditional on career choice.

In the empirical analysis that follows I add substantially to our knowledge of adolescents' beliefs about the relationship between educational and occupational attainment and the effects that these beliefs have on college entry. Because adolescents' perceptions of typical incumbent educational attainment may differ from the education they believe they will need to enter an occupation themselves in the future, I focus on adolescents' perceptions of the education *they* will need to enter the occupation *they* expect. I first document adolescents' beliefs about the education required to enter the occupations they expect and juxtapose these beliefs with actual distributions of educational attainment among incumbents. I next estimate the effects that perceived educational requirements have on college entry. Lastly, I examine the determinants of perceived educational requirements, including an examination of school effects.

DATA

Data are drawn from the *National Education Longitudinal Study, 1988* (hereafter, NELS88). The first round was conducted in 1988 with a sample of 24,599 eighth grade students. Follow-up interviews were conducted in 1990, 1992, 1994, and 2000. Parents, teachers, school administrators, and librarians also completed questionnaires.[49]

Perceived educational requirements are based on two questions asking students what occupation they expect to have when they are 30 years old and how much education they believe they will need for this occupation. The details of the questions are important in understanding the limitations of the data, so the complete questions and response options are presented. Respondents are first asked:

[49] Attrition in the first and second follow-ups was addressed by adding new students to the sample. These new students are included in the analysis.

Which of the categories below comes closest to describing the job or occupation that you expect or plan to have when you are 30 years old? Even if you are not sure, circle your best guess.

OFFICE WORKER such as data entry clerk, bank teller, bookkeeper, secretary, word processor, mail carrier, ticket agent
TRADESPERSON such as baker, auto mechanic, housepainter, plumber, phone/cable installer, carpenter
FARMER, FARM MANAGER
FULL-TIME HOMEMAKER
LABORER such as construction worker, car washer, garbage collector, farm worker
MANAGER such as sales manager, office manager, school administrator, retail buyer, restaurant manager, government administrator
MILITARY such as career officer or enlisted person in the Armed Forces
OPERATOR of machines or tools, such as meat cutter, assembler, welder, taxicab/bus/truck driver
PROFESSIONAL I such as accountant, registered nurse, engineer, banker, librarian, writer, social worker, actor, athlete, artist, politician, <u>but not including school teacher</u>
PROFESSIONAL II such as minister, dentist, doctor, lawyer, scientist, college teacher
OWNER of a small business or restaurant, contractor
PROTECTIVE SERVICE such as police officer, firefighter, detective, sheriff, security guard
SALES such as sales representative, advertising or insurance agent, real estate broker
SCHOOL TEACHER such as elementary, junior high, or high school, <u>but not college</u>
SERVICE WORKER such as hair stylist, practical nurse, child care worker, waiter, domestic, janitor
TECHNICAL such as computer programmer, medical or dental technician, draftsperson
NOT PLANNING TO WORK
OTHER
WILL BE IN SCHOOL[50]

Immediately after this question students are asked:

How much education do you think you need to get the job you expect or plan to have when you are 30 years old?

No high school
Some high school
High school diploma
Less than two years of vocational, trade, or business school
Two years or more of vocational, trade, or business school
A degree from a vocational, trade, or business school

[50] The categories "Full-time homemaker" and "Not planning to work" are collapsed into a single "Not planning to work" category.

Some college education
2 year college degree
4 or 5 year college degree
Graduate degree (Master's or PhD)
Professional degree (JD or MD)
Not planning to work

Responses to this latter question are treated as measures of *perceived educational requirements*. For frequencies, refer to Table 5.1, which also includes means and standard deviations for all variables used in the analysis. I retain the categorical nature of the responses when estimating the effect of perceived educational requirements on college entry, but I switch to a continuous "years of education" variable for analysis of the determinants of perceived educational requirements. The conversion is detailed in Table 5.1.

Surely one determinant of the education adolescents believe they need to enter the occupation they expect is the occupation they expect. Although perceptions are often inaccurate, adolescents expecting to be technicians, for example, should generally believe that they require more education to enter their expected occupation than adolescents expecting to be laborers because more education is required to become a technician than a laborer. Differences in beliefs that arise from differences in occupational expectations are not of interest in this chapter. Instead, this chapter addresses beliefs that exist conditional on occupational expectations; therefore, when modeling the effects of beliefs and the determinants of beliefs I condition upon occupational expectations.

A shortcoming of the NELS88 data is that occupational expectations are measured using broad occupational categories, such as "technician," instead of more detailed occupational categories such as "computer programmer," "medical technician," and "draftsperson." This limits my ability to control for occupational expectations because each of the broad categories is comprised of a somewhat heterogeneous group of occupations. It is difficult to determine how serious this

Table 5.1. Variables Used to Analyze Beliefs About Educational Requirements of Expected Occupations. NELS88 1988–2000.

Variable	Description	Mean	Stand. Dev.	Section
INDIVIDUAL LEVEL	N=10,328			
Perceived educational requirements (categorical)	The education respondents believe will need to enter the occupation they expect at age 30.			F2 Student
	No postsecondary schooling (includes response categories "No high school"; "Some high school"; "High school diploma")	.05	.22	
	Vocational, trade, or business school (includes responses "Less than two years of vocational, trade, or business school"; "Two years or more of vocational, trade or business school"; "A degree from a vocational, trade, or business school")	.14	.35	
	Some college (includes responses "Some college education" and "2-year college degree")	.09	.28	
	4 or 5 year college degree	.39	.49	
	Graduate degree (Master's or PhD)	.19	.39	
	Professional degree (JD or MD)	.09	.29	
Perceived educational requirements (continuous)	Years of education respondents believe they need to enter the occupation they expect at age 30. Recoded from categorical responses as follows: No postsecondary schooling=12 Vocational, trade, or business school=13 Some college=14 4 or 5 year college degree=16 Graduate degree=19 Professional degree=19	16.13	2.23	F2 Student
Enrollment in a 2- or 4-year college	Respondent has been enrolled in a 2- or 4-year college as of the 2000 round (yes=1). Private for-profit colleges and vocational or business schools do not qualify.	.79	.40	F3 Student & F4 Student
Enrollment in a 4-year	The respondent has been enrolled in a 4-year college (1=yes)	.58	.49	F4 Student

Table 5.1 (Continued)

college				
White	Student is white (yes=1)	.73	.45	F4 Student
Black	Student is black (yes=1)	.12	.32	F4 Student
Hispanic	Student is Hispanic (yes=1)	.10	.30	F4 Student
Asian	Student is Asian (yes=1). Note that included in the category "Asian" are groups that do not correspond to the current colloquial use of the word Asian. For example, those who trace their ancestry to India, Bangladesh and Pakistan are coded as Asian.	.04	.20	F4 Student
American Indian	Student is American Indian (yes=1)	.01	.11	F4 Student
Missing Race/ethnicity	Student's race/ethnicity is missing.	.00	.02	F4 Student
Female	Student is female (yes=1)	.50	.50	BY Student
Cognitive skill	Composite measure that averages scores from math and reading tests taken in the 2nd follow-up. Missing values are filled in with composite scores from the 1st follow-up. Test scores increase from the 1st to 2nd follow-up, so scores for the 1st follow-up were increased by the mean difference between 1st and 2nd follow-up test results for all respondents who completed both sets of tests. Remaining missing values were filled in with base-year test scores using the same adjustment procedure.	51.1	9.64	F2, F1, & BY, Test Batteries
Family income	Total gross family income from all sources. Coded as a continuous variable using midpoints of income categories and $250,000 for the highest category (which is $200,000 or more). Missing values are replaced with responses to the same question that was asked on the base-year parent questionnaire. Family income is higher in the 1992 round than the 1998 round, presumably because of inflation and the aging of parents. To adjust for these differences I have simply added the	48,807.20	40,126.57	F2 Parent & BY Parent

Table 5.1 (Continued)

	difference between BY and F2 incomes to the BY incomes.			
Parental education	Highest grade completed by the most-educated parent, or of either parent if education is missing for the other parent. Missing values are replaced with values reported by students. 2nd follow-up values are used; missing values are filled in with base-year responses.	14.32	2.38	F2 & BY Parent; F2 & BY Student
Psychic costs	Summation of how much reading respondents do per week not in connection with schoolwork, and agreement with the statements: "I think the subjects I'm taking are interesting and challenging"; I get a feeling of satisfaction from doing what I'm supposed to do in class." Responses are converted to z-scores before they are summed.	.00	1.98	F1 Student
Academic Self-Concept	How the adolescent thinks of their ability as a student. Responses to the following six statements are summed to create a composite measure: "Choose the answer that is best for you" (1=False; 2=Mostly false; 3=More false than true; 4=More true than false; 5=Mostly true; 6=True). 1. I learn things quickly in English classes. 2. I get good marks in English 3. I have always done well in mathematics 4. I'm hopeless in English classes 5. I get good marks in mathematics 6. I do badly in tests of mathematics Items 4 and 6 are reverse coded.	12.92	5.4	F1 Student
Occupational expectations	Occupational category of the type of work expected at age 30.			F2 Student
	Clerical	.03	.16	
	Tradesperson	.02	.14	
	Farmer, farm manager	.01	.09	
	Laborer	.01	.07	

Table 5.1 (Continued)

	Manager	.05	.21	
	Military	.02	.15	
	Operator	.01	.10	
	Professional I	.34	.47	
	Professional II	.16	.37	
	Owner	.05	.22	
	Protective service	.04	.20	
	Sales	.02	.12	
	School teacher	.07	.25	
	Service worker	.02	.15	
	Technical	.06	.23	
	Not planning to work (includes response "Full-time homemaker")	.09	.29	
	Other	.00	.05	
Importance of work success	The subjective importance of "Being successful in my line of work." (1="Not Important"; 2="Somewhat Important"; 3= "Very Important."). Treated as a continuous measure.	2.88	.35	F2 Student
Importance of money	The subjective importance of "Having lots of money." (1="Not Important"; 2="Somewhat Important"; 3= "Very Important."). Treated as a continuous measure.	2.26	.62	
Importance of being an expert at work	The subjective importance of "Becoming and expert in my line of work." (1="Not Important"; 2="Somewhat Important"; 3= "Very Important.") Treated as a continuous measure.	2.61	.58	
Sampling weight	4th follow-up questionnaire weight (F4QWT)	--	--	
SCHOOL-LEVEL				
Academic track	Percentage of students in the academic track.	50.69	29.28	F2 Admin.
College focus	A measure of college focus is	38.13	5.36	F2 Admin.

Table 5.1 (Continued)

	created by summing the number of the following "college-encouraging" services a school offers: programs on college application procedures; programs on financial aid; SAT/ACT courses; college fairs; meetings with college representatives.			
Job focus	A measure of work focus is created by summing the number of the following "pro-work" services a school offers: Interest inventories (for choosing a job); job fairs; letters of recommendation to employers; practice interviews; arrangement of interviews with employers; job placement courses employment services; job placement counselor; employment readiness workshops.	20.46	19.47	F2 Admin.
Parental education	Mean education of students' parents.	14.34	1.74	F2 & BY Parent; F2 & BY Student
Family income	Mean income of students' families.	51,312.34	33,211.61	F2 Parent & BY Parent
Cognitive skill	Mean cognitive skill of students.	51.24	6.33	F2 Student

Notes. Data are weighted using the 4th follow-up questionnaire weight. Statistics include imputed values.

problem is, but examination of the issue using NLSY79 suggests that the problem is not serious. The NLSY79 records occupational aspirations in the detailed 1970 COC (see Chapter 4 for more detail on the NLSY79). Broad occupational categories like the ones used in the NELS88 can be constructed for the NLSY79 by grouping the 1970 COC occupations into categories. Analysis shows that the broad occupational categories constructed in the NLSY79 capture 86 percent of the variance in the educational requirements of the detailed occupations (results not shown). This

suggests that the broad occupational categories used in the NELS88 capture the vast majority of the differences in occupational expectations.

College entry is entry into a two or four-year college as of the 2000 round.[51] I also examine separately entry into a four-year college, which is also measured as of the 2000 round. Cognitive skill, family income, and parental education are also included in the analysis (see Table 5.1 for more details). I want to adjust for the perceived ability to complete college and psychic costs to isolate the effects beliefs about educational requirements. There is no measure of the perceived ability to complete college, but a composite measure of "academic self-concept" is constructed using items in the first student follow-up on ability and performance in mathematics and English. Psychic costs are measured with responses to three questions, also from the first student follow-up questionnaire. One question asks respondents if they think that the subjects they are taking are interesting and challenging. Another asks if they go to school because they get a feeling of satisfaction from doing what they are supposed to in class. (These are the same questions used in Chapter 3, which used the ELS02 data.) There are no measures of the enjoyment of reading and mathematics, but in the first follow-up student questionnaire respondents report how much they read each week not in connection with schoolwork. These three variables are converted to z-scores and summed to create a measure of the psychic costs of schooling.

School-level variables are used to determine what school characteristics predict perceived educational requirements. School-mean cognitive skill, parental education, and family income are constructed from the relevant student measures just discussed.

[51] Steps taken to ensure confidentiality in the public-use data mean that a handful of respondents may be incorrectly coded on this variable. In the 2000 round respondents reported up to eight postsecondary institutions they attended since the 1994 interview, but the public release data only lists the sector for the first and last postsecondary institutions attended. This should not be a major problem because most students (83 percent) reporting having attended any postsecondary institutions since the 1994 round report having attended either one or two (F4NINST), and most students have attended either a 2- or 4-year college as of the 1994 interview, so it can be ascertained if they attended one.

Percentage of students in the academic track is drawn from the second follow-up School Administrator Questionnaire. The second follow-up School Administrator questionnaire is also used to measure schools' college focus and job focus. College focus is measured as the number of the following "pro-college" services a school offers: programs on college application procedures, programs on financial aid, SAT/ACT courses, college fairs, and meetings with college representatives. A measure of work focus is created by summing the number of the following "pro-work" services a school offers: interest inventories (for choosing a job), job fairs, letters of recommendation to employers, practice interviews, arrangement of interviews with employers, job placement courses, employment services, high school job placement counselor, and employment readiness workshops.

Respondents are excluded from the analysis if they responded "Not planning to work" to the perceived educational requirement question or if they have missing values for the college entry questions. Missing values for other regressors are imputed using Stata's best-subset regression imputation command "*impute.*" Missing values for school-level variables are also imputed.

Slightly different samples are used for (1) estimation of the effects of perceived educational requirements on college entry and (2) analysis of the determinants of perceived educational requirements. The sample used for estimation of the effects of perceived education requirements on college entry is limited to respondents enrolled in school in the 1992 round, who completed a high school diploma by the 2000 round, and for whom valid responses to the college entry questions are available; sample size is N=9,142. The sample used for analysis of the determinants of perceived educational requirements is limited to respondents who attended the same school in 1990 and 1992 (which is necessary to use second follow-

up school administrator data with the public-use data) and for whom second follow-up School Administrator Questionnaire data are available; sample size is N=9,450.

I also briefly analyze the *National Longitudinal Survey of Young Men, 1966*. Because it is used to estimate only a single regression model, I describe the data in Appendix B, but the most important features are discussed in the main text when the data are used.

FINDINGS

DESCRIPTIVE RESULTS

Figures 5.3a and 5.3b present respondents' perceptions of the education they will need to enter the occupations they expect. It is useful to compare these perceptions to objective measures based on the educational attainment of incumbents of the occupations. Typically, when adolescents' perceptions of the education they will require to enter an occupation are compared to incumbents' educational attainment, researchers use data on incumbents drawn from roughly the same time as adolescents' responses (Ludwig 1999; Schneider and Stevenson 1999; Grotevant and Durrett 1980).[52] However, adolescents' responses are reported in 1992 when most were about 18, so incumbent data should be from 12 years later when most respondents will be about 30. I use data from the 2003 *American Community Survey* as a source of incumbents' educational attainment.[53] (See Appendix C for details on the *American Community Survey*.)

[52] In Ludwig (1999) adolescents' responses are from 1979 and the educational attainment of occupational incumbents is drawn from the 1980 March CPS; in Schneider and Stevenson (1999) adolescents' responses are from 1992 and the educational attainment of occupational incumbents is drawn from the 1990 Census. Grotevant and Durrett (1980) do not actually specify when or where their information on occupational incumbent education came from, but adolescents' responses are from 1976 and the study was published in 1980 so their data on occupational incumbents can only be from 4 years in the future or less.

[53] Data from 2004 would be even closer to when most respondents were age 30. However, I use the 2003 ACS because the educational attainment question used in the 2003 is more similar to the

First consider the occupation category Professional I (Figure 5.3a), which is the most commonly selected category. The results show that the educational attainment of incumbents ranges from high school diploma to professional degree. Adolescents' perceptions can be seen as remarkably accurate in the sense that they are distributed across the education categories in roughly the same pattern as actual incumbent education. The same is true for Professional II, which is the second most commonly selected category. Indeed, the results for all occupational expectation categories could be described in this way at least to an important extent.

If adolescents obtain their information from their experiences, such as their association with incumbents of these occupations, it is easy to see how the distribution of perceptions could resemble the distribution of incumbent educational attainment. For example, an adolescent who thinks that they require a master's degree to become a technician may know a technician with a master's degree, whereas another adolescent who thinks that they require a high school diploma to become a technician may know a technician with a high school diploma.

This is not to say that adolescents' perceptions are wholly accurate. First, even if using similarity in the distributions of perceptions and incumbent education is accepted as a reasonable measure of accuracy, the results reveal substantial overestimations for some of the less frequently expected occupations. For example, the proportion of respondents believing that a vocational degree is necessary to become a tradesperson or a machine operator is much higher than the proportion of tradespersons or machine operators who have vocational degrees. Second, similar distributions of perceptions and incumbent education are not strong evidence of accuracy because although some incumbents have much more or less education than

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perceived educational requirement question in the NELS88 data. Specifically, the 2003 ACS question asks about vocational, trade and business schools while the 2004 question does not.

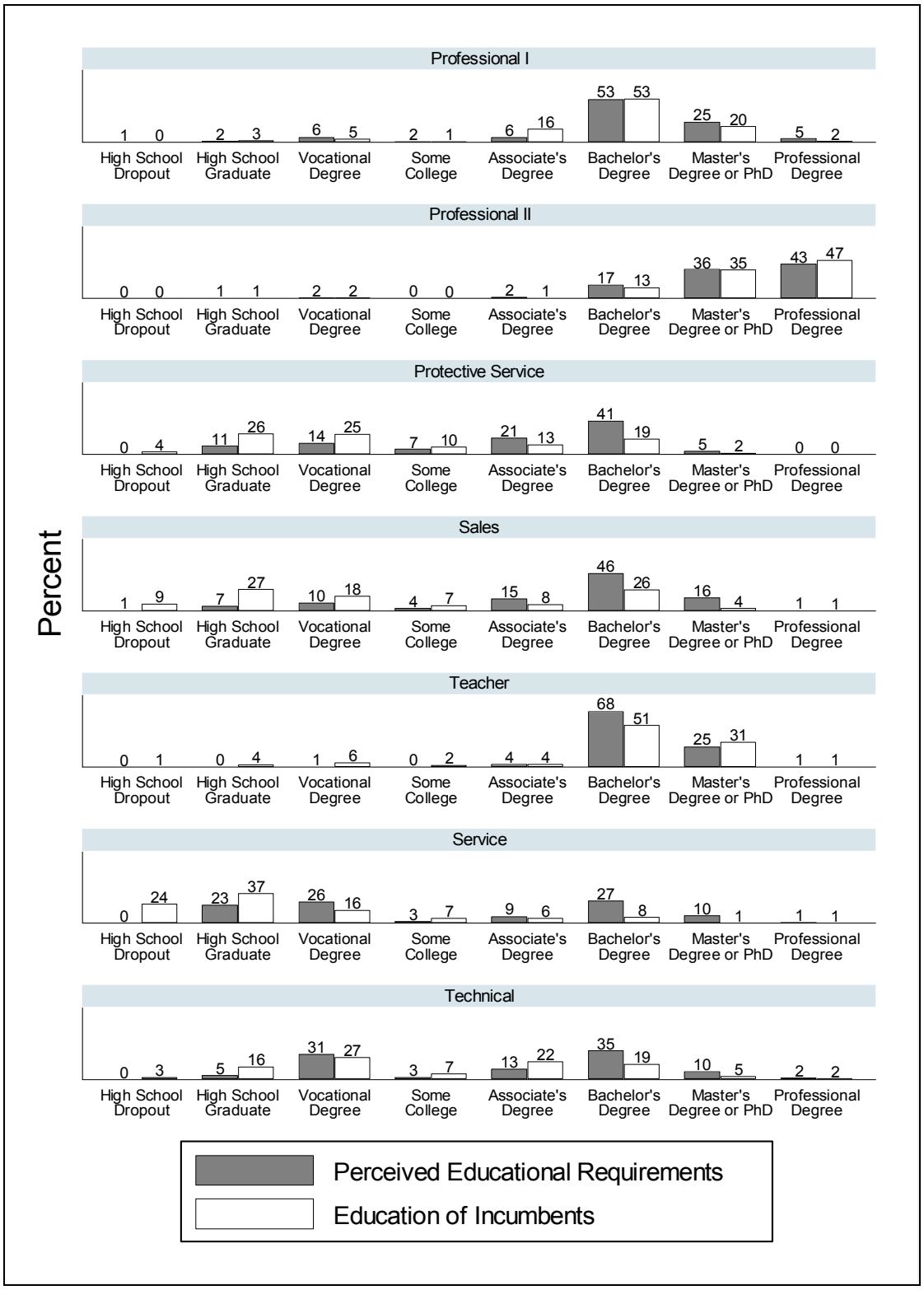

Figure 5.3a. Distributions of Perceived Educational Requirements and Educational Attainment of Incumbents by Occupation Expected. NELS88, 1992 (for perceived educational requirements) and ACS 2003 (for education of incumbents).

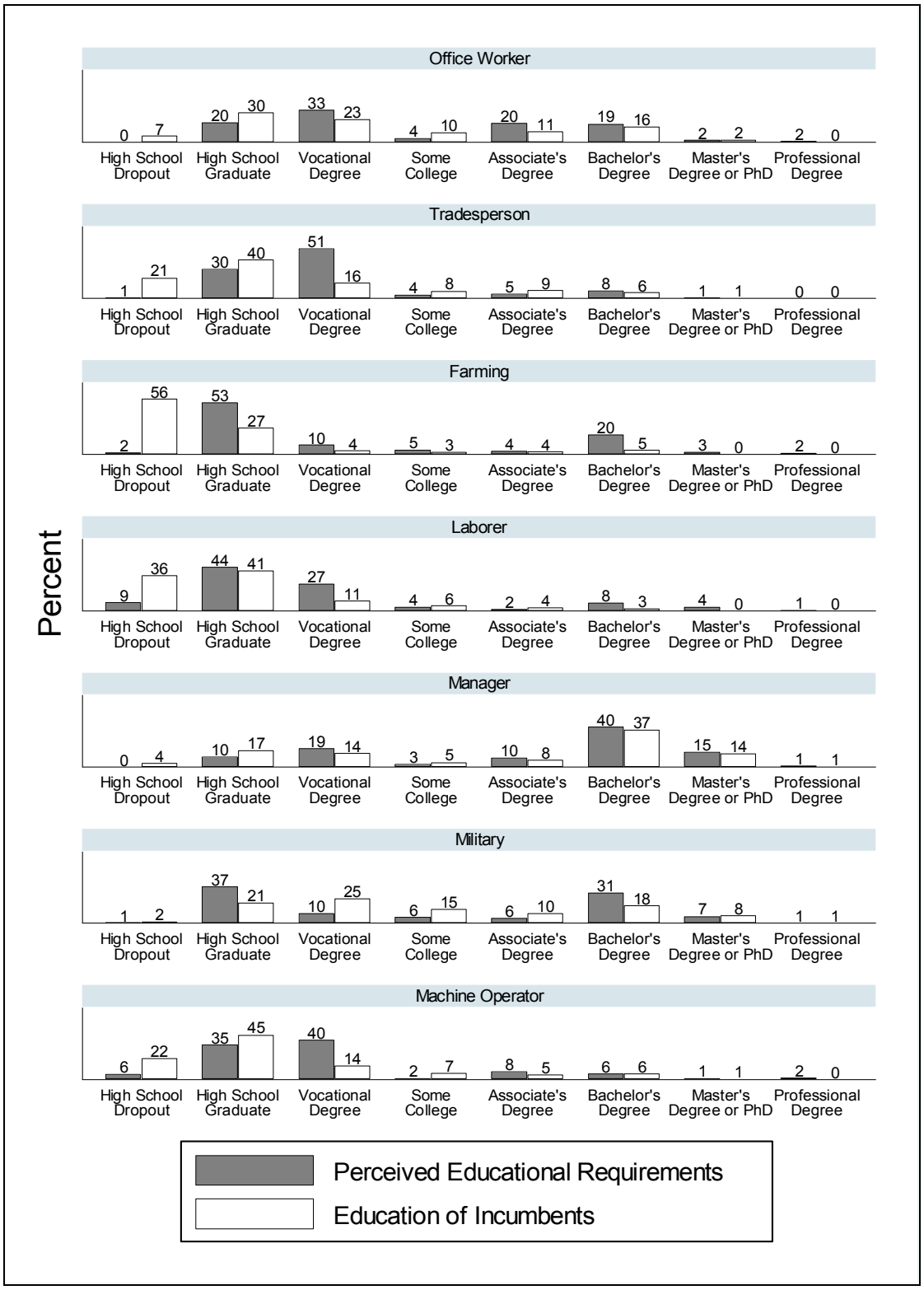

Figure 5.3b. Distributions of Perceived Educational Requirements and Educational Attainment of Incumbents by Occupation Expected. NELS88, 1992 (for perceived educational requirements) and ACS 2003 (for education of incumbents).

typical incumbents, it may be unreasonable for an adolescent to think that *they* will need much more or much less education than the typical incumbent. For example, 5 percent of respondents expecting to have an occupation in the Professional I category believe that they will need a Professional degree to enter it. However, even though there are some incumbents in the Professional I category that have Professional degrees, it seems unreasonable for adolescents to think that *they* will need one. It seems more reasonable to think that they will need a bachelor's degree, which is the modal incumbent educational attainment.

THE EFFECTS OF PERCEIVED EDUCATIONAL REQUIREMENTS

I turn next in Table 5.2 to estimation of the effects of perceived education requirements on college entry. Column 1 of Table 5.2 first presents unadjusted entry rates into two- or four-year colleges for each of the perceived education categories. Predictably, entry rates increase with increasing perceived requirements. Entry rates range from a low of .413 for those perceiving that no postsecondary schooling is required to enter the occupations they expect, to .941 for those perceiving that a professional degree is required. The effects of moving from one perceived educational requirement to the next highest level are presented in Column 1 below the entry rates. As we would expect, results show that effects are highly nonlinear. Entry rates for those perceiving that some college is required to enter the occupation they expect are over 20 percent higher than entry rates among those perceiving vocational school requirements. In contrast, there is essentially no effect from moving from Graduate degree to Professional degree, which seems logical.

Other effects are of intermediate magnitude. This may not seem entirely logical. For example, the belief that training at a vocational, business, or trade school is required should have no effect on college entry. Similarly, adolescents who believe

Table 5.2. Proportion of Students at Each Perceived Educational Requirement Level Entering a 2- or 4-year College by 2000. NELS88 1988–2000.

PANEL A. ENTRY INTO A 2- OR 4-YEAR COLLEGE Perceived education requirements of occupation expected at age 30	(1) Unadjusted Results	(2) Matching Results
	ENTRY RATES	
	Unadjusted entry rates	Rates when balanced to the population
(1) No postsecondary schooling[a]	.413	.552
	(.043)	(.072)
(2) Vocational, trade or business school[b]	.512	.665
	(.027)	(.035)
(3) Some college, but no 4-year degree[c]	.730	.780
	(.018)	(.025)
(4) 4- or 5-year college degree	.848	.842
	(.011)	(.010)
(5) Graduate degree (Master's or PhD)	.938	.883
	(.011)	(.013)
(6) Professional degree (JD or MD)	.941	.868
	(.024)	(.027)
	EFFECTS	
	Naïve Estimates	Matching Estimates
	δ_{NAIVE}	δ_{ATE}
(1) to (2)	.099	.113
	(.057)	(.078)
(2) to (3)	.218	.115
	(.020)	(.039)
(3) to (4)	.118	.062
	(.020)	(.025)
(4) to (5)	.090	.041
	(.017)	(.016)
(5) to (6)	.003	–.015
	(.024)	(.027)

PANEL B. ENTRY INTO A 4-YEAR COLLEGE	(1) Unadjusted	(2) Matched
	ENTRY RATES	
	Unadjusted entry rates	Rates when balanced to the population
(1) No postsecondary schooling[a]	.146	.329
	(.021)	(.058)
(2) Vocational, trade or business school[b]	.200	.337
	(.022)	(.032)
(3) Some college, but no 4-year degree[c]	.239	.427
	(.026)	(.026)
(4) 4- or 5-year college degree	.643	.635
	(.013)	(.011)
(5) Graduate degree (Master's or PhD)	.811	.688
	(.016)	(.016)

Table 5.2 (Continued)

(6) Professional degree (JD or MD)	.846	.733
	(.020)	(.034)
	EFFECTS	
	Naïve Estimates	Matching Estimates
	δ_{NAIVE}	δ_{ATE}
(1) to (2)	.054	.008
	(.030)	(.058)
(2) to (3)	.039	.090
	(.033)	(.037)
(3) to (4)	.404	.208
	(.029)	(.028)
(4) to (5)	.168	.053
	(.022)	(.020)
(5) to (6)	.035	.045
	(.027)	(.041)

Notes. Bootstrap standard errors in parentheses. N=9,142.
[a] Includes responses: No high school; Some high school; and High school diploma.
[b] Includes responses: Less than two years of vocational, trade, or business school; Two years or more of vocational, trade, or business school; A degree from a vocational, trade, or business school.
[c] Includes responses: Some college education; 2-year college degree.
*Response groups are balanced on occupational expectations, cognitive skill, race and ethnicity, sex, family income, parental education, academic self-concept, and the psychic costs of schooling (see Table 5.1 for the construction of these variables).

that no postsecondary schooling is required should not enroll in college at all, yet we see that over 40 percent do. Note that adolescents' beliefs about educational requirements, their occupational expectations, or both their beliefs and expectations could have changed since the questions were asked on the 1992 questionnaire. These updated beliefs and expectations may explain seemingly irrational college entry decisions.

Examination reveals marked differences among the students comprising each of the perceived educational requirement categories. The differences follow a familiar pattern in which the students who perceive high educational requirements also have other characteristics that would lead them to have higher college entry rates, such as high cognitive skill, family income, parental education, and academic self-concept. It is thus necessary to adjust for these pretreatment differences. As discussed, differences in occupational expectations are another obvious source of differences in perceived

educational requirements; specifically, those expecting occupations with higher educational requirements should perceive higher educational requirements than others. These types of differences were the subject of Chapter 4; I seek to control for them here to estimate the effects of perceptions.

Just as I did in Chapters 2 and 3, I estimate the average treatment effects of moving from one category of perceived educational requirements to the next higher perceived requirement. In other words, I have generated balancing weights for each of the perceived education requirement groups that results in each group expecting the same distribution of occupations, cognitive skill, family income, and so on.[54]

The results (Column 2) show that balancing each category to the population has predictably increased college entry rates for the groups with the lowest perceived educational requirements and decreased college entry rates for the groups with the highest perceived requirements. The effects of moving from one perceived educational requirement to the next higher perceived educational requirement have declined substantially. They remain fairly large, however, especially for movements between the categories at the lower end of the continuum. For example, increasing perceived education requirements from "No postsecondary" to "Vocational, trade, or business school" increases the probability of entering college by about 11 percent, but the increase from "four- or five-year college degree" to "Graduate degree" increases the probability of college entry by only about 4 percent.

Panel A of Table 5.2 does not distinguish between entry into two-year and four-year colleges, but it is worthwhile to look specifically at entry into four-year colleges because exploratory analysis revealed important results that emphasize the magnitude of the effects of perceived education requirements. Panel B of Table 5.2

[54] It might be thought that doing so would result in extremely high balancing weights like the ones observed in Chapter 4 when I tried to use matching to estimate the effects of job values, but this turns out not to be the case.

presents results parallel to those presented in Panel A, except that now entry rates are for four-year colleges only. The most notable result in Column 1 is the large naïve estimate of the effect of moving from perceiving that some college is required to perceiving that a four-year degree is required, which is roughly .4. Column 2 shows that, even after balancing, the effect is estimated to be about .21. This effect is much larger than the effect for any other transitions. This is what we would expect: those thinking that they require four-year degrees should be decidedly more likely to enter four-year colleges than those perceiving lower educational requirements.

A POSSIBLE SOURCE OF BIAS. I mentioned earlier that it can be difficult to distinguish between the effects of education-first and occupation-first satisficing. Estimating the effect of perceived education requirements of the occupations that respondents *expect* (rather than at occupations more generally) is an instance of this difficulty. The estimates presented in Table 5.2 have been interpreted within an occupation-first framework as the effect of perceived education requirements on college entry, but they can also be interpreted within an education-first framework as the effect of perceived educational requirements on occupational aspirations. This is because in an education-first framework some adolescents with high perceived educational requirements will lower their occupational expectations and expect a less-than-ideal occupation, say occupation *X*, and this will leave them with the same occupational expectation as other adolescents with lower perceived education requirements whose first choice of occupation is occupation *X*. This is a complicated and important point that warrants a lengthy digression.

The issue is most easily explained graphically through an example that assumes education-first satisficing. We have already considered in Figure 5.2 the pair of students *A* and *B* who would ideally like to become engineers, and who have

decided that they will attain education level e_{att}. This figure is presented again as Figure 5.3a. Both *A* and *B* would like to be engineers, but because *A* believes that they cannot be an engineer with education e_{att}, *A* lowers their occupational expectations to technician.

Figure 5.3b presents two more adolescents, *C* and *D*, who have decided to obtain education $e_{att\text{-}2}$, a lower level of educational attainment. Both would like to become technicians. Because *D* believes that they cannot become a technician with education $e_{att\text{-}2}$, *D* lowers their occupational expectation to machine operator as shown in Figure 5.3b. The occupational expectation of *C* remains at technician because *C* believes that they can become a technician at a lower level of education.

Now suppose that we examined the relationship between perceived educational requirements and educational plans conditional on occupational expectations. In this case we will look at the relationship conditional on the occupational expectation technician. Both *A* and *C* expect to become technicians so I examine them. Figure 5.3c, which presents the relevant information, shows that *A* expects more education than *C*. However, the higher perceived educational requirements of *A* have not *caused* them to expect more education than *C*. Instead, the higher perceived educational requirements have caused *A* to lower their occupational expectations, and it only appears that it has caused them to increase their educational attainment.

This may seem like a peculiar set of circumstances, but if high perceived educational requirements generally cause adolescents to lower their occupational aspirations, then perceived educational requirements should be positively related to educational goals and attainment conditional on educational expectations more generally. Therefore, using perceptions of the educational requirements of *expected* occupations will overstate the effects of perceived education requirements on college entry. Indeed, it is possible that perceived education requirements have no effect on

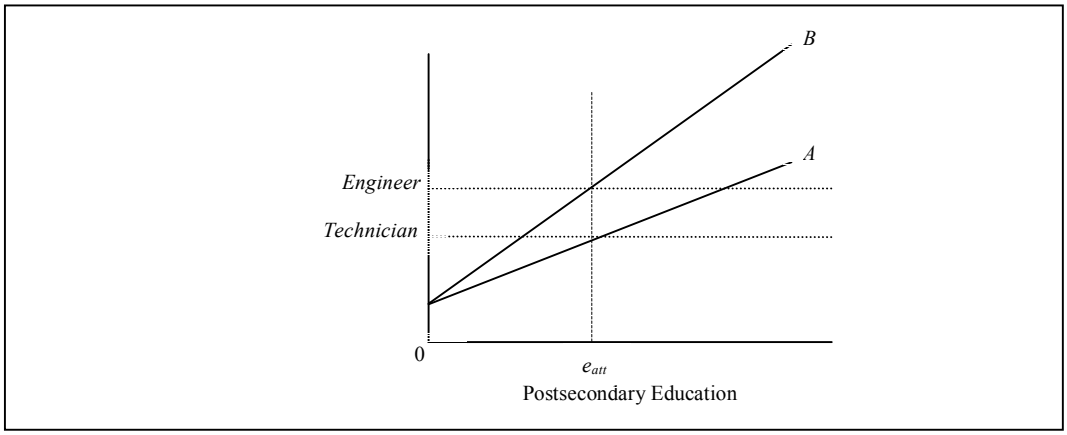

Figure 5.5a. Mapping Functions for Adolescents Whose Ideal Occupational is "Engineer" and Whose Inflexible Educational Goal is e_{Att}.

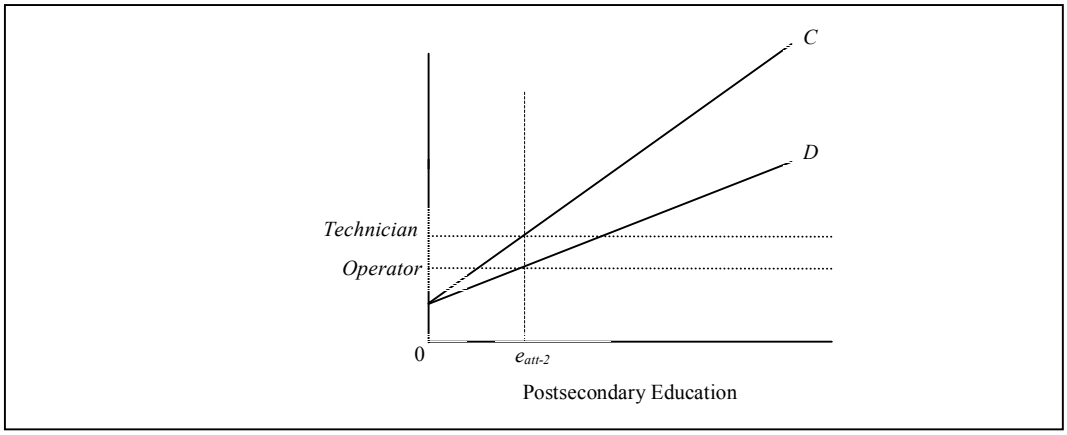

Figure 5.5b. Mapping Functions for Adolescents Whose Ideal Occupation is "Technician" and Whose Inflexible Educational Goal is e_{att-2}.

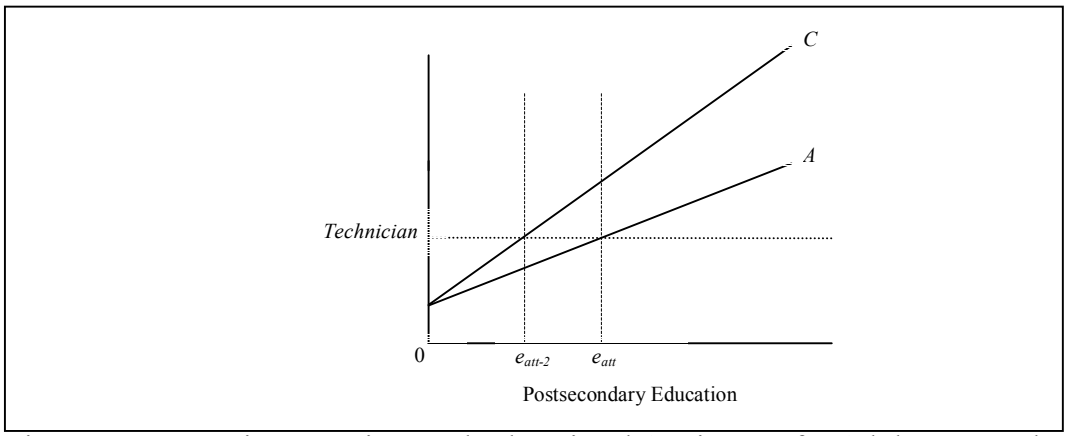

Figure 5.5c. Mapping Functions and Educational Attainment for Adolescents Whose Occupational Expectation is "Technician."

college entry and that education-first satisficing alone drives the results reported in Table 5.2.

The crucial question is "How much do perceived educational requirements lower occupational expectations?" If perceived educational requirements lower occupational expectations by a great deal the effect estimates in Table 5.2 will be seriously biased upwards; if they lower them only slightly the effect estimates are will not be seriously biased (unless other omitted variables are important).

It might be thought that the NELS88 could be used to estimate the effect of perceived education requirements on occupational expectations. Whether or not a respondent perceived high education requirements could be determined by comparing their beliefs about the education required to enter the occupation they expect to the modal attainment of incumbents of that occupation from the 2003 ACS. From this it could be determined, for example, if respondents are overestimators of education requirements. For example, the modal educational attainment of incumbents in the *Technical* category is a vocational degree, so respondents believing that more education than a vocational degree this is required to enter a *Technical* occupation would be overestimaters. Similarly, the modal educational attainment of incumbents of *Professional I* occupations is a bachelor's degree, so respondents believing that more education is required to enter this occupation category would be overestimaters. Doing so reveals that overestimaters do tend to have lower occupational expectations. However, this is likely artifactual because there is a type of ceiling effect in which the higher the occupational expectation, the lower the probability of overestimating because there are fewer educational attainment categories above the modal educational attainment. In the most extreme case respondents with the highest occupational expectations (Professional II) cannot overestimate the education requirements of the

occupations they expect because Professional degree is the modal education level among incumbents.

To avoid the ceiling effect I need a measure of perceived educational requirements of occupations unrelated to the occupations respondents expect. The *National Longitudinal Survey of Young Men, 1966* (hereafter, NLSYM66) contains useful variables. The NLSYM66 administers a short test of occupational knowledge known as the *Knowledge of the World of Work* (hereafter, KWW). For one of the types of questions in the KWW, respondents are given an occupation (e.g., "forklift operator") and are asked how much education they think that typical incumbents in that occupation have. There are ten of these questions asking about ten different occupations. The responses to these questions can give us a measure of perceived education requirements more generally, not just for the occupations adolescents expect. I take the average of the responses to the ten questions and treat this as a measure of respondents' beliefs about educational requirements of occupations. High values indicate that respondents think that more education is required to enter any given occupation and lower values indicate that respondents think that less education is required.

The NLSYM66 also includes respondents' occupational aspirations for age 30 coded in the 1960 COC. Occupational expectations are preferable to occupational aspirations, so to look at expected occupations I have limited the sample to respondents who believed that their chances of entering the occupation they aspired to were either "Excellent," "Good," or "Fair" (those who report "Poor" are dropped). Education-first satisficing predicts that high perceived education requirements lead adolescents to aspire to less-than-ideal occupations (e.g., engineering technician) with lower educational requirements than their most preferred occupation (e.g., engineer). I therefore need the educational requirements of expected occupations to test the

prediction of education-first satisficing. I use the 1960 Census to generate the educational requirements of the occupations respondents want. Using this objective measure of educational requirements is problematic because we know that adolescents' beliefs about educational requirements are often inaccurate. Nonetheless, adolescents appear to generally know which occupations require more education than others, and this measure should allow us to get a sense of the effect of perceived education requirements on occupational expectations.

To estimate the effect that perceived education requirements have on occupational expectations, I regress the years of education of the occupation respondents expect on mean perceived educational requirements. Also included as control variables are parental education, socioeconomic status of father's occupation, cognitive skill, score on the KWW test, and dummy variables for gender, and race and ethnicity. The results, which are presented in Table 5.3, show that an increase of one year in perceived education reduces the educational requirements of occupations expected by only .026 years. An example illustrates that this is a very small effect. If one adolescent believed that the ten occupations in the KWW on average required a high school diploma and a second adolescent believed that they required a four-year college degree, the model does predict that the latter adolescent would change their occupational aspiration from an ideal occupation to a less-than-ideal occupation with lower education requirements. However, the model predicts that the less-than-ideal occupation would have education requirements only about .1 year lower ($.026 \times 4 \approx .1$). To give a sense of how much of a reduction in occupational expectations this would be, electrical engineers have about .3 more years of education than civil engineers based on the 1960 Census. Thus, perceiving high educational requirements may lead adolescents to lower their occupational aspirations, but these results suggest that they do so by only a trivial amount. Therefore, the estimates of the effect of perceived

education requirements presented earlier in Table 5.2 are probably not grossly overstated as a consequence of the effect of perceived educational requirements on occupational expectations. More recent data or data on females may yield different results, but it seems sensible to tentatively accept the estimates in Table 5.2.

Table 5.3. Coefficients from a Regression Model Predicting the Educational Requirements of Occupations Wanted at Age 30. NLSYM66, 1966.

Outcome=Educational requirements of occupation aspired to	
Mean perceived education	–.026
	(.133)
Black	.375
	(.247)
Hispanic	.395
	(.244)
Other race/ethnicity	.943
	(.696)
Socioeconomic status of father's occupation	.005
	(.003)
Parental education	.101**
	(.030)
Cognitive skill	.032**
	(.006)
Age	–.054
	(.053)
KWW score	.028*
	(.013)
Constant	9.064**
	(2.336)
R^2	.090

Notes. N=1,439. Robust standard errors in parentheses. * significant at 5%; ** significant at 1%

DETERMINANTS OF EDUCATION REQUIREMENT BELIEFS

Table 5.4 examines the determinants of perceived educational requirements with a series of regression models. Note that I use a "years of education required" measure in this analysis rather than the categorical measure used in the estimation of the effects of perceived educational requirements on college entry. (See Table 5.1 for details on converting the categorical measure into a years of education measure.) Some may object that a series of ordered categories is more appropriate. However,

results based on a continuous measure are more intuitive, and preliminary analysis revealed that results are substantively similar whether perceived educational requirements are treated as an ordinal or a continuous variable.

Model 1 regresses perceived educational requirements on job values and dummy variables for gender, race and ethnicity, and 16 dummy variables for occupational expectations (which are included to control for occupational preferences). Job values are included to control for "intra-occupational" aspirations. Although means and standard deviations in Table 5.1 are for unstandardized variables, work values have been converted to z-scores to assess their relative strength. The results (Column 1) show that valuing being successful at work and being an expert at work both increase perceived requirements, which may be because respondents reporting the same occupation categories may expect different specific occupations. Females perceive roughly the same education requirements as males and blacks perceive roughly the same education requirements as whites. Hispanics perceive lower educational requirements than whites, and Asians perceive decidedly higher requirements than whites.

Model 2 adds family income, parental education, and cognitive skill as regressors; all three of these variables have been converted to z-scores to facilitate comparisons of their effects. Results (Column 2) show that all three predict higher perceived education requirements. Parental education and cognitive skill estimates are quite large. Note the effect that adding these regressors has had on the race and ethnicity estimates. Now both blacks and Hispanics perceive much higher educational requirements than whites. Thus we have another instance in which Hispanic-white and black-white differences in college-encouraging perceptions favoring Hispanics and blacks are induced by conditioning on cognitive skill and family background. Note

Table 5.4. Regression Coefficients from Multilevel Models Predicting Education Beliefs. NELS88, 1988–1992.

Outcome=Perceived years of education required to enter the occupation expected at age 30.	(1)	(2)	(3)	(4)
Intercept	16.306***	16.509***	16.368***	16.361***
	(.022)	(.018)	(.019)	(.019)
School Level				
% in Academic Track				.072**
				(.025)
Family Income				.061
				(.036)
Parental Education				.102*
				(.040)
Cognitive Skill				–.067*
				(.033)
College Focus				.039*
				(.017)
Work Focus				–.036
				(.025)
Student Level				
Female	–.032	.065	.072	.078*
	(.039)	(.037)	(.038)	(.038)
Black	.012	.583***	.570***	.561***
	(.069)	(.075)	(.074)	(.075)
Hispanic	–.124*	.485***	.470***	.491***
	(.059)	(.065)	(.064)	(.065)
Asian	.553***	.444***	.432***	.426***
	(.065)	(.068)	(.063)	(.064)
Family Income		.094***	.087***	.040*
		(.016)	(.016)	(.018)
Parental Education		.297***	.292***	.261***
		(.021)	(.021)	(.023)
Cognitive Skill		.533***	.533***	.523***
		(.024)	(.022)	(.023)
Success at Work	.137	.109***	.109***	.109***
	(.020)	(.023)	(.023)	(.023)
Expert at Work	.077	.132***	.133***	.136***
	(.018)	(.019)	(.019)	(.019)
Steady Work	.024	.037	.037	.039
	(.020)	(.023)	(.023)	(.023)
Money	–.092	.000	.000	.003
	(.012)	(.018)	(.018)	(.018)
Occupational expectation dummy variables	YES	YES	YES	YES
τ_{00}			.213***	.184***

Notes. N=12,814 level-one observations (students); N=1,146 level-two observations (schools). Additional regressors include the race and ethnicity categories "Native American," and "Race missing." Dummy variables for occupational expectations are also included.

also that conditioning on cognitive skill and family background reduces Asian-white differences (primarily because Asians' cognitive skill is higher than whites' cognitive skill), but Asians continue to perceive much higher educational requirements than whites. It is unclear why blacks, Hispanics, and Asians perceive higher education requirements than whites conditional on cognitive skill and family background because the relative standing logic introduced in Chapter 2 does not seem to apply here. Minorities may believe that they require more education than whites because they anticipate labor-market discrimination, but I cannot see why this mechanism would not lead blacks and Hispanics to perceive higher educational requirements than whites before conditioning on cognitive skill and family background.

Model 3 (Column 3) is a multilevel model that models the nested structure of the data. It is a random-intercept model, which allows mean levels of perceived educational requirements to vary by school. Examination of the variance of mean perceived requirements across schools, which is denoted τ_{00} in Table 5.4, reveals statistically-significant variation conditional on the level-one variables in the model. However, a comparison of Models 2 and 3 shows that allowing mean levels of perceived educational requirements to vary across schools has little effect on estimates of the level-one effects. For example, perceived educational requirements are higher among blacks and Hispanics, but this appears to have little to do with the types of schools they attend.

In an effort to explain the variation in mean levels of perceived requirements across schools, Model 4 (Column 4) adds the school-level variables percentage of students in the academic track, college focus, job focus, school-mean cognitive skill, school-mean parental education, and school-mean family income as predictors of level-two intercepts. All school-level variables have been converted to z-scores. The results show that the percentage of students in the academic track and school-mean

family income both increase school-mean perceived education requirements. Consistent with my predications, college focus appears to increase perceived educational requirements and job focus appears to lower them, but the effects are weak and fail to reach statistical significance at the $p<.05$ level for the latter. Other effects are also small and fail to reach statistical significance. Also observe that these variables account for only about 15 percent of variation in perceived requirements that exists across schools. Thus schools may influence perceived education requirements, but the majority of inter-school variation is unaccounted for with the variables considered here.

CONCLUSIONS

This chapter investigated adolescents' perceptions of the relationship between educational and occupational attainment and the effects that these perceptions have on college entry. Unlike past research focusing on the accuracy of adolescents' perceptions, this chapter addresses beliefs about the *level* of education required for occupations. Specifically, it looks at the education adolescents think they will need to enter the occupation they expect at age 30.

Results show considerable variation in adolescents' perceptions. For example, among adolescents expecting to work in a "technical" occupation, about 30 percent believe that a vocational degree is required, 13 percent believe that an Associate's degree is required, 35 percent believe that a bachelor's degree is required, 10 percent believe that a master's degree or PhD is required, and the remaining 22 percent of respondents' beliefs are spread out from high school graduate to Professional degree. It is hard not to concur with Grotevent and Durrett (1980) who conclude that "high school students appear to be making decisions of major consequence on less than adequate information" (p. 180) and that providing students with reliable information

about the educational requirements of occupations should become a more important part of school counselors' duties.

Adolescents who perceive higher educational requirements are more likely to enter college than adolescents who perceive lower educational requirements. For example, adolescents who believe that the occupation they expect requires at least some college are about 11 percent more likely to enroll in college than adolescents who believe that they can enter the occupation they expect with training at a vocational, trade, or business school. Those who believe that a four-year degree is required to enter the occupation they expect are over 20 percent more likely to enroll in a four-year college than those who believe they can enter the occupation with only some college or an associate's degree.

Cognitive skill and parental education are strongly related to perceived educational requirements. Conditional on cognitive skill and family background measures blacks, Hispanics, and Asians perceive higher educational requirements than whites. It is unclear why whites perceive lower educational requirements than other groups. Blacks, Hispanics, and Asians may have better or different information about the education of typical incumbents or they may believe that they require more education to enter the occupations they expect, such as may be the case if discrimination in hiring or promotion was anticipated.

Perceived educational requirements are higher in some schools than in others. The percentage of students in the academic track and school-mean levels of family income predict higher perceived educational requirements. It was hypothesized that when high schools appear to promote postsecondary schooling (e.g., they host many college representatives, offer assistance to students in the college preparation and application process, and so on) they would increase the perceived educational requirements of their students because this promotion would lead students to believe

that postsecondary education is required for most jobs. The evidence supports this conclusion, but a school's "college focus" has fairly effects on perceived educational requirements.

Students' beliefs about the relationship between educational and occupational attainment have not made their way into the mainstream study of social stratification, but the findings presented here suggest that they may be one of the most important determinants of postsecondary educational attainment. Perceived educational requirements could be a powerful way to manipulate educational attainment. It seems likely, however, that providing accurate information to adolescents would not increase college entry rates because overestimation appears to be slightly more common than underestimation.

CHAPTER 6. PREFERENCES, PERCEPTIONS, AND EMPIRICAL PUZZLES IN EDUCATIONAL ATTAINMENT

Thomas Kuhn (1962) famously argued that opposition to dominant scientific paradigms develops as empirical "puzzles" accumulate. Paradigms are unified explanatory frameworks of broad scope, and a puzzle emerges when some observation fits poorly into the framework. In other words, a puzzle is something that should be within the scope of the paradigm but that it cannot explain or can explain in only an unsatisfactory ad hoc manner. Kuhn has been critical of the application of his ideas to the social sciences, but his emphasis on the role that empirical puzzles play in determining the fortunes of explanations seems relevant here. This is because the inability of investment models and the Wisconsin Model to explain numerous empirical puzzles has probably been seen as their most critical shortcoming.

Most troubling have been findings of minority-white differences in the educational attainment process. Conditional on family background and cognitive skill, blacks' college plans, enrollment, and attainment are higher than those of whites' plans, enrollment, and attainment (Morgan 1996; Hoelter 1982; Hout and Morgan 1975; Bennett and Xie 2003; Rivkin 1995; Kane and Spizman 1994; Herrnstein and Murray 1994:319–320; Light and Strayer 2002). Results are not as well documented for Hispanic-white and Asian-white differences, but the weight of the evidence suggests that Asians' (Goyette and Xie 1999) and Hispanics' plans and attainment are higher than the plans and attainment of whites with comparable family background and cognitive skill (Kao and Tienda 1998). Bennett and Xie (2003) use the expression "net-black advantage" to refer to the fact that blacks have higher rates of college entry than whites conditional on family background and cognitive skill. I use this same terminology and add the expressions "net-Asian" and "net-Hispanic" advantage to

refer to similar findings on Asian-white and Hispanic-white differences where they exist.

The traditional Wisconsin Model specifies that aspirations and attainment are ultimately determined by family background and cognitive skill, so clearly it cannot account for the high expectations and attainment of minorities that exist conditional on these factors. In fact, the Wisconsin Model can be seen as the paradigm that created the puzzles, and the decline of the Wisconsin Model has been attributed to its inability to account for group differences in expectations, attainments, and the link between the two (Morgan 1998).

Investment models also offer little understanding of minority-white differences. Manski and Wise (1983) suggest that schooling has stronger effects on blacks' earnings. However, despite scattered findings in support of this hypothesis, the weight of the evidence suggests that education has roughly the same returns for blacks, whites, and Hispanics (Barrow and Rouse 2006; Ashenfelter and Rouse 2000). The limited evidence available does suggest slightly higher returns for Asians among males (Ashenfelter and Rouse 2000). Direct costs are lower for blacks (and less so for Hispanics) because they receive more financial aid (Kane and Spizman 1994; Venti 1983), and the higher probability of unemployment among young blacks lowers the opportunity costs of college attendance (Rivkin 1995; Manski and Wise 1983). But these facts cannot explain Asian-white differences and are likely of insufficient magnitude to explain black-white differences—especially in college entry—which are extremely large as will be seen shortly.

Evidence on *perceptions* of the costs and benefits of postsecondary education also fails to explain race and ethnicity differences. On average, both adolescents and adults overestimate tuition by a factor of two or more (Avery and Kane 2004; Ikenberry and Hartle 1998; Post 1990; Grodsky and Jones 2006; Horn, Chen, and

Chapman 2003), but beliefs vary little across racial and ethnicity groups. Avery and Kane (2004) also found no systematic differences in beliefs about the returns to education across two sets of schools, one of which was composed primarily of poor minorities and one of which was composed primarily of affluent whites. Rouse (2004) also found similar perceived returns when comparing students from a Baltimore high school serving poor neighborhoods and a Wisconsin school serving more affluent neighborhoods.

Alongside the enduring puzzle of minority-white differences in college entry, a new group difference puzzle has developed. The educational expectations and attainment of females have historically been below those of males, but a long-term, strong, upward trend has led to a "net-female advantage" in expectations and attainment (National Center for Education Statistics 2006:159; Buchmann and DiPrete 2006).[55]

The secular trend in females' expectations relative to males is unsurprising given the rise of female labor force participation, but neither the Wisconsin Model nor conventional investment models can account well for the fact that females' attainment has come to exceed males' attainment. The Wisconsin Model offers little guidance because males and females have essentially identical test scores and family resources. Although there is some evidence of higher returns for females (Jacob 2002; DiPrete and Buchman 2006), education appears to have roughly the same return for males and females. Females are also more apt to withdraw from the labor market to raise children, which lowers the time over which investments in schooling can be recovered. Jacob (2002) argues that females have higher noncognitive skills that may lower the psychic costs of college or may increase the chances of acceptance or

[55] This net-female advantage is now so great that some administrators are considering "affirmative action" admission policies for male applicants (Green and Green 2004, cited in Buchmann and DePrite 2006).

financial aid offers. Jacob often operationalizes noncognitive skills as behavior (such as grades, problem behaviors, hours of homework, and so on), which could be consequences of educational decisions rather than causes of them. For example, if males are more likely to decide that postsecondary schooling is not a worthwhile investment they may subsequently put less effort into their studies.

Jacob (2002:589, footnote 2) also mentions the possibility of gender differences in employment preferences, such as differences in preferences for employment in the military, but he does not pursue this possibility. Powers and Wojtkiewicz (2004) explore this possibility and find that occupational aspirations can explain male-female differences in high school completion, but their data are too old to examine the net-female advantage in postsecondary education.

I also argue that the Wisconsin Model and investment models provide unsatisfactory accounts of the effects of cognitive skill and family background on educational attainment. In the Wisconsin Model cognitive skill affects grades, which affect significant others' expectations, which affect students' attainment (see Figure 1.1). However, there remains a fairly strong relationship between cognitive skill and educational attainment conditional on both grades and significant others' expectations. Those working in the human capital tradition often suggest or assert that this "net-cognitive skill advantage," to extend this terminology still further, arises because higher ability adolescents get higher returns to schooling (e.g., Frank 1985:211; Herrnstein and Murray 1994), but despite numerous attempts to do so this claim has not been convincingly shown. Others argue that cognitive skills lower psychic costs (Cunha, Heckman, and Navarro 2006; Garen 1985). This claim needs to be empirically examined and other possibilities need to be considered.

In the Wisconsin Model family background predicts significant others' expectations, which lead to higher attainment via students' aspirations. It is never

clearly spelled out why the significant others, particularly the parents, of those with advantaged family backgrounds have higher expectations. The effect of family income on educational attainment is not generally seen as puzzling because it should be strongly related to the ability to comfortably finance college or finance it at all. What is more puzzling is the relationship that other measures of family background have with educational attainment conditional on family income. This is especially true of parental education; estimation always yields a "net-parental education advantage" in which parents' educational attainment has a large effect on adolescent educational attainment conditional on family finances and other predictors of educational attainment. It is sometimes vaguely suggested that well-educated parents value the cultural or symbolic benefits of college (Raftery and Hout 1993; Boudon 1974; Ellwood and Kane 2000), but this has not been shown. Returns to education do not seem to vary systematically with family background (Altonji and Dunn 1996) leaving traditional investment theories with little power to explain family background effects that exist conditional on the ability to finance college.

The net-female, net-black, net-Hispanic, net-Asian, net-cognitive skill, and net-parental education advantages in college entry are *empirical puzzles*.[56] In this chapter I examine the extent to which the college-encouraging preferences and perceptions considered in Chapters 2 through 5 can jointly account for these empirical puzzles. Results presented in Chapters 2 through 5 suggests that preferences and perceptions can explain at least part of the empirical puzzles because college-encouraging preferences and perceptions were shown to be (conditionally) either positively related

[56] I accept that the puzzles discussed are indeed puzzles requiring an explanation. However, some researchers do not see them that way or act as though they do not. For example, when examining black-white or Hispanic-white differences in educational expectations some researchers do not condition on cognitive skill (e.g., Kao and Tienda 1998). Consequently, blacks and Hispanics do not have unusually high expectations, and they tend to have rather low attainment. Researchers taking this approach typically fail to explain why they omit cognitive skill and family background, so it is difficult to know their perspective.

or unrelated to cognitive skill, parental education, female, black, Hispanic, and Asian (and college-encouraging preferences and perceptions are never negatively related to these variables).

Although reasonable conjectures have been made, it is not always clear what drives these relationships. For example, we do not really know why parental education is positively related to perceived educational requirements or to the perceived ability to graduate. Nonetheless, if it can be tentatively accepted that they are positively related then we can determine if these relationships can explain the empirical puzzles.

DATA

Multiple datasets have been used in the previous chapters to permit superior measurement of key concepts. However, to examine the ability of the subjective rationality framework to explain the empirical puzzles it is best to use a single dataset that best measures the various concepts because this enables examination of the combined ability of preferences and perceptions to explain the empirical puzzles. The NELS88 offers the best opportunity to measure all of the concepts, primarily because it allows measurement of the perceived requirements of expected occupations, which appear to have strong effects on college entry. The NELS88 also allows reasonable measurement of psychic costs, perceived ability, and occupational preferences. The NELS88 sample is recent enough to address the net-female advantage, large enough to address the net-black advantage, and can also address the net-Hispanic and net-Asian advantages because it includes supplementary samples of Hispanic and Asian students.

The NELS88 includes several self-reported job values questions, such as questions asking the importance of "Being successful at work" and "Being an expert at work," which I use to measure occupational preferences. I also include occupational expectations as measures of occupational preferences. Assuming that occupational

expectations represent only preferences is problematic because, as I discussed in Chapter 4, occupational expectations likely represent some mixture of occupational preferences and perceived accessibility. Thus the effects of occupational expectations on college entry likely represent some mixture of the effects of occupational preferences and perceived ability. This is of less concern here than it was in Chapter 4 because I am not trying to isolate the effects of occupational preferences; instead, I am trying to look at the combined ability of preferences and perceptions to explain the empirical puzzles. Thus it is unimportant that a single measure likely taps into several of the concepts.

For more details on the variables used in this chapter see the discussion of the data in Chapter 5.

RESULTS

PARENTAL EDUCATION. I first consider whether or not preferences and perceptions can explain the net-parental education effect within the matching framework introduced in Chapter 1 and employed in Chapters 2, 3, and 5. Parental education is categorized into four treatment states: (1) a high school diploma or less; (2) some college, but no four-year college degree; (3) a four-year college degree; and (4) a graduate degree (master's degree or PhD) or professional degree. Column 1 of Table 6.1 presents unadjusted differences in college entry rates across these four categories. Column 1 shows that entry rates increase as parental education increases. Naïve estimates of effects, which are presented below the entry rates in Column 1, show that the effect of parental education is strongest for movement out of the lowest parental education category and weakest for movement into the highest category. In fact, there is almost no effect for moving from "four-year degree" to "Graduate or Professional degree."

Table 6.1. Actual and Counterfactual College Entry Rates for Respondents in Each Parental Education Group. NELS88, 1988–2000.

	(1) No matching	(2) Matched on family income and cognitive skill	(3) Subjective Rationality Model
		ENTRY RATES	
	Unadjusted	Traditional Controls	Preferences and Perceptions
(1) High school diploma, or no high school diploma	.634 (.017)	.713 (.020)	.772 (.015)
(2) Some college, no 4-year degree	.787 (.012)	.813 (.009)	.823 (.009)
(3) 4-year college degree	.930 (.009)	.896 (.014)	.888 (.016)
(4) Graduate degree (master's or PhD) or Professional degree	.948 (.015)	.842 (.035)	.837 (.033)
		EFFECTS	
	Naïve estimates	Traditional Estimates	Preferences and Perceptions
(1) to (2)	.153 (.021)	.099 (.022)	.051 (.017)
(2) to (3)	.143 (.015)	.083 (.016)	.065 (.018)
(3) to (4)	.019 (.017)	–.054 (.039)	–.050 (.039)

Notes. Bootstrap standard errors are in parentheses.

These effects are not the puzzle I hope to explain. Past research shows that a considerable portion of the unadjusted relationship between parental education and college entry is due to differences in cognitive skill, family income, and race and ethnicity. It is the effect of parental education on college entry net of its relationship with these other variables that I am interested in explaining. Column 2 presents results when each of the four parental education categories have been balanced to have the population distributions of cognitive skill, family income, gender, and race and ethnicity. Column 2 shows that much of the effect of parental education on college entry is due to the relationship between parental education and these other factors and that the effect of moving from a parental education "four-year degree" to "Graduate or Professional degree" is completely caused by cognitive skill and family income. In

fact, there is a puzzling negative effect that suggests that conditional on cognitive skill and family background adolescents whose parents have four-year degrees are more likely to enter college than adolescents whose parents have graduate or professional degrees. Perhaps this surprising finding is owing to the considerable measurement error in self-reported professional degrees revealed by Black, Sanders, and Taylor (2003). Many barbers, beauticians, and technologists report having professional degrees, presumably because their education is related to their vocation.

The results in Column 2 are the baseline estimates I seek to explain by balancing on preferences and perceptions. Specifically, I balance on the perceived ability to complete college (which is measured in the NELS88 with academic self-concept), psychic costs, occupational preferences (which are measured in the NELS88 with job values and occupational expectations), and perceived educational requirements of the occupation expected at age 30. Column 3 presents results when all four parental education categories have been balanced to the population as on all of these measures as well. Note that I am not balancing on preferences and perceptions *instead of* on cognitive skill, family income, and the other variables balanced upon in Column 2; I am now balancing on preferences and perceptions *in addition to* cognitive skill, family income, parental education, and race and ethnicity.

Comparison of the effect estimates in Columns 2 and 3 shows that preferences and perceptions account for almost half of the effect of moving from parental education "High school/no diploma" to "Some college" and about 20 percent of the effect of the next transition from "Some college" to "four-year degree." The puzzling negative effect for moving from "four-year degree" to "Graduate or Professional degree" is unexplained. Thus it appears that preferences and perceptions are capable of explaining a substantial portion of net-parental education effects but by no means all of them.

COGNITIVE SKILL. Table 6.2 presents results from a parallel analysis on the effects of cognitive skill, which is divided into fourths because no natural boundaries exist in measures of cognitive skill. All of the estimates are included, but in the interests of brevity I discuss only the effect estimates. Column 1 shows that effect estimates are fairly large, and, like parental education effects, they are highest for first quartile effects and lowest for third quartile effects. However, unlike what was observed for parental education, third quartile effects are fairly large.

I next balance each of the fourths to have the population distributions of parental education, family income, gender, and race and ethnicity. A comparison of the effects for the matched samples (Column 2) to the naïve estimates shows that balancing reduces effect estimates, but the effects remain large.

I next balance on preferences and perceptions and present the results in Column 3. A comparison of Columns 2 and 3 reveals that preferences and perceptions can account for over one-third of the first quartile effects, three-quarters of the second quartile effects, and over 20 percent of third quartile effects. Thus, preferences and perceptions can explain substantial portions of the effects of cognitive skill, but they cannot explain the entire effect of cognitive skill.

RACE AND ETHNICITY. Table 6.3 examines net-black, net-Hispanic, and net-Asian advantages in college entry. Column 1 presents unadjusted entry rates separately for whites, blacks, Hispanics, and Asians. Column 1 shows that Asians have the highest entry rate (.922), whites have the second highest (.801), Hispanics the third highest (.780), and blacks have the lowest (.735). I present the naïve estimates for minority-white differences in college entry below entry rates in Column 1.

Column 2 presents estimated entry rates for each of the four race and ethnicity groups when they have been weighted so that the distributions of cognitive skill,

Table 6.2. Actual and Counterfactual College Entry Rates for Respondents in Each Cognitive Skill Fourth. NELS88 1988–2000.

	(1) No matching	(2) Matched on family income and parental education	(3) Subjective Rationality Model
		ENTRY RATES	
	Unadjusted	Traditional Controls	Preferences & Perceptions
1st Fourth	.593	.635	.724
	(.021)	(.017)	(.016)
2nd Fourth	.759	.787	.818
	(.013)	(.012)	(.011)
3rd Fourth	.870	.863	.837
	(.012)	(.013)	(.013)
4th Fourth	.960	.941	.895
	(.007)	(.012)	(.014)
		EFFECTS	
	Naïve estimates	Traditional Controls	Preferences & Perceptions
1st Quartile Effect	.166	.151	.094
	(.023)	(.019)	(.018)
2nd Quartile Effect	.111	.076	.019
	(.017)	(.017)	(.017)
3rd Quartile Effect	.090	.078	.058
	(.013)	(.016)	(.019)

Notes. Bootstrap standard errors are in parentheses.

parental education, family income, and gender resembles the distributions in the entire sample. Column 2 shows a net-black advantage of .066, a net-Hispanic advantage of .083, and an increase in the net-Asian advantage to .124. These are the net-advantages I hope to explain with preferences and perceptions.

To see if my subjective rationality approach can explain any part of the net-black, net-Hispanic, and net-Asian advantages I next balance the distributions of the four preferences and perceptions to the population distributions (in addition to cognitive skill, parental education, family income, and gender). The results, which are presented in Column 3, show that the net-black advantage is reduced to .026 (a reduction of about 60 percent), the net-Hispanic advantage is reduced to .065 (a

reduction of about 20 percent), and the net-Asian advantage is reduced to .107 (a reduction of about 15 percent).

Table 6.3. Actual and Counterfactual College Entry Rates for Whites, Blacks, and Hispanics. NELS88 1988–2000.

PANEL A. BLACK-WHITE DIFFERENCES	(1) Base college entry rate	(2) Matched to Population on Cognitive skill and Background	(3) Matched to Population on Preferences and Perceptions
		ENTRY RATES	
	Unadjusted entry rate	Matched entry rate 1	Matched entry rate 2
Whites	.801	.771	.781
	(.008)	(.009)	(.009)
Blacks	.735	.837	.807
	(.038)	(.030)	(.018)
Hispanics	.780	.854	.846
	(.021)	(.020)	(.014)
Asians	.922	.895	.888
	(.012)	(.015)	(.016)
		EFFECTS	
	Naïve estimate	Matching estimate 1	Matching estimate 2
Black-White	–.065	.066	.026
Difference	(.040)	(.033)	(.020)
Hispanic-White	–.021	.083	.065
Difference	(.024)	(.022)	(.017)
Asian-White	.121	.124	.107
Difference	(.015)	(.018)	(.019)

Notes. Bootstrap standard errors in parentheses.

GENDER. Table 6.4 addresses the net-female advantage in college entry. Column 1 shows a surprisingly small female advantage of only .039. Column 2, in which cognitive skill, parental education, family income, and race and ethnicity have all been balanced to the population, shows a net-female advantage of .036. Column 3 shows that balancing on preferences and perceptions has reduced the net-female advantage to just .012 (a reduction of about 66 percent).

Table 6.4. Actual and Counterfactual College Entry Rates for Males and Females. NELS88 1988–2000.

	(1) Base college entry rate	(2) Matched to Population on Cognitive skill and background	(3) Matched to Population on Preferences and Perceptions
		ENTRY RATES	
	Unadjusted entry rate	Matched entry rate 1	Matched entry rate 2
Females	.814	.813	.808
	(.011)	(.010)	(.011)
Males	.775	.777	.797
	(.012)	(.010)	(.009)
		EFFECTS	
	Naïve estimate	Matching estimate 1	Matching estimate 2
Female-Male	.039	.036	.012
difference	(.019)	(.016)	(.014)

Notes. Bootstrap standard errors in parentheses.

CONCLUSION

This chapter examined the extent to which college-encouraging preferences and perceptions can explain several empirical puzzles that have emerged in the educational attainment literature. These empirical puzzles are perhaps best expressed as questions for which as yet no good answer has been offered and empirically supported:

- *Why are females more likely to enter college than males?*
- *Conditional on family income and cognitive skill, why is parental education related to college entry?*
- *Conditional on family income and parental education, why is cognitive skill related to college entry?*
- *Conditional on cognitive skill, family income, and parental education why are blacks, Hispanics, and Asians more likely to enter college than whites?*

The results presented in this chapter suggest that college-encouraging preferences and perceptions can explain substantial portions of the empirical puzzles.

With superior measures of preferences and perceptions I suspect that even larger proportions of the puzzles could be accounted for.

Although I have presented plausible explanations for the relationships between preferences and perceptions on the one hand and cognitive skill, family background, sex, and race and ethnicity on the other, I have done little to test these explanations. Before college-encouraging preferences and perceptions can be accepted as credible explanations for the empirical puzzles it is necessary to more fully understand these relationships. Nonetheless, the findings represent a potentially important beginning to a new way of looking at many troubling findings. Certainly the findings cast doubt on the many speculative explanations that have been offered in the literature.

CHAPTER 7. CONCLUSION

I have developed a subjective rationality perspective in the Weberian social action tradition. Entering college is treated as instrumentally-rational social action intended to secure desirable labor-market outcomes. My approach is within what I call the "realistic tradition" of rational choice theory because I permit nonpecuniary costs and benefits, interpersonal variation in preferences and perceptions, and a satisficing decision rule.

This general approach has been subjected to several criticisms in the past. One criticism, often leveled by sociologists, is that rational choice theory makes unrealistic assumptions. Another criticism is that my approach is "psychological reductionism" that pays insufficient attention to social structure. A criticism often level by economists is that the introduction of satisficing and interpersonal variation in preferences and perceptions robs rational choice theory of its predictive power and invites post-hoc explanations of behavior.

In Chapter 1 I outlined what I thought were logical shortcomings of these criticisms and evidence from existing research that supports the general approach I take. Instead of repeating these counterarguments, I turn now to a summary of the results, which I believe provides the strongest support for my approach. Chapters 3 and 4 provide strong support for the existence of nonpecuniary preferences and considerable interpersonal variation in these preferences. Chapters 2 and 5 also show that perceptions vary a good deal interpersonally and that perceptions seem often to be somewhat inaccurate. For example, many adolescents appear to overestimate their ability to complete college and hold mistaken beliefs about the schooling required to enter occupations they expect.

Most importantly, Chapters 2 through 5 also provide considerable evidence that preferences and perceptions influence college entry. Chapter 2 showed that the perceived ability to complete college has strong effects on college entry. Chapter 3 demonstrated that the psychic costs of schooling affect the expectation of a four-year degree, but the effects were not as strong as might have been expected. Chapter 4 showed that occupational preferences have fairly strong effects on the expectation of a four-year degree, especially when occupational preferences are measured with occupational expectations or aspirations (rather than with job values). Chapter 5 showed that adolescents who perceive high educational requirements for the occupations they expect enter college at higher rates than those who perceive lower educational requirements.

Ignorability is always questionable, and where I have specified unidirectional causality reciprocal causality is often plausible. The estimates I present should therefore be considered provisional. This being granted, however, I think that the estimates strongly support the position that the roles played by the preferences and perceptions analyzed here are of quantitative importance in the decision to enter college.

Chapter 6 explored the possibility that college-encouraging preferences and perceptions could explain several findings in the educational attainment literature for which no reasonable explanations as yet exist. These include the findings that cognitive skill and parents' education are strongly related to college entry net of their relationship with family income, that females enter college at higher rates than males, and that blacks, Hispanics, and Asians enroll in college at higher rates than whites of comparable cognitive skill and family background. The results presented in Chapter 6 demonstrated that college-encouraging preferences and perceptions may explain considerable portions of each of these puzzles.

DIRECTIONS FOR FUTURE RESEARCH

The empirical findings presented in Chapters 2 through 6 represent a promising beginning for an empirically-oriented subjective-rationality model of educational decisions, but more research needs to be conducted to advance this type of model. In this section I propose directions for future research, which I separate into three categories: (1) research that more carefully tests various aspects of the approach empirically, (2) research that extends the approach into analysis of college-encouraging preferences and perceptions over time, and (3) research that broadens the approach advocated here to include other types of college-encouraging preferences and perceptions.

EMPIRICAL TESTS. The subjective rationality approach presented here would benefit from data designed to measure key concepts. It is probably only with data designed to measure concepts in rational choice models that we can expect credible estimation and adjudication between competing interpretations (Edling 2000). Above all, we need measures of what adolescents think college is like, measures of their attitudes toward various occupational outcomes, and what types of outcomes they would expect at various hypothetical levels of education. We also need data that can be used to establish causal ordering, especially of psychic costs and occupational preferences.

TREND ANALYSIS. The subjective rationality framework may be useful in understanding temporal changes in college entry. The last 50 years have seen large increases in college entry and changes in preferences and perceptions could underlie these trends. For example, the perceived ability to complete college may have increased. As noted in Chapter 2, a comparison of data from 1972 and 1980 suggests

that the belief that one possesses the ability to complete college increased substantially in just these eight years. Similarly, occupational preferences may have shifted. Trend analysis of female-male differences in occupational preferences may be extremely revealing. Shu and Marini (1998) compared females' occupational aspirations in 1968 and 1979 and found a narrowing of gender gaps in the prestige, earnings, and required education of occupations wanted over these years. Changes of this type could have occurred since 1979 that could explain increases in the female college entry rates relative to males. Perceived educational requirements may also have been increasing, although I know of no good data that could be used to examine this hypothesis. Lastly, psychic costs may have decreased. A movement in the 1980s towards greater course selection (the "shopping-mall" curriculum) and the longer-term movement away from rote learning may have led to a greater enjoyment of schooling.[57]

A MORE COMPLETE MODEL. Although my approach is in what I call the "realistic tradition" of rational choice, probably even more realistic models are necessary to substantially improve our understanding of the college entry decision. I have focused on the effects that a college education has on occupational outcomes, but college entry could be motivated by its effects on other outcomes. College entry could be motivated by concerns over social standing (apart from the social standing of occupations). It is easy to image, for example, that some adolescents enter college, especially selective colleges in demanding majors, to show others that they are capable

[57] The NCES datasets are an obvious source of data to study trends, especially in conjunction with Project Talent data (which was collected in the early 1960s) where uniform variables are available. Although it lacks measures of cognitive skill, *Monitoring the Future* data is also potentially very useful. The majority of MTF questions have been asked of high school seniors every year from 1976 to the present, and variables are available that could be used to measure psychic costs, academic self-concept, occupational preferences, and even (implied) perceived educational requirements.

of doing so. Adolescents may also enter college to access a promising marriage market, expand their intellectual horizons, please their parents, and so on.

Adolescents may value education for its own sake, rather than valuing education as a means to another end. In Weber's typology, pursuing postsecondary schooling could be "value-rational" rather than "instrumentally-rational" social action (1968:24). A question in the ELS02 asking how important "Getting a good education" is to respondents, is strongly related to educational expectations conditional on a host of covariates, including the importance of "Getting a good job" and "Becoming an expert at work." This is at least consistent with the idea that college is seen as a goal in itself, rather than as a means to an end.

In addressing psychic costs, I focused on academic activities narrowly defined. However, there are possibly other important types of psychic costs, some of which have been touched upon. For example, college culture is widely seen to be liberal (i.e., left-wing), secular, and hedonistic. We do not know the extent to which perceptions of, or tastes for these aspects of college culture encourage or dissuade college entry.

I can imagine a fruitful integration of "social identity" and subjective rationality perspectives. Some adolescents likely think of themselves as the type of person who enters college while others think of themselves as the type of person who does not. There are differences, at least in central tendencies, between the more and less educated. In the social sciences we focus on positive aspects of the more educated or interpret differences in a way flattering to the more educated (especially when differences are associated with desirable labor-market outcomes). Not everyone sees things this way. There are those that see abstract problem solving as completely unrelated to actual problems they might want to solve in the future. Mathematics is a prime example. This belief seems to be associated with a sense of superiority over those who engage assiduously in the solving of such problems in what is perceived to

be a mindless, conformist, and even obsequious manner. Casual observation reveals that some people think, rightly or wrongly, that nothing of value is learned at college and that college should consequently be avoiding as a waste of time, its effects on labor-market outcomes notwithstanding. I believe these feelings can have strong effects and that people are willing to incur costs to maintain their self-image.

Similarly, some adolescents appear to think of "student"—even "collegian"—as a preadult role that they seek to exit as soon as is feasible to begin what they see as their adult lives. My guess is that this attitude is more common among males, which could explain part of the net-female advantage in college entry. Just as some adolescents are eager to take on adult roles, other adolescents may be reluctant to take them on. College may also be a postponement of decisions that some adolescents are not yet prepared to make.

POLICY IMPLICATIONS

The Wisconsin Model argued that expectations are the proximate cause of educational attainment. This led to early proposals that educational attainment could be manipulated by manipulating students' expectations. How does one raise expectations? The Wisconsin Model only suggests that this can be done by manipulating significant others' expectations.

My subjective rationality approach suggests that educational attainment can be manipulated by manipulating preferences and perceptions. This is more instructive than to argue that expectations should be increased because it gives more direction on specifically what should be manipulated and it gives a wider menu of alternatives for manipulating educational attainment. As I have mentioned in the previous chapters, the subjective rationality framework suggests that college entry rates can be increased by increasing adolescents' confidence that they can complete college, decreasing the

perceived psychic costs of college, changing adolescents' occupational preferences in such a way that makes them want more education, and increasing the level of education adolescents perceive to be necessary to enter occupations they expect.

There are multiple ways these ends can be accomplished. The perceived ability to complete college can be increased by increasing academic self-concept or by decreasing how challenging adolescents believe college will be. Occupational preferences that lead to higher college entry rates can result from fostering different standards or higher standards for evaluating an occupation's desirability or acceptability. The education students believe is required to enter occupations they expect can be increased by increasing how much education they believe current incumbents possess or by increasing how much they think educational requirements will rise by the time they attempt to enter the occupation. Psychic costs can be lowered by increasing the intrinsic value of academic activities (like reading and abstract problem solving) or by decreasing the psychic costs adolescents predict college will entail.

What is more, with the possible exception of occupational preferences, the perceptions and preferences considered here are likely somewhat more manipulable than significant others' expectations. This is especially true for perceptions, which can be changed by simply providing information to adolescents that they find credible. Certainly these perceptions are more manipulable than the exogenous variables whose effects they appear to mediate, such as cognitive skill.

APPENDIX A

STEP-BY-STEP DESCRIPTION OF ESTIMATION OF AVERAGE TREATMENT EFFECTS FOR MANY-VALUED TREATMENTS

Chapter 1 addressed estimation of the average treatment effect for the treated (ATT) of a binary treatment variable *D*. In Chapter 2 I am estimating the average treatment effect (ATE) of the perceived ability to complete college, which has four categories, known as "treatment states." Thus, this example is different in two ways from the example in Chapter 1.

First consider the issue of estimating ATE instead of ATT with a binary treatment variable. To estimate average treatment effects for the treated (ATT) with a binary treatment variable, one subsample in the dataset (the control group) is weighted to be balanced to another, mutually exclusive subsample in the dataset (the treatment group). Models are estimated that predict membership in one or the other of these two groups. When estimating ATE we want to balance each subsample—not to another subsample—but to the entire sample. Naturally, each subsample and the entire sample are not mutually exclusive. However, it is convenient to think of the subsample and the entire sample as mutually exclusive and to actually create these conditions with the data.

This is done by appending the dataset to itself. (Although it is not what I have done, this can be visualized as opening the dataset and then pasting another identical copy of the dataset beneath it in a spreadsheet.) I generate a dichotomous variable *P* (for "population," even though I am dealing with a sample), which equals one for the appended dataset and zero otherwise. With this dataset, it is straightforward to estimate ATE using the steps outlined in Chapter 1.

Step one: Estimate the probability of selection into the population. Begin with the control group. When considering the control group, the sample is limited to the appended dataset (P=1) and respondents from the original dataset in the control group (P=0, D=0). I first model the treatment selection mechanism with a logistic regression model. Using the sampling weights supplied with the data (*wgt*), I regress P on cognitive skill, grades, time spent on homework, mother's aspirations, track placement, family income, parental education, and dummy variables for gender and race and ethnicity. These regressors are represented collectively here as X. From the results of this model I estimate the probability of selection into the population (P=1), again using the sampling weights:

$$\Pr(P = 1 \mid X)^{wgt}$$

Recall that the superscripted *wgt* indicates that the variable *wgt* is used as a sampling weight.

Step two: Generate balancing weights. For each respondent i in the control group, I generate an "adjustment factor" $f_{1,D=0}$, which is the odds of that respondent being in the population (as opposed to in the control group):

$$f_{1,D=0} = odds(P = 1 \mid X)^{wgt}$$

For the adjustment factor $f_{1,\,D=0}$, the subscript 1 indicates that I am performing the first iteration of the weighting routine; the subscript D=0 denotes the control group. These adjustment factors are then multiplied by the sampling weight variable

wgt to generate a new sampling weight variable $wgt1_{D=0}$ that is intended to balance the pretreatment variables in the control group to the entire sample:

$$wgt1_{D=0} = wgt \cdot f_{1,D=0}$$

These new sampling weights are then used as sampling weights for those in the control group. The population retains its original sampling weights.

I then iterate through these steps to improve balance (i.e., to make the distributions of the pretreatment variables in the control group more like the distributions in the entire sample). For the next iteration I use the sampling weights I just created—$wgt1_{D=0}$—to create a new set of sampling weights $wgt2_{D=0}$. For example, when I model the treatment selection mechanism I use the sampling weight $wgt1_{D=0}$, and I use the sampling weight $wgt1_{D=0}$ when I generate the probability of selection into the population:

$$\Pr(B = 1 \mid Cog, Epar, Inc)^{wgt1_{D=0}}$$

and when I generate then new weighting variable:

$$wgt2_{D=0} = wgt1_{D=0} \cdot f_{2,D=0}$$

Now $wgt2_{D=0}$ is used as a sampling weight to balance the control group to the population. I perform 10 iterations and generate a final weighting variable $wgt10_{D=0}$.

To balance the treatment group to the population the same steps are performed with the treatment group substituted for the control group. The average treatment

effect is estimated as the difference in the outcome, which is college entry in this example, across the treatment and control groups using the appropriate weights:

$$\delta_{ATE} = E[Y \mid D = 1]^{wgt10_{D=1}} - E[Y \mid D = 0]^{wgt10_{D=0}}$$

Moving from a binary treatment variable to a treatment variable with more than two alternative treatment states is fairly straightforward. With a binary treatment variable I would have to go through the steps twice: once for the controls and once for the treated. For a treatment variable with J treatment states (where $J>2$) the steps must be performed J times, once for each alternative treatment state. In the present example, there are four categories of perceived ability to complete college: "Definitely not/I doubt it"; "Not sure"; "Yes, probably"; and "Yes, definitely."

Once these steps have been performed for each of the alternative treatment groups, the average treatment effects of moving from one treatment state to another can be estimated as the difference in entry rates between the treatment groups. I have focused in the text on the effects of moving from one perceived ability level to a level of perceived ability directly adjacent to it, but it is possible to estimate any contrast.

APPENDIX B

DESCRIPTION OF THE NATIONAL LONGITUDINAL SURVEY OF YOUNG MEN, 1966

The *National Longitudinal Survey of Young Men, 1966* (hereafter, NLSYM66) is a household survey of civilian, noninstitutionalized males in the United States aged 14 to 24 in 1966. The NLSYM66 administers a test battery known as the *Knowledge of the World of Work* (hereafter, KWW). Ten of the items ask respondents how much education they believe typical incumbents of ten occupations possess. The mean of the responses to these 10 questions is used to measure respondents' beliefs about the education requirements of occupations.

Occupational knowledge is measured as the total score on all items in the KWW section of the 1966 questionnaire. The NLSYM66 also includes respondents' occupational aspirations for age 30, coded in the 1960 COC. I generate values for the actual educational requirements for these occupations with data from the 1960 Census. Family background is measured with both parental education and the socioeconomic status of the occupation of the household head. A test of cognitive skill is not administered to respondents for the NLSYM66. However, results of aptitude and achievement tests submitted by respondents' high schools are available for the majority of respondents. Table B.1 presents further description of the variables and their means and standard deviations.

The sample is limited to respondents aged 18 or younger at the time of the 1966 interview who believed that their chances of entering the occupation they aspired to were either "Excellent," "Good," or "Fair" (those thinking their chances are "Poor" are dropped from the analysis because their responses cannot reasonably be considered to be expectations). Missing values for independent variables are imputed using

Stata's best-subset imputation command "impute." The resulting sample size is N=1,439.

Table B.1. Variables Used in the Analysis. NLSYM66.

Variable	Description and NLSYM66 Variable Names	Mean	Stand. Dev.
Occupational aspiration	Mean highest grade completed among incumbents of the occupation respondents aspire to. (R0032900)	12.75	2.86
Perceived educational requirements	Mean educational attainment believed to be held by typical incumbents in the occupations in the Knowledge of the World of Work test	13.69	.70
White	Student is white (yes=1). (R0002300)	.79	.41
Black	Student is black (yes=1). (R0002300)	.12	.33
Hispanic	Student is Hispanic (yes=1). (R0002300)	.08	.27
Other Race/ethnicity	Nonwhite, nonblack (yes=1). (R0002300)	.01	.08
Socioeconomic status head of family	Duncan index of father's occupation when the respondent was 14 years old (R0062550). Missing values are filled in with SEI of fathers' occupation in the last 12 months (R0063090). Remaining missing values are filled in with the SEI of mother's occupation in the last 12 months (R0063290).	37.24	24.44
Parental education	Education of the most educated parent, or the education of either parent if education is missing for the other (Father R0063100; Mother R0063300)	11.70	2.99
Cognitive skill	Scores from a variety of aptitude/achievement tests administered by respondents' schools. (R0171100)	104.19	14.39
Age	Age in the 1966 interview (R0002200)	15.92	1.38
Occupational knowledge	Score on the Knowledge of the World of Work test items. (R0061900)	33.06	7.19

Notes. Imputed values included. Statistics calculated using 1966 sampling weights (R0000200).

APPENDIX C

THE AMERICAN COMMUNITY SURVEY

The 2003 *American Community Survey* (hereafter, ACS) is used to generate the educational profile of incumbents of the occupational categories used in the NELS88 occupational expectation question. Most respondents were about 18 in the second follow-up (1992), so 2004 data would be more appropriate. However, the educational attainment question in the 2003 data is closer to the NELS88 question on perceived education requirements because it includes a category "Vocational, Technical, or Business School Degree," which is not in the 2004 ACS. The ACS sample was limited to respondents aged 28 to 35. Using only respondents who were 30 years old resulted in an insufficient sample size, and exploratory analysis revealed no relationship between age and educational attainment within occupation categories in the 28 to 35 age range.

To generate coarse occupational categories in the ACS that are similar to the occupational expectation categories used in the NELS88 I selected groups of occupations from the ACS that I believed were fairly representative of the occupations in the NELS88 categories. Sometimes this meant taking all occupations from the ACS of a certain general type (e.g., all sales occupations in the ACS are used for the category "Sales" in the NELS88), while at other times this meant selecting specific occupations, often from different broad categories, to generate a representative group of occupations. I selected occupations for the NELS88 category "Laborer" in this way. Table C.1 presents the occupational crosswalk.

I slightly modified both the NELS88 perceived educational requirement and the ACS education attainment classifications into a third classification system that is fairly uniform across the two surveys. Table C.2 presents the educational crosswalk.

Table C.1. Uniform Occupation Categories for the NELS88 and 2003 American Community Survey.

NELS88	2003 American Community Survey
1. Office Worker	All Office occupations (5000–5930)
2. Tradesperson	First-line supervisors/managers of construction trades (6200), Carpenters (6230), Carpet, floor, and tile installers and finishers (6240), Cement masons (6250), Electricians (6350), Glaziers (6360), Painters, construction, and maintenance (6420), Paperhangers (6430), Pipelayers, plumbers, pipefitters, and steamfitters (6440), Plasterers and stucco masons (6460), Construction and building inspectors (6660), Elevator installers and repairers (6700), Repair occupations (7000–7560), Other installation, maintenance, and repair workers (7620), Bakers (7800), Cabinetmakers and bench carpenters (8500), Jewelers and precious stone and metal workers (8750)
3. Farmer	All farming occupations (6000–6130)
4. Full-Time Homemaker	N/A
5. Laborer	Construction laborers (6260), Insulation workers (6400), Reinforcing iron and rebar workers (6500), Roofers (6510), Sheet metal workers (6520), Helpers, construction trades (6600), Fence erectors (6710), Hazardous materials removal workers (6720), Highway maintenance workers (6730), Miscellaneous construction workers, except septic (6760), Misc. extraction workers, including roof bolters (6940), Helpers, installation, maintenance, and repair workers (7610), Helpers, production workers (8950)
6. Manager	All managerial occupations (10–430)
7. Military	All military occupations (9810–9830)
8. Machine Operator	Paving, surfacing, and tamping equipment operators (6300), 6320, 6740, 6800, 6820, 6830, 6840, 7710, 7720, 7830, 7840–8460, 8530–8600, 8620–8740, 8800–8940, 9000–9310
9. Professional I	800, 1200, 1230, 1300–1530, 3130–3240
10. Professional II	2040, 2100, 2110, 2200, 3000–3060, 3120, 3250, 3260
11. Small Business Owner	N/A
12. Protective Service	All protective service occupations (3700–3950)
13. Sales	All sales occupations (4700–4960)
14. Teacher	All nonpostsecondary teachers (2300–2340)
15. Service Worker	3600–3640, 4020–4650
16. Technical Worker	1540, 1550, 1560, 1900–1960, 3110, 3300–3540, 8760
17. No Plans to Work	N/A
18. Other	N/A
19. Will be in School	N/A

Table C.2. Uniform Education Categories for the NELS88 and 2003 American Community Survey.

NELS88	2003 American Community Survey	Uniform Category	Uniform Highest Grade Completed
0. No high school	1–8. No schooling completed to 12th grade, no diploma	1. Less than high school	10
1. Some high school			
2. High school diploma	9. High school graduate	2. High school graduate	12
3. <2 Years of vocational, trade, or business school			
4. 2+ Years of Voc/Trade/Business School	11. Voc/Tech/Business Degree	3. Voc/Tech/Business Degree	14
5. Degree from a Voc/Trade/Business School			
6. Some college education	10. Some college, but no degree	4. Some college	14
7. 2-Year college degree	12. Associate degree	5. Associate degree	14
8. 4- or 5-year college degree	13. Bachelor's degree	6. Bachelor's degree	16
9. Graduate degree (Master's or PhD)	14. Master's degree	7. Graduate degree	19
	16. Doctorate degree		
10. Professional degree	15. Professional degree	8. Professional degree	20

Note. The education question in the NELS88 is Q65 in the 2nd Round Student Questionnaire, which asks students "How much education do you think you need to get the job you expect or plan to have when you are 30 years old?"

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