Chapter 4

Who Are the GEDs?

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Contents

4.1   A New Breed of GED

The first cohort of exam-certified high school equivalents were World War II veterans who had been trained and disciplined in the armed forces. After the war, they were welcomed home as heroes. Many had left high school to serve their country, and the early high school equivalency program helped reintegrate them into society. Given their training and discipline, it is not surprising that the veterans who were able to pass the exam were relatively successful later in life, often performing as well in college as high school graduates.[1]

The modern GED program does not target war heroes; modern GED recipients leave high school for very different reasons. Figure 4.1 displays self-reported reasons for dropping out of high school for GED recipients and other dropouts based on evidence from two longitudinal data sets.[2] For each demographic group, it shows the proportion reporting the indicated reason for dropping out of school for both dropouts and GED recipients. Responses are mutually exclusive in the top panel but are not mutually exclusive in the bottom panel. A black dot indicates whether the means are statistically significantly different from each other, comparing GEDs and other dropouts. The "⊢⊣" represents standard error bars for each mean.

Today, GED recipients leave school for reasons similar to other dropouts: Figure 4.1 shows that many GED recipients leave school because they are expelled, lack ability, or dislike school. Many female GEDs drop out due to pregnancy.[3,4] GEDs tend to dislike school less than dropouts. Male GEDs are more likely to report the desire to work as their

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[1]See the discussion in Chapter 2 about the performance of exam-certified veterans in college. Atkinson (1949) reports that veterans outperformed nonveterans due to their higher levels of maturity and motivation. Gowan (1949) reports that exam-certified veterans performed better than nonveterans, despite having lower grades in high school. For a contrasting view, see D'Amico (1953), who found that the exam-certified veterans had lower grades and higher attrition rates from college.
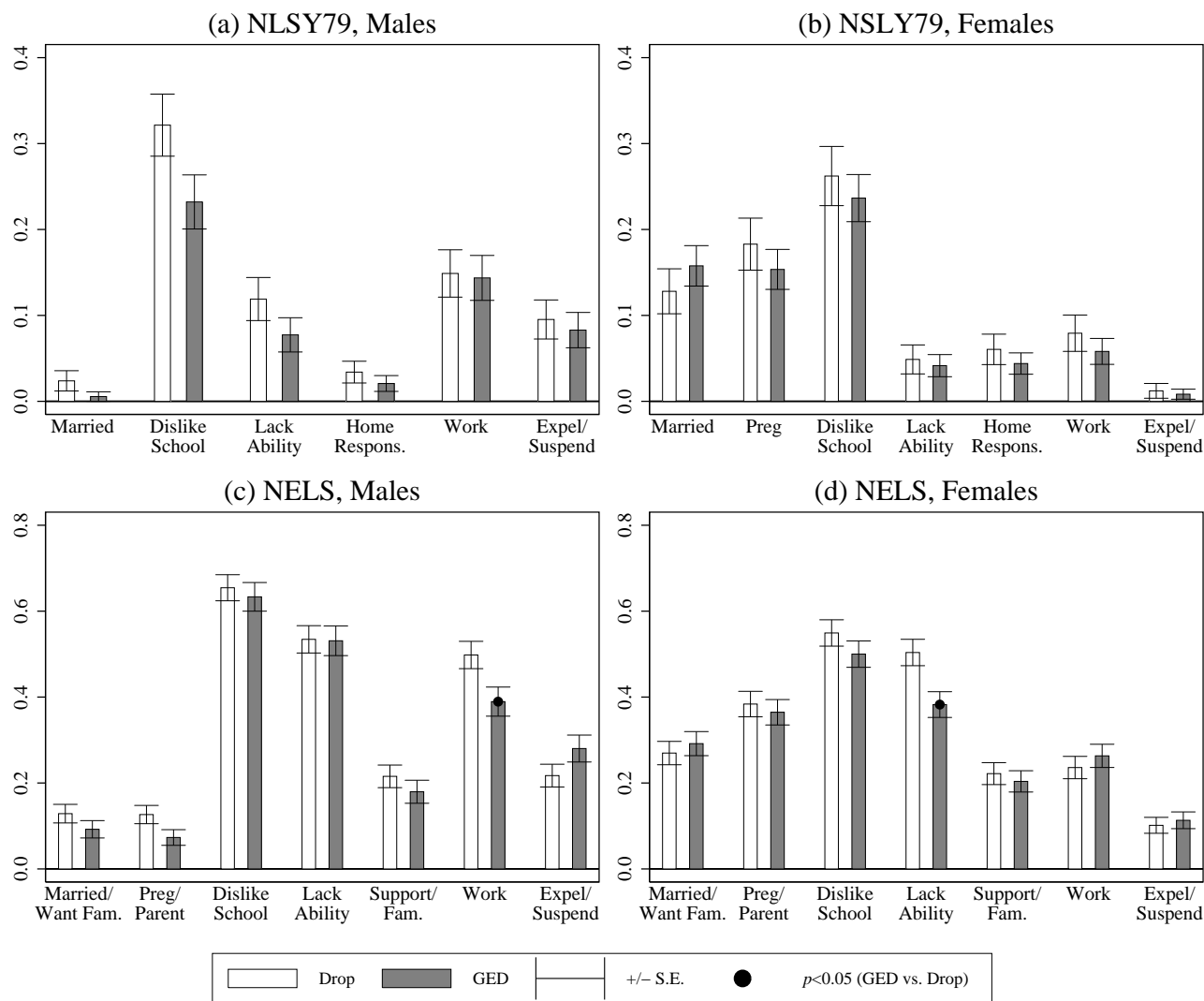
[2]The National Longitudinal Survey of Youth 1979 (NLSY79) and the National Educational Longitudinal Survey (NELS). For a detailed description of these data sets, see Web Appendix Sections W5.1.1.1 and W5.1.1.8. The Web Appendix mentioned in this note and subsequent notes is found at `http://jenni.uchicago.edu/Studies_of_GED`.

[3]See Chapter 3 for a discussion of trends in average age at which recipients take the test.

[4]The reasons for dropping out from the NELS data have been aggregated to similar categories in the NLSY79 data. Figures A4.1–A4.8 in the Web Appendix show similar figures by race and final levels of postsecondary education.

reason for leaving school, and female GEDs are less likely to report that they lack ability compared to other female dropouts.

Figure 4.1 Reasons for Leaving School

This chapter shows that the GED recipients of today are as smart as high school graduates who do not attend college but lack a variety of character skills. During adolescence, GED recipients are as likely as, or even more likely than, other dropouts to take drugs, exhibit violent behavior, participate in criminal activities, and have sex at a young age. Their behavioral problems start at early ages. As a group, they have disadvantaged backgrounds. These patterns are found in four major data sets that span different cohorts.

People and their circumstances can change. Measures of adolescent behaviors and skills might miss important changes in skills or circumstances that occur after people drop out of school. We do not have direct measures of skills over the life cycle. As a partial substitute, we explore which life events coincide with GED certification. Male GED recipients often certify during spells of recent joblessness.[5] Females who do not work after dropping out are much less likely to certify. As Figure 4.1 shows, about half of female dropouts leave high school due to pregnancy or marriage. These women tend to have better adolescent behaviors and to complete more grades of school than noncertifying dropouts. It is likely that some of them would have graduated from high school had they not become pregnant. They tend to earn their GED certificate at the age where their youngest child is between 2 and 3, typically when their children enter day care or school.

Our study of GED recipients shows that graduation from high school depends on skills not captured by standardized achievement tests.[6] In many aspects of character, GED recipients are not equivalent to high school graduates. The main message from this chapter, and indeed this book, is that achievement tests fail to capture important character skills. Chapters 5 and 9, and an entire recent literature, show how important these skills are for success in life.[7]

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[5]This is reminiscent of the "Ashenfelter's dip" associated with participation in job training programs. See, for example, Ashenfelter (1978), Heckman and Robb (1985), and Heckman et al. (1999) for discussions of this empirical regularity.

[6]See Heckman and Rubinstein (2001) for an early discussion of this finding.

[7]See the surveys in Borghans et al. (2008a) and Almlund et al. (2011).

4.2   GEDs Have Greater Cognitive Ability than Other Dropouts

The GED exam is an achievement test. Thus, it is not surprising that GED recipients perform better than other dropouts on a variety of other achievement tests.[8] Figure 4.2 shows mean test scores on other achievement tests besides the GED for the achievement tests noted at the bottom of each figure.[9] The top panels show scores for the entire population of GEDs, including those who eventually attend college. The bottom panels show scores for the population that never attends college.[10]

Figure 4.2 presents results from a series of pairwise tests of differences in means using a 5% significance level. As before, a black dot represents a statistically significant difference in the means between GEDs and dropouts. White diamonds represent a statistically significant difference between high school graduates and dropouts. A white circle represents a statistically significant difference between GEDs and high school graduates.

In the top panels of Figure 4.2 (which include people who attend college), both male and female GED recipients have higher test scores than other dropouts but lower scores than high school graduates. The GED allows recipients to enroll in college. Those who enroll differ from those who do not. However, as noted in Chapter 1 and as discussed further in Chapter 5,

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[8]See Table 1.2 in Chapter 1. See the data description section in the Web Appendix for more details on these tests. Table A4.1 describes these tests. Figures A4.10–A4.13 show similar figures by race. We use the Armed Forces Qualifying Test (AFQT) from the National Longitudinal Survey of Youth 1979 (NLSY79) and National Longitudinal Survey of Youth 1997 (NLSY97), the Peabody Individual Achievement Test (PIAT) from the NLSY97, and the eighth-grade subject tests from the National Education Longitudinal Study (NELS). For more details on these data sets, see Section W5.1.1 of the Web Appendix.

[9]Scores are reported in terms of units of population standard errors.

[10]Test scores for the NLSY79 and NLSY97 are adjusted to a common baseline level of schooling, accounting for the effects of schooling at the time the test is taken. When the AFQT was administered, the surveyed individuals were of different ages and had acquired different levels of schooling. These differences affect their measured performance. In order to make valid comparisons of academic ability, we adjust individual scores to account for the level of schooling at the time the test is taken. This adjustment controls for final educational attainment using procedures developed in Hansen et al. (2004), Carneiro et al. (2005), and Heckman et al. (2011) that account for selection into schooling based on unobserved ability. This adjustment enables us to make comparisons of latent cognitive ability between dropouts, GED recipients, and high school graduates at a common baseline level of schooling. See Section A4.2.2 in the Web Appendix for a detailed description of the method. The adjustments do not change any conclusions of our analyses.

only 40% of GED recipients pursue any postsecondary education. Most GED recipients who attend some college stay for less than one year.[11,12] The bottom panels of Figure 4.2 show that GED recipients and high school graduates who do not attend postsecondary education have very similar test scores.[13] We cannot reject the hypothesis of equality of mean test scores for GEDs and high school graduates who do not attend any postsecondary education. Passing the GED exam is a good predictor of the cognitive ability measured by achievement tests.

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[11]A few dropouts attain some postsecondary education. Some postsecondary institutions do not require a high school diploma or GED certificate to attend. Chapter 5 presents a detailed analysis of educational attainment for each of these groups.

[12]Despite their lack of success in college, GED recipients who attempt college might be more able or ambitious than dropouts who do not.

[13]An exception is the NELS math test for males, where high school graduates have higher scores.

Figure 4.2 Cognitive Ability Tests
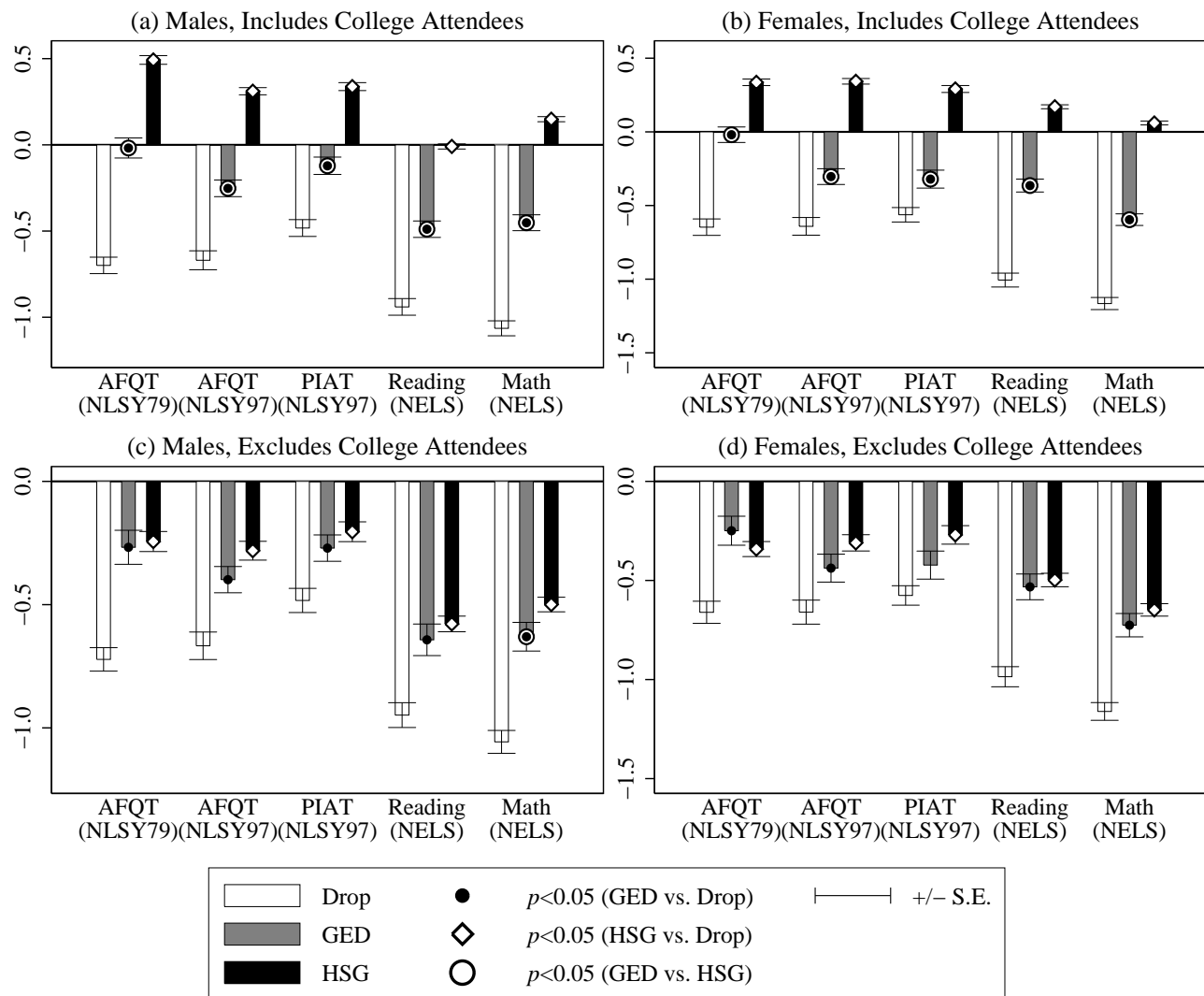
Sources: National Longitudinal Survey of Youth 1979 (NLSY79); National Longitudinal Survey of Youth 1997 (NLSY97); National Educational Longitudinal Survey (NELS).
Notes: The AFQT test was administered to the NLSY79 in 1980 when individuals were age 15 to 22. The AFQT was administered to the NLSY97 when individuals were age 12 to 16. The NELS subject tests were administered in eighth grade. NLSY79 and NLSY97 AFQT scores are adjusted for years of schooling at the time of the test as described in the Web Appendix Section A4.2.2. The "Excludes College Attendees" sample consists of individuals who never attended a two- or four-year college.

Figure 4.2 presents mean achievement test scores by educational level. A focus on means can be misleading. It is possible that the distributions are skewed so that only a select group of GED recipients have higher cognitive ability than dropouts. Figure 4.3, taken from the analysis of Heckman et al. (2011), shows that GED recipients and high school graduates

who do not go on to postsecondary education have almost identical distributions of cognitive

ability.[14,15]

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[14]See Heckman et al. (2006) for a similar analysis.

[15]The patterns are similar across all races in both the NLSY79 and National Adult Literacy Survey (NALS) data. An exception is that black female GED recipients have cognitive ability more similar to dropouts in the NLSY79. See Figures A4.14–A4.15 in the Web Appendix.

Figure 4.3 Distribution of Cognitive Skill by Education Group
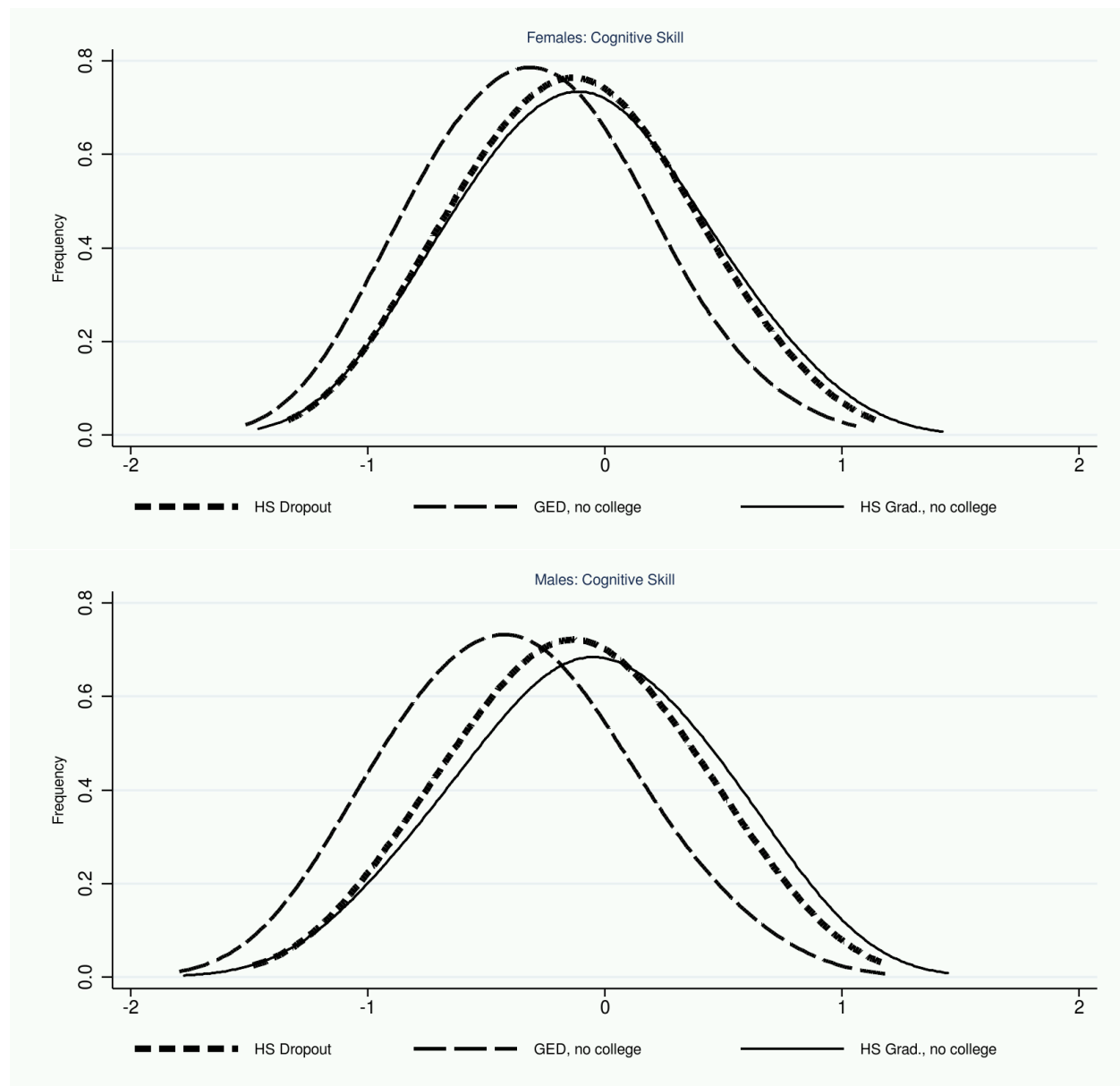
Source: Reproduced from Heckman et al. (2011), which uses data from the National Longitudinal Survey of Youth 1979 (NLSY79).

Notes: The distributions above represent cognitive factors, estimated using a subset of the Armed Services Vocational Aptitude Battery (ASVAB), and educational attainment, as laid out in Hansen et al. (2004). The sample is restricted to the cross-sectional subsample for both males and females. Distributions show only those with no postsecondary educational attainment. The cognitive factors are normalized by gender to be mean zero, standard deviation one.

4.3   GEDs Lack Character Skills

If GED recipients have the same cognitive ability as high school graduates who do not attend college, what explains their lower educational attainment? Standardized achievement scores capture only some of the skills required for success in school. Completing high school requires other skills such as self-control, persistence, focus, and determination.

Personality psychologists have long studied character skills. Almlund et al. (2011) and Borghans et al. (2008b) discuss the evidence on the predictive power of "noncognitive" skills, sometimes called character or personality skills. For many outcomes, personality measures are as predictive or more predictive than cognitive measures.[16] GED recipients manifest behaviors indicating their lack of basic character skills.

Figure 4.4 shows standardized personality measures, including self-esteem (a degree of approval or disapproval toward oneself),[17] locus of control (the extent to which people feel that they have control of their lives),[18] and self-concept (a person's self-perceptions or how a person feels about himself)[19] for dropouts, GED recipients, and high school graduates.[20] On these measures, GED recipients are intermediate between high school graduates and dropouts. These differences are statistically significant.

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[16]See Almlund et al. (2011) and Borghans et al. (2008b) for histories of personality psychology and a review of some trait taxonomies and their predictive power.

[17]See Rosenberg (1965) for a detailed description of this test.

[18]See Rotter (1966) for a detailed description.

[19]See Weinberg and Abramowitz (2002) for a detailed description.

[20]Tables A4.2–A4.5 in the Web Appendix provide the survey questions used to construct the measures. Figures A4.16–A4.23 show similar figures by race and levels of postsecondary education.

Figure 4.4 Personality
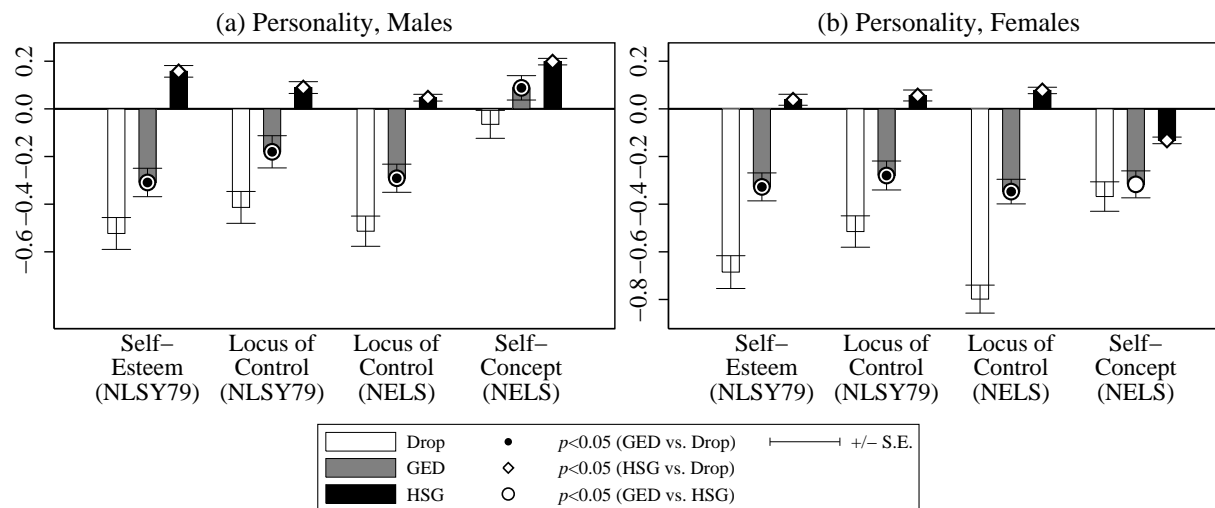
Sources: National Longitudinal Survey of Youth 1979 (NLSY79); National Educational Longitudinal Survey (NELS).

Personality is multifaceted. The measures used in Figure 4.4 represent only a portion of the full array of measures discussed in personality psychology.[21] Another source of information on character uses behaviors to capture the character skills of adolescents.[22] We examine a host of risky and school-related behaviors measured in the adolescent years as a way to capture differences in personality skills among GED recipients, other dropouts, and high school graduates. As noted in Almlund et al. (2011), all psychological measures are assessments on some task. Some tasks are tests; other tasks are behaviors. The distinction made by psychologists and some economists between test-based measures of skills and measured behaviors is arbitrary.[23]

Figures 4.5 and 4.6 show measures of early adolescent risky behavior across education categories, including drug use, smoking, criminal activity, and violent behavior.[24] GED recipients engage in risky behaviors as much as, or, in many cases, more than, other dropouts. As an exception, female GED recipients are less likely to have been in a fight or committed a

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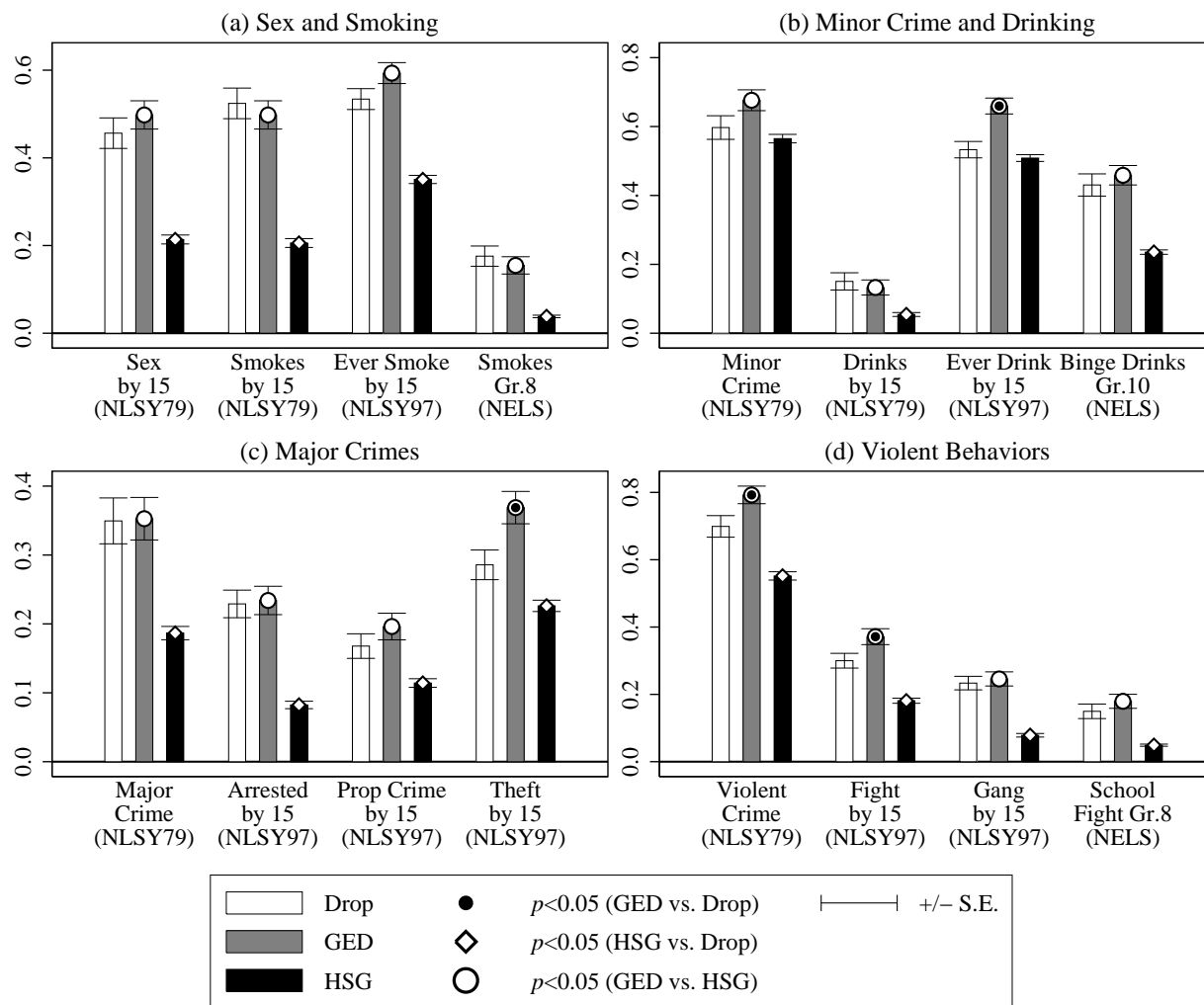[21]See Almlund et al. (2011).

[22]See Almlund et al. (2011) Heckman et al. (2011) and Heckman and Kautz (2012).

[23]See our discussion in Chapter 9, in Almlund et al. (2011), and in Heckman et al. (2011).

[24]Figures A4.24–A4.39 in the Web Appendix show similar graphs across race and postsecondary education.

violent crime. In all cases, high school graduates are less likely to engage in these behaviors compared to both GED recipients and high school dropouts.
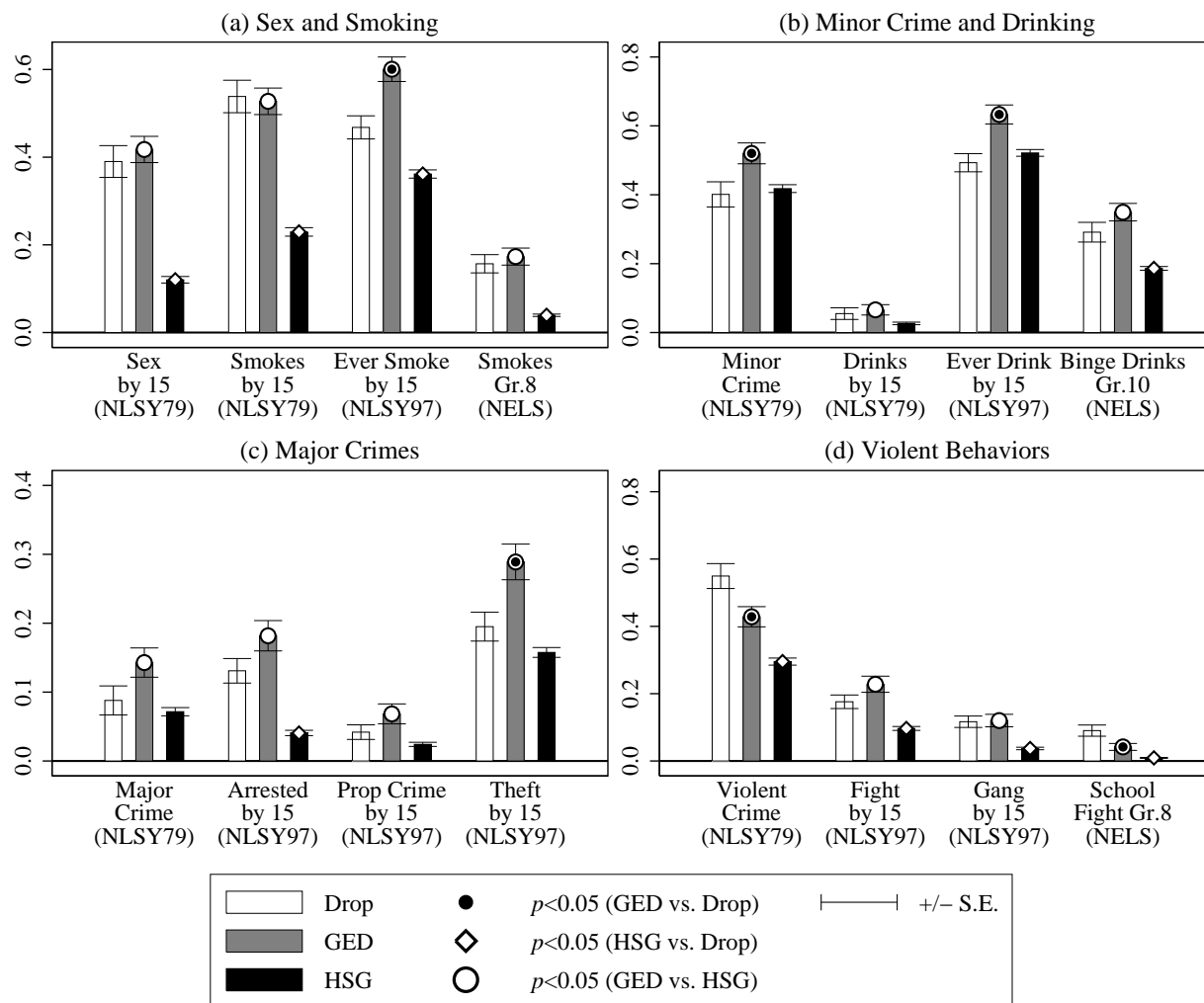
Figure 4.5 Risky Behaviors (Males)

Figure 4.6 Risky Behaviors (Females)

(a) Sex and Smoking

(b) Minor Crime and Drinking

(c) Major Crimes

(d) Violent Behaviors

Sources: National Longitudinal Survey of Youth 1979 (NLSY79); National Longitudinal Survey of Youth 1997 (NLSY97); National Educational Longitudinal Survey (NELS).

Variable Definitions: Drinks by 15—Whether the respondent used to drink on a regular basis—at least once or twice per month by age 15; Ever Drink by 15—Whether the respondent ever drank alcohol by age 15; Binge Drinks Gr. 10—Whether the respondent had at least 5 drinks in a row within the past two weeks in 10th grade; Sex by 15—Whether the respondent had sexual intercourse by age 15; Smokes by 15—Whether the respondent smoked more than 100 cigarettes in her life and smoked daily by age 15; Ever Smoke by 15—Whether the respondent smoked an entire cigarette by age 15; Smokes Gr. 8— Whether the respondent smoked daily in 8th grade; Minor Crime—Whether the respondent was involved at least once in one of the following: vandalism, shoplifting, petty theft, fraud, and holding or selling stolen goods; Major Crime—Whether the respondent was involved at least once in one of the following: auto theft, breaking/entering private property, and grand theft; Violent Crime—Whether the respondent was involved at least once in one of the following: fighting at work or school, assault and battery, and aggravated assault.

There are substantial differences among the different attainment groups. Figure 4.7 shows a number of school-related behaviors for dropouts, GED recipients, and high school

graduates.[25]   Across many measures of performance in school, GED recipients tend to do worse than high school graduates and are much more similar to dropouts. GED recipients and dropouts are very similar in terms of GPA, days absent, credits earned by ninth grade, and remedial class placement. The primary difference between GED recipients and other dropouts is that GEDs, on average, complete more grades of high school. It is not surprising that GED recipients have grades similar to those of other dropouts because grades depend on character skills more strongly than achievement tests.[26]

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[25]Figures A4.40–A4.47 in the Web Appendix show similar graphs across race and postsecondary education.
[26]See, for example, Duckworth and Seligman (2005), Almlund et al. (2011), and Borghans et al. (2011).

Figure 4.7 School-Related Behaviors
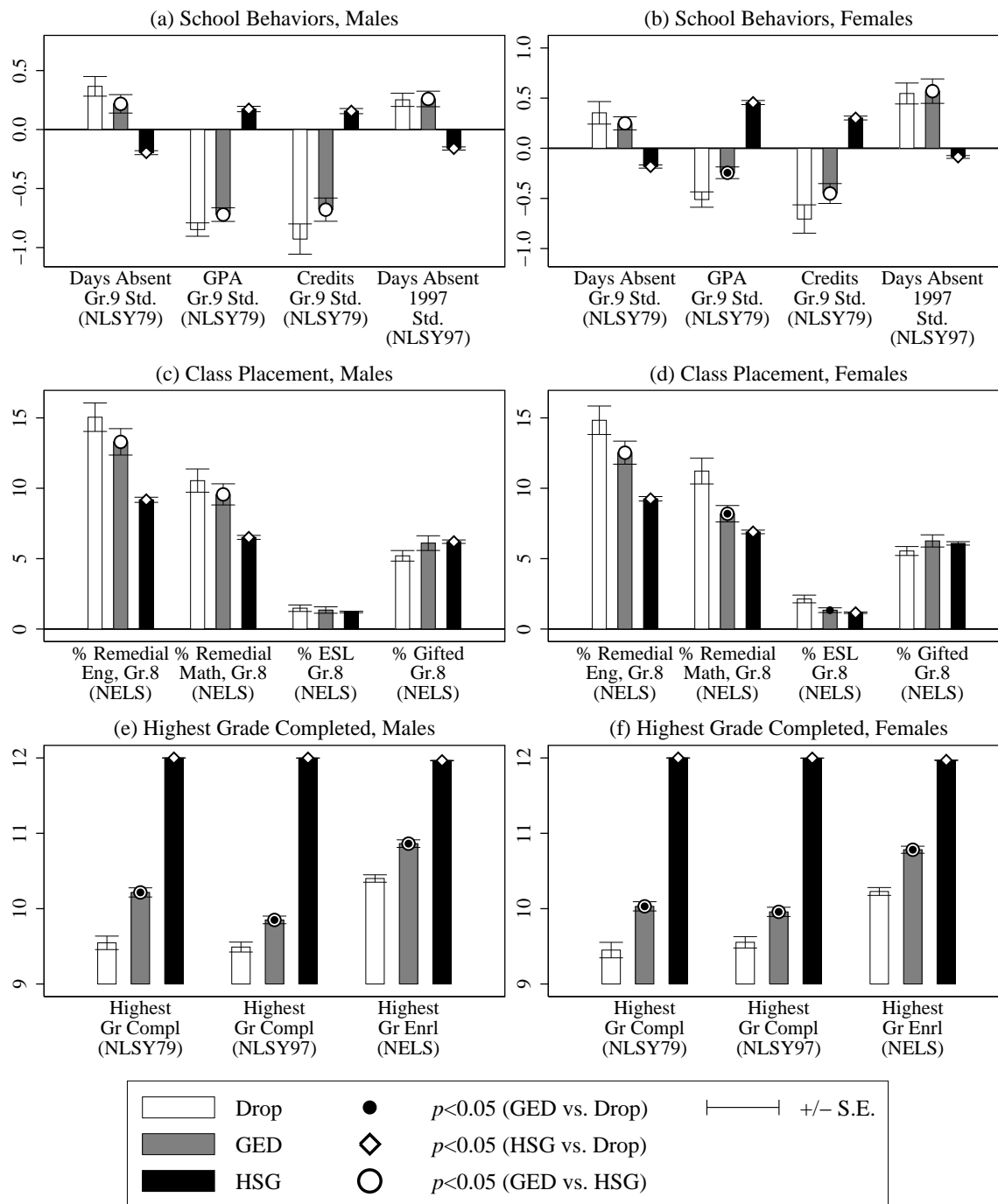
Variable Definitions: Days of Absence—The number of days that the student was absent during 9th grade in the NLSY79 and the number of days that the student was absent during the fall semester of 1997 in the NLSY97; GPA was calculated based on credits and grades earned in 9th grade; Credits Gr. 9—Cumulative number of credits obtained in 9th grade; Remedial English, Gr. 8—Percent of students in the remedial reading program in 8th grade; Remedial Math, Gr. 8—Percent of students in the remedial math program in 8th grade; ESL Gr. 8—Percent of students in English as a Second Language (ESL) training in 8th grade; Gifted Gr. 8—Percent of students in gifted and talented education in grade 8; Highest Grade Completed—Highest grade the respondent completed in elementary and secondary school.
Note: Days absent, GPA, and Credits have been normalized to have a mean of zero and a standard deviation of one.

Figure 4.8 shows differences in the distributions of character skills for dropouts, GEDs, and high school graduates who never attend college. This is the character counterpart of the distributions of cognitive ability displayed in Figure 4.3. GED recipients have the same level of cognitive ability as high school graduates who do not go on to college, but they have the same low levels of character skills as dropouts. Inadvertently, the GED test developed by the American Council of Education (ACE) is a powerful instrument for identifying relatively smart people who, on average, have the same character deficits as dropouts.

Figure 4.8 Distribution of Character Skills by Education Group
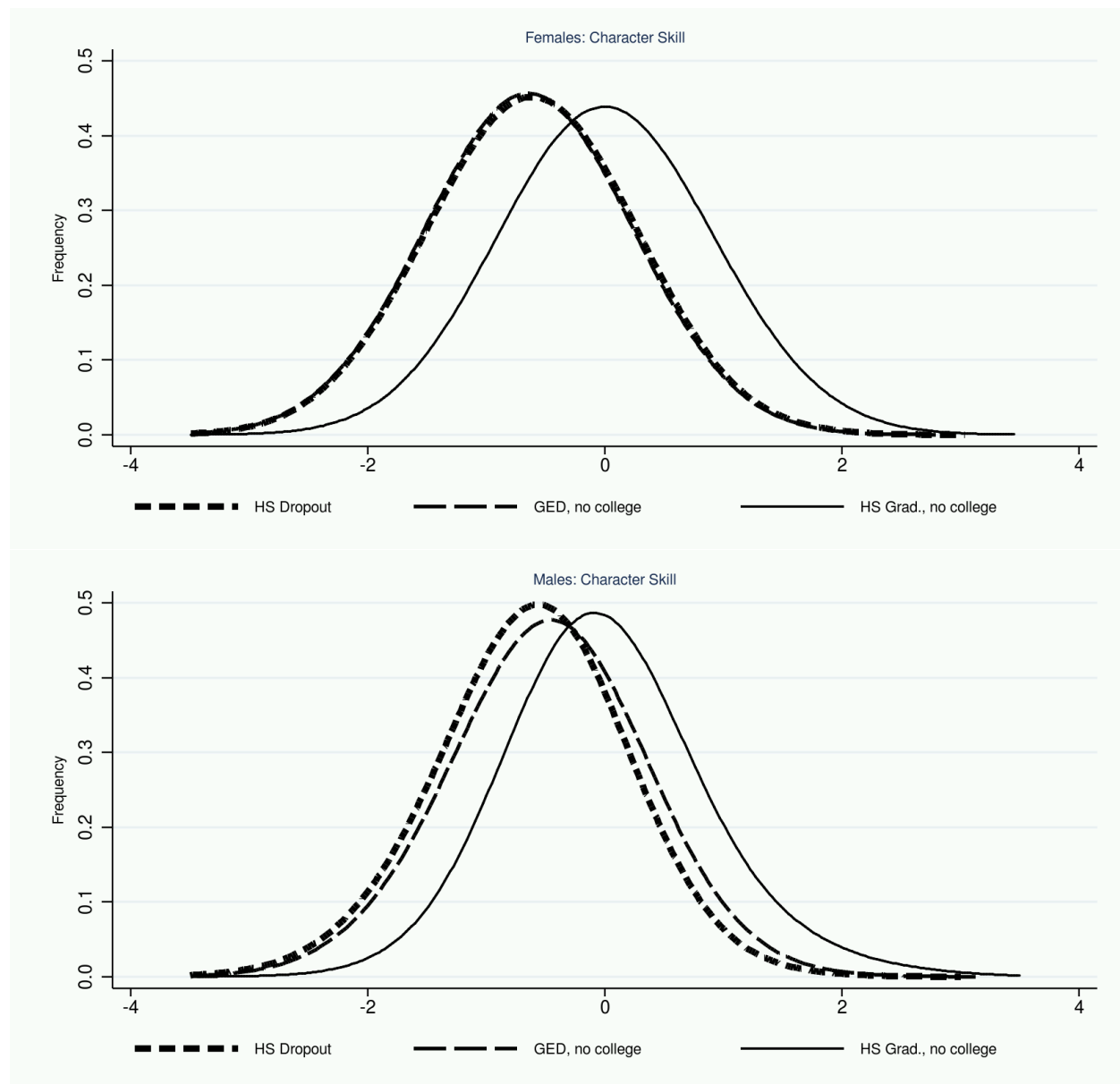
Notes: The distributions represent noncognitive factors, estimated using measures of early violent crime, minor crime, marijuana use, regular smoking, drinking, and early sexual intercourse. Sample restricted to the cross-sectional subsample for both males and females. Distributions show only those with no postsecondary educational attainment. The noncognitive factors are normalized to be mean zero, standard deviation one.

In Chapter 5, we show that GEDs have higher rates of turnover from jobs, college, and marriages than high school graduates. On some tasks, they perform worse than dropouts. GED recipients also drop out of the military at much greater rates than high school grad-

uates.[27] For most GEDs, the skill deficits that cause them to drop out of school persist throughout their lives.

4.4   Differences in Skills Emerge Early Across Educational Groups

Differences in cognitive ability across education groups emerge in elementary school, long before the decision is made to drop out of high school. The top panels of Figure 4.9 show standardized PIAT scores by educational group between ages 6 and 12.[28] Even at age 6, there are sharp differences among future dropouts who never certify, GEDs, and high school graduates. As in Figure 4.2, GED recipients are intermediate between other dropouts and high school graduates. Relative levels of cognitive ability among dropouts, GED recipients, and high school graduates are stable across ages. The shortfalls for female GED recipients compared to high school graduates are much less than the shortfalls for male GED recipients. This presages an important conclusion of the analysis of Chapter 5. On many dimensions, female GED recipients compare more favorably to dropouts who never GED certify than male recipients. This pattern persists through life.

Differences in behavioral problems also emerge early. The bottom panels of Figure 4.9 show how differences in the Behavioral Problems Index (BPI) evolve between ages 6 and 12. The BPI is based on a 28-question survey given to parents about their child.[29] Higher values of the index indicate worse behaviors. Even at these early ages, eventual GED recipients are similar to high school dropouts, while eventual high school graduates are much better.

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[27]See Chapter 6.

[28]The data are from the Children of the National Longitudinal Survey of Youth (CNLSY). Unlike the measures in the NLSY79 and NLSY97, these tests require no adjustment for age of schooling at the date of the test because the participants took the tests at the same ages.

[29]Table A4.2 in the Web Appendix defines the BPI.

Figure 4.9 Early Cognitive and Noncognitive Tests
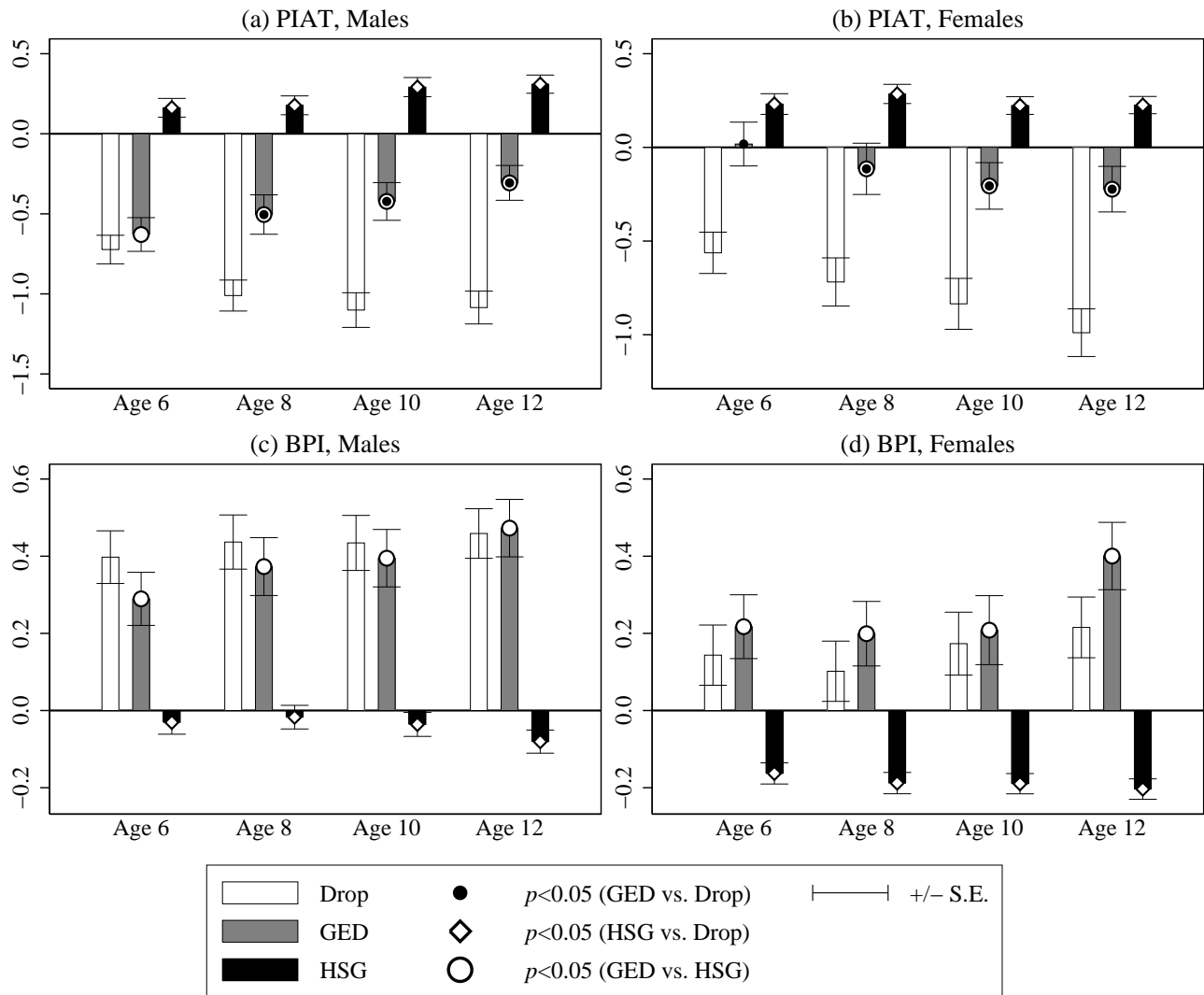
Notes: The Peabody Individual Achievement Test (PIAT) is a widely used childhood achievement test. The PIAT score is normalized to have mean zero and variance one across the entire population. The Behavioral Problems Index (BPI) is based on a 28-question survey given to parents about their child. The BPI is normalized to have mean zero and variance one across the entire population.

4.5   Differences in Background between Educational Certification Groups

Behavioral problems are linked to poor family backgrounds.[30] A substantial body of recent evidence suggests that investment in early childhood is an important determinant of later-life outcomes.[31] High school completion is no exception.

Figure 4.10 shows background variables for dropouts, GED recipients, and high school graduates.[32] In general, high school graduates come from better backgrounds. Both dropouts and GED recipients are more likely to come from poorer families and broken homes with mothers who have lower levels of education. Compared to other dropouts, GED recipients are more likely to come from wealthier families and have more educated mothers.[33] The bottom panels show measures of material, cognitive, and emotional parental investment for ages 1–3 and 4–7.[34] Poor parenting might contribute to the behavioral problems of the GED recipients.[35,36]

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[30] See Carneiro et al. (2003), McLanahan (2004), and Francesconi (2007).

[31] See, for example, Knudsen et al. (2006), Heckman (2008), Cunha et al. (2010), Heckman et al. (2010), and Moon (2012).

[32] The sources are NLSY79, NLSY97, NELS, and CNLSY.

[33] These findings are consistent across all data sets.

[34] The measures of investment are based on home environment and parental interactions and are represented by factor scores that have been standardized to have mean zero and variance one across the entire population. GED recipients and dropouts receive much less parental investment compared to high school graduates.

[35] See the literature surveyed in McLanahan (2004) and Cunha et al. (2006).

[36] See the discussion in Chapter 3 about the possible role of changes in family structure in contributing to the increase in rates of GED test taking and the stagnation of high school graduation rates.

Figure 4.10 Background
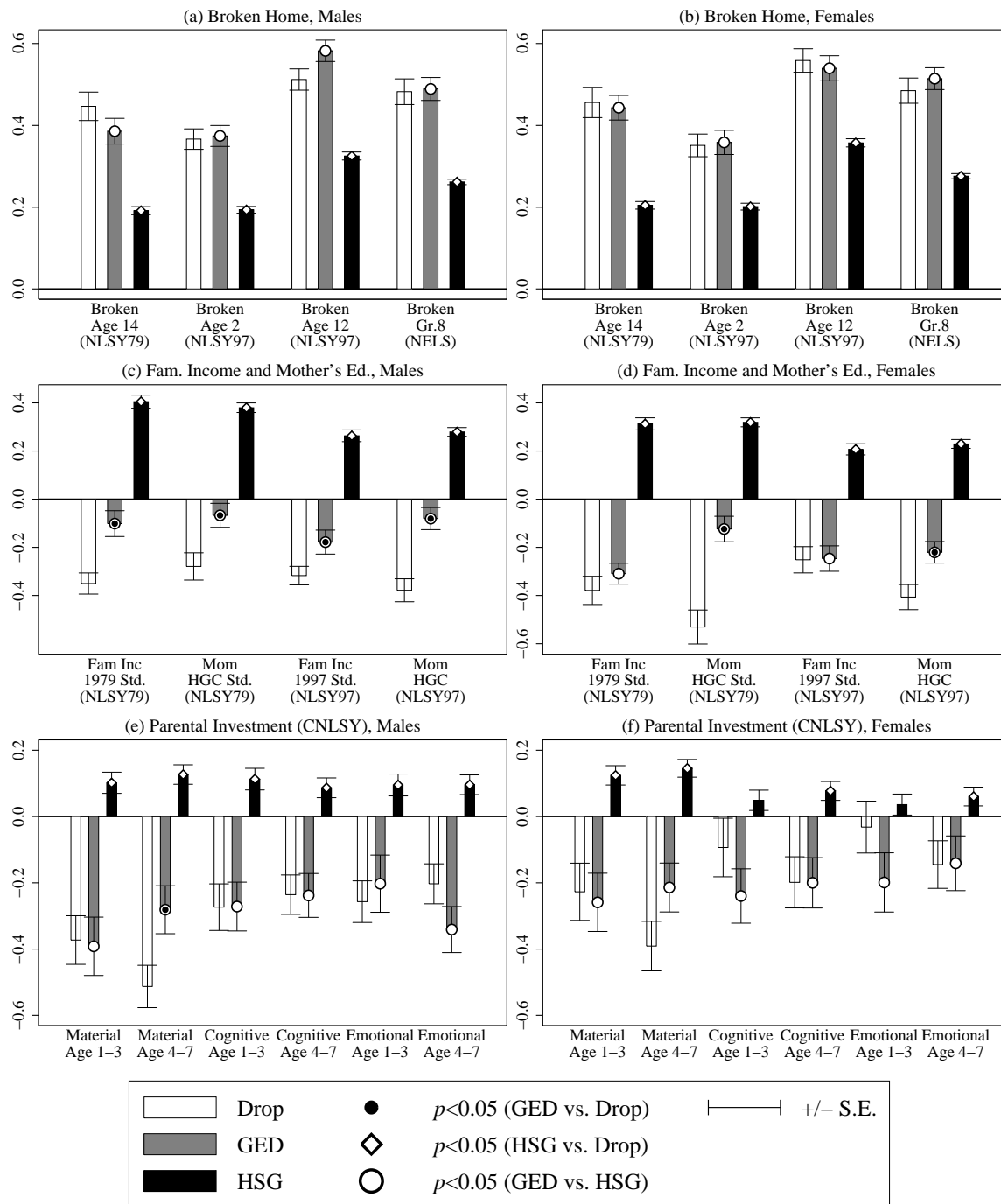
Sources: National Longitudinal Survey of Youth 1979 (NLSY79); National Longitudinal Survey of Youth 1997 (NLSY97); National Educational Longitudinal Survey (NELS); Children of the National Longitudinal Survey of Youth (CNLSY).

Variable Definitions: Parental Investment is measured by material resources (child's access to books, toys, CD or tape player, musical instruments, and books or magazines at home), cognitive stimulation investments (how often the children are read to, taught lessons, and brought to cultural events, and characteristics of the home environment) and emotional support investments (verbal and physical interactions with child, disciplinary behavior, and responsibility of child for household chores). Broken Home rates are defined as percent of children who don't live with their two biological parents. Mother's Highest Grade Completed represents years of schooling completed by mother.

4.6   Life Events Surrounding GED Certification

The previous sections establish that, as a group, GED recipients are relatively smart but lack character skills. People and their circumstances can change. Considerable evidence from economics and psychology shows that skills can change and be changed throughout the life cycle.[37] Given that many GED recipients earn their degrees long after dropping out of high school, it is possible that some change. Figure 4.11 shows the distribution of the ages when people GED certify. About half certify after the age of 20.

Figure 4.11 The Fraction of Eventual GEDs Who Certify at Each Age
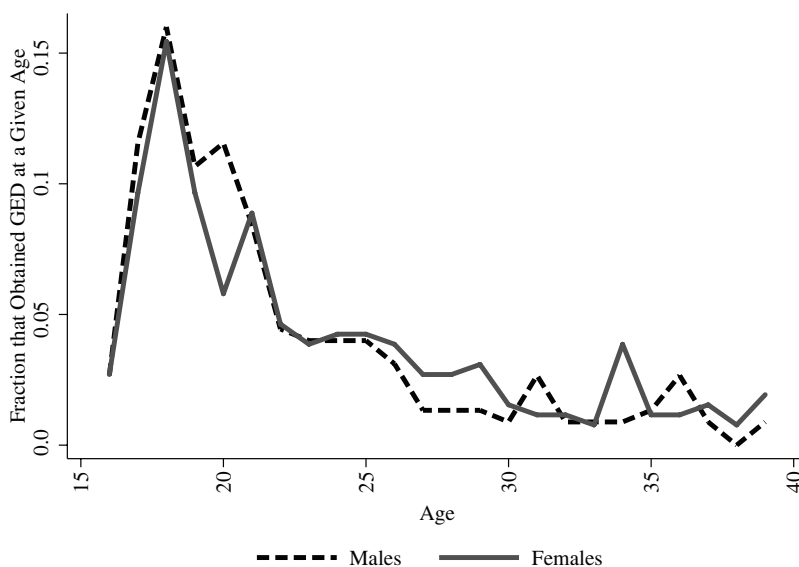
Our data lack repeated measures on character and cognitive skills. As a partial substitute, we investigate whether GED certification coincides with other life events that could be indicative of a change in people or their circumstances. We consider fertility patterns, incarceration, and employment histories.

As previously noted, many young women drop out of high school due to pregnancy. These women differ from other female GED recipients in important ways. Figure 4.12 compares women who drop out due to pregnancy with other GED recipients. Panel (a) shows that

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[37]See Borghans et al. (2008b) and Almlund et al. (2011) for reviews of the evidence.

the women who drop out due to pregnancy have similar cognitive abilities, self-esteem, locus of control, grades, and credits earned. On a variety of other measures they are better than other female recipients. They miss fewer days of school, complete more grades of high school, and are less likely to engage in other risky behaviors, with the exception of adolescent sex. Most of these differences are statistically significant. If they had not become pregnant, these women likely would have graduated from high school.

Figure 4.12 Attributes of Female GED Recipients who Drop Out due to Pregnancy Compared to Other Female GED Recipients
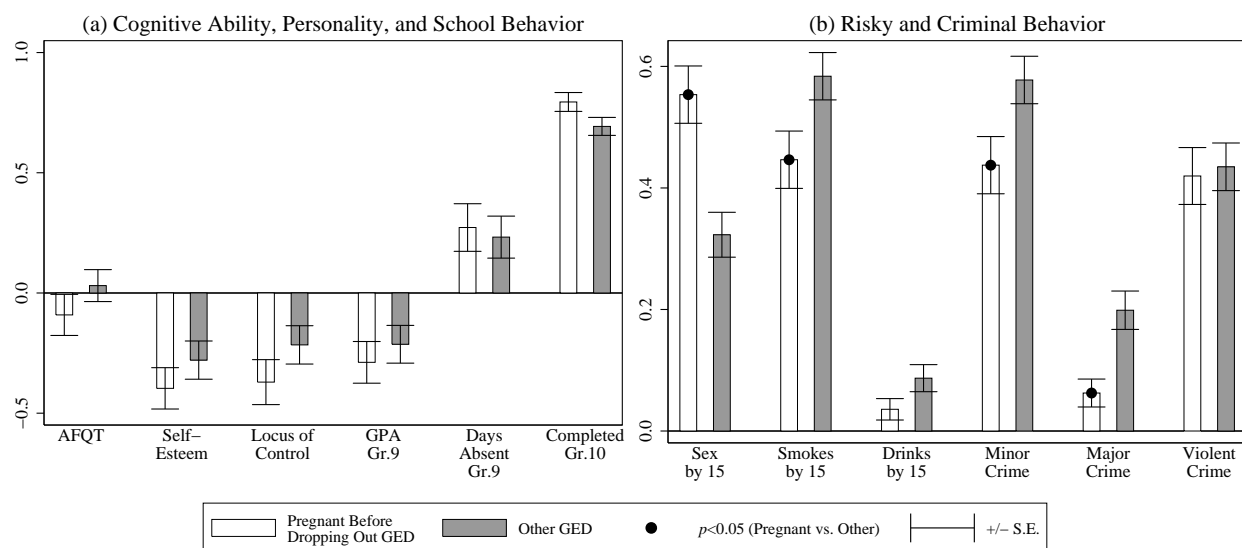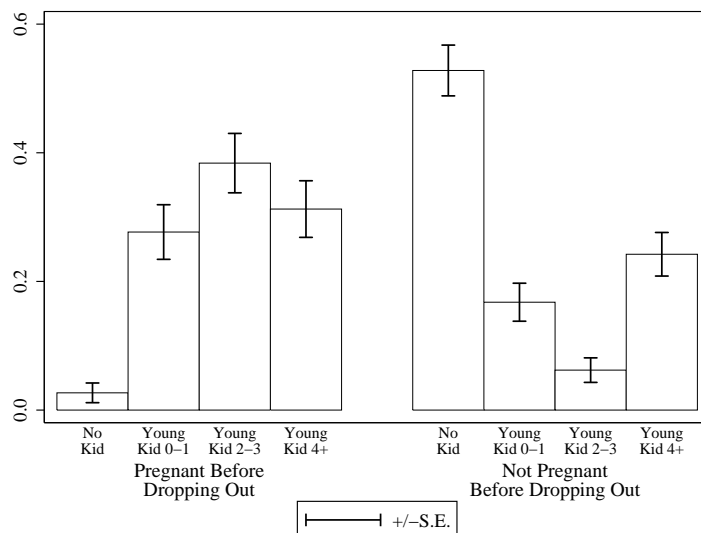

Source: National Longitudinal Survey of Youth 1979 (NLSY79).
Variable Definitions: AFQT scores are adjusted for years of schooling at the time of the test as described in Web Appendix Section A4.2.2. Days of Absence—The number of days that the student was absent during 9th grade in the NLSY79 and the number of days that the student was absent during the fall semester of 1997 in the NLSY97. GPA was calculated based on credits and grades earned in 9th grade. Drinks by 15—Whether the respondent used to drink on a regular basis—at least once or twice per month by age 15. Sex by 15—Whether the respondent had sexual intercourse by age 15. Smokes by 15—Whether the respondent smoked more than 100 cigarettes in her life and smoked daily by age 15. Minor Crime—Whether the respondent was involved at least once in one of the following: vandalism, shoplifting, petty theft, fraud, and holding or selling stolen goods. Major Crime—Whether the respondent was involved at least once in one of the following: auto theft, breaking/entering private property, and grand theft. Violent Crime—Whether the respondent was involved at least once in one of the following: fighting at work or school, assault and battery, and aggravated assault.

Most of the women who drop out due to pregnancy GED certify either shortly after the birth of their child or when the child is old enough to attend school. Figure 4.13 shows whether women have children at the time of certification, and if so, the age of the youngest child. The bars on the left show estimates for women who drop out due to pregnancy, and

the bars on the right show the estimates for other GED recipients. Over 40% of the women who drop out due to pregnancy earn their GED when their youngest child is 2 or 3, the age when many children enter day care or preschool. As their children grow up, they are less constrained and have more opportunities to seek employment or a GED certificate. The majority of female certifiers who do not drop out due to pregnancy earn their certificates before they have children. Chapter 5 shows that the women who drop out due to pregnancy and later earn a GED are relatively more successful in the labor market compared to other female GED recipients and dropouts. Their better character skills pay off.

Figure 4.13 Age of Youngest Child at Time of GED Receipt for Female GED Recipients Who Drop Out due to Pregnancy Compared to Other Female GED Recipients

Source: National Longitudinal Survey of Youth 1979 (NLSY79).

As discussed in Chapter 3, prison has become a major source of GED certification because prisoners are given incentives to certify. GED certification is encouraged in many prisons and often helps qualify a prisoner for early parole. Figure 4.14 shows the fraction of GED certificates issued in prison out of the total number of GED certificates for black, Hispanic, and white males. Almost 20% of black male GED recipients earn their GED in prison. Fewer than 1% of females of any race obtain their GED while incarcerated.

Figure 4.14 Fraction of the Eventual Male Certificate Holders Earning a GED While in Jail
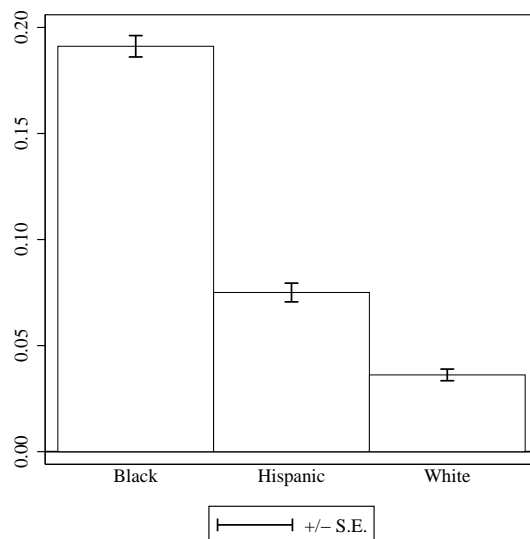
Source: National Longitudinal Survey of Youth 1979 (NLSY79).

Sample: The sample includes those who attend college.

A number of studies have noted that employment or earnings decline before people enter job training programs. This phenomenon is called Ashenfelter's dip in the literature on labor economics.[38] We find a similar pattern for male GED recipients. Figure 4.15 shows the annual hours worked surrounding certification for males and females. We restrict the sample used to create the figure to people who have at least three years of potential labor market experience before and after certification and those who have not been incarcerated during that period.[39]

The employment profiles surrounding GED certification are strikingly different between men and women. The number of hours worked for males dips at the time of certification and rebounds within three years. This dip is consistent with the explanation that men who lose their jobs obtain a GED with the hope that it will help them become reemployed. For females, the number of hours worked is roughly stable until the time of certification and then rises. GED certification is followed by an increase in their labor supply. It seems that

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[38]See, for example, Ashenfelter (1978), Heckman and Robb (1985), and Heckman et al. (1999).

[39]Potential labor market experience is measured from the last year of attendance in secondary school.

female dropouts planning to work in the future are more likely to attain a GED certificate.

We further investigate the labor supply of female GEDs in Chapter 5.

Figure 4.15 Proportion Employed Before and After Certification

4.7   The Relative Importance of Skills and Background in Determining Educational Outcomes

The previous sections describe the characteristics of GED recipients but do not address the relative importance of different characteristics in determining educational outcomes. The descriptive analyses presented earlier suggest a number of potential determinants of dropping out of high school and GED certification. Studying one cause at a time may present a misleading picture of the important determinants taken together.

This section presents multivariate models of the determinants of high school graduation and GED receipt. We estimate a model of the determinants of high school graduation, using measures of background and ability.[40] Variables are normalized so that a higher value represents a "better" value; for example, a higher value for the crime variable indicates lower levels of criminal behavior.[41]

Figure 4.16 presents estimates of how a standardized change in a variable changes the probability of graduating from high school. All continuous variables are standardized, and for them we report one standard deviation changes. For discrete variables we report the effects of binary changes.[42] The marginal effects are estimated for each individual and then averaged across individuals. All continuous variables have been standardized to have mean 0 and variance 1.

The results from the multivariate model are consistent with the general patterns observed in the univariate tabulations. For both males and females, cognitive skills, character skills,
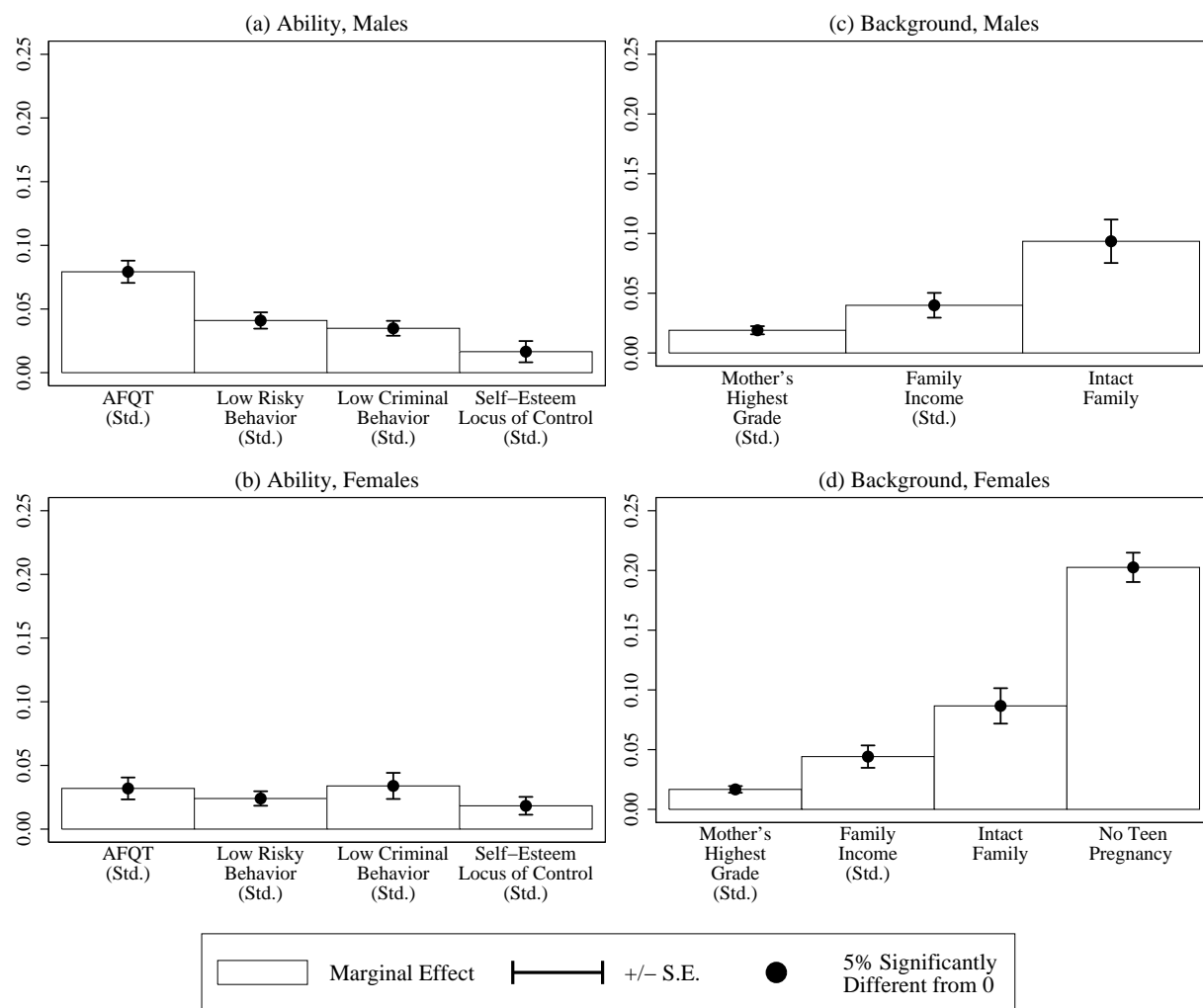
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[40]Among the variables are mother's highest grade completed, family income, intact family status, AFQT, and factors based on adolescent risky behavior, criminal behavior, and personality measures (self-esteem and locus of control). For females, we also include teen pregnancy.

[41]We additionally control for race, region of residence, whether the respondent lived in the South at age 14, and whether the respondent lived in an urban area at age 14.

[42]Let $\Phi(X_i\beta)$ be the probability of high school graduation given variables X_i for individual i, where $\Phi()$ is the normal cumulative distribution function (cdf). For any continuous covariate, say the kth, the marginal effect of X_{ki} is $MFX_i = \beta_k\phi(X_i\beta)$, where ϕ is the normal probability distribution function (pdf) where continuous variables are normalized to have a unit variance. The marginal effect of the kth discrete variable is $MFX_i = \Phi(\beta_k + X_{qi}\beta_q) - \Phi(X_{qi}\beta_q)$, where X_{qi} are the other covariates. We average across individuals to obtain the average marginal effect: $\overline{MFX} = \frac{1}{N}\sum_{i=1}^{N} MFX_i$.

and background all predict graduation from high school. For females, teen pregnancy is a major determinant of dropping out. These measures of character skills have incremental validity above and beyond the measures of cognitive ability. Graduating from high school requires skills besides cognitive ability.

Figure 4.16 Estimated Marginal Effects of Predictors of High School Graduation for Males and Females

We also investigate the determinants of GED certification. We estimate the probability of

GED certification at different ages for dropouts. We restrict the estimation sample to persons

who drop out of high school and estimate a discrete hazard model for whether an individual earns a GED in any time period.[43,44] To examine the effect of joblessness on certification that is evident in Figure 4.15, we include a measure for whether the respondent is currently not working but was recently employed in the past two years (No Work, Recently Employed) and whether the respondent is currently not working but was not recently employed within the past two years (No Work, Not Recently Employed). For females, we also include a measure of whether the respondent was pregnant before dropping out of high school and include interaction with dummy variables indicating the age of the youngest child.[45]

Figure 4.17 graphs the effects of the indicated variables on the discrete hazards averaged over the sample realizations for males. The estimated effect for those not working is graphed relative to the effect for those who are working. The effects for marriage and divorce are measured relative to people who have never been married. Consistent with the univariate tabulations, cognitive ability predicts GED certification, but the measures of character skills and background have little incremental effect. Not working but having been recently employed predicts certification. Being married or divorced has a positive but statistically insignificant effect on certification. Being incarcerated has a substantial positive effect on certification. Figure 4.18 displays the corresponding estimated average effects on the hazards

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[43]We construct the following likelihood function: Let δ_{ij} be receipt of the GED in period j by person i, measured on an annual scale starting after person i drops out of high school.

$$\text{Define } m_i = \begin{cases} j & \text{associated with } \delta_{ij} = 1, j \in \{1, \ldots, T\} \text{ if such a } j \text{ exists,} \\ T & \text{if there is no } j \text{ such that } \delta_{ij} = 1, j \in \{1, \ldots, T\}, \end{cases}$$

where T is the longest possible available panel observation and m_i is the length of time the GED recipient spends in the dropout state before GED certifying. m_i is T if a person never GED certifies. For a sample of size N, the likelihood is

$$\mathcal{L} = \prod_{i=1}^{N} \prod_{j=1}^{m_i} \Phi((\alpha_j + x_{ij}\beta)(2\delta_{ij} - 1)),$$

where Φ is the CDF of a normal random variable.

[44]We use the same set of background and ability measures as used to predict high school graduation (except for teen pregnancy), but also include variables describing sets of life events. For males, we include whether the respondent is currently incarcerated, married, or divorced.

[45]For both genders, we also control for the years since dropping out of high school, race, region of residence, whether the respondent lived in the South at age 14, and whether the respondent lived in an urban residence at age 14.

for females. Panels (a)–(c) are analogous to the male results. As for males, cognitive ability predicts earning a GED, while the measures of character skills are less powerful predictors of GED certification.

Figure 4.17 Average Marginal Effects on the Hazard Rate for GED Certification for Males

Source: National Longitudinal Survey of Youth 1979 (NLSY79).
Controls: The model also includes controls for years since dropping out of high school, race, region of residence, whether the respondent lived in the South at age 14, and whether the respondent lived in an urban residence at age 14. AFQT scores are adjusted for years of schooling at the time of test as described in the Web Appendix Section A4.2.2. Risky Behavior — A factor based on drinking (on a regular basis at least once or twice per month), hard drug use, daily smoking (among people who alrea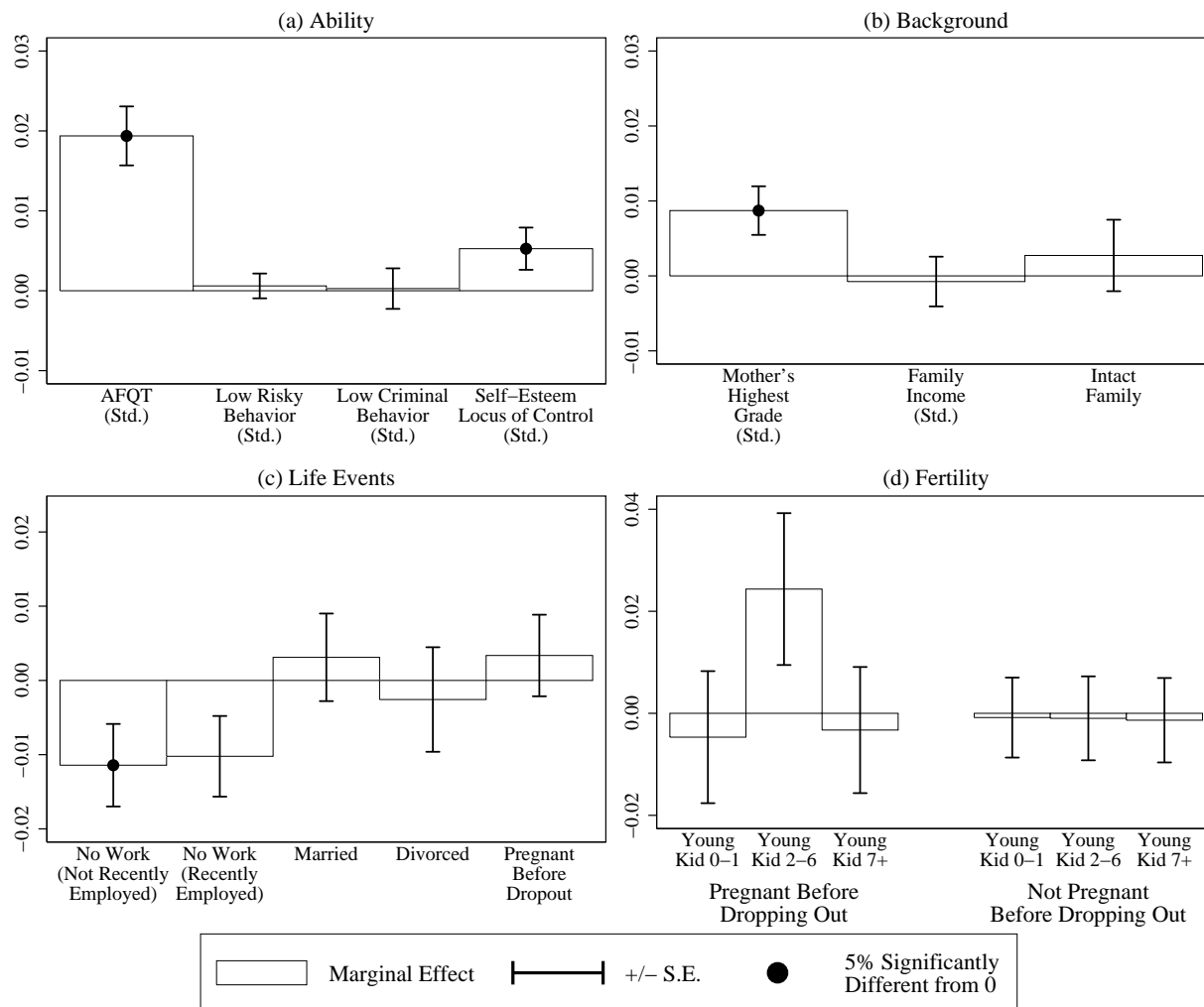dy smoked at least 100 cigarettes), and sexual intercourse by 15. Criminal Behavior — A factor based on participation in minor crime (vandalism, shoplifting, petty theft, fraud, and holding or selling stolen goods), major crime (auto theft, breaking/entering private property, and grand theft), and violent crimes (fighting at work or school, assault and battery, and aggravated assault). Self-Esteem and Locus of Control — A factor based on self-esteem (Rosenberg) and locus of control (Rotter). Mother's Highest Grade Completed represents years of schooling completed by mother. Intact Family — Child lived with his two biological parents at age 14. No Work (Not Recently Employed) — Currently not working and was not employed during the previous two years. No Work (Recently Employed) — Currently not working and has been employed during at least one of the previous two years. (Std.) means the measure was presented in standard deviation units. For more information, see Table A4.7 in the Web Appendix.

Figure 4.18 Average Marginal Effects on the Hazard Rate for GED Certification for Females

Source: National Longitudinal Survey of Youth 1979 (NLSY79).
Controls: The model also includes controls for years since dropping out of high school, race, region of residence, whether the respondent lived in the South at age 14, and whether the respondent lived in an urban residence at age 14. AFQT scores are adjusted for years of schooling at the time of test as described in the Web Appendix Section A4.2.2. Risky Behavior — A factor based on drinking (on a regular basis at least once or twice per month), hard drug use, daily smoking (among people who already smoked at least 100 cigarettes), and sexual intercourse by 15. Criminal Behavior — A factor based on participation in minor crime (vandalism, shoplifting, petty theft, fraud, and holding or selling stolen goods), major crime (auto theft, breaking/entering private property, and grand theft), and violent crimes (fighting at work or school, assault and battery, and aggravated assault). Self-Esteem and Locus of Control — A factor based on self-esteem (Rosenberg) and locus of control (Rotter). Mother's Highest Grade Completed represents years of schooling completed by mother. Intact Family — Child lived with her two biological parents at age 14. No Work (Not Recently Employed) — Currently not working and was not employed during the previous two years. No Work (Recently Employed) — Currently not working and has been employed during at least one of the previous two years. (Std.) means the measure was presented in standard deviation units. Pregnant/Not Pregnant Before Dropout means the respondent was pregnant/not pregnant before dropping out of school. For more information, see Table A4.7 in the Web Appendix.

Panel (d) shows the marginal effect of the age of children at home on GED recipiency separately for women who drop out of high school due to pregnancy and women who do

not. The first three bars show the average effects of the age of the youngest child given for women who dropped out due to pregnancy.[46] The second set of bars shows the effects for females who do not drop out due to pregnancy. The estimates are graphed relative to those for women who have no children in the household. As suggested by Figure 4.13, women who drop out due to pregnancy and have a child 2 to 3 years old are likely to certify.

Evidence from Heckman et al. (2011) is consistent with the finding in this chapter that both cognitive and character skills predict high school graduation, whereas only cognitive skill predicts receipt of a GED. Heckman et al. (2011) estimate a sequential model of education to study the effects of education on a variety of outcomes, controlling for cognitive and character skills and the endogeneity of education. As part of their model, they estimate the effect of cognitive skills and character skills on the probability of obtaining different educational choices, allowing for nonlinear relationships between skills and choices. Figure 4.19, taken from their paper, shows how changes across deciles of cognitive ability and noncognitive skills affect the probability of graduating from high school.[47] Both cognitive and noncognitive skills affect the probability of graduating from high school across all deciles of the skill distributions. People can compensate for deficits in cognitive skills with noncognitive skills. Even people with low cognitive skills are still likely to graduate from high school if they have high levels of noncognitive skills. Figure 4.20 shows how character and cognitive skills affect the probability of obtaining a GED conditional on having dropped out of high school. Consistent with the findings in this chapter, only cognitive skills affect the probability of receiving a GED.

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[46]We calculate these "conditional" marginal effects for the discrete hazards in the following way. Let $\Phi(\beta X_{ij})$ be the probability of earning a GED given covariates X_{ij} for individual i at time j, where $\Phi()$ is the normal cumulative distribution function (CDF). Let β_k be the coefficient associated with one of the dummy variables for having a youngest child of a given age, β_l be the coefficient associated with being a woman who drops out due to pregnancy, and β_m be a coefficient associated with the interaction term between the dummy variables for having a youngest child of a given age and being a woman who drops out due to pregnancy. Let X_{nij} be a vector of other covariates. The "conditional" marginal effect of having a child of a given age for person i at time j is given by $MFX_{ij} = \Phi(\beta_k + \beta_l D + \beta_m D + \beta_n X_{nij}) - \Phi(\beta_l D + \beta_n X_{nij})$, where D is set to 1 when calculating the effect for women who drop out due to pregnancy and 0 when calculating the effect for other GED recipients.

[47]This analysis also controls for the economic incentives that might affect these choices.
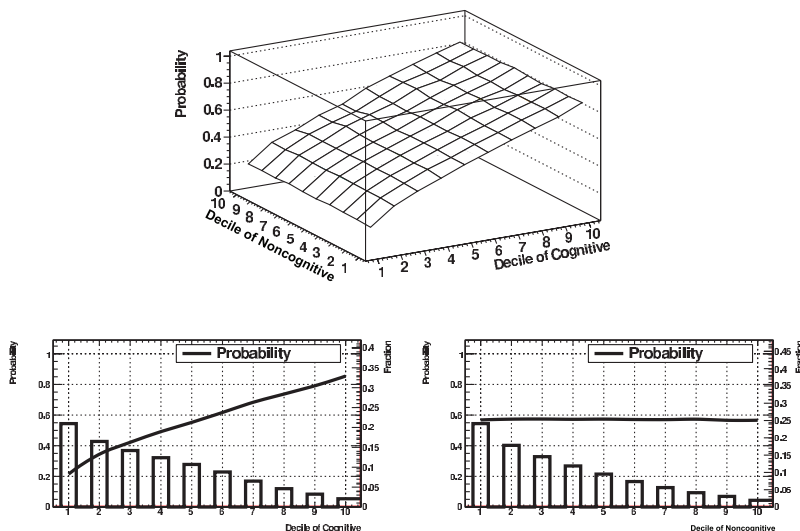
Figure 4.19 Probability of Graduating from High School, by Cognitive and Noncognitive Skill Decile
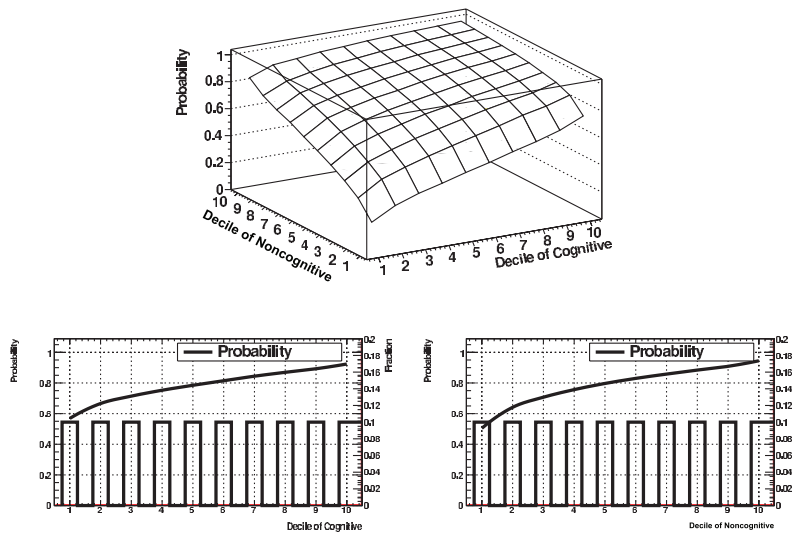
Source: Reproduced from Heckman et al. (2011), which uses data from the National Longitudinal Survey of Youth 1979 (NLSY79).

Notes: This figure reports the average probability of graduating from high school from a multistate dynamic model of schooling attainment. The 2D plots show the marginal effect of increasing cognition (left) or noncognitive skills (right) on probability of finishing high school (i.e., where noncognitive and cognitive skills, respectively, have been integrated out). The bars in the 2D plots display, for a given decile of the endowment, the fraction of individuals who reach the state where they make the decision of whether or not to complete high school. The fact that these decile bars are uniform indicates the fact that all individuals in the analysis face this decision.

Figure 4.20 Probability of GED Certification, Conditional on Having Dropped Out, by Cognitive and Noncognitive Skill Decile

Source: Reproduced from Heckman et al. (2011), which uses data from the National Longitudinal Survey of Youth 1979 (NLSY79).
Notes: This figure reports the average probability of getting a GED, given that an individual has chosen to drop out. The 2D plots show the marginal effect of increasing cognition (left) or noncognitive skills (right) on probability of obtaining a GED (i.e., where noncognitive and cognitive skills, respectively, have been integrated out). The bars in the 2D plots display, for a given decile of the endowment, the fraction of individuals who reach the state where they make the decision of whether or not to certify as a GED.

4.8   Summary and Conclusions

The pool of exam-certified high school equivalents has changed greatly over the past 60 years. At the outset, exam-certified equivalents were World War II veterans. The early equivalency tests were successful because they targeted these veterans who had abundant character skills. The test certified their cognitive skills, and their military experience certified their character skills.

Nowadays, GED exam certification sends a mixed signal. In this chapter we show that across four different data sets, GED recipients have higher cognitive ability than other dropouts, but come from similar backgrounds and exhibit similar behaviors. The GED exam certifies cognitive skills, but dropping out of high school reflects a shortfall of character skills.

It is telling that the military—the organization that first promoted exam-certified equiv-

alency—generally does not accept applicants with only a GED certificate.[48] Chapter 5 investigates how GED recipients perform in the labor market and other aspects of life.

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[48]Chapter 6 presents an analysis of the performance of GEDs in the military.

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