Volume Title: Studies of Supply and Demand in Higher Education

Volume Author/Editor: Charles T. Clotfelter and Michael Rothschild, editors

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-11054-0

Volume URL: http://www.nber.org/books/clot93-1

Conference Date: May 17-19, 1991

Publication Date: January 1993

Chapter Title: Trends in College Entry among Whites, Blacks, and Hispanics

Chapter Author: Robert M. Hauser

Chapter URL: http://www.nber.org/chapters/c6098

Chapter pages in book: (p. 61 - 120)

3 Trends in College Entry among Whites, Blacks, and Hispanics

Robert M. Hauser

For the past two decades and in the foreseeable future, the key educational transitions among American youth have occurred and will occur during middle to late adolescence. These include, but are not limited to, high school dropout or completion and entry into colleges, universities, or other postsecondary schools. These transitions are keys to the quality and productivity of the future work force because they are the main points at which youth now leave the educational system for work, military service, family formation—and, in some cases, street or prison life. For the past several years, public attention in the United States has focused mainly on the first of these transitions—high school dropout. For example, the highly publicized National Goals for Education (U.S. Department of Education 1990) proclaim 90 percent high school completion as one of six primary goals, but they focus less attention on the transition from secondary to postsecondary schooling, which is mentioned as one among several objectives subsidiary to the goal of "adult literacy and lifelong learning."[1]

Robert M. Hauser is Vilas Research Professor of Sociology and director of the Institute for Research on Poverty at the University of Wisconsin–Madison.

This research was supported by grants from the National Institute on Aging, the Spencer Foundation, the Kenneth and Carolyn Brody Foundation, and the William F. Vilas Trust Estate. It was carried out at the University of Wisconsin–Madison, using facilities of the Center for Demography and Ecology, for which core support comes from the National Institute of Child Health and Human Development and the William and Flora Hewlett Foundation, and facilities of the Institute for Research on Poverty, which is supported by a grant from the Office of Assistant Secretary for Planning and Evaluation, U.S. Department of Health and Human Services. The author thanks Linda Jordan, Taissa S. Hauser, Julia Gray, and Yu Xie for assistance in the preparation and documentation of the Uniform October Current Population Survey file, 1968–1988, and he thanks Hanam Samuel Phang for assistance in research. The opinions expressed herein are those of the author.

1. Goal 2 says, "By the year 2000, the high school graduation rate will increase to at least 90 percent," and adds the objective, "The gap in high school graduation rates between American students from minority backgrounds and their nonminority counterparts will be eliminated." By

The transition from high school completion to whatever may follow is and will be the most important decision point in the American educational system. High school completion is the single point at which the most Americans leave schooling.[2] It is the point at which the largest share of the cost of schooling shifts from public to private hands—even though there is massive public funding for postsecondary schooling. It is the point that determines access to the kinds of jobs that are and will be most in demand in the American economy of the twenty-first century.

Wage differentials are growing between the college educated and persons with some college or a high school diploma or who are high school dropouts (Murphy and Welch 1989). For example, figures 3.1 and 3.2 show trends since the 1960s in the earnings of black and white male high school graduates and in the earnings of high school graduates relative to men with other levels of completed schooling. After increasing from the middle 1960s to the middle 1970s, the real earnings of male high school graduates declined through the middle 1980s. The earnings of high school dropouts relative to high school graduates also declined. After the middle 1970s, the relative earnings of men with college experience increased. Those for college graduates rose most rapidly, from about 20 percent more than the earnings of high school graduates to 40 or 50 percent more. There is every reason to believe that these differentials are a valid reflection of the growing demand for a highly educated work force, that they will continue (Bishop and Carter 1990), and that they provide sound and compelling evidence of the need to monitor and foster the transition from high school completion to further schooling and the labor market.

Were no other factors at work, one might expect the chances (i.e., likelihood) of college entry to follow the trends in the relative earnings of college and high school graduates. In fact, this has roughly been the case for white men, but factors other than wages in the civilian labor market have also influenced trends in college entry. These include changes in social and economic background, in rates of high school completion and the academic performance of graduates, in the size and composition of the armed forces, in the cost of going to college, in the amount and composition of financial aid for college education, and in the social and economic opportunities of minorities and women (Kane 1991b; Hauser, in press). Unfortunately, limits on the coverage

contrast, goal 6 says, "By the year 2000, every adult American will be literate and will possess the knowledge and skills necessary to compete in a global economy and exercise the rights and responsibilities of citizenship." Among the objectives subsidiary to goal 6 is "the proportion of those qualified students, especially minorities, who enter college; who complete at least two years; and who complete their degree programs will increase substantially."

2. To be sure, college dropout is also large. Slightly more than half of white college entrants complete 16 years of school by the time they reach ages 25 to 29, and only about one-third of minority entrants complete 16 years of school by ages 25 to 29. However, college dropout occurs over a prolonged period, and it affects only the survivors of the transition from high school to college.

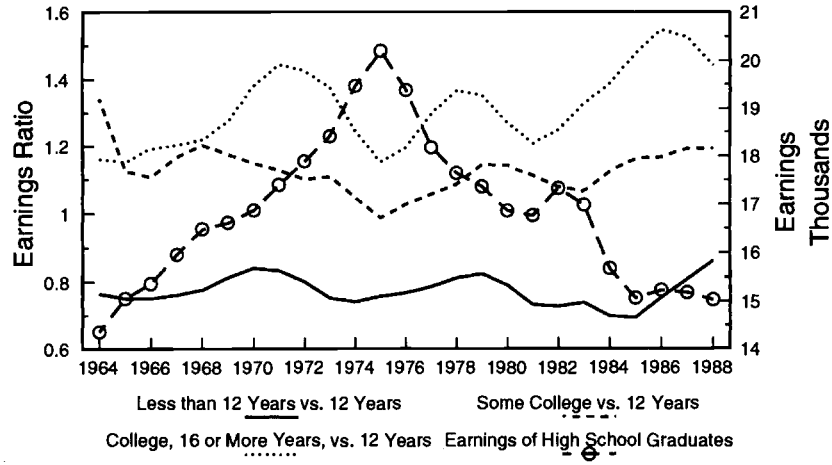

Fig. 3.1 Earnings of black males age 25–34: Ratios at various education levels, compared to high school graduates, 1964–1988
Note: Data are three-year moving averages from March CPS.

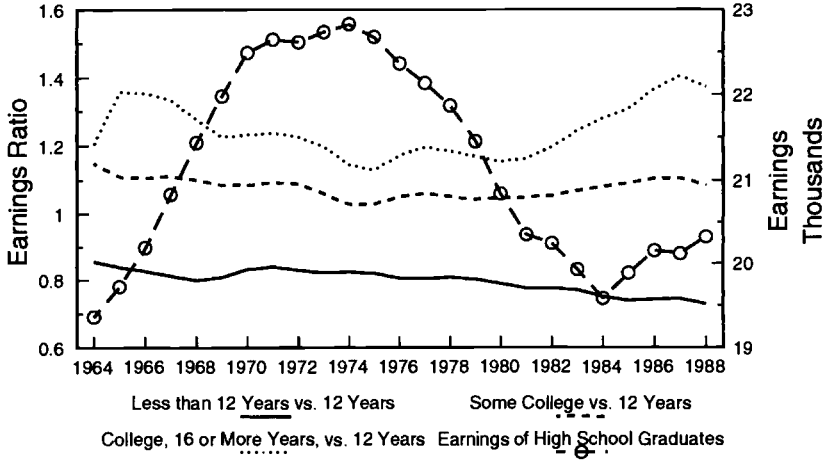

Fig. 3.2 Earnings of white males age 25–34: Ratios at various education levels, compared to high school graduates, 1964–1988
Note: Data are three-year moving averages from March CPS.

and detail of federal educational statistics make it impossible to produce a comprehensive account of the influence of these factors; in fact, the data have not been good enough to provide a definitive and timely account of trends in college access of major population groups, such as those defined by race, gender, and family income (Hauser 1991a, 1991b). For example, accounts of

post-1970 trends in the college attendance of blacks and whites range widely: there have been no adverse trends for blacks, or none that could not be explained by the decreasing selectivity of high school graduation (Hu 1991); there was an anomalous upward bubble in black college attendance in the middle 1970s, after which things returned to the level of the late 1960s (Pelavin and Kane 1990; Koretz 1990); after the middle 1970s there was a decline in college enrollment among 18- and 19-year-old blacks, but this was offset by delayed entry into college (Kane 1991a, 1991b); and there was a decline in black college entry after the middle 1970s, from which there has been little or no recovery (Jaynes and Williams 1989; Carter and Wilson 1990; Mortenson 1991; Hauser and Anderson 1991; Hauser, in press).

In this essay, I take a fresh look at trends since 1972 in college entry by gender among black, Hispanic, and white high school graduates. The analysis is based on a new time series of cross sections from October Current Population Surveys (CPS), 1972 to 1988 (Hauser 1991c), in which the records of high school graduates have been linked to the characteristics of their households and parents. Using these data, I ask to what degree the observed differences and trends in college entry among white, black, and Hispanic men and women can be explained by group differences and trends in social and economic background. I first estimate the basic trends in college entry from the October CPS and compare them with an independent, alternative series from the March CPS. Second, I describe trends in social background and in household residence among whites, blacks, and Hispanics. Third, I estimate levels and trends in college entry, controlling social background, within each racial-ethnic group, and I assess the importance of social background in the observed trends. Fourth, I estimate a pooled equation in social background across all the groups and use it to compare levels and trends in college entry among the groups.

My analyses lead to four major findings and a caution about our ability to monitor future trends in college entry. First, there has been an almost continuous increase in women's chances of college entry relative to those of men from the early 1970s to the late 1980s. This gain cuts across racial and ethnic lines; it is virtually the same among whites, blacks, and Hispanics. Among dependent high school graduates, women's chances of college entry have exceeded those of men in every year since 1975. Second, the chances of college entry among white men declined from the early 1970s through 1980, and they subsequently recovered to match the high levels of the Vietnam War era. Thus, the chances of college entry among white men and women have grown to unprecedented levels. Third, blacks' chances of college entry relative to those of whites rose from 1973 to 1978 and declined thereafter to levels at or below those of the early 1970s. The growth of the 1970s was accelerated by steady improvements in the educational attainments of black parents and by a decline in the size of black families; the decline of blacks' chances of college entry in the 1980s was moderated by continuing improvements in social back-

ground. Together with other available evidence, these findings suggest that net increases in the cost of college attendance are the major factor in the decline of blacks' chances of college entry. Fourth, when social background is controlled, the chances of college entry among Hispanics exceed those among whites from the early 1970s through the late 1980s, while the chances of college entry among blacks exceed those among whites from the early 1970s through the early 1980s. The decline in college entry among blacks has brought their chances just below those of socially and economically similar whites, while Hispanics' chances of college entry are consistently much higher than those of comparable whites or blacks.[3] These findings raise difficult questions about efforts to increase the chances for educational and economic advancement among blacks and Hispanics. Should efforts to increase minority opportunities rest with the achievement of statistical parity? Or should public policy, recognizing disparities of social background as well as uneven rates of advancement in educational, economic, social, and political status, tolerate or even encourage minority advantage in school transitions? Finally, while it is important to continue to monitor trends and differentials in the chances of college entry among men and women and across racial and ethnic groups, a recent change in the content of the October Current Population Survey will substantially reduce the statistical reliability of the data series after 1988. Unless the previous content of the CPS is restored, or alternative data series become available, we will be less able in the future than in the past to monitor year-to-year changes in the transition from high school to college (Hauser 1991b).

Racial and ethnic differences are important, both because of their obvious relevance to issues of equity and equality of opportunity and because of their implications for the future American economy. The demographer's stock in trade is the explanation of differences by population composition. If minorities are less successful in educational transitions than whites, or even if improvements in the status of minorities occur slowly, the growing share of minorities in the American population will itself reduce the educational attainment of the future work force.

Much of my analysis focuses on trends in college entry since 1972, the first year in which it was possible to identify Hispanics consistently in the October CPS. As shown in figure 3.3, the share of minorities among high school graduates has grown steadily. From 1972 through 1988, Hispanics grew from 4.3 to 6.5 percent of high school graduates, and blacks grew from 10.3 to 14.3

3. Cameron and Heckman's discussion (in this book) is irrelevant to any but the last of my conclusions, and it ignores many of the analyses reported herein. Selection into high school graduation obviously affects ethnic differentials in college entry, but it is not a likely source of trends in ethnic differentials during the 1970s and 1980s. Also, Cameron and Heckman offer little evidence that effects of social background on college entry differ between dependent and nondependent graduates.

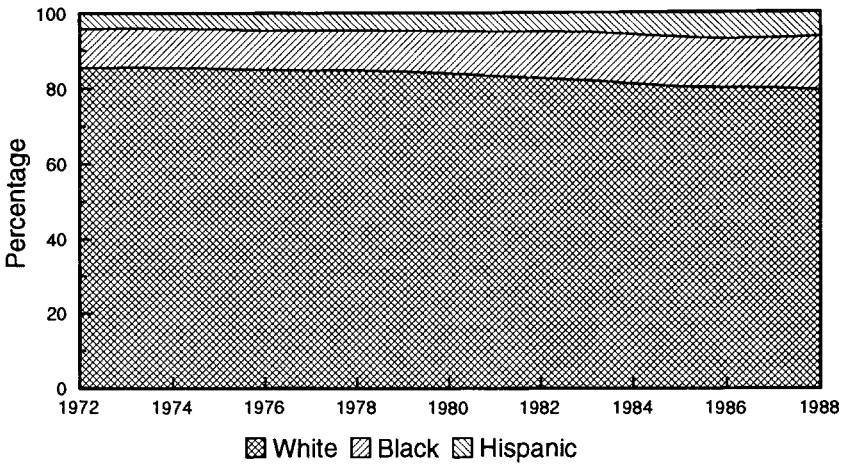

Fig. 3.3 Race and ethnicity of recent high school graduates: 1972–1988
Note: Data are three-year moving averages for youth in October CPS.

percent of high school graduates. Obversely, the share of whites (and others) has declined from 85.5 percent to 79.2 percent.[4] This change in composition stems in part from increasing rates of high school completion by minority youth, but it is also fed by changes in the racial and ethnic composition of birth cohorts. The shift in population composition will continue. In 1972, Hispanics were 6.7 percent of five- and six-year-olds, and blacks were 14.3 percent of five- and six-year-olds (U.S. Bureau of the Census 1974, table 1). In 1988, Hispanics were 11.2 percent of five- and six-year-olds, and blacks were 15.3 percent of five- and six-year-olds (U.S. Bureau of the Census 1990, table 1). Thus, before the turn of the century, these disadvantaged minorities will constitute about one-quarter of persons reaching adulthood in the United States.[5]

3.1 Data on College Entry

The Current Population Survey of the Bureau of the Census is a large national survey of the civilian, noninstitutional population, currently covering

4. Unless otherwise noted, all data reported herein are based on tabulations from public-use versions of the March or October CPS.

5. The percentages of Hispanics and blacks are not additive in published tabulations of the U.S. Bureau of the Census because persons of Hispanic origin may be of any race. However, in the independent analyses reported here, I have given precedence to blacks in order to construct a mutually exclusive and exhaustive racial-ethnic classification. That is, all blacks are classified as black, and Hispanics are all classified as nonblack. Only about 5 percent of Hispanics identify themselves as black in the CPS (U.S. Bureau of the Census 1988). "White" is used throughout to refer to persons who are neither black nor Hispanic.

about 55,000 households each month. Each October it fields an educational supplement that ascertains the school enrollment status of persons aged three to thirty-four. Aside from standard labor force and employment variables, the educational supplement ascertains race-ethnicity, sex, age, highest grade of school completed, current grade or year in school, year of high school completion, and school enrollment status in the previous October. The CPS treats children who are living in group quarters while away at school as if they were living in their parents' households, and it is thus feasible for us to attach the social and economic characteristics of parents and parental households to children who are living in their parents' households or away at school.[6]

There are some problems in using the CPS data to measure adolescent educational transitions. The samples become excessively small and statistically unreliable when we try to focus on key transitions, especially among minority groups. Family income is not measured well,[7] and academic ability is not measured at all. We lose the link with parents when children leave their parents' household and do not live in group quarters at school. The CPS does not cover persons in the military or in institutions, such as prisons and jails, that now house a substantial minority of young adults. The CPS tells us little about the schools or colleges in which students are enrolled; we learn only whether enrollment is at a two-year or four-year public or private institution. Other recent content changes have further reduced the usefulness of the October data (Hauser 1991b). At the same time, unlike the institutional or longitudinal surveys of the National Center for Education Statistics, the October CPS does provide annual data on college entry and enrollment.

For many years, the October CPS has included a question about the year of high school graduation of persons aged 14 to 24; together with current college enrollment data, this permits a highly focused look at the transition from high school to college. We can ask what share of each year's high school graduates was enrolled in college in the following October. Most of these graduates are young enough to be dependents at the time of the survey, so their records can be linked with those of their parents. Unlike age-specific rates of college par-

6. I have created uniformly formatted versions of this file for the years 1968 to 1989 (Hauser 1991c). However, the present analysis covers only the years 1972 to 1988 because Hispanics were not identifiable before 1972, and the 1989 data became available too late to be included.

7. The October CPS family income variable is probably the worst income measure obtained in any major federal statistical program; yet it is the main economic measure used in the measurement of access to postsecondary education. It is a CPS control card item, which means that it is asked of anyone entering the sample for the first time in a calendar year. The item is a single question about family income in the 12 months preceding sample entry, not in a calendar year, and the responses are coded in broad groups. By contrast, the March CPS now ascertains about a dozen specific sources of income in the preceding calendar year, and the Survey of Income and Program Participation (SIPP) ascertains more than 50 sources of income. For this reason, among others, I have given no precedence to family income among the several socioeconomic background variables used in the analysis. I have also introduced two more reliable, long-term measures of economic standing: housing tenure (own versus rent) and household head's occupational status. The former is a proxy for wealth, while the latter is a proxy for permanent income; neither of these variables was used in Cameron and Heckman's analysis of the NLSY data.

ticipation, enrollment, or attendance, college entry rates are both timely and specific (Hauser 1991b).

One problem with this series is that it is ordinarily based on the experience of a single cohort of high school graduates as reported in a single October CPS (Jaynes and Williams 1989; Mortenson 1990); thus, the number of observations and their statistical reliability are limited. There are typically about 2,100 recent high school graduates in an October CPS, of whom about 200 are black and one hundred are Hispanic. While it is possible to draw valid conclusions when the data are cumulated over a period of years, the data are not reliable in any one year for minority groups or for other similarly small subpopulations. There is a trade-off between timeliness and specificity on one hand and reliability on the other.

To increase the statistical reliability of the college entry series, I used a feature of the October design that has recently been dropped. Until 1988, the CPS identified the calendar year of high school graduation for several years preceding the calendar year of the survey. Using this question, plus other questions on highest grade attended and college enrollment in the preceding year, I pooled reports from each year's CPS about college enrollment in the previous October by the high school graduating class of the preceding year together with the contemporaneous reports about the college enrollment of that year's class. There are changes in population coverage between the first and second year after high school graduation because some youths leave their parents' home to join the military, form independent households, or for other reasons. Thus, I estimated trends in college entry using a statistical model that takes the effect of the coverage difference into account.[8] In 1988 the Census Bureau dropped the detailed responses to the question about year of high school graduation, retaining only the distinction between graduates in the current year and in any previous year. Thus, in future years, it will not be possible to pool observations across years as I have done in the present analysis.

3.2 Trends in College Entry

Figure 3.4 shows the college entry series for black, Hispanic, and white men and women from 1972 through 1988.[9] The estimated proportions enter-

8. Before pooling the contemporaneous and retrospective reports, I tested for interaction effects between the effects of graduation year and year of report within each racial-ethnic group; there were no statistically significant interactions. Because there is 50 percent overlap in CPS households in the same month from one year to the next, this procedure does not double the precision of the estimates, but it is a substantial improvement. Effects of year of report have been included in all models used in the present analysis, but all reported estimates are normed on contemporaneous reports.

9. The estimates are based upon samples of 6,102 blacks, 2,801 Hispanics, and 50,348 whites (and others, e.g., Asians and American Indians) from the October Current Population Surveys, 1972 to 1988. All of the reported analyses are based upon the logit model for individual observations. Graphical displays of time series were constructed by taking three-year moving averages of predicted logits or of predicted contrasts between logits. The analyses were carried out without

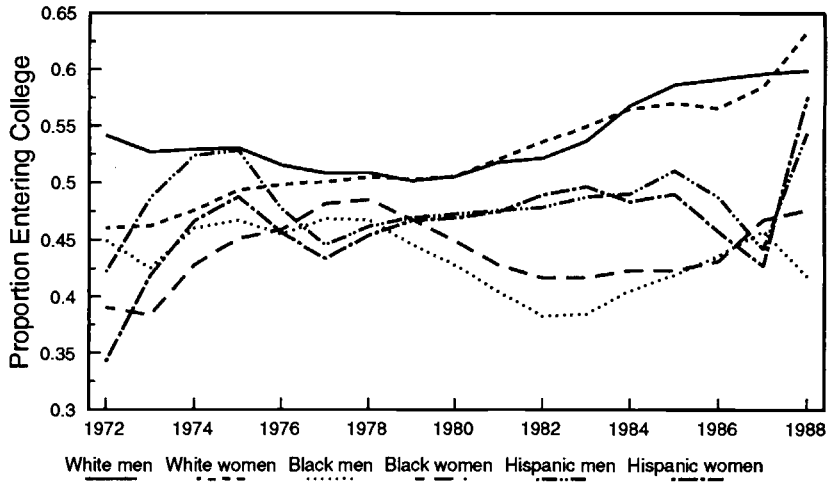

Fig. 3.4 College entry by sex and race-ethnicity: Recent high school graduates, 1972–1988

Note: Data are three-year moving averages of model estimates from October CPS.

ing college are based on a logit model that specifies effects of sex, race-ethnicity, sex by race-ethnicity, the interactions between year of graduation and race-ethnicity, and the interactions between year of graduation and sex. Although the model includes the two-way interactions among sex and race-ethnicity, these terms were not statistically significant ($L^2 = 3$ with 2 df). That is, gender differences in college entry were essentially the same among whites, blacks, and Hispanics. Furthermore, the three-way interaction effects among sex, race-ethnicity, and year of graduation were of borderline statistical significance, and these were not included in the model.[10] That is, although some trends in college entry differed by gender and some by race-ethnicity, gender differences in the trends were similar within each racial-ethnic group. The absence of interactions or trends in interactions between race-ethnicity

any correction for a sampling design factor. For this reason, the analysis may give undue importance to small differences among time periods or among racial-ethnic groups. Among graduates for whom there were contemporaneous reports of October enrollment, family income refers to the previous 12 to 15 months—that is, the period during which college entry decisions were most likely to have been made. However, among graduates with retrospective enrollment reports, family income pertains to the year after high school graduation.

10. While these effects are nominally statistically significant with $p = 0.01$ ($L^2 = 44$ with 32 df), they are not large enough to reject null under a Bayesian information criterion, $bic = L^2 - df \times \ln(N) = -308$, where negative values of bic suggest that the model is acceptable (Raftery 1986). Furthermore, since the data include two observations for each household covered in both the contemporaneous and retrospective reports of college attendance, the chi-square test statistic is too large by a factor of about one-third, even without an adjustment for the sample design factor.

and gender is an important finding, for it disconfirms some highly publicized claims about the distinctive problems of black men. If black men are at a disadvantage with respect to college entry, it is because, like black women, they are black and, like white men, they are men; there is no unique effect on college entry nor a unique trend associated with being both black and male.[11]

Figure 3.4 shows distinct trends for blacks, whites, and Hispanics, along with distinct differences from those trends between men and women of each racial-ethnic group. Whites of both sexes enjoyed consistently higher chances of college entry than any other group, except that college entry chances of white women were less than those of Hispanic men early in the 1970s. College entry chances of white men declined throughout the 1970s but recovered dramatically after 1980, when the chances of college entry among white men and women rose in parallel. College entry chances of Hispanics peaked in the middle 1970s and have been essentially stable since then, possibly excepting a recent increase. College entry among blacks rose during the 1970s but declined from 1979 to 1983, after which they may have recovered some of the earlier loss; however, through most of the period, the college entry chances of blacks have been less than those of whites or Hispanics.

Even though the series in figure 3.4 are based on a constrained model, it is difficult to follow as many as six trend lines. Figure 3.5 shows the college entry series for white men on a logarithmic scale, along with three other series that document major effects on the trends: women versus men, blacks versus whites, and Hispanics versus whites.[12] That is, the male-female comparison holds for whites, blacks, and Hispanics, while the black-white and Hispanic-white comparisons hold for men and women. The college entry chances of white men declined in the last half of the 1970s and then rose by 1988 to a peak above that of the 1970s. In the mid-1970s, about 53 percent of white men entered college; the college entry rate dropped to 50 percent by 1980 but increased to 60 percent in 1988. The series shows growth in black college entry chances relative to those of whites during the 1970s, with a peak late in the decade. At the peak, the college-going chances of blacks were almost equal to those of whites. But the peak was followed by an equally rapid decline that lasted through the first half of the 1980s. Hispanic enrollment chances follow those of whites more closely than do those of blacks. Hispanic chances of college entry converged upward toward parity with those of whites by the middle 1970s. After this peak, they declined to a level about 5 percentage points less than whites until the middle 1980s, after which the series appears to fluctuate unreliably. Women's chances of college entry grew steadily relative to those of men from the early 1970s through 1983; in the early 1980s, women enjoyed greater chances of college entry than men. After 1983, wom-

11. Similarly, there is no unique advantage in being both white and female; compare Koretz (1990).

12. Although figure 3.5 shows series on two different scales, the metric and range of each scale are the same.

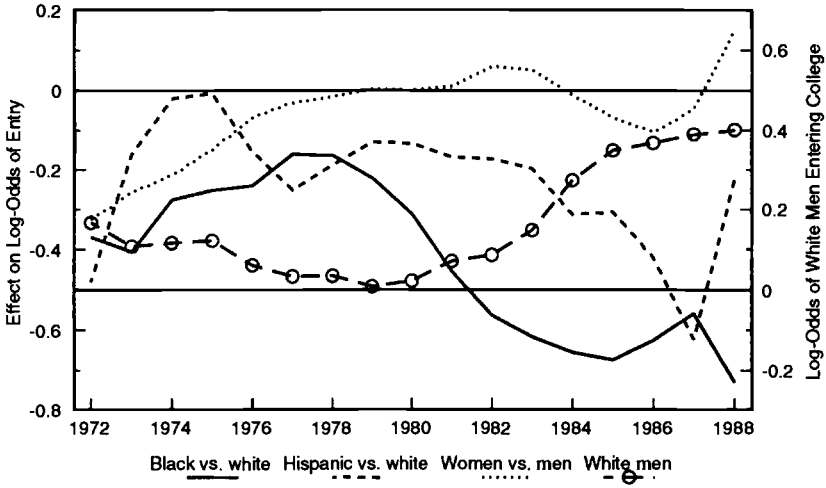

Fig. 3.5 Effects of sex and race-ethnicity on college entry: Recent high school graduates, 1972–1988

Note: Data are three-year moving averages of model estimates from October CPS.

en's college entry chances declined to a level slightly below those of men, but they reached a new peak later in the decade.

These series do not measure whether individuals ever entered college but only whether they entered in the fall after high school graduation; this is a weakness of the CPS since, as Kane (1991a, 1991b) and Hauser (1991b) have shown, the black-white gap in college entry closes to some degree through delayed enrollment. If disadvantaged groups delay college entry, then a decline in the initial transition from high school to college need not lead to a decline in the chance of ever entering college. On the other hand, the costs of delayed or prolonged schooling are real and should not be ignored. It is also difficult to come up with a later measure of college entry that does not confound the effects of delayed entry with those of prolonged or part-time attendance (Hauser 1991b), and it is impossible to maintain the CPS linkage between youth and their parents' households much beyond the completion of high school.

Fortunately, we can check the findings in figure 3.5 against an entirely independent and cumulative measure of college attendance. Figure 3.6 shows time series from the March CPS, corresponding to those in figure 3.5 but based on the share of high school graduates who ever enrolled in college by ages 21 to 24. The share of men entering college is less here than in the series in figure 3.5, and the college-going chances of blacks and Hispanics relative to whites are also less. These differences may be attributable to the inclusion of reported high school graduates who completed the 12th grade late or earned a high school equivalency. Such persons are less likely than on-time graduates

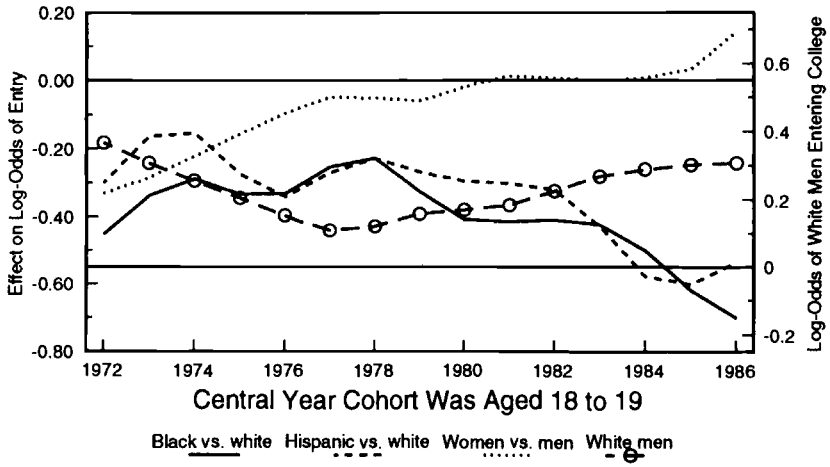

Fig. 3.6 Effects of sex and race-ethnicity on college entry by age 21–24: High school graduates, 1972–1986

Note: Data are three-year moving averages for persons age 21–24 in March CPS.

to enter college, and there are relatively more of them among blacks and Hispanics than among whites. Aside from these differences, there is substantial similarity between the shapes of the trends shown in figures 3.5 and 3.6, although those shown in figure 3.6 are smoother because of the four-year width of each age cohort. In figure 3.6 as in figure 3.5, there is a fall and rise of college attendance among white men, a rise and fall among blacks relative to whites, and sustained growth among women relative to men. There is less similarity between the immediate and cumulative series for Hispanics, whose college chances relative to whites follow an irregular downward trend. It is not clear whether the Hispanic series are simply unreliable or whether there are real differences in trend between immediate and cumulative college entry.

3.3 Trends in Social Background

Social background composition is a highly significant source of group differences and of historic changes in educational attainment (Hauser and Featherman 1976; Mare 1979; Kane 1991b). In this section of the analysis, I describe differentials and trends in the social background characteristics of high school graduates that are obtained in the October CPS; in the next section, I present estimates of the effects of these characteristics on college entry. These variables include geographic location, age, household structure, and parental education, occupation, income, and housing tenure. Geographic location and age have been measured for all of the graduates, without regard to their residence in parental households (hereafter, dependency). I have ignored nonde-

pendent graduates in describing the other background characteristics. Note that the population is high school graduates, not all youth, and that high school graduation is differentially selective among whites, blacks, and Hispanics; that is, in recent years, graduates represent about 90 percent of whites, 80 percent of blacks, and 60 percent of Hispanics (Frase 1989). When I present trends in social background (in figures 3.7 through 3.12), I present time series for racial-ethnic groups only; but when I show the effect of these trends on college entry (in figures 3.13 through 3.15), I present time series for racial-ethnic groups by gender. One can assume that, with minor exceptions, the social background of men and women in any racial or ethnic group is the same, and that is why I have not shown trends in social background by sex. We cannot expect gender differences in social background composition to explain gender differences in entry to college because there has been very little difference in the selectivity of high school graduation by gender.

3.3.1 Metropolitan Location

Metropolitan location may indicate proximity to institutions of higher education, differences in the quality of schooling, and access to labor market opportunities that compete with college entry. Figure 3.7 shows the distribution of white, black, and Hispanic graduates by metropolitan location. For this analysis, the 17 largest Standard Metropolitan Statistical Areas in 1970 were designated as metropolitan. Graduates were classified as residents of the central cities or suburban rings of those areas or as "other," even though they may have lived in smaller metropolitan areas. White graduates became less likely to live in the large metropolitan areas between 1972 and 1988, but there appear to have been no reliable changes in the metropolitan location of blacks or Hispanics.[13] Blacks and Hispanics were far more likely than whites to live in the large metropolitan areas, and within those areas, they were more likely to live in central cities than in suburban rings.

3.3.2 Regional Location

Regional location may affect access to higher education through differential access to low-cost public colleges or community colleges, and regional differences in access may also differ among racial-ethnic groups, as in the case of the traditionally black colleges in the South. Figure 3.8 shows no substantial shifts in the regional location of white, black, or Hispanic graduates from the 1970s through the 1980s, but there are consistent regional differences in the location of the three groups. Whites are more evenly distributed across the four major census regions, while blacks remain highly concentrated in the South and underrepresented in the West. Hispanics are highly concentrated in the West and South and are underrepresented in the North.

13. There is anomalous variation in several of the series for Hispanics, and I have ignored it throughout as a result of the small numbers of Hispanic graduates covered in the CPS.

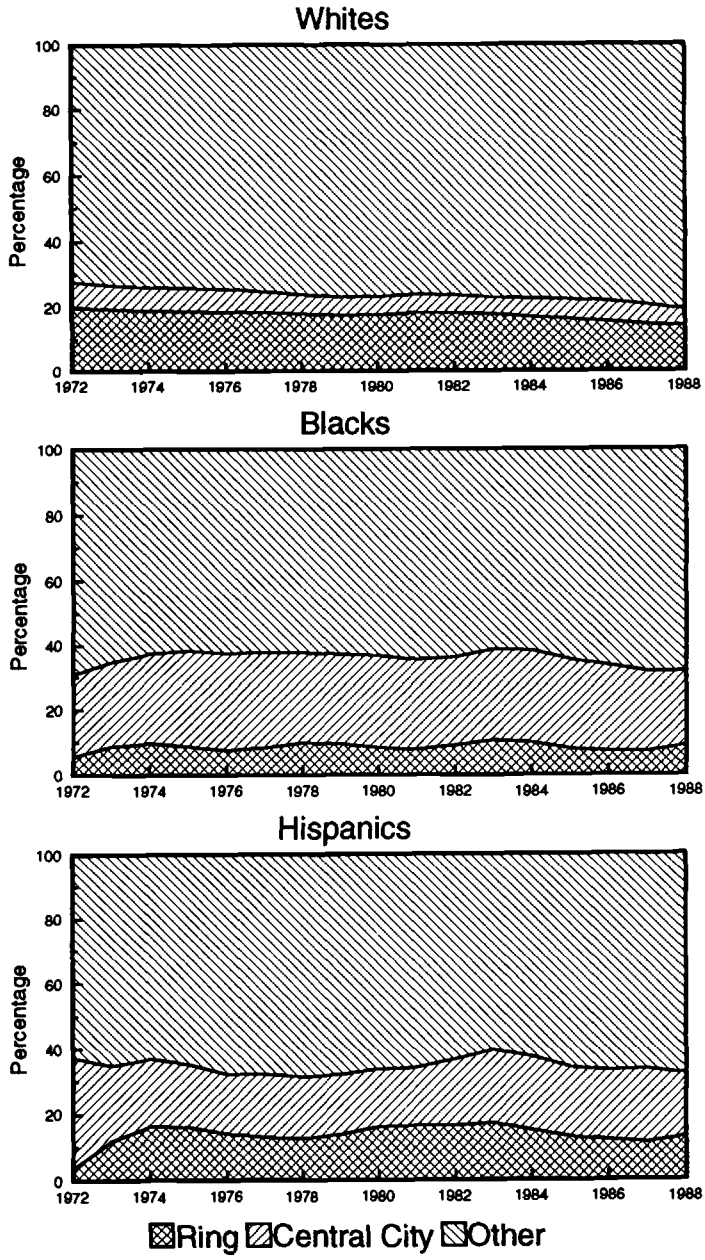

Fig. 3.7 Trends in metropolitan location by race-ethnicity: Recent high school graduates, 1972–1988

Note: Data are three-year moving averages of residence in 17 largest metropolitan areas among youth in October CPS.

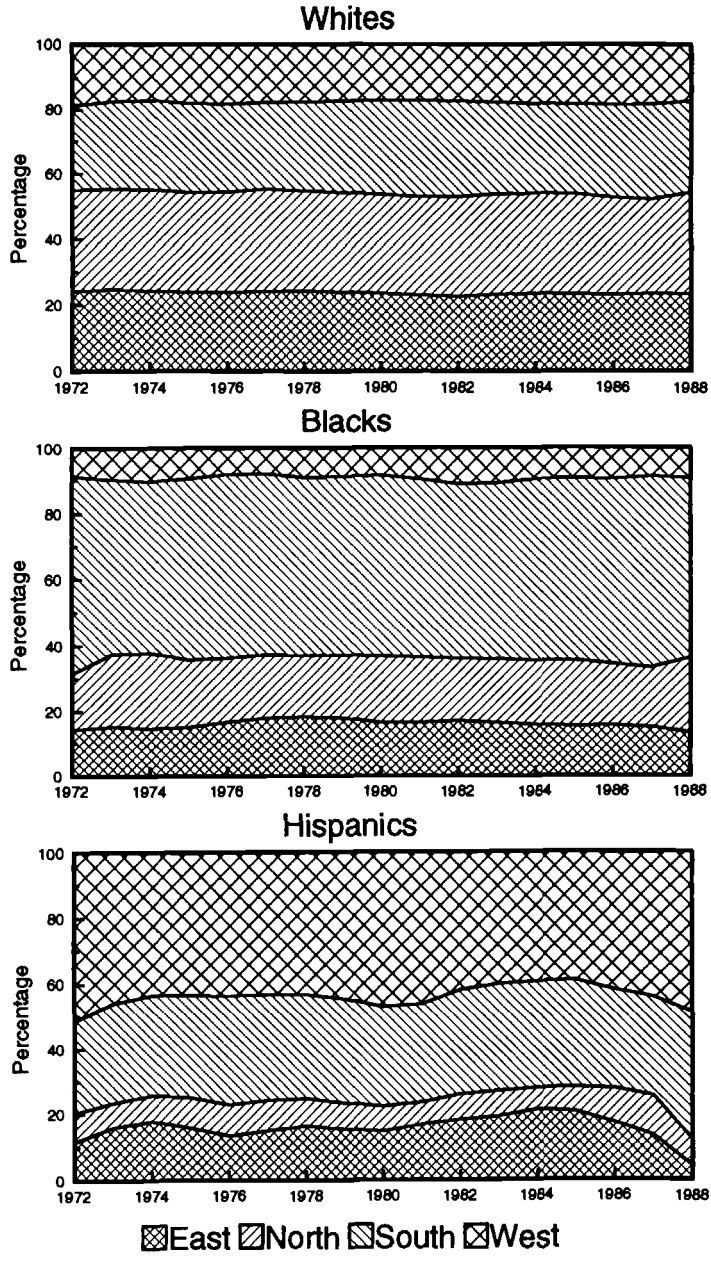

Fig. 3.8 Trends in regional location by race-ethnicity: Recent high school graduates, 1972–1988

Note: Data are three-year moving averages for youth in October CPS.

3.3.3 Age of Graduates

Among whites the age at high school completion increased slightly from 1972 to 1988. Later graduation may lower the chances of college entry because it is a proxy for previous academic problems or for greater family responsibility, economic independence, or labor market opportunity. As shown in figure 3.9, the share of white graduates less than 18 years old has declined steadily, while the share aged 19 or more has increased. This may be a result both of increasing school retention and of increased reporting of high school equivalency as graduation. There are fewer signs of reliable trends among blacks or Hispanics, but the age at high school completion is higher among the minority groups. Even in 1988 about 20 percent of white high school graduates were 19 years or older, but during the 1970s and 1980s roughly 25 percent of black graduates and 30 percent of Hispanic graduates were that old.

3.3.4 Household Structure

For consistency in the analysis, I arranged the household data for dependent children so there was always a record for a household head. If there were a householder and spouse present, I defined the male as the household head and the female as the spouse of head. In the few cases where there was a male householder but no spouse, the male was also defined as the head; if no male householder or spouse was present, I defined the female as the head. Thus, by construction, there were no data for the spouse of head in single-parent households.

Figure 3.10 shows time series in three measures of household structure: the share of female-headed households, the share of household heads without occupations, and the mean number of children in the household. The share of white graduates living in female-headed households grew from about 15 to 20 percent from 1972 to 1988, while that of Hispanics grew from about 20 percent to more than 30 percent.[14] Black graduates were far more likely than whites or Hispanics to live in single-parent households; their share of female-headed households grew from 40 percent to more than 50 percent between 1972 and 1980, and it appears to have been stable thereafter.

Only about 7.5 percent of the household heads of white graduates were without occupations as reported in the CPS, while nearly one-quarter of black household heads were without occupations. The share of Hispanic heads without occupations was between that of whites and blacks. The share of white heads without occupations was essentially stable from the 1970s through the 1980s, but that among blacks was appreciably higher from the late 1970s through the early 1980s.

The number of children in the household included persons 18 years or less in age, plus the reference person if he or she was 19 or older. This is a proxy

14. I doubt the reliability of the rapid increase in female-headed households among Hispanic graduates in the late 1980s.

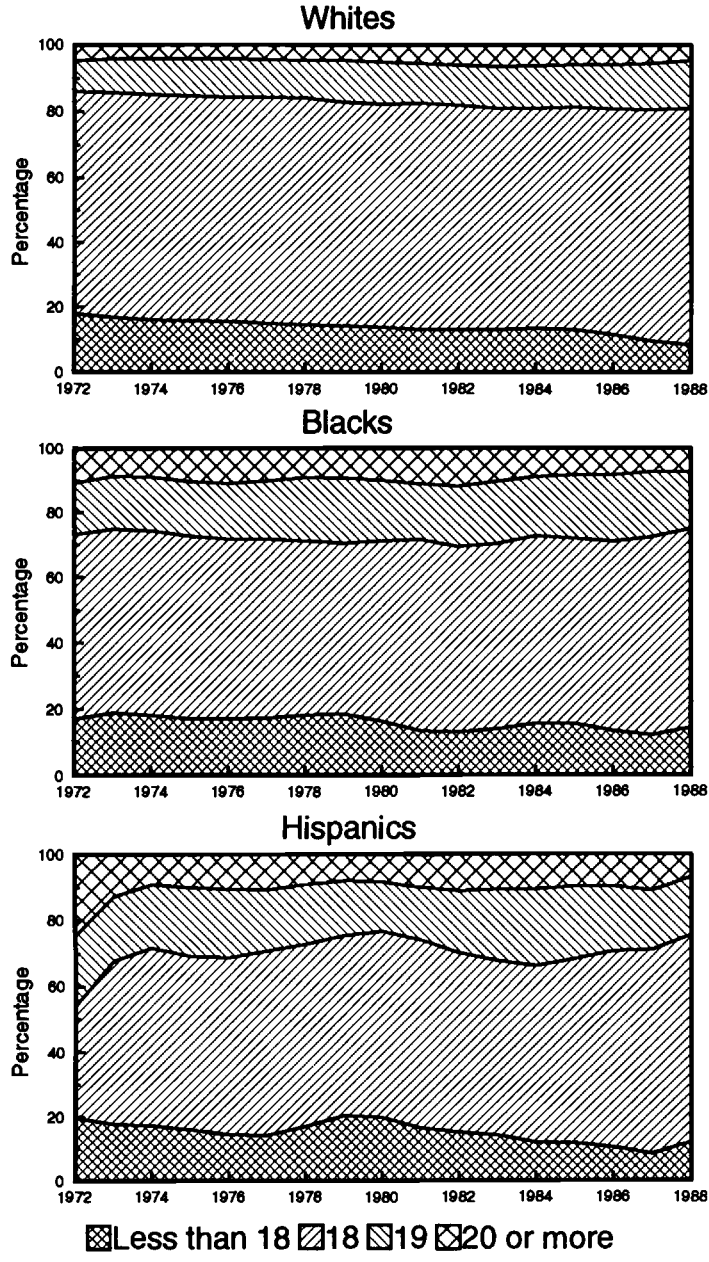

Fig. 3.9 Trends in age of graduates by race-ethnicity: Recent high school graduates, 1972–1988

Note: Data are three-year moving averages for youth in October CPS.

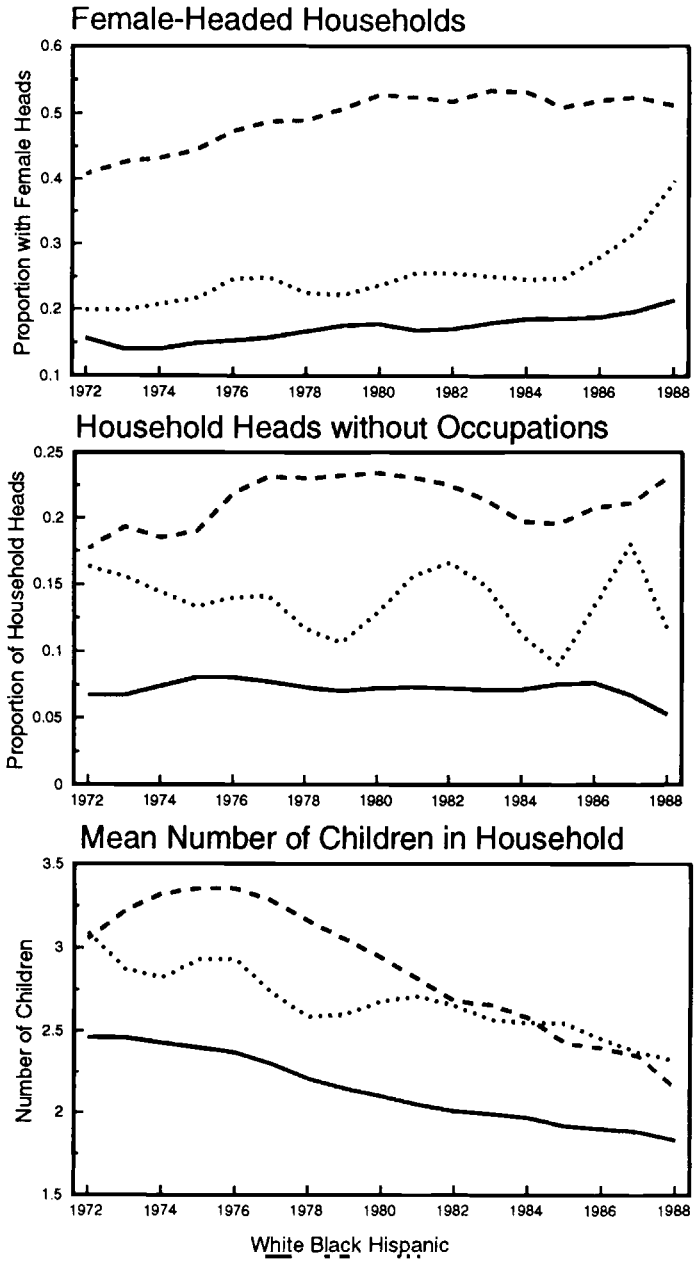

Fig. 3.10 Trends in household structure by race-ethnicity: Recent high school graduates, 1972–1988

Note: Data are three-year moving averages for dependent youth in October CPS.

measure of the size of the sibship, which is known to lower educational chances, but it excludes older siblings and those who have left the parental household.[15] Excepting a brief rise among blacks from the early to middle 1970s, this measure of demand for household resources decreased steadily among all three racial-ethnic groups from the 1970s through the 1980s. The number of children was consistently lower among whites than among blacks or Hispanics. The number of children was initially greater among blacks than among Hispanics, but those two series converged early in the 1980s.

3.3.5 Parental Schooling

Figure 3.11 shows trends in the completed schooling of parents of high school graduates. Consistent with the long-term secular growth of schooling, there are steady increases in the average levels of school completion among the fathers and mothers of white and black high school graduates.[16] There is much less evidence of a trend among the parents of graduates of Hispanic origin, and the educational attainments of Hispanic parents are consistently less than those of black or white parents. One reason for the lesser growth in schooling among parents of Hispanic graduates, and for some of the other distinctive characteristics of the Hispanics in this population, may be the contribution of new immigrants. Unfortunately, the CPS data do not include a measure of nativity or of date of immigration, so it is not possible to distinguish trends in the characteristics of the native population from those of immigrant groups.

3.3.6 Parental Socioeconomic Status

Figure 3.12 shows trends among the parents of high school graduates in four measures of socioeconomic status: occupational status (on the Duncan [1961] socioeconomic index [SEI] for occupations),[17] heads with farm occupations, annual household income, and home ownership. Father's occupational status affects children's educational and occupational chances, and among whites its influence on postsecondary schooling is about as large as that of parents' income or education (Sewell and Hauser 1975; Featherman and Hauser 1978). Mean occupational status of the household head was consistently higher among whites than among blacks or Hispanics. The mean for whites was around 40 to 45 points—roughly the level of self-employed cabdrivers, electricians, construction supervisors, and policemen—while that for

15. Thus, some dependent college students in the household were not counted.

16. Also, see Hauser and Featherman (1976) and Hauser and Anderson (1991).

17. The SEI is a weighted average of occupational education and income in which the weights have been chosen to predict a survey-based measure of occupational social standing. The version of the scale used here was constructed for 1970-basis census occupational titles by Stevens and Featherman (1981), using characteristics of occupations in the 1970 census and prestige measures obtained by Siegel (1971) from surveys by the National Opinion Research Center in the mid-1960s. It was updated for 1980-basis census occupation titles by Stevens and Cho (1985).

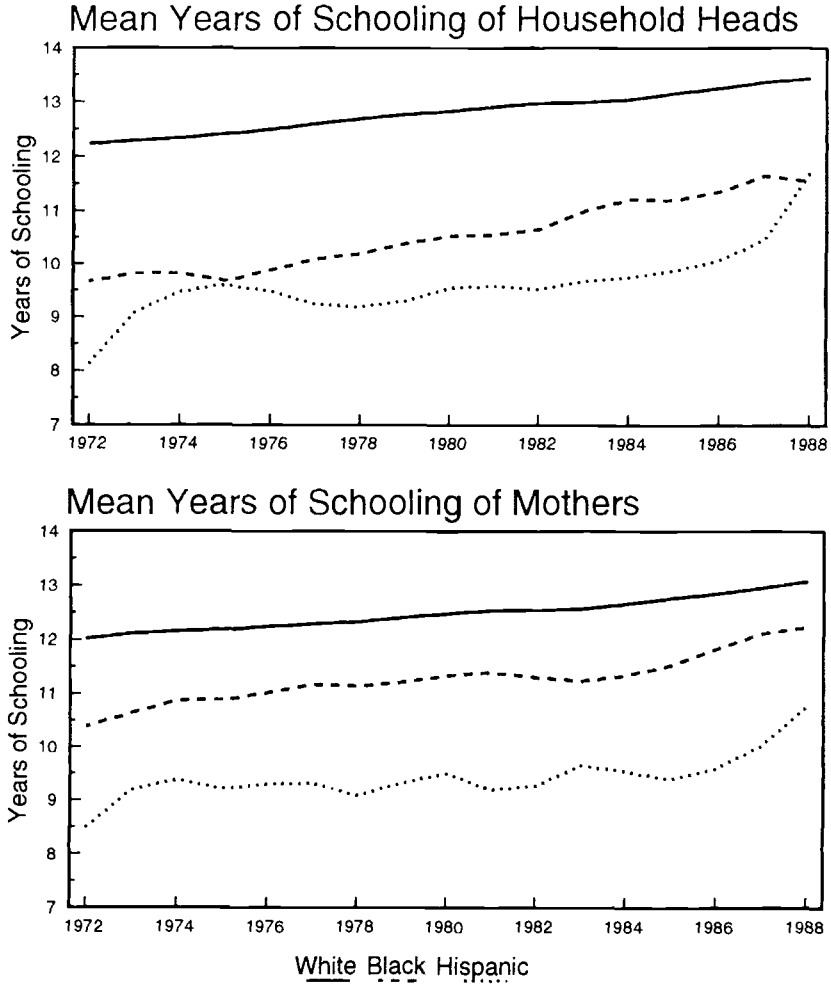

Fig. 3.11 Trends in parental schooling by race-ethnicity: Recent high school graduates, 1972–1988

Note: Data are three-year moving averages for dependent youth in October CPS.

blacks and Hispanics was about 25 to 30 points—roughly the level of office messengers, brickmasons, plasterers, ushers, and oil refinery laborers. There was no consistent evidence of a trend in status among Hispanics, but that of blacks and of whites grew from the 1970s through the 1980s.

The prevalence of farm occupations declined among white and black household heads, but it fluctuated wildly among Hispanics. Historically, farm youth obtain less schooling than persons with otherwise similar social and economic background. However, the negative effects of farm background have gradually declined among blacks and whites, and the effect of farm background on edu-

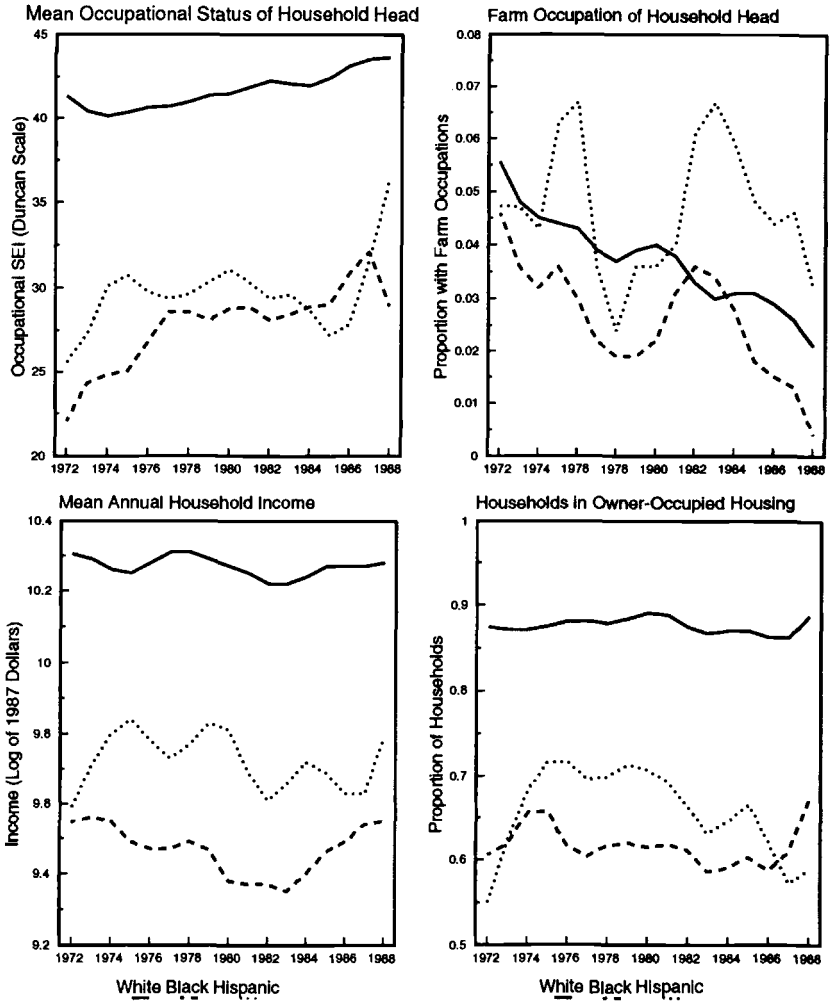

Fig. 3.12 Trends in socioeconomic status by race-ethnicity: Recent high school graduates, 1972–1988

Note: Data are three-year moving averages for dependent youth in October CPS.

cational attainment is positive for white men born after the middle 1930s (Hauser and Featherman 1976, 109, 114).[18] Thus, in recent cohorts, one might expect the decline in farm origins to reduce chances of college entry.

18. The effects of farm background depend on the position of farm occupations in the Duncan scale, which reflects the low levels of schooling and income among farmers. Farm occupations rate lower in socioeconomic status than they do in prestige, as determined by popular ratings of occupational standing. However, the changing influence of farm background on schooling is not an artifact of changes in the position of farmers in the Duncan scale. Farm youth used to fare even

Household income is a key variable in economic analyses of college entry, as well as a trigger of eligibility for financial aid. However, previous research has shown that parents' incomes are by no means dominant among the socioeconomic variables affecting chances of postsecondary schooling (Sewell and Hauser 1975; Hauser, Tsai, and Sewell 1983). The CPS household income item is not of high quality (Hauser 1991b), and this adds to my doubts about its significance in the present analysis. There were great differences in household incomes among whites, blacks, and Hispanics; figure 3.12 shows that in constant 1988 dollars white families earned about $30,000, Hispanic families about $16,000, and black families about $13,000. White household income declined slightly from 1972 to 1975, rose through 1978, and declined again through 1983, after which it rose almost to the level of the early 1970s. Black household income declined from the mid-1970s through 1983, after which it appears to have grown sharply back to the levels of the early 1970s.

Home ownership is a crude measure of wealth; thus, we would expect it to increase the chances of college entry. The racial-ethnic differentials in home ownership are similar to those in household income. Nearly 90 percent of white high school graduates came from families in owner-occupied housing, compared to about 60 percent of blacks and 70 percent of Hispanics. There is no evidence of a trend in home ownership among the families of white graduates. It may have declined among blacks and Hispanics from the middle 1970s through the middle 1980s, but some of the year-to-year fluctuations appear too large to be credible.

It may be useful to summarize the major differentials and trends in social background. As expected, white graduates are better off than black or Hispanic graduates in almost every way: they are younger; they are less likely to come from single-parent households or households without an employed head; they come from households with fewer children; and their parents are better educated, hold higher-status jobs, make more money, and are more likely to own their own homes. It is less easy to characterize differentials between blacks and Hispanics. Blacks are more likely to come from single-parent households or households without an employed head; their household incomes are lower; and their rates of home ownership are less than those of Hispanics (except in 1987 and 1988). On the other hand, black parents have more schooling than the parents of Hispanic graduates. Among all three racial-ethnic groups, the prevalence of female-headed households increased during the 1970s and 1980s, while the number of children in the household decreased. Among white and black graduates, parental schooling and occupational status increased, while farm background decreased; but these trends appear not to have occurred among Hispanics. There is no uniform trend to-

worse than one would expect from their fathers' low level of occupational status, and they now fare better.

ward improvement or deterioration in social background among any of the racial-ethnic groups, but one might expect, given the importance of parental schooling and family size, that there was a general improvement in the predisposing conditions of family background for college entry among whites and blacks.

3.4 Social Background and College Entry

In order to measure the influence of social background on college entry, I first carried out separate analyses for white, black, and Hispanic graduates. The estimates are based on a logistic regression equation that also includes effects of year of graduation and of the year of the survey report but no interactions between gender and the year of the survey report. Recall that characteristics of the household and its members, other than the reference person, were treated as missing for all graduates who were not classified as dependents. Estimated effects of variables other than age, sex, and regional and metropolitan location pertain only to dependent graduates, and those effects could be somewhat different among all graduates. Within each racial-ethnic group, I recoded the characteristics of nondependents at the mean values of the variables for dependent graduates. Thus, the estimated effects of nondependency contrast the college entry of nondependent graduates with the college entry of the average dependent graduate in that racial-ethnic group.[19] There were also some households for which income was not reported, some heads without occupations, and a large number of female-headed households where, by construction, there were no data for spouse's education. In these cases, I recoded the missing cases at the mean values for nonmissing cases in the racial-ethnic group and introduced a dummy variable for the cases with missing data. Thus, within each racial-ethnic group, the dummy variable for female-headed household contrasts the college-going chances of graduates from female-headed households with those of graduates from two-parent

19. Obviously, the data for nondependents add no information to the models about the slopes of variables for which those data were missing, but they do add information about the effects of sex, race, age, dependency status, regional and metropolitan location, and year of high school graduation. This use of data for nondependent graduates is, unfortunately, ignored in Cameron and Heckman's commentary. I looked for interactions between year of report and the effect of each social background variable in each racial-ethnic group. Different effects could result from differences in dependency status between the year of high school graduation and the following year, when dependency is less prevalent, or they could result from differences in the temporal referent of the background variable (e.g., to the year of high school graduation or the following year). In a global test, none of the slope differences is statistically significant. The effect of family income is significantly less in the second than in the first year among blacks but not among whites, nor are slope differences of housing tenure or occupational status significant among blacks or whites. These tests give very little support to Cameron and Heckman's findings about dependency status and the effects of family income in the NLSY. As in my analysis, Cameron and Heckman find no appearance of slope differences for any variable other than family income and they do not report a test of the significance of the observed differences.

households whose mothers had completed the average level of schooling among mothers in such households.[20]

Table 3.1 shows estimated effects of social background and dependency status on college entry in each racial-ethnic group. Dependent women are more likely than men to enter college in all three groups, and the effect is largest among blacks and smallest among Hispanics; however, the interaction effect of sex with race-ethnicity is not statistically significant. Nondependent youth are much less likely to enter college than dependent youth, and in every group this effect is even larger among women than among men.[21] The interpretation of these effects is problematic because nondependency may be an effect, rather than a cause, of college entry. Graduates may be living in independent households because they have not entered college, rather than not attending college because they are no longer dependents. This does not affect other estimates in table 3.1, except in the cases of age and of regional and metropolitan location, because the other estimates pertain only to dependent graduates. However, dependency status does affect the overall comparison of male and female college entry chances, and it could affect the comparisons among whites, blacks, and Hispanics. Thus, in a later section of the analysis, I compare trends and differentials in college entry between men and women and among the racial and ethnic groups in the full model with trends and differentials under simpler specifications of the association of dependency status, sex, and race-ethnicity with college entry.

The effects of central city and nonmetropolitan residence are expressed as deviations from college entry among suburban residents in large metropolitan areas. Central city residence increases the chances of college entry among the small minority of white youth from central cities (compare figure 3.7) but not among black or Hispanic graduates. The positive effects among blacks and Hispanics are not statistically significant, but they are also not significantly different from the effects among whites. Among all groups, college-going chances are slightly lower outside the large metropolitan areas than in their suburban rings, and there are no significant differences among the groups in these effects.

The effects of regional location are expressed as deviations from the chances of college entry in the East. Here, there is substantial heterogeneity among racial-ethnic groups that deserves more detailed study. Whites' college entry chances are similar in the South and East, but they are better in the West

20. For nondependent graduates, the dummy variables for missing data were assigned the arithmetic means of those variables among dependent youth.

21. Because the model interacts sex with dependency status, the main effect of sex pertains to dependent women. For example, among white dependents, the effect of being female is an increase of 0.161 in the log-odds of college entry. Being nondependent reduces the log-odds of entering college by 1.060, and being a nondependent female reduces the log-odds by an additional 0.629. Thus, among white dependents, women have an advantage of 0.161 over men in the log-odds of college entry; among white nondependents, women have a disadvantage of $(0.161 - 0.629 =) -0.468$.

Table 3.1 **Effects of Sex, Nondependency, and Social Background on College Entry: White, Black, and Hispanic High School Graduates**

	White		Black		Hispanic	
Variable	Effect	SE*	Effect	SE	Effect	SE
Sex (female = 1, male = 0)	0.161	0.022	0.243	0.059	0.032	0.088
Nondependency						
Nondependent	−1.060	0.055	−0.195	0.190	−0.278	0.220
Female nondependent	−0.629	0.054	−0.736	0.190	−0.479	0.220
Metropolitan location (relative to suburban ring)						
Central city	0.186	0.047	0.045	0.108	0.194	0.150
Not large metropolitan	−0.133	0.027	−0.137	0.106	−0.053	0.123
Region (relative to East)						
North	−0.108	0.027	−0.271	0.092	−0.514	0.181
South	−0.041	0.028	−0.134	0.086	−0.265	0.142
West	0.119	0.032	0.264	0.113	−0.308	0.133
Age	−0.183	0.010	−0.127	0.022	−0.116	0.027
Female-headed household	−0.170	0.031	−0.113	0.068	0.061	0.114
Head without occupation	0.066	0.044	0.042	0.080	0.045	0.143
Children in household	−0.076	0.009	−0.133	0.017	−0.045	0.029
Head's education	0.158	0.005	0.059	0.011	0.063	0.015
Spouse's education	0.145	0.007	0.087	0.017	0.005	0.017
Head's occupational status	0.133	0.007	0.133	0.024	0.158	0.035
Head's farm occupation	0.414	0.059	0.094	0.229	0.385	0.233
Family income not reported	0.038	0.041	−0.102	0.130	−0.368	0.200
Family income (log)	0.172	0.020	0.066	0.047	0.203	0.074
Housing tenure (own = 1, rent = 0)	0.343	0.035	0.360	0.067	0.083	0.106
Sample size	50,348		6,102		2,801	

Note: Excepting race-ethnicity, sex, age, regional and metropolitan location, and dependency status, all variables pertain only to dependent graduates. The effect of occupational status is reported for a unit of ten points on the Duncan SEI. Dummy variables for year of high school graduation and for retrospective versus contemporaneous reports are also included in each equation.

*Standard error.

and worse in the North than in the East. Blacks' college entry chances are better in the West than in the East, but they are worse in the North and South than on either coast. Hispanics' college entry chances are similar in the South, and West, where they are somewhat worse than in the East, and they are worse in the North than in any other region. Thus, all groups fare less well in the North and South relative to the East, while whites and blacks fare better in the West than in the East, and Hispanics fare worse in the West than in the East. In general, the regional differences appear to be larger among minority than

among majority populations; among Hispanics this could be a consequence of regional differences in the origin of the Hispanic population. However, these effects are large, and their interpretation is not obvious. This is one of the reasons I have examined trends in entry separately for each racial-ethnic group before attempting to compare overall trends and differentials.

There are highly significant negative effects of age on college entry within each racial-ethnic group, and the effects are significantly less among blacks and Hispanics than among whites. That is, although late graduation is an obstacle to college entry, it is less so among the less privileged groups, where late graduation is more common. This suggests that late graduation may have more heterogeneous sources among minorities—for example, late school entry rather than grade retardation. Another possibility is that the greater prevalence of late graduation among minority groups may make it less of a handicap than it is among majority whites. Differences in age at high school graduation may account for part of the difference between whites and minorities in college entry, and the increasing age at high school graduation among whites may have slowed the growth of college entry.

Residence in a female-headed household has a statistically significant negative effect on college entry among whites, but its effect among blacks, though negative, is smaller than that among whites and is not statistically significant. Among Hispanics, the effect of living in a female-headed household is actually positive, but it is not statistically significant. The negative effect among whites is less than the effect of a single year of age and barely larger than the effect of sex. Thus, net of other family and household characteristics, the effect of residence in a female-headed household is moderate in comparison with that of other factors influencing college entry. We do not expect black-white differences in intact family to contribute substantially to the black-white differential in college entry, nor do we expect that the increase in female-headed households substantially reduced growth in college entry. In none of the racial-ethnic groups does college entry depend on whether the household head has an occupation.

The number of children in the household has a significant negative effect on college entry among blacks and whites but not among Hispanics. The effect is also significantly stronger among blacks than among whites or Hispanics. Thus, we would expect the black-white difference in number of children to help explain the difference in college entry, and we would expect the decline in number of children (figure 3.10) to contribute to growth in college entry among blacks and whites.

Among whites, both education of head and education of spouse of head have the expected large positive effects on chances of college entry. The effects are only about half as large among blacks, but they are still highly significant statistically. Among Hispanics, the effect of head's education is similar to that among blacks, but there is no significant effect of spouse's education. Given the large educational differences among heads of white,

black, and Hispanic households and the steady growth of schooling among heads and spouses in white and black households (figure 3.11), we expect that differentials and trends in parental schooling will contribute substantially to the explanation of racial-ethnic differentials in college entry and that they will contribute to growth in college entry among whites and blacks.

Head's occupational status has similarly large and highly significant effects on college entry in all three racial-ethnic groups. For example, among whites the effect of a 10-point increase in occupational status on the Duncan scale, 0.133, is similar to that of a one-year increase in mother's educational attainment, 0.145. Among blacks and Hispanics, the effect of a 10-point increase in occupational status is larger than that of a year of schooling of either parent. Thus, we expect majority-minority differences in household head's occupational status (figure 3.12) to help explain racial-ethnic differentials in college entry, and we expect growth in head's occupational status among blacks and whites to contribute to growth in college entry.

Having a household head with a farm occupation contributes positively to the chances of college entry among whites. Since the effect of a farm occupation, 0.414, is just about three times that of a 10-point difference in occupational status on the Duncan scale, 0.133, we can say that the effect on college entry of being a farm son or daughter is equivalent to a 30-point increase in the occupational status of farmers, given their placement on the scale. The estimated effect of head's farm occupation is less than one-quarter as large among blacks as among whites, but it is about the same among Hispanics as among whites; however, none of these intergroup differences is statistically significant. Since the share of households with farm heads is small in each racial-ethnic group and the differences among the groups are not consistent (figure 3.12), we do not expect the effect of farm occupations to explain racial-ethnic differences in college entry. However, the steady decline in heads with farm occupations among whites must contribute a modest negative component to their trend in college entry.

Family income has a large and significant effect on college entry among whites and Hispanics but not among blacks, and the effect among blacks is significantly lower than among whites.[22] Thus, one might expect white-Hispanic differences in family income to account for a positive difference between their chances of college entry. It is not clear how one ought to interpret the absence of a family income effect among blacks. One way to put the matter is that public policy, perhaps among other factors, has eliminated income as a barrier to college entry among blacks, though not among whites or Hispanics, even though it has not eliminated the influence of other background factors that impede college entry—for example, parental schooling, occupational

22. There is no significant effect of missing data on family income among any of the three racial-ethnic groups. That is, children from households that did not answer the family income question had chances of college entry that were similar to those of households with average levels of family income.

standing, and the presence of other children in the household. On the other hand, one might say that the parents of black children, unlike those of white (or Hispanic) children, are unable to improve the college entry chances of their offspring by earning more money. This is similar to the perverse form of equality of opportunity for intergenerational occupational mobility that was experienced by black men in the 1960s (Duncan 1968).[23] The family incomes of white graduates declined from the late 1970s through the early 1980s (figure 3.12), so we expect family income to have contributed modestly to the observed trend in college entry among whites. Among blacks, family income declined from the early 1970s through the early 1980s and then recovered, but the effect of family income is so small that we do not expect it to contribute significantly to the observed trend.

Home ownership has similarly large and significant effects on college entry among whites and blacks but not among Hispanics. Since black households are less likely than white households to live in owner-occupied dwellings (figure 3.12), we expect the difference in home ownership to contribute to the black-white difference in college entry. However, since there is no reliable trend in home ownership among the racial-ethnic groups, we do not expect it to contribute to the trend in college entry.

In summary, among background characteristics, only sex, dependency status, age, head's educational attainment, and head's occupational status have consistently significant effects on college entry among whites, blacks, and Hispanics. If we disregard the erratic estimates among Hispanic graduates and consider blacks and whites alone, we can add number of children in the household, spouse's educational attainment, and home ownership to the set of variables consistently affecting college entry. Differentials in social background on each of these variables may contribute to racial-ethnic differentials in college entry. Positive trends in head's and spouse's educational attainment and head's occupational status, along with the decline in number of children, probably contributed to growth in college entry from the 1970s through the 1980s. At the same time, increases in age at high school graduation and in female headship (among whites) may have depressed chances of college entry. In the next section, we examine the overall effect of changes in social background on the college entry of whites, blacks, and Hispanics.

3.5 Trends in College Entry with Background Controlled

For each racial-ethnic group, I estimated two logistic regression equations for college entry. The first equation included only the effects of year of report, sex, year of high school graduation, and the interaction of sex with year of graduation. Estimates from this equation give the logs of the odds-ratio of

23. There are large income differentials in college entry among all three racial-ethnic groups, but they disappear among blacks when other background variables are controlled.

college entry for men and women in each year. The second equation includes the same variables as the first but adds effects of the social background variables and nondependency and the interaction effects of nondependency with sex. Thus, the effects of social background, but not those of nondependency, were assumed to be equal for men and women within each ethnic group. With any fixed configuration of social background, predictions from this equation estimate the trend in college entry net of changes in social background and dependency. Using these two equations, I estimated two components of the trend in college entry for each sex and racial-ethnic group. The first component is the trend in college entry net of social background and dependency, given by the effects of year of high school graduation and of the year by sex interactions in the second equation. The second component is the trend in college entry predicted from changes in social background and dependency, which is given by the differences between the corresponding effects of year of high school graduation for each sex in the two equations.

Figure 3.13 shows the components of trend in college entry among white men and women. The upper panel shows the trends net of social background and dependency status, and the lower panel shows the trends predicted from social background.[24] The graph is constructed so the sex difference in college entry pertains to dependent high school graduates, while the estimated sex-specific trends pertain to both dependents and nondependents. From 1972 through 1975, dependent white women and men had essentially the same chances of college entry. From 1975 to 1980, white men's chances of college entry declined while women's chances were stable, but men's and women's chances of college entry rose almost in parallel thereafter. As shown later in this paper, the difference in men's and women's chances of college entry is largely a result of the differing effects of dependency on their college entry chances: dependent women are more likely to enter college than dependent men, while nondependent women are much less likely to enter college than nondependent men. As shown in the lower panel of figure 3.13, the overall effect of changes in social background and dependency status was an almost linear growth in college entry among white men and women. Thus, the observed decline in college entry of whites in the late 1970s (figure 3.4) was less sharp than it would have been in the absence of changes in social background and dependency, while the observed growth in their college entry after 1980 was faster than it would otherwise have been.

As shown in the upper panel of figure 3.14, the chances of college entry among black men and women diverged in the middle 1970s, just as they did among whites, but in the case of blacks the divergence may have been created by rapid growth in women's chances of college entry. After 1977 there were

24. These estimates are conditional on the assumptions that effects of social background are the same for men and women except in the case of dependency status, that the effects of social background and dependency status are constant from 1972 through 1988, and that trends in college entry among men and women do not differ by dependency status.

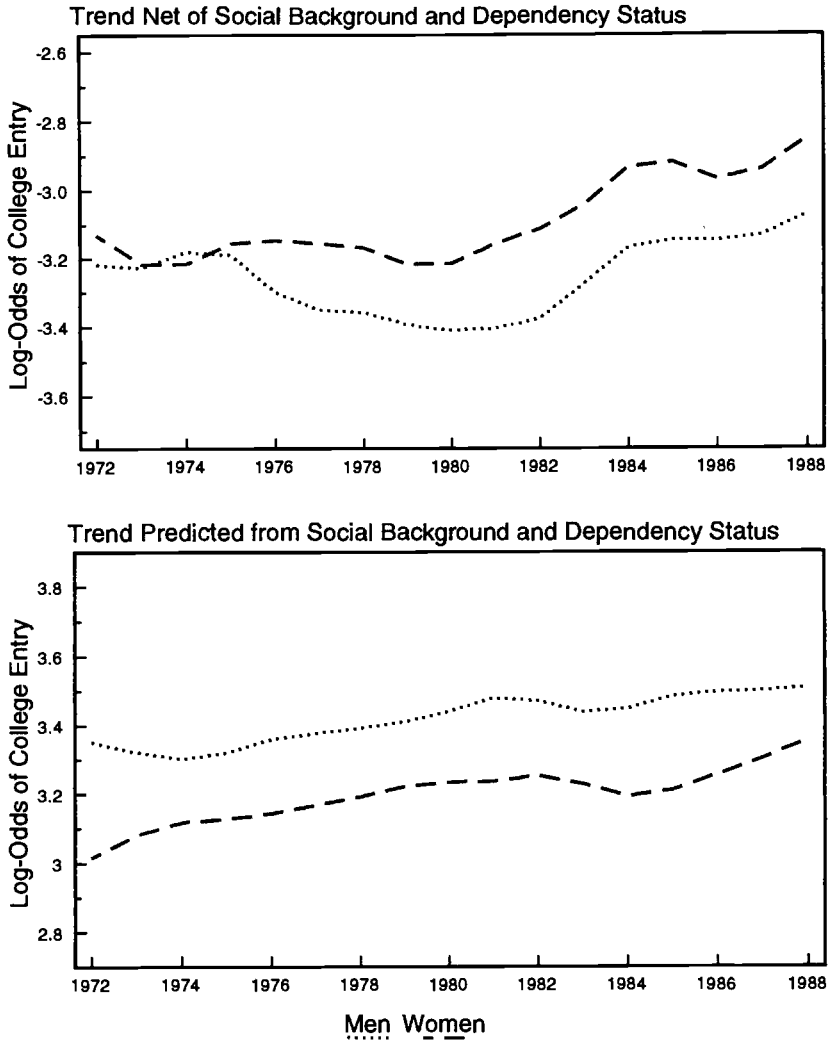

Fig. 3.13 Components of trend in college entry among whites: Recent high school graduates, 1972–1988

Note: Data are three-year moving averages from October CPS.

parallel declines in the college entry chances of black men and women through 1983, after which the chances of college entry may have improved.[25]

25. The separate estimates for black women and men in 1972 and in 1988 are probably too unstable to permit any firm statements about trends; recall that there are no contemporaneous data for 1973 nor any retrospective data for 1988. When I pool the estimates of trends for black men and women, the series shows increasing college entry chances from 1972 to 1975, a sharp decrease from 1977 through 1983, and a partial recovery from 1973 to 1988.

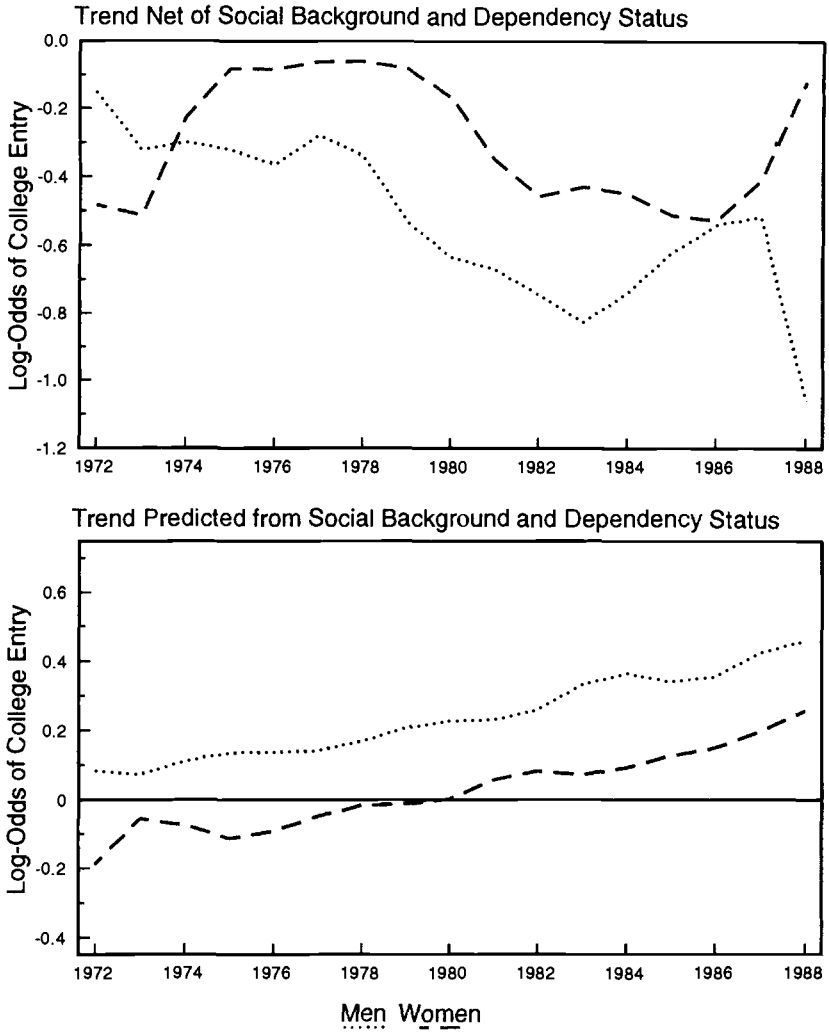

Fig. 3.14 Components of trend in college entry among blacks: Recent high school graduates, 1972–1988

Note: Data are three-year moving averages from October CPS.

The lower panel of figure 3.14 shows that among blacks, as among whites, the overall effect of changes in social background and dependency status was an almost linear growth in the chances of college entry for men and women, and the growth was faster among blacks than among whites. Thus, the observed decline in black chances of college entry from the middle 1970s through the early to mid-1980s was muted by rapid improvement in the back-

ground characteristics of black high school graduates.[26] Had there been no such trend in background characteristics, the downturn in chances of college entry among blacks would have been much larger, and it might have been detected earlier.

Trends in the components of Hispanics' chances of college entry are shown in figure 3.15. Unlike whites and blacks, there are no significant sex differences in the effects of year of high school graduation on college entry when social background is controlled ($L^2 = 23$ with 16 *df*), so I have displayed pooled estimates of the trend in the upper panel of figure 3.15. Excepting a possible small rise and fall in the middle 1970s and some instability after 1985, the series shows essentially no change.

There does not appear to be a consistent long-term trend among Hispanics toward improvement in social background composition, at least as it relates to their college-going chances. Although there appear to be improvements early and late in the series of social background composites, I think they are unreliable given the lack of consistent change. That is, because cohorts of parents bear children over a period of years, one would not expect to observe rapid change in the social background of successive cohorts of high school graduates, unless there were also drastic changes in selection into high school graduation.[27]

3.5.1 Dependency and College Entry

The first three rows of table 3.1 show the interaction effects of sex and dependency on college entry. Among all three racial-ethnic groups, dependent women are more likely to enter college than are dependent men. This effect is small and not statistically significant among Hispanics, but the estimate is also not significantly different from those for whites or blacks. Nondependents are less likely to enter college than dependents, regardless of sex and race-ethnicity. The main effect of nondependency, which pertains to males, is much stronger among whites than among blacks or Hispanics; it is not statistically significant in the minority groups. There is an additional effect of nondependency among women in all three groups, and there are no significant differences among the groups in this sex interaction.

The effects of dependency would not be of special interest except that my single-equation model may incorrectly specify that nondependency is a cause, rather than an effect, of college entry. Even if the equation were wrong in this way, the error could not seriously affect estimated trends and differentials if

26. As shown by Featherman and Hauser (1976), there is a long-term trend toward improvement in the social background characteristics of blacks—except in the important case of nonintact families—and there is no reason to link that trend specifically to the post-1954 dismantling of legally mandated school segregation (compare Kane 1991b).

27. In my current research on trends in high school dropout, I find no evidence of increases in high school dropout in the early 1970s and late 1980s that could explain sudden growth in the social background characteristics of Hispanic high school graduates.

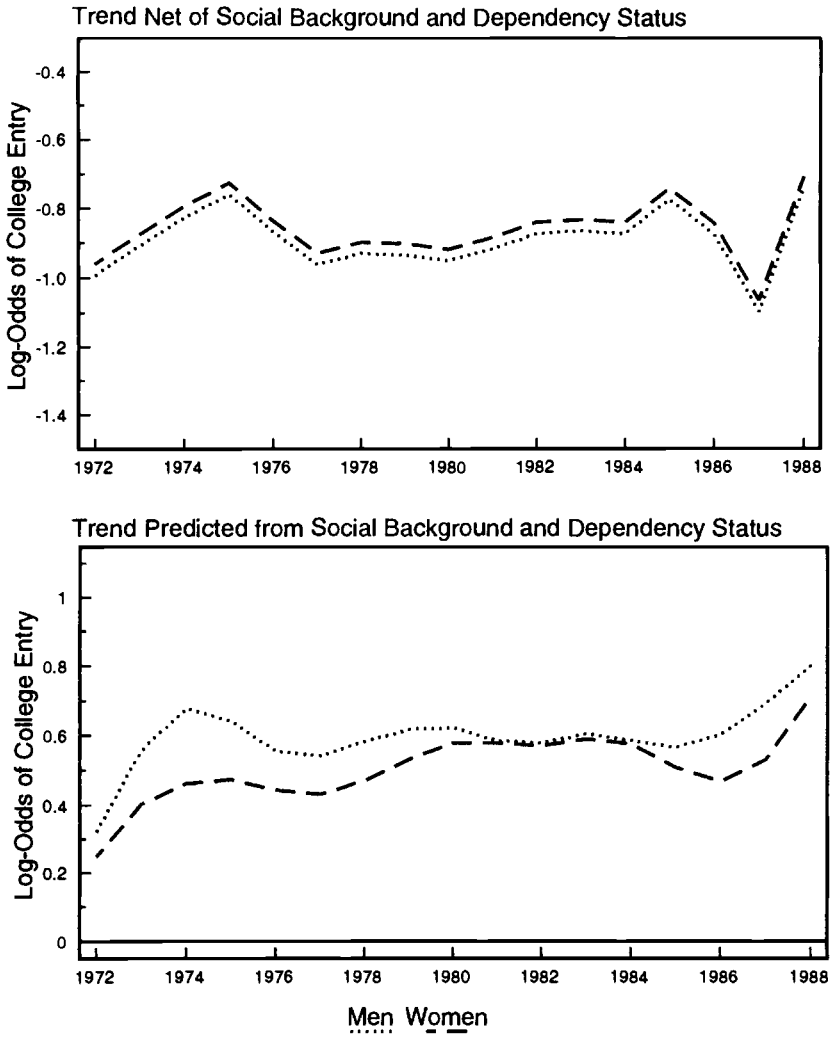

Fig. 3.15 Components of trend in college entry among Hispanics: Recent high school graduates, 1972–1988

Note: Data are three-year moving averages from October CPS.

there were very few nondependents among recent high school graduates, but this is not the case. Figure 3.16 shows trends in estimated percentages of nondependents by sex among whites, blacks, and Hispanics. The estimates are based on a logistic regression of dependency status on calendar year, year of report, race-ethnicity, and sex, in which calendar year is permitted to interact with race-ethnicity but not with sex. That is, trends in dependency status

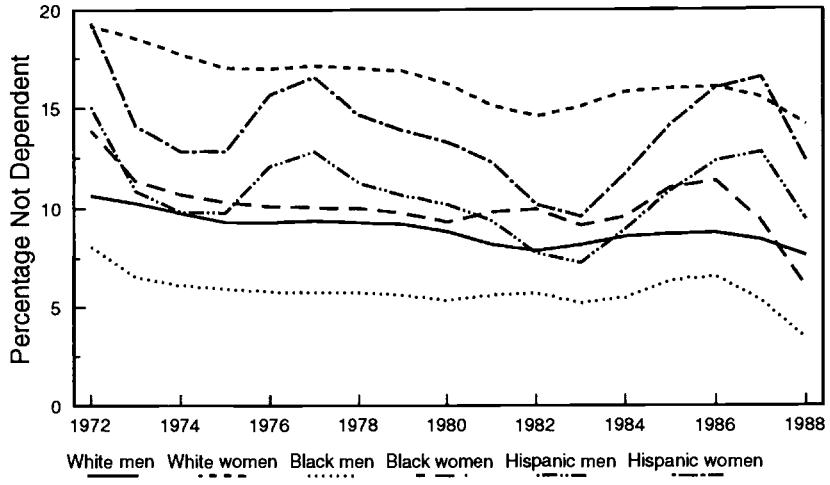

Fig. 3.16 Percentage of nondependents among recent high school graduates by sex and race-ethnicity, 1972–1988

Note: Data are three-year moving averages of model estimates from October CPS.

vary across the racial-ethnic groups, but the trends are the same for men and women within each group.

Rates of nondependency range from about 5 percent to 20 percent across years and racial-ethnic groups. In general, dependency increased from the early 1970s through the late 1980s. For example, nondependency decreased from 19 percent to 14 percent among white women, and it decreased from 8 percent to 3 percent among black men. The only exception to this trend is an anomalous jump in the series for Hispanics after 1983. Within each racial-ethnic group, men were consistently less likely to be nondependent than women were; the sex differential was largest among whites and smallest among Hispanics. Within each sex, whites were consistently more likely to be nondependent than blacks were. Presumably, this is a consequence of the greater economic resources and opportunities of young whites; they are more able to afford to set up independent households. Similarly, in most years, Hispanic women were less likely to be nondependent than were white women, but Hispanic men were more likely to be nondependent than were white men.

What are the likely implications of these trends and differentials in dependency for rates of college entry? First, given the negative association between nondependency and college entry, decreasing rates of nondependency will tend to increase college entry. This is one component of growth in the background effects for whites and blacks shown in figures 3.13 and 3.14. Second, women are more likely to be nondependent than men, but the sex differential in college entry changes with dependency status. Dependent women have better chances of college entry than dependent men, but nondependent women

have worse chances of college entry than nondependent men. Thus, the effect of a failure to control dependency status will vary both with the share of women who are nondependent and the effects of sex within dependency status. Because of the ambiguous causal role of dependency status and the opposite effects of sex on college entry among dependents and nondependents, it may be best to be agnostic about the implications of the present analysis for overall gender differentials in college entry. Third, since whites are more likely to be nondependent than blacks, the black-white difference in college entry chances will be understated if we fail to control dependency status. There may be a similar effect on the Hispanic-white difference in college entry, but that is less clear from the findings in figure 3.16 and table 3.1.

3.5.2 Racial-Ethnic Differentials in College Entry

In order to compare differentials in college entry among whites, blacks, and Hispanics, I estimated logistic regressions in which the effects of social background were constrained to be equal in each year, in all three racial-ethnic groups, and among men and women. Because more than 80 percent of high school graduates were white, the data for whites dominate the estimates, and in effect the analysis yields comparisons of white, black, and Hispanic rates of college entry, standardized on the white regressions and conditioned on the social background composition of the three groups.[28] Sex and race-ethnicity were permitted to interact in the equation for college entry, and each of those variables was permitted to interact with dependency status, but there were no three-way interactions. The effect of sex differed by calendar year ($L^2 = 40$ with 16 *df*) as did the effect of race-ethnicity ($L^2 = 120$ with 32 *df*), but there was no three-way interaction among sex, race-ethnicity, and calendar year ($L^2 = 50$ with 32 *df*). That is, just as in the analyses without controls for social background, when social background and dependency status were controlled, sex differences in the trend in college entry were similar among whites, blacks, and Hispanics.

The estimated trends and differentials in college entry among white, black, and Hispanic men and women are shown in figure 3.17. The estimates are normed on dependent youth in their year of high school graduation, and I have evaluated the trends and differentials near the average proportion of college

28. Cameron and Heckman's complaint about these intergroup comparisons seems overblown. Obviously, to compare groups only at the grand mean of the regressors would be somewhat arbitrary in the presence of strong interactions; the significance of the interactions between race-ethnicity and the effects of social background, globally or severally, does not establish their importance in the assessment of trends and differentials. For example, note that the trend lines in figure 3.17 for each racial-ethnic group are similar to those previously estimated independently within each racial-ethnic group (compare the top panels of figures 3.13, 3.14, and 3.15). The apparent insensitivity of these trends to the source of estimated background effects is ignored in Cameron and Heckman's discussion. It would be useful to supplement the trend analyses reported here with a parallel analysis, comparing blacks, whites, and Hispanics but using the black regressions as the standard. Having carried out many similar exercises in the past, I doubt that this one would alter the present conclusions in any significant way.

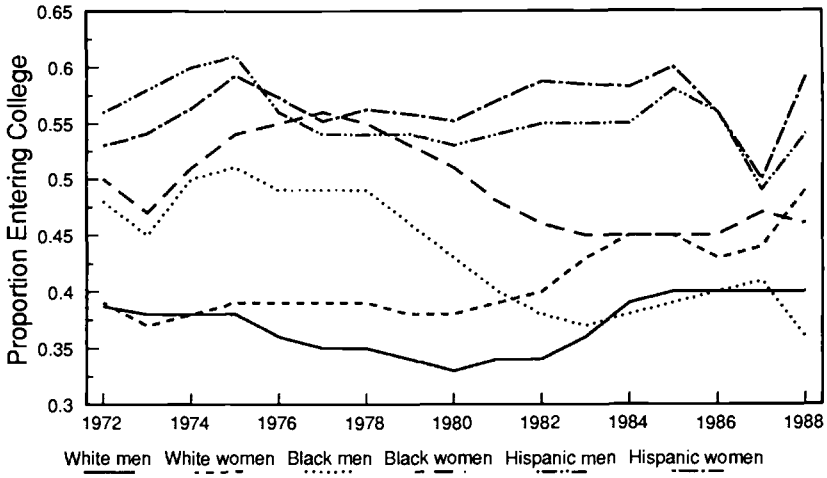

Fig. 3.17 College entry net of social background by sex and race-ethnicity: Dependent high school graduates, 1972–1988

Note: Data are three-year moving averages of model estimates from October CPS.

entry among male black dependents. Thus, the trend lines for other groups—white or Hispanic, male or female—show estimated proportions of college entry among persons in each group with the characteristics of black male dependents.

Figure 3.17 shows four striking findings. First, the estimates in the full model yield much larger intergroup differentials in college entry than are observable in the original data. Second, among black and white dependents, women's chances for college entry steadily improve relative to those of men. Third, controls for dependency status and social background eliminate or reverse the original racial and ethnic differentials (compare figure 3.4). For example, nearly half of black male dependents entered college in the middle 1970s, but fewer than half of white male dependents with the same social characteristics entered college. Among dependent youth, through most of the 1970s and 1980s, when social background is controlled, Hispanics enjoy better chances of college entry than blacks of the same sex, and blacks in turn have better chances of college entry than whites of the same sex. Differentials in social background, including dependency status, are more than sufficient to account for white advantage in access to college in the first year after high school graduation. Fourth, while chances for college entry grew among whites, they declined among blacks. After the late 1970s, the chances of black college entry declined from a situation of net black advantage to the point where there essentially was parity between dependent blacks and whites of each sex and the same social and economic background.

Figure 3.18 shows the trend in college entry among dependent white men, controlling social background, along with the trends in the black-white,

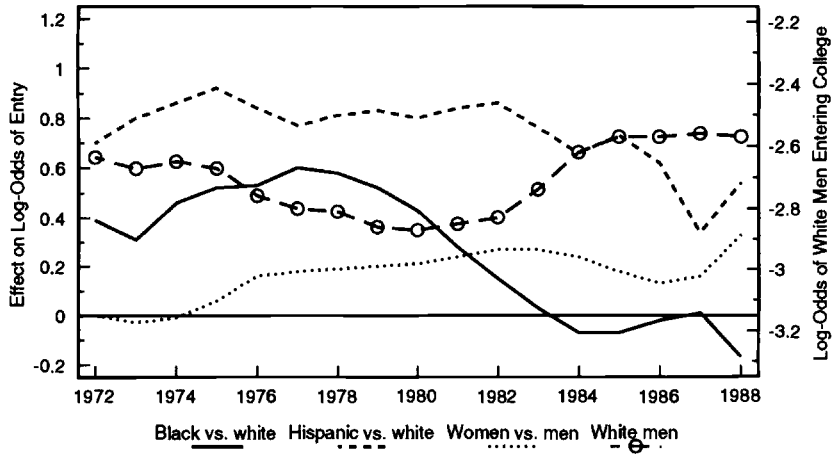

Fig. 3.18 Effects of sex and race-ethnicity on college entry net of social background and dependency status: Recent high school graduates, 1972–1988
Note: Data are three-year moving averages of model estimates from October CPS.

Hispanic-white, and female-male contrasts.[29] To facilitate comparison, these effects are shown on the same scale as the comparable contrasts in figure 3.5, where dependency status and social background were not controlled. There is substantial similarity in the shape of each of the corresponding contrasts in figure 3.5 and in figure 3.18, but there are also important differences in the shape and location of the contrasts. For example, there is little difference in the shape of the baseline trend among dependent white men. However, peak attendance in the late 1980s is higher than peak attendance in the early 1970s in the observed data of figure 3.5, but not in the adjusted data of figure 3.18, because of the contribution of improved social background to the growth of college entry among whites.

The shape of the black-white contrast is also similar in figures 3.5 and 3.18, but the troughs of the early 1970s and the late 1980s are at almost the same level—about 0.4 less than whites—in the observed data but not in the adjusted data. In figure 3.18, even in the early 1970s, once social background was controlled, dependent black men had much better college entry chances than dependent white men; in the late 1980s, dependent black men had very nearly the same college entry chances as dependent white men.[30] The improvement in the black-white contrast in the 1970s was less steep in the ad-

29. As displayed, the black-white and Hispanic-white contrasts pertain to dependent men, while the female-male contrast pertains to dependent whites. Under the model, the trends in the black-white and Hispanic-white contrasts are the same for men and women regardless of dependency status, while the trends in the female-male contrasts are the same among whites, blacks, and Hispanics regardless of dependency status.

30. On the average, the black-white contrast is 0.082 larger among dependent women than among dependent men, so black women may have better college entry chances relative to white women than those shown in figure 3.18.

justed than in the observed series, while the decline in the black-white contrast in the 1980s was sharper in the adjusted than in the observed series. The poor social backgrounds of blacks relative to whites account for the overall shift in the contrast from negative to positive between the observed and adjusted series, while the more rapidly improving social backgrounds of blacks account for the differing shapes of the observed and adjusted black-white contrasts.

In the case of the Hispanic-white contrast, there is no consistent trend either in the observed series of figure 3.5 or in the adjusted series of figure 3.18; but rather than hovering about zero, the Hispanic-white contrast in the adjusted series is about 0.8. That is, among dependent men of equal social background, the college entry chances of Hispanic men far exceed those of white men.[31]

The shape of the female-male contrast in the observed series of figure 3.5 is virtually the same as in the adjusted series of figure 3.18. We would expect this from the virtually identical social background distributions of dependent men and women. However, there is a difference in the vertical location of the two contrasts. In the adjusted series, unlike in the observed series, women have better college entry chances than men in every year after 1975. As explained earlier, dependent women are more likely to enter college than are dependent men, but the observed series of figure 3.5 also reflects the experience of nondependent women. Women are more likely to be nondependent than men, while nondependency is associated with poor college entry chances, especially among women. To illustrate this, figure 3.19 shows the female-male contrasts under three alternative models.[32] The gross effect is taken from the model of figure 3.5, and the effect in the full model is taken from figure 3.18. The third series is estimated from a model in which dependency status, but no other background variables, enters the model of college entry. There is a sharp upward shift in the female-male trend line when dependency status is controlled, but there is almost no shift in the trend line when the other background variables are added to the model. The ambiguous causal standing of dependency status may leave us wondering about the overall college entry chances of women relative to men, but the evidence is clear that from the 1970s to the 1980s the college entry chances of women improved sharply relative to those of men.

The effects of dependency status on the black-white and Hispanic-white contrasts are much different than its effects on the female-male contrast. Figures 3.20 and 3.21 show estimates of the racial-ethnic contrasts that correspond to the female-male contrasts of figure 3.19. Both the black-white and Hispanic-white contrasts become larger when dependency status is controlled; thus, it is most unlikely that a failure to control dependency status would lead

31. On the average, the Hispanic-white contrast is 0.118 smaller among dependent women than among dependent men, but this difference accounts for only a small share of the Hispanic advantage.

32. The effects shown in figure 3.19 are pooled across whites, blacks, and Hispanics.

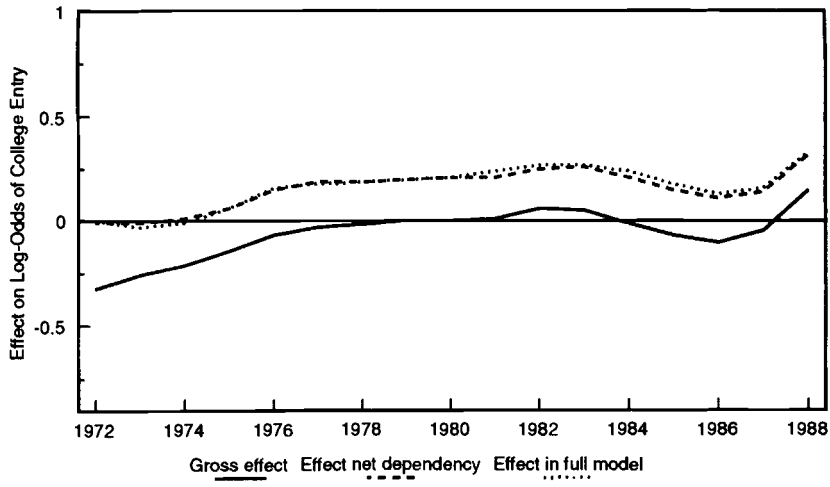

Fig. 3.19 Sex differences in college entry: Recent high school graduates, 1972–1988

Note: Data are three-year moving averages of model estimates from October CPS.

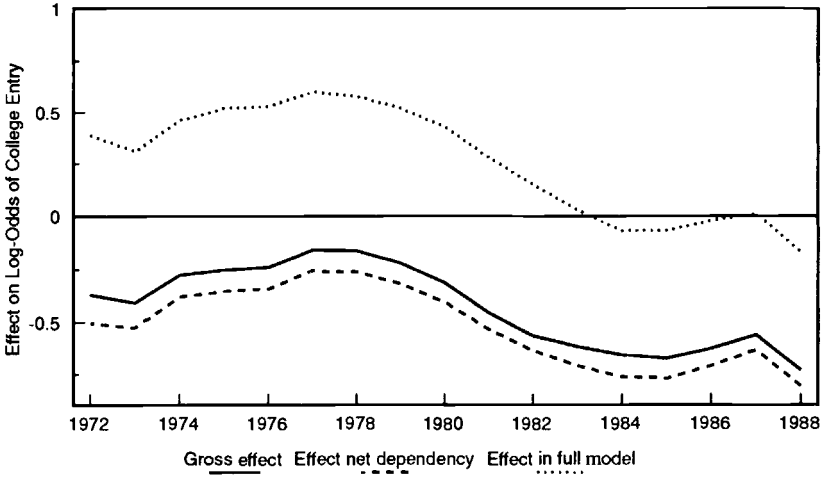

Fig. 3.20 Black-white differences in college entry: Recent high school graduates, 1972–1988

Note: Data are three-year moving averages of model estimates from October CPS.

us to overestimate the black-white or Hispanic-white differences in college entry.[33]

33. Curiously, Cameron and Heckman's discussion of dependency status and college enrollment ignores the analyses of figures 3.16 through 3.19.

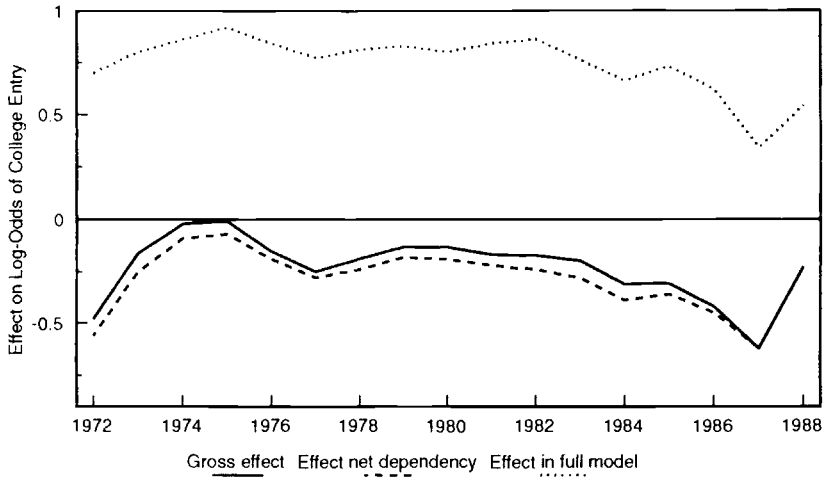

Fig. 3.21 Hispanic-white differences in college entry: Recent high school graduates, 1972–1988

Note: Data are three-year moving averages of model estimates from October CPS.

3.6 How Much Equality of Opportunity?

This analysis confirms some previous findings about differentials and trends in college entry while adding some new findings about them as well. More important, the analysis also opens a few new areas of ignorance. By combining contemporaneous and retrospective reports of post–high school activity, we confirm earlier findings of a fall and rise in the college-going chances of white men from the early 1970s to the late 1980s. Contrary to some previous analyses, we find clear evidence of divergent trends in college entry between blacks and whites during this period. Relative to those of whites, black college entry chances rose during the 1970s and declined from the late 1970s through the 1980s. While data for Hispanics are less reliable, they appear to show little difference between whites and Hispanics in trends in college entry. Thus, whatever explanation one offers for the divergent trends among blacks and whites ought not to apply equally to the contrast between Hispanics and whites.

Several explanations have been offered for the decline in college entry chances of blacks relative to those of whites. These include changes in the incomes of black families, changing gender differentials in college entry, differential recruitment of blacks and whites into the armed forces, changes in academic performance or in the selectivity of high school graduation, changes in plans and desires to attend college, and changes in the cost of a college education. The available evidence rules out all of these except changes in the net cost of college attendance. While black-white differences in social back-

ground are more than sufficient to account for black-white differences in college entry, we found no support for the hypothesis that trends in the black-white difference in college entry can be explained by trends in family income—or by trends in any of the other social and economic characteristics available in the CPS. Likewise, we have seen that the decline in college entry chances has affected both black men and black women. Evidence from other sources rules out some of the other explanations (Hauser, in press). Although almost all entrants into military service since the late 1970s have been high school graduates, black rates of entry into military service declined during the same period that black chances of college entry declined. High school completion has increased among blacks, but the change has not been dramatic, and it has been accompanied by improvements in the academic performance of blacks relative to whites. Plans and aspirations to attend college have grown among blacks, as among whites (Hauser and Anderson 1991). Thus, changes in cost appear to be the most likely explanation of changing black and white chances of college entry. Hauser (in press), among others, points to the shift in support from grants toward loans as a source of change that would be especially disadvantageous to blacks, while Kane (1991b) emphasizes changes in net cost associated with rigidity in the size of Pell Grants.[34]

While the overall chances of men and women are obscured by the complex relationships among gender, dependency status, and college entry, the evidence is clear that there has been steady improvement in the college entry chances of women relative to those of men. In addition, contrary to a great deal of received opinion, there is no substantial evidence that, at any point in time, gender differences in college entry differ among blacks, whites, and Hispanics or that trends in gender differences in college entry differ among blacks, whites, and Hispanics. That is, differentials and trends in the effect of gender cut across racial and ethnic lines, and differentials and trends in the effect of race and ethnicity cut across gender lines.

Among whites and blacks but not among Hispanics, global improvements in social background composition have been a steady source of growth in college entry. Growth in parents' levels of schooling and declines in family size were major components of these improvements, which were not dampened by increasing rates of family disruption. Improvements in social background slowed both the observed decline in white chances of college entry in the 1970s and the observed decline in black chances of college entry in the 1980s; obversely, they accelerated the growth of white chances of college entry in the 1980s and of black chances of college entry in the 1970s.

Differences in the effects of social background characteristics among racial and ethnic groups raise questions that should be pursued in additional analyses of these or other bodies of data. For example, why do the effects of family

34. One difficulty with Kane's explanation is that it would appear to apply equally to blacks and whites.

income differ among whites, blacks, and Hispanics? Is this a consequence of nonlinearity in the effects of income across the different segments of the income distribution occupied by the three groups, or are there real differences in income-specific preferences, in the impact of financial aid policy, or in the location of populations relative to schools with differing costs? Similarly, why are the effects of parental schooling larger among whites than among blacks or Hispanics? Why is living in a female-headed household a greater obstacle to college entry among whites than among blacks or Hispanics? Why do regional differences in college entry appear to differ substantially among whites, blacks, and Hispanics? Why is independence from the parental household associated with much lower chances of college entry among whites than among blacks or Hispanics?

Even without controlling academic performance, traditional differentials in the chances of college entry between whites and blacks or Hispanics are reversed when a full set of social background characteristics is controlled. Once social background is controlled, even though blacks' chances of college entry declined sharply relative to those of whites after the late 1970s, they never fell far below those of whites.[35] When social background is controlled, Hispanic chances of college entry are consistently much higher than those of blacks or of whites. One reason for the net advantage of Hispanic high school graduates may be the selectivity of high school graduation: only about 60 percent of Hispanics graduate from high school. However, the selectivity of high school graduation is much less among blacks and whites, and the difference between black and white graduation rates is much less than that between white or black and Hispanic graduation rates.

These findings raise, in a rather pointed way, the question of how much compensation for preexisting population differences ought to be the goal of public policy. If, among persons with the same social background, minority chances of college entry exceed those of the white majority, is there a rationale for expanded efforts to improve the relative chances of minorities? On the negative side, one might argue that the goal of public policy ought to be limited to establishing parity among groups. Majority groups are often as quick to condemn reverse discrimination as minority groups are to object to traditional patterns of discrimination. On the positive side, given the evidence of persistent disadvantage among minorities in other social and economic processes, as well as the large and persistent differences in social background between majority and minority groups, one might argue that we should con-

35. Given the well-documented differences in academic performance favoring majority whites (Jaynes and Williams 1989), it is reasonable to assume that the present findings underestimate the college entry chances of blacks relative to those of whites with the same academic performance and social background. On the other hand, since the academic performance of black high school students has improved rapidly since 1980, the net decline in the college entry chances of blacks may be even greater than the decline that I have estimated without controlling academic performance.

tinue or expand public efforts to improve the status of minorities where the promise of success is greatest. If, during the late 1970s, economic and social conditions gave a real advantage to black youth in one of the most significant transitions from youth to adulthood, should we not attempt to understand and reestablish those conditions? These questions go well beyond the present data, but the data show that they are not merely of hypothetical interest.

References

Bishop, John H., and Shani Carter. 1990. The worsening shortage of college graduate workers. Center for Advanced Human Resource Studies, School of Industrial and Labor Relations. Working Paper no. 90-15. Ithaca, N.Y.: Cornell University.

Carter, Deborah J., and Reginald Wilson. 1990. Ninth annual status report: Minorities in higher education. Washington, D.C.: American Council on Education.

Duncan, Otis Dudley. 1961. A socioeconomic index for all occupations. In *Occupations and social status*, ed. Albert J. Reiss, Jr., 109–138. New York: Free Press.

———. 1968. Patterns of occupational mobility among negro men. *Demography* 5(1):11–22.

Featherman, David L., and Robert M. Hauser. 1976. Changes in the socioeconomic stratification of the races, 1962–1973. *American Journal of Sociology* 82(November):621–51.

———. 1978. *Opportunity and change*. New York: Academic Press.

Frase, Mary J. 1989. Dropout rates in the United States: 1988. Analysis Report no. NCES 89-609. Washington, D.C.: National Center for Education Statistics.

Hauser, Robert M. 1991a. Educational transitions and the future workforce: Federal statistics to inform public policy. Institute for Research on Poverty Notes and Comments. Madison: University of Wisconsin–Madison.

———. 1991b. Measuring adolescent educational transitions among black Americans, Hispanics, and whites. Institute for Research on Poverty Discussion Paper 951-91. Madison: University of Wisconsin–Madison.

———. 1991c. *Uniform October Current Population Survey person-household file, 1968–1988*. Codebook for machine-readable data file. Madison, Wis.: Center for Demography and Ecology.

———. In press. The decline in college entry among African Americans: Findings in search of explanations. In *Prejudice, politics, and race in America today*, ed. Paul Sniderman, Philip Tetlock, and Edward Carmines. Stanford, Calif.: Stanford University Press.

Hauser, Robert M., and Douglas K. Anderson. 1991. Post–high school plans and aspirations of black and white high school seniors, 1976–1986. *Sociology of Education* 64(October):263–77.

Hauser, Robert M., and David L. Featherman. 1976. Equality of schooling: Trends and prospects. *Sociology of Education* 49(April):99–120.

Hauser, Robert M., Shu-Ling Tsai, and William H. Sewell. 1983. A model of stratification with response error in social and psychological variables. *Sociology of Education* 56(January):20–46.

Hu, Arthur. 1991. Hu's on first. *Asian Week*, February 22:21.

Jaynes, Gerald David, and Robin M. Williams, Jr., eds. 1989. *A common destiny: Blacks and American society*. Committee on the Status of Black Americans, Com-

mission on Behavioral and Social Sciences, National Research Council. Washington, D.C.: National Academy Press.

Kane, Thomas J. 1991a. College cost and the timing of college entry. Cambridge, Mass.: Kennedy School of Government, Harvard University. Manuscript.

———. 1991b. College entry by blacks since 1970: The role of tuition, financial aid, local economic conditions, and family background. Cambridge, Mass.: Kennedy School of Government, Harvard University. Manuscript.

Koretz, Daniel. 1990. *Trends in the postsecondary enrollment of minorities*. Santa Monica, Calif.: Rand Corporation.

Mare, Robert D. 1979. Social background composition and educational growth. *Demography* 16(February):55–71.

Mortenson, Thomas G. 1990. College entrance rates for recent high school graduates. ACT Financial Aid Research Briefs, vol. 5. Iowa City, Iowa: American College Testing Program.

———. 1991. Equity of higher educational opportunity for women, black, Hispanic, and low income students. ACT Student Financial Aid Research Report Series, no. 91-1. Iowa City, Iowa: American College Testing Program.

Murphy, Kevin, and Finis Welch. 1989. Wage premiums for college graduates: Recent growth and possible explanations. *Educational Researcher* 18(May):17–26.

Pelavin, Sol H., and Michael Kane. 1990. *Changing the odds: Factors increasing access to college*. New York: College Entrance Examination Board.

Raftery, Adrian E. 1986. Choosing models for cross-classifications. *American Sociological Review* 51(February):145–46.

Sewell, William H., and Robert M. Hauser. 1975. *Education, occupation, and earnings: Achievement in the early career*. New York: Academic Press.

Siegel, Paul M. 1971. Prestige in the American occupational structure. Doctoral diss. University of Chicago.

Stevens, Gillian, and Joo Hyun Cho. 1985. Socioeconomic indexes and the new 1980 census occupational classification scheme. *Social Science Research* 14(June):142–68.

Stevens, Gillian, and David L. Featherman. 1981. A revised socioeconomic index of occupational status. *Social Science Research* 10(December):364–95.

U.S. Bureau of the Census. 1974. Social and economic characteristics of students: October 1972. *Current Population Reports*. Population Characteristics, Series P-20, no. 260. Washington, D.C.: U.S. Government Printing Office.

———. 1988. The Hispanic population in the United States: March 1985. *Current Population Reports*. Population Characteristics, Series P-20, no. 422. Washington, D.C.: U.S. Government Printing Office.

———. 1990. School enrollment—social and economic characteristics of students: October 1988 and 1987. *Current Population Reports*. Population Characteristics, Series P-20, no. 443. Washington, D.C.: U.S. Government Printing Office.

U.S. Department of Education. 1990. National goals for education. Washington, D.C.: U.S. Government Printing Office.

Comment

Stephen V. Cameron and James J. Heckman

Robert Hauser presents a fascinating and comprehensive analysis of trends in college entry by high school graduates from different demographic groups. The CPS data he uses are the largest available data sets that enable analysts to track year-by-year variation in college entry. Sample size may not compensate for intrinsic limitations in the data, however.

In this paper, we question the strength of the evidence supporting the main conclusions set forth by Hauser and others who use CPS samples. Hauser is well aware of many of the limitations of the October CPS and addresses some of them in this and other work. We examine several of these shortcomings by looking at college enrollment data based on the National Longitudinal Survey of Youth (NLSY), which we briefly summarize below. Although these data contain substantially fewer persons than the CPS and cannot be used to estimate aggregate annual enrollment rates reliably, they are longitudinal in nature, contain much more information on family background characteristics, and enable analysts to construct measures of family resources for all persons—not just those who are "dependents" as classified by the CPS. Using these richer data, it is possible to estimate more interpretable models of schooling attendance that do not support many of Hauser's main conclusions. We report our analyses elsewhere (Cameron and Heckman 1991a, 1991b, 1992a) and summarize them here.

We also raise an important interpretive problem that plagues this paper and many others in this literature. Following a long tradition, Hauser estimates the parameter of one transition equation in a multistate educational process: the transition from high school to college. High school graduation is a selective process. Many more whites graduate from high school than do blacks or Hispanics. In the presence of unmeasured ability and motivational variables, his estimates of behavioral equations for the transition from high school to college confound the effects of variables in placing a person in the category of being a high school graduate and being eligible for college with the effects of those variables in "causing" persons to go to college. Cameron and Heckman (1991a, 1992a) present evidence indicating the importance of measuring or controlling for such motivational models in explaining the determinants of education transitions and call into question the validity of behavioral models

Stephen V. Cameron is a research associate at the Center for Social Policy Evaluation, Harris School of Public Policy, University of Chicago. James J. Heckman is Henry Schultz Professor of Economics and Public Policy at the University of Chicago, director of the Center for Social Policy Evaluation at the Harris School, and a member of the NBER.

Portions of this paper are based on joint work reported in Cameron and Heckman (1990, 1991a, 1991b, 1992a). This research was sponsored by NSF Grant SES-91-11455 and by a grant to the Harry and Lynde Bradley Foundation to the Harris School of Public Policy at the University of Chicago. The authors thank Michael Rothschild and Robert Hauser for helpful comments on this paper.

of educational transitions estimated on repeated–cross-section data sets such as CPS.

This evidence and Hauser's own evidence render suspect his analysis of racial-ethnic differences in college entry. It is not appropriate to constrain family background effects to equality in accounting for racial/ethnic trends. Such a procedure amounts to implicitly picking one value of background characteristics to compare outcome differences between nonparallel college attendance equations. The benchmark value chosen is only implicitly defined, has no compelling justification, and in fact has a peculiar and unintuitive property. A better method of comparison would be to examine the difference in estimated nonparallel equations at a *range* of explicitly stated and plausible values. The widely held intuition that slope-constrained equations pass through the overall sample mean is false.

Our comments are presented in the following order. First, we discuss the limitations of the CPS data. Second, we summarize the relevant dissonant results from our own research. Finally, we discuss the peculiar properties of Hauser's method of comparing determinants of demographic differences in schooling attainment.

Limitations of the CPS Data

The CPS data are less than well suited for establishing the link between family income and educational decisions. The problem is that young persons who do not live at home and who do not live in group quarters if they attend college are assigned their own income (or the income of the young person and associated spouse) rather than that of their parents. This problem has given rise to a convention in the CPS-based determinants of schooling literature to restrict samples to dependents who are high school graduates in order to estimate equations determining who goes to college. It also gives rise to a focus on college enrollment rather than on college graduation, despite the greater importance of the latter in determining career outcomes. The CPS dependency link between youth and their parents becomes much weaker for youth making postsecondary schooling decisions beyond initial entry decisions.

Two distinct problems are created by this convention: (1) excluding nondependents, one cannot ascertain random-sample or population family income effects on schooling participation, and (2) conditioning on a choice variable (dependency status) generates a standard simultaneous equation problem since dependency status is likely to be affected by the same unobservables governing college attendance decisions. By using dependency as a causal, or "right-hand side," variable, Hauser produces biased estimates of the impact of socioeconomic variables on college attendance. Putting the simultaneity problem to one side, by conditioning on a choice variable, Hauser underestimates (in absolute value) the effect of any variable that moves college attendance and dependency status together and overstates (in absolute value) the population effect of variables that have opposite effects on attendance and dependency.

Some evidence on the empirical importance of the first problem for blacks, whites, and Hispanics is presented in tables 3C.1 and 3C.2. The data consist of recent high school completers, both males and females, between the ages of 14 and 24.[1] Using the NLSY data, it is possible to construct a CPS-like measure of family income that measures the parent's family income if the individual is a dependent and measures his or her family income otherwise. This measurement is taken in the year following high school completion, when college attendance is measured. In addition, we present a measure of parents' family income for both dependents and nondependents by using parents' family income measured at the interview in the year earlier.[2] Table 3C.1 presents means of both "correct" NLSY and dependency-based CPS measures for 14- to 24-year-old recent high school completers—the same group studied by Hauser.

For whites and Hispanics enrolled in college, mean parental family income of dependents is higher than it is for nondependents, but the difference is not large. For blacks the difference is essentially zero. For Hispanics and whites not enrolled in college, this gap is maintained. For blacks, the dependent-nondependent gap in parental income is much less for those not enrolled in school than it is for those enrolled in school. As expected, the CPS dependency-based family income measure badly understates true parental income for nondependents.

Table 3C.2 provides the ingredients for answers to three questions:

1. What is the effect of conditioning on dependency status?
2. Conditioning on dependency, what is the effect of using family income concurrent with enrollment rather than in the previous year, when college plans are being crystallized?
3. Given that nondependents have missing data for family background and family income, what is the effect on the estimates of adding an indicator variable for nondependency status and imputing the missing data?

Table 3C.2 reports estimates of logit models for attendance or nonattendance in college in the spring following high school graduation that are similar to those employed in our other work (Cameron and Heckman, 1992a, 1992b). Estimates for college attendance in the October following high school graduation are qualitatively similar and for the sake of brevity are deleted. To answer the first question, column 1 in each panel gives the "true" family income effect; column 2 gives the effect of excluding nondependents from the analysis. In all cases, the effect of family income is significantly underestimated when nondependents are excluded, especially so for blacks. The log-odds ratio for income declines by 25 percent to 35 percent for different groups and

1. More precisely, individuals who either graduated high school or obtained an equivalency degree in the previous year and are now eligible for college entry for the first time.

2. October CPS and NLSY measures of family income are equally poor on one account: both ask householders a single question about total family rather than a series of questions, as is done in March CPS or the Survey of Income and Program Participation.

Table 3C.1 **Means of Parent's Family Income and Current Family Income by Race and Dependency Status for NLSY 14- to 24-Year-Old Males and Females Completing High School in the Previous Year, Excluding Individuals Joining the Military (thousands of 1988 dollars; means with standard errors of means in parentheses)**

	Whites		Blacks		Hispanics	
	Dependent*	Nondependent	Dependent*	Nondependent	Dependent*	Nondependent
Enrolled in College:						
Parent's family income*	$38.4 (0.7)	$32.7 (2.7)	$22.7 (0.8)	$22.4 (3.0)	$27.5 (1.0)	$24.2 (2.6)
Current family income†	$38.5 (0.7)	$8.0 (0.8)	$21.8 (0.8)	$ 4.1 (0.5)	$27.5 (1.0)	$ 8.1 (0.9)
N (% of total race group)	1,167 (31%)	107 (4%)	537 (35%)	55 (4%)	303 (35%)	46 (5%)
Not enrolled in college:						
Parent's family income*	$30.0 (0.5)	$24.4 (0.9)	$18.2 (0.5)	$15.0 (0.5)	$22.1 (0.9)	$17.8 (1.3)
Current family income**	$31.1 (0.6)	$10.2 (0.4)	$18.2 (0.5)	$ 7.2 (0.8)	$24.0 (0.9)	$10.6 (0.9)
N (% of total race group)	1,019 (37%)	460 (17%)	688 (44%)	270 (17%)	371 (42%)	157 (18%)

Note: To exclude individuals who had graduated high school before the survey began, only individuals between the ages of 13 and 17 in 1978, the beginning of the first NLSY wave, were included in this sample.

*Not married living at home, in a dormitory, or in jail.

**Measured from the previous interview or when the individual was last a dependent.

†Counts parent's family if the individual is a dependent, and counts the individual's family if not a dependent. Measures the same characteristics of income as the CPS measure, except the measure reported here includes food stamps.

Table 3C.2 **March College Enrollment Probabilities for NLSY Males and Females Ages 14 to 24 Completing High School in the Past Year, Excluding Individuals Joining the Military: Logistic Probabilities (*T*-values in parentheses)**

Variable*	Using Both Dependents and Nondependents and Family Income from Previous Year (1)	Using Dependents Only and Family Income from Previous Year (2)	Using Dependents Only and Family Income from Current Year (CPS Method) (3)	Using Both Dependents and Imputed Data for Nondependents (4)
		A. Whites		
Intercept	−6.824 (14.6)	−6.753 (12.3)	−6.776 (12.5)	−6.508 (13.5)
Female	0.199 (2.2)	0.290 (2.9)	0.290 (2.9)	0.293 (3.0)
Number of siblings	−0.119 (4.7)	−0.124 (4.5)	−0.123 (4.5)	−0.123 (4.5)
HGC of father	0.189 (10.3)	0.190 (9.2)	0.194 (9.5)	0.192 (9.3)
HGC of mother	0.254 (9.3)	0.268 (8.7)	0.273 (8.9)	0.273 (8.9)
Family income**	0.012 (4.4)	0.009 (3.8)	0.006 (2.4)	0.005 (2.3)
Broken home	0.157 (1.1)	0.188 (1.1)	0.109 (0.7)	0.097 (0.6)
Farm age 14	0.290 (1.5)	0.211 (1.0)	0.188 (0.9)	0.146 (0.8)
South age 14	0.343 (3.3)	0.300 (2.6)	0.305 (2.7)	0.320 (3.1)
County average wage†	−0.013 (0.6)	−0.021 (0.8)	−0.017 (0.7)	−0.012 (0.6)
1979	1.343 (5.5)	1.347 (4.0)	1.342 (4.1)	0.912 (3.7)
1980	0.836 (3.5)	0.936 (2.8)	0.966 (3.0)	0.535 (2.2)
1981	1.051 (4.5)	1.155 (3.5)	1.148 (3.6)	0.684 (2.9)
1982	0.897 (3.8)	1.081 (3.2)	1.075 (3.3)	0.603 (2.7)
1983	1.194 (5.0)	1.486 (4.4)	1.475 (4.5)	1.042 (4.4)
Nondependent	—	—	—	−0.963 (5.4)
Nondependent female	—	—	—	−0.840 (3.3)
−2** log-likelihood	3000.0	2469.9	2478.1	2938.9
N	2650	2171	2171	2650

(*continued*)

Table 3C.2 (continued)

Variable*	Using Both Dependents and Nondependents and Family Income from Previous Year (1)	Using Dependents Only and Family Income from Previous Year (2)	Using Dependents Only and Family Income from Current Year (CPS Method) (3)	Using Both Dependents and Imputed Data for Nondependents (4)
		B. Blacks		
Intercept	−4.052 (7.9)	−3.534 (6.2)	−3.516 (6.2)	−3.610 (6.9)
Female	0.555 (4.8)	0.500 (4.0)	0.503 (4.0)	0.508 (4.1)
Number of siblings	−0.081 (3.7)	−0.078 (3.3)	−0.077 (3.3)	−0.075 (3.2)
HGC of father	0.016 (0.8)	0.022 (1.0)	0.024 (1.1)	0.025 (1.1)
HGC of mother	0.148 (5.1)	0.128 (4.1)	0.125 (4.0)	0.125 (4.0)
Family income**	0.014 (3.0)	0.009 (2.2)	0.011 (2.9)	0.011 (3.0)
Broken home	0.009 (0.1)	0.089 (0.7)	0.077 (0.6)	0.074 (0.6)
Farm age 14	0.012 (0.0)	−0.073 (0.2)	−0.036 (0.1)	0.034 (0.1)
South age 14	0.138 (1.1)	0.041 (0.3)	0.035 (0.3)	0.095 (0.8)
County average wage†	−0.011 (0.7)	−0.013 (0.8)	−0.013 (1.1)	−0.011 (1.0)
1979	1.167 (4.2)	1.214 (3.8)	1.252 (3.9)	0.958 (3.4)
1980	0.818 (3.2)	0.934 (3.1)	0.947 (3.1)	0.688 (2.7)
1981	0.882 (3.6)	0.975 (3.3)	1.015 (3.4)	0.744 (2.9)
1982	0.976 (3.9)	1.152 (3.8)	1.175 (3.8)	0.850 (3.3)
1983	0.661 (2.5)	0.785 (2.5)	0.813 (2.6)	0.640 (2.5)
Nondependent	—	—	—	−1.244 (4.4)
Nondependent female	—	—	—	0.189 (0.5)
−2** log-likelihood	1809.5	1535.4	1529.2	1773.2
N	1499	1220	1220	1499

C. Hispanics

Intercept	−2.329 (3.9)	−1.303 (2.0)	−1.236 (1.9)	−1.827 (3.0)
Female	0.089 (0.6)	0.152 (0.9)	0.145 (0.9)	0.151 (0.9)
Number of siblings	−0.029 (0.9)	−0.040 (1.1)	−0.040 (1.1)	−0.035 (1.0)
HGC of father	0.050 (2.0)	0.053 (1.9)	0.056 (2.1)	0.059 (2.1)
HGC of mother	0.004 (0.1)	0.000 (0.0)	0.003 (0.1)	0.002 (0.1)
Family income**	0.011 (2.1)	0.008 (1.5)	0.005 (0.9)	0.004 (0.8)
Broken home	−0.495 (2.5)	−0.512 (2.3)	−0.558 (2.5)	−0.556 (2.5)
Farm age 14	−0.338 (0.8)	−0.307 (0.6)	−0.307 (0.6)	−0.188 (0.4)
South age 14	−0.028 (0.2)	−0.081 (0.4)	−0.093 (0.5)	−0.055 (0.3)
County average wage†	−0.007 (0.3)	−0.009 (0.3)	−0.014 (0.4)	−0.012 (0.4)
1979	1.195 (3.3)	0.862 (2.2)	0.900 (2.3)	1.010 (2.8)
1980	0.834 (2.6)	0.569 (1.6)	0.598 (1.6)	0.701 (2.1)
1981	1.207 (3.9)	1.041 (2.9)	1.059 (3.0)	1.103 (3.4)
1982	1.053 (3.4)	0.686 (1.9)	0.689 (2.0)	0.906 (2.9)
1983	0.941 (2.9)	0.576 (1.6)	0.586 (1.6)	0.881 (2.7)
Nondependent	—	—	—	0.952 (3.0)
Nondependent female	—	—	—	−0.214 (0.5)
−2** log-likelihood	1058.9	871.1	872.5	1043.1
N	848	673	673	848

Note: Enrollment is measured at the yearly interview date—February or March for most people. If the interview was after March, then March enrollment was determined from the monthly school enrollment data. Only individuals 13 to 17 at the beginning of 1978—the initial year of coverage of the NLSY—were included, to exclude individuals who had completed high school before 1978. Approximately 2 percent of each racial-ethnic group was dropped because parent's family income was missing. In addition, another 1 to 2 percent was dropped due to missing values in the highest grade completed of either the father or the mother. Finally, approximately 2 percent of the total sample individuals were dropped, as they had joined the regular military since completing high school.

**Definitions of variables:* *Female* is an indicator for females. *Number of siblings* is the total number of siblings. *HGC of Father/Mother* is the highest grade completed by the individual's father or mother when the individual was age 14. *Family income* is the total family income of the parents of the individual. *Broken Home* is an indicator variable coded 1 if either parent was not in the household when the individual was age 14. *Farm age 14* and *South age 14* are binary variables indicating the individual at age 14 lived in a farm residence or the southern states respectively. *County average wage* is defined in the footnote below. The *year* variables are indicators for the year in which the individual is at risk of college entry; years 84–88 are the left-out variable. *Nondependent* indicates that the individual has his/her own household and was not in the parents' household in March. *Nondependent female* is the nondependency indicator interacted with the female indicator.

**Denominated in thousands of 1988 dollars.

†This variable measures the average county wage rate for individuals with high school–level skills. It is denominated in thousands of 1988 dollars. See Cameron and Heckman (1992a, 1992b) for a detailed description of the construction.

becomes statistically insignificant for Hispanics. Column 3 of the table addresses the second question. Instead of using the family income for dependents only at the time decisions are made (column 2), it is based on a sample that uses contemporaneous family income for dependents and produces results analogous to what one could estimate with the October CPS. For whites and Hispanics, estimates decline to half the "true" value. Estimates for blacks constitute the only exception to this rule. Note, however, that among the list of socioeconomic variables, only the family income variable demonstrates extreme sensitivity to the treatment of dependency status. (For blacks, the family income variable weakens when October rather than spring attendance is analyzed.)

The third question we ask is whether one can improve on these estimates by employing the solution of Hauser to missing family background variables for nondependents. He imputes the values of the missing data for nondependents at the mean value of those variables for dependents. He also includes a dummy variable for nondependency status. In a linear regression model, this procedure can be shown to be equivalent to estimating all slope coefficients from the sample of dependents. In the last column of table 3C.2, we include an indicator variable for nondependency status and for nondependency interacted with "female," and for each racial-ethnic group we impute family income and other family income variables using the means of the dependent group.[3]

The results from this procedure can be seen by comparing columns 3 and 4. There is virtually no change in the point estimates. This is not surprising: no new information is added to the model by this technique.

It is worth noting at this point that we have estimated several other specifications. We do not follow Hauser and condition on housing tenure, because it is unavailable in the NLSY. We also do not employ as a regressor the occupational status of the household head. In a variety of models that include a full set of region, central city, and age variables, the empirical results were virtually identical to those presented in table 3C.2.

One final adjustment to the specification—transforming family income from natural units to log form, as in Hauser's table 3.1—again results in little quantitative difference in the estimates for whites and Hispanics. However, the coefficient on family income for blacks becomes small and insignificant for all specifications analogous to those in our table 3C.2, columns 1–4. This raises yet another question about the robustness of Hauser's main conclusion that black family income changes cannot account for the changes in black college enrollment. Using a Box-Tidwell transformation (see, e.g., Heckman and Polachek 1974), we find that Hauser's log specification is incorrect for blacks and whites. In fact, linear specifications are statistically significant in the black equations, but our log specifications are statistically insignificant at conventional levels.

3. This is the specification analogous to that reported in Hauser's table 3.1.

A Summary of the Main Findings of Our Related Work

In our own research we use the NLSY data to estimate school enrollment and graduation equations for whites, blacks and Hispanics. The NLSY data are much richer than the CPS data. By following the same persons over time, we can study the determinants and consequences of educational selectivity, which is an especially acute problem among minority group members.

In a series of papers, (Cameron and Heckman 1991a, 1991b, 1992a, 1992b), we set forth, and estimate, econometric models that control for selectivity in educational attainment. We develop a tractable econometric model of schooling in which family resources, parental environmental variables, local labor market alternatives, and federal and state tuition cost/subsidy variables are introduced as explanatory variables. For blacks, Hispanics, and whites, it is possible to produce an econometric model that fits the data and is consistent with a simple neoclassical economic model. Better market opportunities for unskilled workers inhibit educational attainment. Better family resources, better home environments, and lower college tuitions promote schooling attendance. Failure to control for educational selectivity greatly reduces the role of socioeconomic variables in explaining minority college attendance.

Our analysis is relevant to the interpretation of Hauser's evidence. First, our evidence on the importance of controlling for educational selectivity casts doubt on Hauser's estimates of behavioral parameters that do not control for selectivity in estimating schooling transitions. Second, our weak estimates of black responses to tuition costs and family resources cast doubt on Hauser's conclusions about the importance of college tuition costs in accounting for black-white differences in college attendance. Third, differences in estimated behavioral coefficients across different demographic groups call into question Hauser's methodology in accounting for racial/ethnic differences in college entry—a topic to which we now turn.

Comparing Nonparallel Regression Lines

In the section 3.5.2., "Racial-Ethnic Differentials in College Entry," Hauser performs a standard statistical exercise. He seeks to compare the vertical difference between two nonparallel log-odds regression lines. He does this by constraining the *slope* coefficients for socioeconomic variables to a common value for all demographic groups, allowing only demographic-specific intercepts to be free. These adjusted intercepts then form the basis for his interpretive analysis. He reports the result that when family background variables have the same effect on all demographic groups, minorities are more likely to enter college than are whites. In light of the evidence summarized above and presented in Hauser's table 3.1, it is incorrect to constrain the slope coefficients to equality across demographic groups.[4] In our table 3C.3, we test these

4. There is the additional problem that sample sizes are very different for different demographic groups. Using a common significance level across different demographic groups produces test procedures with power that depends on sample size. A more reasonable procedure recognizes that

Table 3C.3 **Tests of Aggregation (using the specification in column 1 of table 3C.2)**

	A. Sex (chi-square *P*-values below)		
	White	Black	Hispanic
Slope coefficients equal	.13	.58	.92

	B. Race (chi-square *P*-values below)			
	White = Black = Hispanic	White = Hispanic	White = Black	Black = Hispanic
Slope coefficients equal with race dummies free	.00	.00	.00	.00
Slope coefficients equal with dummies for race interacted with sex	.00	.00	.00	.00

aggregations formally for the full sample of dependents and nondependents, using the "correct" family income and the specification found in our table 3C.2. Though little behavioral difference is found between males and females across racial-ethnic groups (table 3C.3A), aggregation of any combination of racial-ethnic groups is strongly rejected (table 3C.3B). The implications of these differences are explored in Cameron and Heckman (1992b). It is important to take care in interpreting Hauser's finding, which also appears in Cameron and Heckman (1991b, 1992b).

In a linear regression setting, the problem "solved" by Hauser is to pick a point of evaluation of the vertical difference between two nonparallel regression lines. Clearly, at some point the lines cross. For simplicity, suppose that there are two groups: "1" = the minority group; "0" = the majority group. Each group's outcome measure is characterized by a separate regression line with a different slope and possibly a different intercept. Assume only one regressor. Letting $d = 1$ if an observation comes from the minority population ($= 0$ otherwise), a conventional regression specification writes

$$(1) \qquad Y = Y^1 d + Y^0(1 - d) = \alpha + \gamma d + \beta X + \Delta(dX) + U.$$

The equation for the majority outcome is $Y^0 = \alpha + \beta X + U$, while the equation for the minority outcome is $Y^1 = \alpha + \gamma + (\beta + \Delta)X + U$. Constraining $\Delta = 0$, pooling the samples and denoting the least squares estimators by "^", we establish in the Appendix that in a linear regression setting, the estimated vertical difference between the majority and minority regression lines is

$$\text{plim } \hat{\gamma} = \gamma + \Delta[\omega_0\mu_1 + (1 - \omega_0)\mu_0]$$

significance levels for pretest estimators of the type used by Hauser should be adjusted for sample size. See Donohue and Heckman (1991), where this issue is discussed and examples of the effects of such adjustments are studied.

where $\mu_1 = E(X \mid d = 1)$ is the mean of X in the minority population $\mu_0[= E(X \mid d = 0)]$ is the mean of X in the majority population, and

$$\omega_0 = \frac{\sigma^0_{xx}(1 - P)}{\sigma^0_{xx}(1 - P) + \sigma^1_{xx}P}$$

where σ^0_{xx} is the variance of X in the majority population "0," σ^1_{xx} is the variance of X in the minority population "1," and $P = E(d)$ is the minority population proportion.

Thus, in a linear regression setting, Hauser's adjusted intercept amounts to choosing the following point of evaluation for the vertical difference between two nonparallel regressions:

$$\omega_0\mu_1 + (1 - \omega_0)\mu_0 \tag{2}$$

and adjusting γ by the difference in slopes between "1" and "0" sample members:

$$\Delta[\omega_0\mu_1 + (1 - \omega_0)\mu_0].$$

There is no reason for preferring this point of evaluation over another. See figure 3C.1 for a graphical exposition of the case $\Delta > 0$, $\gamma < 0$ and $\mu_1 < \mu_0$. Just as the value of the vertical difference at $X = 0$ in the unconstrained model (i.e., γ) has no logical priority as "the" distance between two nonparallel lines, neither does the point expressed in equation (2). In fact, the implicit point used by Hauser and many others has very peculiar properties. The larger the minority proportion (P) and the larger the variance in X among minority members (i.e., the greater the proportion of explained variation in the minor-

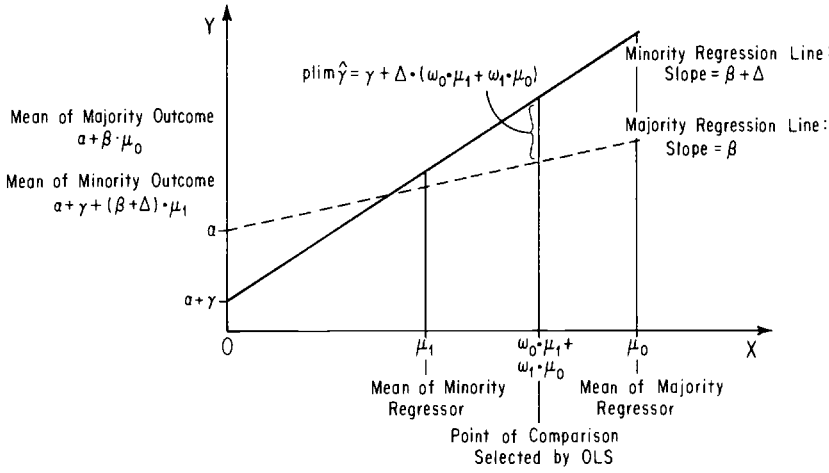

Fig. 3C.1 The implicit point of comparison selected by ordinary least squares (OLS) of the vertical distance between two nonparallel regression lines

ity regression), the greater the weight placed on the majority mean as the point of evaluation of the vertical difference! Put another way, as the proportion of minority members declines ($P \rightarrow 0$), Hauser's implicit point of evaluation in (2) increasingly weights the minority mean.

If, for example, X is parental income, "1" refers to Hispanics, "0" refers to whites, and $\mu_1 < \mu_0$, then $\Delta > 0$ (see Hauser's table 3.1) and $\hat{\gamma}$ overstates γ, with the degree of overstatement increasing with the difference between the variance in majority and minority parental income and decreasing with increases in the proportion of minorities in the sample.

A better way to summarize differences in nonparallel lines would be to pick values at the center (median, mean, etc.) of the X distributions for majority and minority groups and to evaluate sets of these differences. Using a regression-defined point of evaluation introduces the risk of constructing contrasts between outcomes of majority and minority outcome equations at points of evaluation of little interpretive interest.

Of course, this analysis is only suggestive. Hauser fits a nonlinear logit model and not linear regressions, and he uses multivariate X rather than scalar X. These departures from the simple model just presented further obscure the interpretation of the implicit point of evaluation. In any case, it would be clearer to present the full array of differences in vertical contrasts rather than to pick a particular (unknown) point and base strong interpretations on it.

Summary

Hauser's comprehensive survey of trends in college attendance by demographic groups makes fascinating and informative reading. The limited nature of the CPS data hampers his analysis. In a previous draft of this paper, Hauser recognized many of the limitations of his analysis. He has been a vocal proponent of improving the October CPS and encouraging the National Center for Education Statistics to implement new periodic, longitudinal surveys to fill the current gap in education data. It is unfortunate that the editors censored his comments on these vital issues. Our analysis of the NLSY data suggests that many of Hauser's substantive conclusions will not stand the test of better data and better analytic models.

Appendix

The Bias in Estimating Differences between Majority and Minority Group Outcomes by Falsely Constraining Slope Coefficients to Equality While Letting Group Intercepts Be Free

For simplicity, consider a model with only one slope coefficient. Let Y be an outcome of interest. Let $d = 1$ if a person is black (or a member of a minority). $E(d) = P$. Let X be an explanatory variable with $E(X) = \mu$. U is a disturbance with $E(U) = 0$. Write $E(X \mid d = 1) = \mu_1$. Then, for the regression model,

$$\begin{aligned} Y &= \alpha + \gamma d + \beta X + \Delta dX + U \\ E(Y) &= \alpha + \gamma P + \beta\mu + \Delta P\,\mu_1 . \end{aligned}$$

Δ is the difference in slope parameters between majority and minority group members. Thus, the equation for minorities is $Y = (\alpha + \gamma) + (\beta + \Delta)X + U$ and for the majority group is $Y = \alpha + \beta X + U$.

Suppose, as is conventional in the literature, that we measure the difference between majority and minority outcomes by falsely imposing equality of slope coefficients ($\Delta = 0$) but allow for group-specific intercepts. What is the effect of imposing false constraints on the estimated value of γ? At what point (value of X) are we evaluating the contrast (vertical distance) between the two nonparallel lines characterizing the majority and minority populations?

A standard specification error analysis reveals that in the population,

$$Y = \alpha + \gamma d + \beta X + (\Delta dX + U)$$

where the term in parentheses is the new composite error term. Then, assuming finite second moments, and random sampling and denoting regression estimators of α, γ and β by "^",

$$\operatorname{plim}\begin{pmatrix}\hat{\gamma}\\ \hat{\beta}\end{pmatrix} = \Delta\begin{pmatrix} \sigma_{xx} & -P(1-P)(\mu_1-\mu_0)\\ -P(1-P)(\mu_1-\mu_0) & P(1-P)\end{pmatrix}\cdot \begin{pmatrix} P(1-P)\mu_1 \\ P\sigma^1_{xx} + P(1-P)(\mu_1^2 - \mu_0\mu_1)\end{pmatrix}$$

where

$$\begin{aligned} \sigma_{xx} = \operatorname{Var}(X),\ \sigma^1_{xx} &= E[(X-\mu_1)^2 \mid d = 1], \\ \sigma^0_{xx} &= E[(X-\mu_0)^2 \mid d = 0] . \end{aligned}$$

Observe that

$$\operatorname{plim}\begin{pmatrix}\hat{\gamma}\\ \hat{\beta}\end{pmatrix} = \begin{pmatrix}\gamma\\ \beta\end{pmatrix} + \frac{\Delta}{D}\begin{pmatrix} \sigma_{xx} & -P(1-P)(\mu_1-\mu_0)\\ -P(1-P)(\mu_1-\mu_0) & P(1-P)\end{pmatrix}\cdot \begin{pmatrix} P(1-P)\,\mu_1 \\ P\sigma^1_{xx} + P(1-P)(\mu_1^2 - \mu_0\mu_1)\end{pmatrix}$$

where

$$D = \begin{vmatrix} P(1-P) & P(\mu_1 - \mu) \\ P(\mu_1 - \mu) & \sigma_{xx} \end{vmatrix}$$
$$= P(1-P)[P\sigma^1_{xx} + (1-P)\sigma^0_{xx}].$$

Thus

(A1) $$\text{plim } \hat{\gamma} = \gamma +$$

$$\Delta \frac{\sigma_{xx}P(1-P)\mu_1 - P(1-P)\,(\mu_1 - \mu_0)(P\sigma^1_{xx} + P(1-P)(\mu_1^2 - \mu_0\mu_1))}{D}$$

$$= \gamma + \Delta \frac{[\sigma^0_{xx}(1-P)]\mu_1 + [\sigma^1_{xx}P]\mu_0}{\sigma^0_{xx}(1-P) + \sigma^1_{xx}P}$$

(A2) $$\text{plim } \hat{\beta} = \beta +$$

$$\Delta \left(\frac{-P(1-P)(\mu_1 - \mu_0)P(1-P)\mu_1 + P(1-P)\,[P\sigma^1_{xx} + P(1-P)(\mu_1^2 - \mu_0\mu_1)]}{D} \right)$$

$$= \beta + \Delta \frac{P\sigma^1_{xx}}{\sigma^0_{xx}(1-P) + \sigma^1_{xx}P}$$

(A3) $$\text{plim } \hat{\alpha} = \alpha + \gamma P + \beta\mu - (\text{plim } \hat{\gamma})P - (\text{plim } \hat{\beta})\mu$$

$$= \alpha - \Delta \frac{[P(1-P)\sigma^0_{xx}\mu_1 + (P^2\mu_1 + P\mu_0)\sigma^1_{xx}]}{\sigma^0_{xx}(1-P) + \sigma^1_{xx}P} .$$

These relationships have a straightforward interpretation. Equation (A2) is the most familiar. The estimated value of β lies between β and $\beta + \Delta$. It gets closer to $\beta + \Delta$ the higher P is and the higher the variance in population "1" (σ^1_{xx}). As the minority population proportion goes to zero ($P \to 0$) or as the dispersion of X in the minority population (σ^1_{xx}) goes to zero, $\hat{\beta}$ converges to the majority slope coefficient.

From (A1), the estimated contrast between minority and majority outcomes, plim ($\hat{\gamma}$), is the contrast at zero (γ) plus the difference in slope coefficients (Δ) times a value of X intermediate between μ_1 and μ_0. This simply measures the difference between the two regression lines at a value between μ_1 and μ_0 determined by the relative size of the minority in the population and the variability of X in the minority population relative to that in the majority population. Observe that if

$$\omega^0 = \frac{\sigma^0_{xx}(1-P)}{\sigma^0_{xx}(1-P) + \sigma^1_{xx}P}$$

and

$$\omega_1 = \frac{\sigma_{xx}^1 P}{\sigma_{xx}^0(1 - P) + \sigma_{xx}^1 P},$$

then $\omega^0 + \omega^1 = 1$ and $0 \leq \omega^0, \omega^1 \leq 1$, so we may rewrite (A1) as

$$\text{plim } \hat{\gamma} = \gamma + \Delta(\omega^0 \mu_1 + \omega^1 \mu_0).$$

The bias in the contrast moves in the opposite direction to the bias in the slope. Thus as $P \to 1$ or $\sigma_{xx}^1/\sigma_{xx}^0 \to \infty$, $\omega^0 \to 0$ and the implicit point of evaluation comes close to μ_0. That is, the greater the fraction of minority members in the population or the greater the variance of X among the minority members, the closer we come to using the minority mean μ_1 as the point of evaluation! There is no compelling reason for using this point of evaluation to measure the difference between two nonparallel lines.

For example, if X is parental income and $\Delta > 0$, $0 < \mu_1 < \mu_0 < \infty$, then overstatement in $\hat{\gamma}$ increases with the variability of X in the minority population and the relative size of the minority population. In fact, if $\gamma < 0$, plim $\hat{\gamma}$ could be positive.

The interpretation of plim $\hat{\alpha}$ and the extension to a multivariate equation are straightforward and hence are deleted. Relaxation of the random sampling assumption is also straightforward and hence deleted for the sake of brevity.

References

Cameron, Stephen, and James Heckman. 1991a. The determinants of high school graduation and college attendance. Manuscript.

———. 1991b. The nonequivalence of high school equivalents. NBER Working Paper no. 3804. Institute for Research on Poverty, University of Wisconsin, February. Revised August and forthcoming in *Journal of Labor Economics*, January 1993.

———. 1992a. Life cycle schooling decisions: Theory and evidence. University of Chicago. Manuscript.

———. 1992b. Sequential models of schooling. Paper presented at the Institute for Research on Poverty, University of Wisconsin, June 1990. Revised February.

Donohue, John, and James Heckman. 1991. The impact of the functional form of earnings equations in accounting for black economic progress. American Bar Foundation, October. Memorandum.

Heckman, James, and Solomon Polachek. 1974. Empirical evidence on the functional form of the earnings-schooling relationship. *Journal of the American Statistical Association* 69 (June 1974):350–54.

This Page Intentionally Left Blank