ARE THERE RETURNS TO THE WAGES OF YOUNG MEN FROM WORKING WHILE IN SCHOOL?

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Abstract—This paper examines the effects of work experience acquired while youth were in high school (and college) on young men's wage rates. Previous studies have found sizeable and persistent rates of return to working while enrolled in school, especially high school, on subsequent wage growth. We evaluate the extent to which these estimates represent causal effects by assessing the robustness of prior findings to controls for unobserved heterogeneity and sample selectivity. We explore more-general econometric methods for dealing with the dynamic of selection and apply them to data on young men from the 1979 National Longitudinal Survey of Youth (NLSY79). We find that the estimated returns to working while in high school or college are dramatically diminished in magnitude and are not statistically significant when one applies dynamic selection methods.

I. Introduction

THE transition from school to work for youth in the United States has been the focus of much academic research and training policy over the last three decades. A key issue in this transition is the value to youth of acquiring work experience before they leave high school. Advocates of youth working while enrolled in school argue that such jobs serve to familiarize them with the world of work; to foster the development of personal responsibility and good work habits and attitudes; and to learn how to deal with authority—traits that are essential for successful adult work careers. Furthermore, early work experiences presumably give students opportunities to apply what they have learned in school and to appreciate what it takes to succeed in the world of work. Alternatively, critics of adolescent employment argue that maintaining heavy work schedules during the school year interferes with learning and academic performance and may encourage students to drop out of school. (See review in Schoenhals, Tienda, and Schneider (1998).)

Although the empirical evidence on the "returns" to working while in high school varies by the outcome considered,[1] there appears to be an amazing consistency across numerous studies with respect to the effects of working while in high school on subsequent labor market success. First, several studies based on different data sets find that working while in high school is associated with higher employment rates and higher wages later in life.[2] For example, Meyer and Wise (1982) find "a strong [positive] relationship between hours of work while in high school and weeks worked per year upon graduation" and that "persons who work while in high school also receive higher hourly wage rates than those who don't" (pp. 278–279), using longitudinal data on individuals who were high school seniors in 1972. Furthermore, Ruhm (1997), using data from the the National Longitudinal Survey of Youth, 1979 (NLSY79), finds "no evidence of detrimental effects of low to moderate amounts of student employment. To the contrary, job-holding during the senior year [of high school] is associated with substantially elevated future economic attainment, whether the latter is measured by earnings, wages, total compensation, occupational status, or the receipt of fringe benefits" (p. 738).

Second, the estimated returns to subsequent employment, wage rates, and/or earnings from working while in school appear to be sizeable—between 5% and 10% per year for wage rates—and larger than the returns to either part-time or full-time work experience acquired during early adulthood. Meyer and Wise (1982) estimate returns to wages from a year of post–high school work experience at 3% to 5%, measured four years after graduation, whereas the returns to working while in high school are 6% to 9%.[3]

Third, several studies conclude that the labor market "gains" for working while in high school persist well after leaving high school.[4] For example, Carr, Wright, and Brody (1996) find that, twelve years after leaving high school, the levels of employment and wage rates remain higher among youth who worked in high school compared to those who did not.

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[1] See Greenberger and Steinberg (1986), Mortimer and Finch (1986), Barone (1993), Gade and Peterson (1980), Lillydahl (1990), Eckstein and Wolpin (1989), Schoenhals, Tienda, and Schneider (1998), and Tienda and Ahituv (1996). See Donahoe and Tienda (2000) for a review of this literature.

[2] See Stevenson (1978), Stephenson (1981), Meyer and Wise (1982), Ehrenberg and Sherman (1987), Stern and Nakata (1989), D'Amico (1984), Mortimer and Finch (1986), Marsh (1991), Carr, Wright, and Brody (1996), Ruhm (1997), Chaplin and Hannaway (1997), Ahituv, Tienda, and Hotz (1998), and Light (2001).

[3] These effects are net of any differential effects of working while in high school relative to postgraduate work experience on subsequent employment rates because Meyer and Wise (1982) adjust for the former effects in their analysis. Meyer and Wise also find that working while in school has stronger positive effects on the probability of working and hours of work four years after graduation than does postgraduation work experience.

[4] See Carr et al. (1996), Ruhm (1997), and Chaplin and Hannaway (1997).

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Taken together, these findings give credence to claims that acquiring work experience at early ages is essential for instilling the attitudes and habits that build a "work ethic" and that these experiences permanently affect subsequent labor market success. From a policy perspective, such findings provide support for state and local governmental efforts to develop work-based learning and cooperative education programs and for recent federal efforts to encourage such programs under the School-to-Work Opportunities Act of 1994.[5]

It is important, however, to ask whether these estimated effects of working while in school on subsequent labor market outcomes are causal or simply spurious correlations. Acquisition of work experience by youth may increase human capital that, in turn, supports higher wage rates and more stable employment later in life. This is Ruhm's 1997 conclusion from a recent study of the effects of high school work experience on subsequent wages and employment. He claims that "student employment raises future productivity through skills, knowledge, work habits, and experience provided on-the-job by far more than it detracts from educational human capital investments" (p. 770). Light (2001) reaches a similar conclusion.

It also is conceivable that the estimated relationship between early work experience acquired during high school and subsequent labor market success is spurious. These estimated effects might reflect the persistent role of unobserved (or hard to measure) differences in initial skills, ability, and/or familial "connections" that influence both the likelihood that youth acquire early work experience and the degree of labor market success later in life. Meyer and Wise (1982) acknowledge the potential for such an unobserved heterogeneity explanation.[6] This could explain why several studies have found that the returns to working while in school do not seem to diminish even ten years after leaving school—a result that seems somewhat inconsistent with plausible models of human capital investment.[7]

In this paper, we reconsider the evidence on the positive returns to working while in high school (and college) on the subsequent wages of young men.[8] We seek to ascertain the robustness of previous findings to controls for unobserved heterogeneity and the selectivity of experience acquisition. Some of the previous studies have attempted to account for this selectivity and the potential correlation between early work experience and subsequent wages due to unobserved persistent factors, such as ability or family background. We employ an econometric strategy for dealing with dynamic selection bias following Heckman (1981a, 1981c) and Cameron and Heckman (1993, 1999) that has not previously been used in assessments of working while in school on subsequent attainment.[9] This approach to dealing with heterogeneity is distinct from earlier work on the returns to in-school work in three ways. First, we explicitly model the full range of life cycle school and work choices, the human capital accumulation of youth, and the effects of the latter on subsequent wages from adolescence through early adulthood. More precisely, we model the participation decisions of young men with respect to a full set of educational, work, and military activities, and we model them jointly with the observed wage patterns of those who work.

Second, we attempt to control for unobserved, person-specific heterogeneity by using a factor-analytic, random-effects specification adapted from the work of Heckman and Singer (1984). A key issue in the estimation of the effects of earlier events on subsequent choices is the "initial-conditions" problem. For any stochastic process with dependence among time-ordered outcomes, it must be initialized at some beginning date. An initial-conditions problem arises in estimating the parameters of this process when data on the outcomes and determinants of the process is not available for all observations back to these start dates. In such situations, the sequence of missing data must be modeled, and the properties of the resulting estimates hinges on the validity of this modeling.[10] In our application, we minimize, if not eliminate, this problem by using data from the NLSY79. This longitudinal data set contains sufficient information to model virtually all labor market and schooling choices that are likely to be at the discretion of young men. Using these data and the econometric methods previously noted, we generate estimates of the effects of past work and schooling decisions on subsequent wage (and employment) outcomes that are more robust to the selection

[5] The School-to-Work Opportunities Act of 1994 provides "venture capital" to states and communities to encourage programs that provide work-based learning opportunities engaging "employers as partners with educators in providing opportunities for all students to participate in high-quality work experiences."

[6] Meyer and Wise (1982) state: "Working in high school may be an indication of personal characteristics not gained through work, but associated with work in high school as well as greater labor force participation following graduation. It is not that the demand is greater for persons who work in high school, but that these persons have a greater propensity to work" (p. 306).

[7] If higher wages are simply the result of acquiring more work experience (that is, human capital) and the skills acquired from such experience depreciate over time, the returns from high school work experience should diminish with age and become less important than those from postgraduation work experience, all other things equal.

[8] We restrict our attention to the returns of early work experience for youth's wage growth because wage rates constitute the most common measure of an individual's labor market productivity. Ahituv et al. (1998) examine the consequences of early work experience for employment rates. Evaluating the returns of early work experience for young women introduces additional complexities stemming from the endogeneity of birth decisions with respect to employment and work choices. (See Ahituv and Tienda (1999).) Also, the military choice is less relevant for women. For a parallel analysis of young women with appropriate modification of life cycle choices, see Tienda et al. (1999).

[9] Heckman (1981a, 1981c) analyzes the effects of work experience on the labor supply of women, Cameron and Heckman (1993) analyze the returns to wages of a GED, and Cameron and Heckman (1998, 1999) estimate the (educational) grade attainment decisions of youth.

[10] See Heckman (1981a, 1981b, 1981c), Flinn and Heckman (1982a, 1982b), and Heckman and Singer (1984) for more on the initial-conditions problem in economic contexts and estimation strategies to account for its potential bias in dynamic models of individual-level behavior.

biases that are associated with fairly general forms of unobserved heterogeneity.[11]

The third and final distinguishing feature of our analysis is the use of temporal and geographical variation in local labor market conditions (and thus the demand for labor) facing young men; this helps identify the effects of early work experience on subsequent labor market outcomes. Previous studies have found these sources of variation to be crucial in identifying structural effects of past decisions on subsequent labor market success.[12]

The remainder of the paper is organized as follows. In section II, we describe the structure of the longitudinal data taken from the NLSY79 and definitions of variables used in the analysis. Section III describes the life cycle patterns of work and schooling experiences of young men from age 13 through age 28. We also examine the life cycle patterns for wages over early adulthood. Consistent with previous studies, our raw data suggests a positive relationship between wage rates and accumulated experience of working while in school. However, we also find that the young men who acquire substantial amounts of such work experience tend to come from more-advantaged backgrounds and average to higher levels of education. The latter finding indicates potential for the types of endogeneity, or selection bias, in (mis)attributing the observed correlations between work while in school and subsequent wages noted previously.

Section IV outlines our adaptation of the statistical model of Cameron and Heckman (1998) for dealing with selection bias in dynamic settings.[13] Therein, we discuss how our econometric approach and the data we use provide estimates of the effects of lagged choices, such as working while in school, on wages that are robust to certain forms of persistent unobserved heterogeneity. In section V, we present the results of our estimation of the returns to early work experience on the wage growth of young men. We find that including a relatively rich set of background conditions and indicators of labor market conditions in wage equations reproduces the positive effects of working while in school on subsequent wages that are found in previous studies. However, such effects are dramatically diminished in magnitude and statistical significance once we control for unobserved heterogeneity via our random-effects specification. As such, our results indicate a decided lack of robustness to inferences about the benefits of working while in school drawn from previous work. We summarize our conclusions from this analysis and their implications in section VI.

[11] In the terminology of dynamic models, the methods we employ are particularly well suited to distinguish between structural *lagged occurrence dependence* and unobserved heterogeneity.

[12] See, for example, Cameron and Heckman (1998) and Sanders (1995).

[13] See also Heckman (1981c) and Cameron and Heckman (1998, 1999).

II. Data

In this study, we use data on young men from the National Longitudinal Survey of Youth 1979 (NLSY79), which follows a sample of U.S. youth between the ages of 14 and 21 as of January 1, 1979. The original sample consisted of a national probability sample of men and women, and oversamples of several targeted groups—blacks, Hispanics, poor whites, and military enrollees—from these age cohorts. For most of the sample members, interviews were conducted (or attempted) in each subsequent year; we make use of the longitudinal data gathered from the 1979–1990 interviews. Over this twelve-year period, the NLSY79 exhibits a low attrition rate of just over 10% of the original sample.

These annual interviews gathered detailed information on the respondent's schooling, training, and military experiences as well as week-by-week histories of jobs held and their attributes, including occupation, industry, typical hours worked, and hourly wage rates. During the initial interview in 1979, an attempt was made to gather some retrospective information on these outcomes, although this data is inevitably incomplete.

In this paper, we use data for men drawn from the national probability sample and the black and Hispanic oversamples. The inclusion of these two oversamples enhances our ability to draw reliable inferences for the black and Hispanic subgroups. We also restrict our analysis to those respondents who were between the ages of 13 and 16 in 1978 and who would be between 24 and 28 at the 1990 interview. This restriction was made to ensure that we obtained as complete information as possible on all early employment experiences for these young men. By focusing on these younger cohorts, we avoid heavy reliance on retrospective information about the labor force activities gathered in the initial 1979 interview, which is required for the older cohorts in the NLSY79. Except for individuals who participate in informal, remunerated work prior to the legal age for work (14 years old), this sample selection enables us to obtain prospective information on the entire process of school departure and labor market entry. Given these sample restrictions, our analysis sample consists of 2,570 young men, including 1,265 whites, 797 blacks, and 511 Hispanics.

Given our interest in young men's accumulation of work, schooling, and military experiences, we constructed a year-by-year classification of respondents' primary activity at each age, from 13 to 28. Using information from the NLSY79 Work and Schooling Histories and from other parts of its annual surveys, we classified respondents in one of the following six, mutually exclusive, activity categories: (1) School Only, (2) School and Part-Time Work, (3) Part-Time Employment (and no School Attendance), (4) Full-Time Employment, (5) Enlisted in Military, and (6) Other (Non-School, Non-Work) Activities.

In assigning these categories for each person-year, we ascertained if a young man were enlisted in the military during the calendar year at age t; if so, we classified him as being enlisted in the military (activity 5). We then examined a youth's school attendance and reported hours and weeks worked at age t. The part-time employment category (activity 3) was defined to include young men who, at age t: (i) were not enrolled in school and worked less than 35 hours per week on average, and/or (ii) did not start an employment spell that lasted at least 50 weeks of a consecutive 52-week period. Young men at age t were classified in activity 4, full-time employment, if they were employed in one or more jobs for 50 weeks out of a consecutive 52-week period and averaged at least 35 hours per week of work during the calendar year in which they reached age t. Of the remaining respondents who reported attending school during the year, they were assigned to activity (1) or (2), depending on whether they reported doing any work activity during the year. A youth of age t who was not assigned to one of the first five activities was, by default, assigned to activity (6), which served as the residual category.

The assignment of activities at each age for NLSY79 male respondents comprise the outcomes in the dynamic, discrete-choice model used in the econometric analysis. Using these activity definitions, we construct for each age four measurements of work "experience"—*work while attending high school; work while attending college, part-time, non-school-related work;* and *full-time work—accumulated from when the respondent was age 13.* We also constructed the accumulated number of *years spent in school while not working* (that is, *years of only schooling*) and *number of grades completed* to distinguish between the effects of school attendance and grade completion. Finally, we include measures of the accumulated number of years *enlisted in the military* and those spent in the residual category of *other activities.*

An important consideration for one of the estimation strategies we employ in section IV is the availability of data for young men's entire work and schooling histories. Such comprehensive histories are needed to deal with the initial-conditions problem noted in the introduction and discussed further in section IV. Our strategy for measuring a youth's accumulated experiences—and, thus, past choices—at each age exploits the richness of the longitudinal data available in the NLSY79.[14]

As the introduction notes, a key feature of the econometric strategy we use for estimating the causal effects of work experience acquired while enrolled in school is explicitly modeling the temporal correlation of all the activity choices youth make through early adulthood. Therefore, to characterize all choices explicitly, including the initial ones, we model the annual choices for each youth from age 13 on. Although the choice of 13 as the age to initialize the activity-choice process is arbitrary, we believe this age captures most, if not all, of the "choices" that youth make about work, schooling, and military activities. As of age 13, 97% of all young men in our sample were classified as being enrolled full-time (activity 1), with the remaining 3% distributed among the school and work activity (activity 2). Thus, we are confident that, by starting at age 13, we capture all of the work and military choices that these youth made during their early life course.

In table 1, we provide descriptive statistics on respondents' work, schooling, and military experiences. Use of the black and Hispanic oversamples allows us to present all tabulations separately by ethnic and racial groups as well as for the full sample. The incidence and extent of working while enrolled in high school and college is relatively high: 92% of the full sample worked at some time while enrolled in high school, but there are noticeable differences by race and ethnicity. White men were more likely to work during high school (93%) relative to Hispanics (88%) or blacks (85%). Overall, the young men in our sample worked an average of 2.55 of their high school years. As with incidence, whites spent more time working while enrolled in high school (2.61 years) as compared to Hispanics (2.43 years) or blacks (2.25 years). Among college goers (42% of sample respondents), employment was quite common.[15] For the total sample, 88% worked while in college, with some variation in that incidence across racial and ethnic groups.

Table 1 also provides information about the incidence and extent of other work, school, and military activities pursued by the young men in our sample. As has been well documented, white men attain substantially more education (an average of 13.36 grades completed) than do black (12.47) or Hispanic men (12.09), and these discrepancies are quite sizable. White men are much more likely than Hispanics or blacks to have worked at least one year on a full-time basis, and they are also less likely to work on a part-time basis while not enrolled in school than either minority group.[16]

Finally, the types of work experience acquired by young men differ for race and ethnic lines. Between the ages of 13 and 28, white and Hispanic men spent about the same number of years in some sort of work-related activity (9.47 years for whites and 9.42 years for Hispanics), but black men averaged one year less in the workforce. (See table 1.)

[14] We note that several previous studies of the labor market activities of young men—such as, Wolpin (1992), Lynch (1989), and Gritz and MaCurdy (1992)—use accumulated work experience after the respondent had left school. As documented by Ahituv et al. (1994) and in evidence presented later, a nontrivial share of young men accumulate significant amounts of work experience prior to leaving school. Moreover, these differences vary markedly by race and ethnicity. Thus, our attempt to include all work experience, starting at an early age (such as 13) seems further justified.

[15] As has been well documented, the incidence of college attendance varies substantially by race and ethnicity, with whites (45%) attending college at much higher rates than blacks (31%) or Hispanics (28%). See table 1.

[16] Recall that an individual is classified as having worked full-time during a given year if they had worked at least 50 weeks in the year for an average of at least 35 hours per week.

TABLE 1.—WORK AND SCHOOLING EXPERIENCES OF YOUNG MEN, SELECTED AGES

	Black	Hispanic	White	Full Sample[2]
Proportion Having Experienced Various Activities by Age 28:				
Worked while in high school	0.85	0.88	0.93	0.92
Attended college	0.31	0.28	0.45	0.42
Worked while in college, if attended college	0.85	0.89	0.89	0.88
Worked part-time while not going to school	0.70	0.66	0.53	0.57
Worked full-time	0.74	0.83	0.86	0.84
Enlisted in the military	0.19	0.10	0.14	0.15
Involved in other activities	0.40	0.36	0.22	0.26
Years of Experience Accumulated in Various Activities by Age 28:				
Average number years of high school & worked part-time[1]	2.25	2.44	2.62	2.55
Average number years of college & worked part-time, if attended college[1]	2.45	2.68	3.10	3.01
Average number of grades completed	12.47	12.09	13.36	13.13
Average number years attended school since age 13	7.30	7.00	7.73	7.61
Average number years of non-school related part-time work[1]	2.22	2.13	1.58	1.71
Average number years of full-time work[1]	3.59	4.46	4.57	4.42
Average number of years since age 13 spent in some work-related activity[3]	8.47	9.42	9.47	9.56
Average number years in military[1]	0.79	0.46	0.63	0.64
Average number years in other activities[1]	0.97	0.74	0.41	0.52
Number of Observations	571	797	1,265	2,573

Data source: NLSY79
Standard deviations in parentheses.
[1] Years of experience measured from age 13 on.
[2] Full sample estimates use population weights to account for the oversampling of blacks and Hispanics in the NLSY79.
[3] Average of years spent in school-related and non-school-related work activities. It does not include time in the military.

Despite similarity in the same amount of work experience that white and Hispanic young men acquire, the nature of that experience is quite different. Hispanic men gain much less work experience while attending school and are more likely to work at a part-time job (while not enrolled) compared to white men. Blacks acquire less work experience while enrolled than either whites or Hispanics. Finally, as others have noted, black males are more likely to enlist in the military than are either white or Hispanic males.

III. Simple Relationships between Working while in School and the Differences in Labor Market Wages and other Characteristics

We next examine the raw correlations between working while enrolled in high school (and college) and young men's subsequent wages. Table 2 presents average wages by employment-enrollment status as well as the differences in these means for all workers (labeled "Mean Difference in Levels") and in the log of wage rates for youth who worked at various ages (labeled "Mean Difference in Logs"). Estimates are provided for blacks, whites, and Hispanics at ages 17, 22, and 27. Both sets of estimates used data for respondents who reported working and had a valid wage rate at each age recorded in table 2. As the variable sample sizes indicate, the number of men working—for whom we observe a wage rate—differ by age, race, and ethnicity. Furthermore, working men may not be representative of all young men in these demographic groups. We defer, until later, any attempt to account for the selectivity of wage data from samples restricted to youth who work. Estimates based on econometric methods that account for the potential selectivity of employment (and schooling) choices are presented in section V.

As table 2 reveals, the differences in wages between young men who worked while in high school and those who did not are almost always positive and typically statistically significant, whether measured in levels or logs. Specifically, wages are between 6% to 19% higher among youth who worked in high school compared to youth who did not at ages 22 and 27 (roughly five and ten years after high school graduation). Among young men who attended college, the differences in wages between those who worked while enrolled and those who did not are almost always positive and are statistically significant at age 27 for all groups except blacks.

These estimates are consistent with the literature on the effects of working while in school discussed in the introduction. Consistent with previous studies, the size of the wage advantages of youth who worked while enrolled in school do not appear to decline with age. In fact, the wage gap appears to increase from age 22 to 27. These patterns hold for both white and Hispanic men, but not for black men. In fact, wage differences by in-school work status for blacks are not always positive and are seldom significantly different at the ages displayed in table 2.

To provide a life cycle perspective of how the education and experience differentials reported in table 1 arise, table 3 presents estimates of mean differences in years of full-time work experience and grades completed at these ages for black, white, and Hispanic men according to whether they worked while enrolled in school. Table 3 reveals that young men who worked while enrolled in high school or college acquired significantly more work experience and formal education at all ages illustrated. For example, by age 28, high school workers had accumulated 1.3 more years of schooling and one more year of full-time work experience,

TABLE 2.—AVERAGE HOURLY WAGE RATES BY EMPLOYMENT-ENROLLMENT STATUS, AT SELECTED AGES

	Number of Observations	Worked	Did Not Work	Mean Difference in Levels	Mean Difference in Logs
Work Status in High School:[1]					
At Age 17					
Hispanic	438	3.99	4.09	−0.09	−0.061
Black (N = 631)	631	3.93	4.47	−0.54	−0.007
White	1,138	3.72	3.84	−0.12	−0.035
Full sample	2,207	3.77	4.02	−0.26	−0.039
At Age 22					
Hispanic	463	6.57	6.66	−0.09**	0.161*
Black	665	5.87	5.27	0.60*	0.068
White	1,125	6.74	5.70	1.04**	0.139**
Full sample	2,253	6.61	5.67	0.94***	0.141***
At Age 27					
Hispanic	429	9.82	8.26	1.56*	0.194**
Black	623	8.60	8.91	−0.31	−0.016
White	1,089	11.17	10.27	0.90	0.181**
Full sample	2,141	10.75	9.69	1.05	0.172***
Work Status in College:[2]					
At Age 22					
Hispanic	133	6.80	5.92	0.87	0.229
Black	199	6.15	6.08	0.07	0.037
White	501	6.62	6.66	−0.04	0.037
Full sample	833	6.58	6.55	0.03	0.050
At Age 27					
Hispanic	118	11.36	7.84	3.58**	0.479**
Black	187	10.37	8.59	1.79*	0.168
White	491	13.06	10.56	2.50***	0.211***
Full sample	796	12.72	10.19	2.53***	0.224***

Data source: NLSY79
[1] Calculated for all men in sample.
[2] Calculated only for men who attended college.
* Denotes significant at 10% level
** Denotes significant at 5% level
*** Denotes significant at 1% level

on average, compared to young men who did not work in high school. (These differences are statistically significant for all groups compared.) By the same age, youth who worked while attending college accumulated 1.89 more years of schooling and 0.68 more years of work experience than their age counterparts who did not work while in college. However, among college goers, the differences in accumulated work experience are not statistically significant for whites or Hispanics. To the extent that young men enhance their labor market skills by acquiring more education or by working full-time, these tabulations support the view that working while enrolled in school is associated with higher rates of skill acquisition.

In summary, the data presented in tables 2 and 3 are entirely consistent with findings of previous studies that conclude that working while enrolled in school or college represents a productive investment based on its apparent effect on market wages and, possibly, employment. However, we cannot rule out that these observed wage differences simply reflect preexisting differences among youth and an age-related sorting process rather than real returns from educational investments and/or early work experiences. Stated differently, it is possible that more-able or "better-connected" youth acquire jobs during their high school and/or college years and that these same youth have better subsequent employment and schooling opportunities. This scenario also is consistent with the patterns shown in table 3. As important, such advantages would also contribute to the wage differences by high school and college work status displayed in table 2.

Next, we discuss our attempt to untangle systematically the influence of various sources of heterogeneity, especially those that we cannot measure. First, we examine the prima facie case for the "heterogeneity in ability and family background" explanation for the patterns reported in tables 2 and 3. Accordingly, table 4 presents differences in an indicator of young men's aptitudes[17] and a set of family background measures[18] according to high school and college work status. Consider, for example, the mean differences in the Armed Forces Qualifying Test (AFQT) by work status in high school. With the exception of blacks, young men who worked while enrolled in high school averaged

[17] As a part of a U.S. Department of Defense initiative, all respondents in the NLSY79 were administered the Armed Services Vocational Aptitude Battery (ASVAB) in 1980. This battery tested a range of aptitudes, including reading comprehension, word knowledge, mathematical knowledge, and numerical operations, as well as a number of other skills. The sum of the scores on the work knowledge, arithmetic reasoning, paragraph comprehension, and one-half of the numeric operations batteries comprise the Armed Forces Qualification Test (AFQT), which is used to assess the eligibility of individuals seeking to enlist in the U.S. armed services. This test is a good predictor of both the likelihood that enlistees are successful in the military and of initial success in the civilian labor force.

[18] The family background variables were obtained from the 1979 wave of the NLSY79 in which both respondents and their parents were interviewed.

TABLE 3.—EMPLOYMENT RATES, ACCUMULATED WORK EXPERIENCE AND GRADES COMPLETED BY EMPLOYMENT-ENROLLMENT STATUS, AT SELECTED AGES

	Work Status in High School[1]			Work Status in College[2]		
	Worked	Did Not Work	Mean Difference	Worked	Did Not Work	Mean Difference
Grades Completed:						
By Age 18:						
Hispanic	10.67	9.68	0.99***			
Black	10.94	10.63	0.31*			
White	11.29	10.60	0.68***			
Full sample	11.20	10.51	0.68***			
By Age 23:						
Hispanic	11.78	10.42	1.36***	14.34	12.32	2.02***
Black	12.15	11.70	0.45*	14.51	12.46	2.04***
White	12.97	11.36	1.61***	15.03	12.74	2.29***
Full sample	12.77	11.35	1.42***	14.94	12.68	2.25***
By Age 28:						
Hispanic	12.23	10.78	1.45***	15.00	13.15	1.85***
Black	12.51	12.21	0.30	14.86	13.72	1.14***
White	13.44	11.98	1.47***	15.68	13.69	1.99***
Full sample	13.23	11.93	1.30***	15.56	13.67	1.89***
Years of Full-Time Work Experience:						
By Age 23:						
Hispanic	1.53	1.03	0.51**	0.69	0.91	−0.22
Black	1.04	0.74	0.30	0.55	0.42	0.14
White	1.33	1.30	0.03	0.57	0.99	−0.42**
Full sample	1.30	1.11	0.19	0.57	0.91	−0.33**
By Age 28:						
Hispanic	4.60	3.14	1.47***	3.65	3.18	0.47
Black	3.71	2.91	0.79**	3.13	1.97	1.16**
White	4.62	3.78	0.84**	3.62	3.02	0.59
Full sample	4.49	3.47	1.02***	3.57	2.88	0.68**

Data Source: NLSY79
[1] Calculated for all men in sample.
[2] Calculated only for men who attended college.
* Denotes significant at 10% level
** Denotes significant at 5% level
*** Denotes significant at 1% level

TABLE 4.—PERSONAL AND FAMILY BACKGROUND CHARACTERISTICS BY EMPLOYMENT-ENROLLMENT STATUS, AT SELECTED AGES

	Work Status in High School[1]			Work Status in College[2]		
	Worked	Did Not Work	Mean Difference	Worked	Did Not Work	Mean Difference
AFQT Test Score:						
Hispanic	56.32	41.80	14.52***	72.03	52.15	19.88***
Black	47.34	47.74	−0.40	61.11	49.95	11.16***
White	72.58	62.81	9.77***	84.27	73.87	10.40***
Full sample	67.92	56.20	11.72***	81.17	69.60	11.57***
Mother's Educational Attainment:						
Hispanic	8.66	7.04	1.62***	10.34	8.94	1.40
Black	11.14	10.90	0.24	12.32	11.12	1.20***
White	12.12	11.26	0.86***	13.11	11.73	1.38***
Full sample	11.76	10.74	1.02***	12.90	11.52	1.38***
Family Income in 1979 (1000 of $):						
Hispanic	14.02	11.83	2.19	18.92	15.85	3.07
Black	11.38	11.64	−0.26	14.12	9.12	5.00***
White	23.38	18.57	4.81***	28.09	22.46	5.63***
Full sample	21.04	16.24	4.80***	26.12	20.53	5.59***
In Female Headed Household at Age 14:						
Hispanic	0.24	0.24	0.00	0.21	0.31	−0.10
Black	0.35	0.33	0.02	0.33	0.35	−0.02
White	0.09	0.05	0.04	0.09	0.11	−0.02
Full sample	0.14	0.15	−0.01	0.12	0.15	−0.03

Data Source: NLSY79
[1] Calculated for all men in sample.
[2] Calculated only for men who attended college.
* Denotes significant at 10% level
** Denotes significant at 5% level
*** Denotes significant at 1% level

significantly higher AFQT scores than men who did not. Moreover, these differences (which average 11.72 points) are sizeable, averaging around one-half of a standard deviation for the AFQT score, for white and Hispanic, but not black men.[19] Among men who attended college, average differences in AFQT scores are also large (11.57 on average) and statistically significant for all demographic groups.

A similar pattern obtains for differences in mothers' educational attainment and 1979 family incomes of young men who worked during high school and those who did not. The former systematically came from wealthier and more-educated households than the latter. This pattern also obtains among college attendees. However, we find small and statistically insignificant differences by employment-enrollment status in the shares of young men raised in female-headed households.

Thus, these observed indicators of ability and family background suggest that young men who worked while enrolled in high school or while attending college were more "advantaged" than the youth who did not acquire work experience while enrolled in school. We can control for these observable factors in a statistical analysis of the returns to in-school work experience on subsequent labor market attainment. However, the evidence in table 4 strongly suggests that personal and family factors, including possibly unmeasured characteristics such as motivation or innate talents, could also account for the positive correlations between in-school work status and subsequent wages gains displayed in table 2. We argue that there is a strong prima facie case that both observed and unobserved sources of heterogeneity across youth are responsible for the causal link between working while in school and subsequent wages. Therefore, failure to account for this possibility may lead to spurious influences. Accordingly, in the remainder of the paper, we assess the robustness of previous findings about the apparent returns to in-school work experience using an econometric strategy that accounts for person- and family-specific sources of unobserved heterogeneity.

IV. Econometric Specifications for Modeling Wages and Selection

This section describes the econometric specifications used to analyze the effects of early work experience—especially that acquired while attending high school and college—on subsequent wage rates of youth. We begin by presenting the specification of the wage equation that is common to all three of the econometric approaches. Our conceptual formulation distinguishes three types of employment: part-time work that takes place while attending school (activity 2); part-time work that occurs while not enrolled in school (activity 3); and full-time employment (activity 4). To allow for differences in the returns to different types of work experiences in each type of employment and personal characteristics, we specify separate wage equations for each.

We estimate the following Mincerian wage equation:

$$\ln W_{itj'} = \beta_{j'}' Z_{it}^{w-s} + \delta_{Sj'}' S_{it} + \delta_{Ej'}' E_{it} + \delta_{Pj'}' P_i + \delta_{Mj'}' M_{it} + u_{itj'}, \quad (1)$$

for employment types, $j' = 2, 3$, or 4,

where

$W_{itj'}$ denotes the hourly wage rate individual i would obtain in employment state j' at age t;
Z_{it}^{w-s} is a vector of variables that measure the incidence and amount of in-school work experience acquired by age t;
S_{it} is a vector of measures of accumulated education (grades completed, years in school) as of age t;
E_{it} is a vector of measuring accumulated (part-time, full-time, and military) work experience as of age t;
P_i is a vector of observable personal characteristics (such as test scores and demographic characteristics) for the i^{th} individual;
M_{it} is a vector of measures of local labor market conditions facing the individual at age t; and
$u_{itj'}$ is the (unobserved) disturbance term.

Our primary interest is in estimating the $\beta_{j'}$'s, the returns to work experience while enrolled in school, conditional on accumulated years of schooling (S_{it}), other work experience (E_{it}), and the additional factors included in equation (1). Their estimation—as well as that of the δ_{Sj}'s and the δ_{Ej}'s—is potentially subject to two related sources of bias. First, Z_{it}^{w-s} (as well as S_{it} and E_{it}) are likely to be correlated with the unobservable determinants of wages, u_{itj}, which can result in endogeneity bias if equation (1) is estimated with the least squares methods. This bias arises if variables such as ability or motivation are omitted from equation (1) and they also influence educational attainment and accumulated work experience. Evidence presented in tables 3 and 4 heightens the concern about this source of bias. Second, the wage data are available for young men only when they choose to work. If some of the same unobserved factors that influence wage offers (the u_{itj}'s) also affect contemporaneous work decisions, estimation of equation (1) will be subject to selectivity bias. Although the potential for either source of bias is well documented in the literature about estimating wage equations, we briefly outline the elements of a choice-theoretic model that motivates how such biases are dealt with. This model will be used to characterize the dynamic selection estimator we employ in our empirical analysis.

Assume that individuals choose which school/work activity (defined in section II) to engage in at each age over

[19] The standard deviations for the AFQT test scores are 28.6, 18.3, 19.4, and 21.5 for the Hispanic, black, and white subsamples, and for the full sample, respectively.

their lifetimes. Let the subjective payoff, or utility, to the i^{th} individual engaging in activity j at age t be denoted by V_{itj} and, for computational simplicity, that it can be approximated by the following linear function of personal characteristics, market conditions, and past choices[20]:

$$V_{itj} = \gamma_j' Z_{it}^{w-s} + \lambda_{Sj}' S_{it} + \lambda_{Ej}' E_{it} + \lambda_{Pi}' P_i + \lambda_{Mj}' M_{it} + \lambda_{Fj}' F_i + \epsilon_{itj}, \quad (2)$$

for all $j \in J$. The vectors Z_{it}^{w-s}, S_{it}, E_{it}, P_i, and M_{it} are as defined previously, F_i is a vector of family background variables that influence a young man's activity choices, and ϵ_{itj} is a state-specific unobservable variable. At each age, young men choose that activity k—from the set of J (=6) feasible activities—that maximizes their utility:

$$\text{Choose } k \text{ such that } V_{itk} = \max_{j \in J} \{V_{itj}\}. \quad (3)$$

Let d_{iti} denote a 0/1 indicator, where $d_{itk} = 1$ if activity k is chosen and $d_{iti} = 0$ for all $j \neq k$, so that $\sum_{j=1}^{J} d_{itj} = 1$ for all t and i. Note that this model implies that Z_{it}^{w-s}, S_{it}, and E_{it} are functions of the $d_{i\tau j}$'s determined at previous ages τ, $\tau < t$.

Endogeneity and selection biases arise when u_{itj} is correlated with current or past $\epsilon_{i\tau j}$'s. As a result, Z_{it}^{w-s} (and S_{it} and E_{it}) are not orthogonal to u_{itj}, so least squares methods need not produce unbiased estimates of the $\beta_{j'}$'s (or the δ_{Sj}'s and δ_{Ej}'s). Under certain conditions, controlling for person-specific background factors, such as F_i, in the estimation of equation (1) may eliminate both endogeneity and selection bias. In particular, if

$$E(u_{itj} | Z_{it}^{w-s}) \neq 0 \quad (4)$$

but

$$E(u_{itj} | Z_{it}^{w-s}, F_{it}) = 0 \quad (5)$$

holds, then, as noted by Barnow, Cain, and Goldberger (1980) and Heckman and Robb (1985), adding F_i as "control" variables to equation (1) and estimating the resulting equation by ordinary least squares will produce unbiased estimates of $\beta_{j'}$ (and δ_{Sj} and δ_{Ej}). Following the evaluation literature, we refer to this as the *Selection on Observables* strategy for eliminating (endogeneity and selection) biases when estimating the wage equations in equation (1). In essence, including such variables as controls adjusts the bias that arises when right-side variables, such as Z_{it}^{w-s}, are not orthogonal to u_{itj}. Meyer and Wise (1982), Ruhm (1997), Chaplin and Hannaway (1997), and Light (2001) present estimates justified by this logic in their analyses of the returns to in-school work experience. We also later present estimates based on this approach.

A second approach to estimating wage equations focuses directly on a particular characterization of the selectivity bias problem just noted. If

$$\begin{aligned} \text{Cov}(\epsilon_{itj}, u_{it'j'}) &\neq 0 \text{ for } t = t' \text{ and } j \\ &= j' \text{ but Cov}(\epsilon_{itj}, u_{it'j'}) \\ &= 0 \text{ otherwise,} \end{aligned} \quad (6)$$

where $j, j' = 2, 3$, or 4, the estimation of the parameters of the wage equation in equation (1) is subject to contemporaneous selection bias. Standard methods for dealing with this source of bias are described by Heckman (1976, 1979). In essence, these methods add a selection-correction term for each individual to equation (1) that accounts for the likelihood that he works and, thus, that we would observe a wage in the actual data. We label this second approach, the *Contemporaneous Selection Control* strategy. Meyer and Wise (1982), Ruhm (1997), and Chaplin and Hannaway (1997) present estimates using variants of this approach in their work. We also present estimates based on this strategy, using the so-called Heckit estimator (Heckman, 1979).

Finally, we employ a third estimation strategy, labeled the *Dynamic Selection Control* strategy, that adapts the econometric framework of Heckman (1981a, 1981b) and Cameron and Heckman (1993, 1999) for estimating dynamic discrete-choice models that condition on past choices. Specifically, we jointly estimate a model of sequential life cycle activity choices implied by the decision rule in equation (3), using the payoff functions in equation (2) and the wage function in equation (1), and for which we allow for temporal as well as contemporaneous correlation of ϵ_{itj} and u_{itj}. Essentially, the model outlined previously posits that previous schooling and work choices affect a young man's subsequent choices and the wage opportunities he faces. The presence of persistent, person-specific unobservables, such as ability or motivation, will give rise to nonzero temporal and contemporaneous correlations between ϵ_{itj} and u_{itj}. To accommodate such correlations in a computationally tractable way, we follow Heckman (1981a) and Cameron and Heckman (1999) in assuming that the error structure in equations (1) and (2) can be characterized by a factor-analytic, random-effects structure:

$$u_{itj'} = \kappa_{j'} \xi_i + \omega_{itj'}, \text{ for } j' = 2, 3, 4, \quad (7)$$

[20] A more structural model of activity choice over the life cycle would represent these conditional valuation functions, V_{itj}, in terms of (i) preference orderings over goods and leisure, (ii) intertemporal budget constraints, (iii) structural equations that map wages as functions of human capital stocks and their returns, and (iv) human capital production functions that map how future wages depend upon past (and current) work and schooling experiences. The specification and estimation of such structural representations have been the focus of several recent papers in the econometrics literature. See Eckstein and Wolpin (1989) and Rust (1994) for surveys of earlier work in this area and more recent papers by Hotz and Miller (1993), Hotz et al. (1994), and Keane and Wolpin (1994, 1999). Because we focus on analyzing the (net) returns to early work experiences on wages, we adopt a "semi-reduced-form" specification of V_{itj} in equation (2) that depends on the determinants of wages given in equation (1) and other personal and family background characteristics that would likely affect a youth's preferences over goods and leisure.

and

$$\epsilon_{itj} = \alpha_j \xi_i + \nu_{itj}, \text{ for } j = 1, \ldots, 6, \quad (8)$$

where ξ_i denotes a person-specific disturbance or factor, α_j and $\kappa_{j'}$ are choice- and wage-specific factor loadings, and ν_{itj} and $\omega_{itj'}$ denote idiosyncratic disturbance terms that are assumed to be uncorrelated with ξ_i. It follows that:

$$\text{Cov}\,(u_{itk'}, u_{it'j'}) = \kappa_{k'}\kappa_{j'} \text{ Var}\,(\xi_i), \text{ for } t \neq t', \text{ and } k', j' = 2, 3, 4, k' \neq j',$$

$$\text{Cov}\,(\epsilon_{itj}, u_{it'j'}) = \alpha_j\kappa_{j'} \text{ Var}\,(\xi_i), \text{ for } t \neq t', \text{ and for all } j, j' = 2, 3, 4,$$

$$\text{Cov}\,(\epsilon_{itj}, \epsilon_{it'k}) = \alpha_j\alpha_k \text{ Var}\,(\xi_i), \text{ for } t \neq t', j \neq k.$$

The estimation of the multistate, discrete-choice model specified in equations (1) through (8) is accomplished using the nonparametric maximum likelihood (NPML) strategy proposed by Heckman and Singer (1984) in which the distribution of ξ_i is approximated by a discrete distribution with finite points of support. In particular, we allow the number of discrete values for the distribution, K, the locations of the random variable (the ξ_k's, $k = 1, \ldots, K$), and the associated probabilities [$p_k \equiv \Pr(\xi_i = \xi_k)$] to be free parameters that are estimated in conjunction with θ and π.[21] The dynamic selection estimation strategy has several potential advantages over the other two estimators previously described and, therefore, over the previous empirical literature on the returns to in-school work experience. First, it explicitly accounts for the endogeneity of past choices in the estimation of contemporaneous choices and wage outcomes. Second, by using nonparametric procedures to account for ξ_i, it is unnecessary to make functional form assumptions about the distribution of this omitted variable. In this sense, our third estimator is more robust than the standard selection-correction estimators used in past work. Finally, the NLSY79 data we use in our analysis allows us to measure and to model all of the schooling and work choices young men make that might affect subsequent choices. Because we have data on schooling and work choices from age 13 on for all sample members, we minimize the initial-conditions problem that can bias the estimation of life cycle models.[22] Such models require initializing the relationship between the stochastic process governing persistent unobservables, such as ξ_i, and past choices, as measured by Z_{it}^{w-s}, S_{it}, and E_{it}. In our case, this initialization occurs at age 12, where we assume that

$$E(\xi_i | Z_{i,12}^{w-s}, S_{i,12}, E_{i,12}) = 0. \quad (9)$$

That is, accumulated schooling and work experiences as of this age are assumed to be uncorrelated with the person-specific random component affecting wages and choices (ξ_i). This is a plausible assumption because youth typically have no discretion over their schooling choices prior to age 13, and our data suggests that they do not work prior to that age either.[23] The NLSY79 data allow us to model all subsequent school/work choices and thereby allow ξ_i to be correlated with our experience variables (Z_{it}^{w-s}, S_{it}, and E_{it}) at each subsequent age in the estimation of equation (1).

V. Estimates for Alternative Selection and Endogeneity Control Methods

In this section, we present estimates for the econometric models of the choices made and wages received by young men during their transitions from school to work and examine the effects of in-school work experience on these outcomes. We first present the estimates for the models outlined in the previous section, focusing on the effects that family background, initial skills, and local labor market conditions have on the acquisition of alternative types of work experience and on the wages that young men command when they work. We then present estimates of the "net" returns to wages from in-school work experience at various ages for white, black, and Hispanic men to assess the robustness of previous findings for work experience acquired during periods of school enrollment.

Table 5 presents sample means for the variables used to measure personal and family background characteristics used as control variables in the empirical analyses. (These variables are defined in section II.) We exploited information available on the county and state in which the respondent resided at the time of each annual interview to develop several indicators of local labor market conditions for each respondent at each age (year) they were interviewed. The following indicators were measured based on respondents' county of residence: the annual unemployment rate, the average annual income per worker for those employed,[24] the average annual income per worker for those employed in manufacturing jobs, the average annual income per worker for those employed in service-sector jobs, the annual percentage rate of growth in employment, the employment-share-weighted annual percentage growth rate of manufacturing sector employment,[25] and the employment-share-weighted annual percentage growth rate of service-sector

[21] An appendix with the details of the exact form of the nonparametric likelihood function and the methods used to estimate it are available from the authors upon request.

[22] Heckman (1981b) provides a detailed discussion of the initial conditions problem in life cycle models.

[23] Child labor laws in the U.S. prohibit youth from working prior to age 16 (or with parental consent at ages 14 and 15), and most states have mandatory school attendance laws for children younger than age 18.

[24] The income-per-worker variables are expressed in thousands of 1982 dollars.

[25] The employment share-weighted variables were constructed as follows. Let E_{jkt} denote the total number of workers employed in industrial sector j in county k in year t, and let E_{kt} denote total annual employment in the county in year t. Then, the share of employment in the j^{th} sector in

TABLE 5.—MEANS OF EXOGENOUS VARIABLES USED IN (LOG) WAGE EQUATION AND ACTIVITY CHOICE ESTIMATION

Variable	Black	Hispanic	White
Foreign born	0.02	0.23	0.02
	(0.13)	(0.42)	(0.14)
AFQT score	47.40	54.77	72.02
	(18.29)	(20.65)	(19.37)
Percentage Missing AFQT Score	3.60	5.90	4.30
Mother's educational attainment	11.11	8.48	12.07
	(2.49)	(4.33)	(2.32)
Percentage Missing Mother's Education	9.20	10.00	4.50
Father's educational attainment	10.61	8.98	12.51
	(3.18)	(4.71)	(3.24)
Percentage Missing Father's Education	26.20	21.40	6.70
Family income in 1978 (1000's of 1982 $)	11.41	13.77	23.04
	(8.36)	(10.37)	(13.82)
Percentage Missing Family Income	19.50	17.20	18.00
In female-headed family at age 14	0.35	0.24	0.09
	(0.48)	(0.43)	(0.28)
State UE Rate	2.82	3.05	3.00
	(0.94)	(1.10)	(1.05)
Percentage Missing UE Rate	8.50	7.00	7.10
Growth rate in county employment	0.017	0.024	0.022
	(0.030)	(0.028)	(0.032)
Growth rate in county manu. employment	0.011	0.013	0.013
	(0.017)	(0.012)	(0.017)
Growth rate in county service sector empl.	0.001	0.003	0.002
	(0.012)	(0.011)	(0.012)
Percentage Missing County Empl. Growth Data	1.10	1.10	1.00
County income/worker	11.96	12.26	12.20
	(3.05)	(3.53)	(2.93)
County income/worker in manu. sector	22.31	21.88	22.74
	(6.20)	(5.49)	(5.21)
County income/worker in service sector	13.50	14.29	12.80
	(2.90)	(2.99)	(2.48)
Percentage Missing County Income/Worker Data	9.10	4.90	12.60
Percentage of sample in ethnic/racial group	15.03	7.23	77.73
Number of individuals in sample	797	511	1,265
Number of person years	12,364	7,890	19,569

Standard deviations in parentheses
Data Source: NLSY79

employment.[26] Sample means for these variables also are included in table 5.[27]

We estimate the parameters of the wage equations for the Selection on Observables, and the wage and work-school-other activity choice equations for both the Contemporaneous Selection Control and the Dynamic Selection Control models. Because our primary interest is in the returns to working while in school, we do not present the full set of parameter estimates and their estimated standard errors. (They are available from the authors upon request.) However, we briefly consider several statistical indicators of the fit of the three econometric models. First, with the exception of the loading associated with the residual "Other" activity, the factor loadings for the Dynamic Selection Control model are all significantly different from zero. Because the products of factor loadings characterize the covariances between u_{itj} and $\epsilon_{it'j'}$ in equations (1) and (2), the statistical significance of these loadings indicates that these disturbances are contemporaneously and serially correlated.[28] In contrast, the contemporaneous correlations between u_{itj} and ϵ_{itj} in equations (1) and (2) in the Contemporaneous Selection Control model are statistically significant only for the full-time work activity index and its associated wage equation. Although not conclusive, this evidence indicates that

year t is $s_{jkt} = \frac{E_{jkt}}{E_{kt}}$ and the sector-specific growth rates are given by $g_{jkt} = s_{jk,t-1}\left(\frac{E_{jkt} - E_{jk,t-1}}{E_{jk,t-1}}\right)$.

[26] The unemployment rate data was obtained from the GEOCODE supplement to the NLSY79, whereas the remaining variables were constructed from annual, county-level data on industry-specific employment and average earnings that is distributed by the Bureau of Economic Analysis (BEA) of the U.S. Department of Commerce. The measures on industry-specific employment and wage income per worker are drawn primarily from information obtained from state unemployment insurance programs for all major industries at both county and state levels of aggregation.

[27] We filled all missing values for these control variables with zeros. We constructed dummy variables to characterize missing values of these control variables and included these dummies as regressors in both the wage and utility index functions in all of our analyses. Table 5 reports the percentage missing for specific variables or categories of variables.

[28] Recall that correlation between the u_{itj}'s and $\epsilon_{it'j'}$'s gives rise to the endogeneity of in-school work experience (as well as the schooling and other work experience variables) in equations (1) and (2) when estimating wage returns of work experience acquired while enrolled in school.

the serial correlation of activity choice and wage disturbances is important in characterizing the data.

In table 6, we present estimates (and standard errors) of the marginal impacts of having one additional year of various types of work and schooling experiences on wages of young men for the three econometric models implemented.[29] More precisely, we report the effect of an additional year spent in (i) Full-Time School (and an extra grade is completed); (ii) High School & Work (and an extra grade is completed); (iii) College & Work (and an extra grade is completed); (iv) Part-Time Work Only (activity 3); and (v) Full-Time Work Only (activity 4). In addition, we two "net" return estimates: (vi) Net Return to Work while in High School and (vii) Net Return to Work while in College. Net returns (vi) and (vii)—defined as the differences between entries (ii) and (i) and between (iii) and (i), respectively—are derived from the parameter estimates for the wage equation (1). These marginal effects yield the percentage change in wages due to a one-year change in a particular form of experience. Evaluating these effects at different ages (7, 22, and 27) represents ages that youth would typically graduate from high school or college, respectively, and in early adulthood.[30] Panels A, B, and C in table 6 display the results for black, Hispanic, and white men, respectively. These calculations were derived using the coefficients on the race and ethnicity interactions with the various experience variables.

For the Selection on Observables and Contemporaneous Selection models, the net returns to full-time wages of work experience acquired while enrolled in high school or college are consistent with findings from previous studies based on young men (such as Ruhm (1997) and Light (2001), who also use data from the NLSY79). Specifically, for black men (panel A), an extra year spent working while in high school yields in a 2.1% to 2.9% higher full-time hourly wage rate compared to not working while attending high school. These net returns for black men are very precisely estimated. The corresponding net returns to full-time wages for Hispanic men (panel B) range between 1.7% to 2.5%, depending on the econometric specification and age at which the effect was evaluated. These estimates are less precisely estimated. Comparable returns for white men (panel C) are between 2.2% and 3.0% and are precisely estimated.[31]

Consistent with findings from previous studies, the estimated net returns to full-time wage rates from an extra year working while enrolled in high school show little evidence of declining with age. For black men (panel A), the net return to an extra year of high school employment declines between 0.3 to 0.6 percentage points from age 17 to 27. Age decay is similarly small for Hispanic and white young men. Finally, there is little evidence of any wage returns to high school employment associated either with working while enrolled or with part-time employment. For black and Hispanic men, these returns are frequently small, especially at older ages, and almost never estimated precisely. For white men, the corresponding net returns for high school work are larger and estimated with greater precision, at least at older ages.

The Selection on Observables and Contemporaneous Selection Control models yield similar results for net wage returns from college employment. The estimated returns are almost always positive and statistically significant for full-time wages at various ages. Moreover, estimated returns to college employment are substantially higher than returns to high school employment. For black men, returns to college employment range from 4.9% to 5.6% (panel A) and 4.6% to 5.4% for whites (panel C). Hispanic men are the exception to this pattern, but relatively few are college goers because large numbers withdraw from high school prematurely (Tienda & Ahituv, 1996). For this group, the estimated full-time wage returns of spending an extra year working while enrolled in college are noticeably smaller, statistically insignificant, and virtually identical between ages 22 and 27 for both the Selection on Observables and Contemporaneous Selection Control models. Finally, the net wage returns to high school or college employment associated with the "school and work" state are relatively small in magnitude and imprecisely estimated for both Hispanics and whites. However, for black men, the corresponding estimates are sizeable, statistically significant, and comparable in magnitude to the returns from an additional year in full-time employment.

Conclusions about the benefits of high school or college employment on young men's wages change markedly when dynamic forms of selection (and endogeneity) bias are taken into account. (See the three panels of table 6 under the heading "Dynamic Selection Control.") Consider the returns to wages associated with full-time employment in the three panels. Based on the dynamic specification of person-specific unobserved heterogeneity that underlies the Dynamic Selection Control model, the estimated full-time wage returns from high school or college employment are substantially smaller than the corresponding estimates based on the first two methods of dealing with selection and endogeneity. Moreover, these point estimates are almost never statistically trivial. For black men, the estimated net return to wages from an extra year of high school employment ranges from -0.1% to 1.7% and is statistically significant. The corresponding ranges of estimates for Hispanic and white men are -2.6% to -0.9% and -0.4% to 1.2%, respectively. Moreover, the estimated net returns, although

[29] The estimated returns presented in all three panels of table 6 are evaluated at the age-specific (weighted) means of the variables included in the specifications of equations (1) and (2). These means were calculated over the data for all young men.

[30] These effects are evaluated at the appropriate age-specific means of variables used in these calculations, given that work, schooling, and the *other experience variables enter* the Contemporaneous and Dynamic Selection Control models nonlinearly.

[31] The magnitudes of these estimates of net returns are roughly consistent with those found in the studies cited in the introduction.

TABLE 6.—EFFECTS OF AN ADDITIONAL YEAR OF SCHOOL, WORK AND OTHER TYPES OF EXPERIENCE ON WAGES RATES

An Additional Year Spent in:	Change in log of Wage Associated with: School & Work: Selection on Observables	School & Work: Contemp. Selection Control	School & Work: Dynamic Selection Control	Part-Time Work Only: Selection on Observables	Part-Time Work Only: Contemp. Selection Control	Part-Time Work Only: Dynamic Selection Control	Full-Time Work Only: Selection on Observables	Full-Time Work Only: Contemp. Selection Control	Full-Time Work Only: Dynamic Selection Control
Panel A: Blacks									
Evaluated at Age 17:									
Full-time school (& gain add. grade)	0.014	0.009	0.029*	0.043**	0.034**	0.100***	0.033***	0.021**	0.099***
High school & work (& gain add. grade)	−0.001	−0.006	−0.002	0.010	−0.001	0.085***	0.061***	0.045***	0.116***
Part-time work only	0.036	0.054	0.041	0.055***	0.038*	0.044***	0.026***	0.021***	0.019**
Full-time work only	0.209***	0.218**	0.190***	0.040***	0.055***	0.051***	0.101***	0.065***	0.094***
Net return to work while in high school[a]	−0.015	−0.015*	−0.031*	−0.034	−0.035***	−0.015	0.029***	0.024***	0.017
Evaluated at Age 22:									
Full-time school (& gain add. grade)	0.047***	0.047***	0.069***	0.065***	0.057***	0.128***	0.048***	0.038***	0.132***
High school & work (& gain add. grade)	0.046***	0.047***	0.055***	0.056***	0.050***	0.105***	0.072***	0.060***	0.133***
College & work (& gain add. grade)	0.110***	0.107***	0.115***	0.063***	0.067***	0.097***	0.099***	0.095***	0.136***
Part-time work only	0.030	0.045*	0.034	0.052***	0.037*	0.042***	0.028***	0.023***	0.021***
Full-time work only	0.182***	0.192***	0.166***	0.041***	0.053***	0.051***	0.094***	0.063***	0.088***
Net return to work while in high school[a]	−0.001	0.0001	−0.015	−0.008	−0.007	−0.023	0.023***	0.022***	0.0001
Net return to work while in college[b]	0.063***	0.060***	0.045**	−0.002	0.009	−0.031	0.051***	0.056***	0.004
Evaluated at Age 27:									
Full-time school (& gain add. grade)	0.055***	0.055***	0.079***	0.069***	0.062***	0.134***	0.052***	0.042***	0.140***
High school & work (& gain add. grade)	0.054***	0.056***	0.064***	0.062***	0.056***	0.111***	0.075***	0.064***	0.139***
College & work (& gain add. grade)	0.117***	0.114***	0.122***	0.068***	0.071***	0.103***	0.101***	0.096***	0.141***
Part-time work only	0.022	0.034*	0.025	0.048***	0.036**	0.039***	0.031***	0.026***	0.023***
Full-time work only	0.093***	0.100***	0.087***	0.043***	0.044***	0.051***	0.072***	0.057***	0.067***
Net return to work while in high school[a]	−0.001	0.001	−0.014	−0.008	−0.006	−0.023	0.023***	0.021***	−0.001
Net return to work while in college[b]	0.062***	0.059***	0.044**	−0.001	0.009	−0.031	0.049***	0.054***	0.001
Panel B: Hispanics									
Evaluated at Age 17:									
Full-time school (& gain add. grade)	0.052***	0.048***	0.069***	0.007	0.000	0.085***	0.058***	0.051***	0.141***
High school & work (& gain add. grade)	0.032	0.026***	0.033	0.008	−0.002	0.085***	0.083***	0.070***	0.132***
Part-time work only	0.067***	0.084***	0.068***	0.057***	0.040	0.047***	0.026***	0.020***	0.015*
Full-time work only	0.217***	0.226***	0.203***	0.063***	0.078	0.074***	0.115***	0.078***	0.112***
Net return to work while in high school[a]	−0.020	−0.021*	−0.036	0.001	−0.002*	0.000	0.025**	0.019**	−0.009
Evaluated at Age 22:									
Full-time school (& gain add. grade)	0.085***	0.085***	0.109***	0.028	0.023*	0.113***	0.074***	0.068***	0.175***
High school & work (& gain add. grade)	0.079***	0.080***	0.090***	0.055***	0.049***	0.106***	0.094***	0.085***	0.149***
College & work (& gain add. grade)	0.090***	0.087***	0.094***	0.046*	0.050***	0.078**	0.087***	0.086***	0.101***
Part-time work only	0.061***	0.075***	0.061***	0.054***	0.039**	0.045***	0.027***	0.022***	0.017**
Full-time work only	0.191***	0.200***	0.179***	0.063***	0.076***	0.074***	0.108***	0.077***	0.105***
Net return to work while in high school[a]	−0.007	−0.006	−0.020	0.026	0.026**	−0.007	0.019*	0.017**	−0.025
Net return to work while in college[b]	0.005	0.002	−0.015	0.018	0.027	−0.035	0.013	0.017	−0.073***
Evaluated at Age 27:									
Full-time school (& gain add. grade)	0.093***	0.094***	0.119***	0.033	0.028**	0.119***	0.078***	0.072***	0.182***
High school & work (& gain add. grade)	0.087***	0.089***	0.099***	0.060***	0.055***	0.111***	0.097***	0.089***	0.155***
College & work (& gain add. grade)	0.097***	0.094***	0.101***	0.051**	0.054***	0.084***	0.088***	0.087***	0.106***
Part-time work only	0.053***	0.064***	0.052**	0.050***	0.038***	0.042***	0.030***	0.026***	0.019***
Full-time work only	0.102***	0.108***	0.100***	0.065***	0.068***	0.074***	0.086***	0.071***	0.084***
Net return to work while in high school[a]	−0.006	−0.005	−0.019	0.027	0.027**	−0.008	0.019*	0.017**	−0.026
Net return to work while in college[b]	0.003	0.000	−0.017	0.018	0.026	−0.035	0.011	0.015	−0.076***
Panel C: Whites									
Evaluated at Age 17:									
Full-time school (& gain add. grade)	0.043***	0.038***	0.059***	0.007	−0.002	0.085***	0.041***	0.030***	0.113***
High school & work (& gain add. grade)	0.035***	0.029***	0.035***	0.026**	0.016	0.100***	0.072***	0.056***	0.125***
Part-time work only	0.069***	0.086***	0.070***	0.077***	0.060**	0.070***	0.056***	0.049***	0.041***
Full-time work only	0.224***	0.234***	0.208***	0.073***	0.089***	0.082***	0.115***	0.079***	0.112***
Net return to work while in high school[a]	−0.009	−0.010	−0.024**	0.019	0.017	0.014	0.030***	0.025***	0.012
Evaluated at Age 22:									
Full-time school (& gain add. grade)	0.077***	0.076***	0.099***	0.028***	0.021*	0.113***	0.057***	0.048***	0.146***
High school & work (& gain add. grade)	0.082***	0.082***	0.091***	0.073***	0.067***	0.120***	0.082***	0.071***	0.142***
College & work (& gain add. grade)	0.074***	0.072***	0.078***	0.077***	0.081***	0.111***	0.105***	0.102***	0.122***
Part-time work only	0.063***	0.077***	0.063***	0.074***	0.059***	0.068***	0.058***	0.051***	0.043***
Full-time work only	0.197***	0.207***	0.185***	0.073***	0.087***	0.082***	0.109***	0.077***	0.106***
Net return to work while in high school[a]	0.005	0.006	−0.008	0.045***	0.046***	0.007	0.025***	0.023***	−0.004
Net return to work while in college[b]	−0.002	−0.004	−0.021	0.049**	0.060**	−0.002	0.048***	0.054***	−0.024**
Evaluated at Age 27:									
Full-time school (& gain add. grade)	0.084***	0.085***	0.109***	0.033***	0.026**	0.119***	0.060***	0.052***	0.153***
High school & work (& gain add. grade)	0.090***	0.091***	0.101***	0.078***	0.073***	0.126***	0.085***	0.074***	0.148***
College & work (& gain add. grade)	0.081***	0.079***	0.086***	0.082***	0.086***	0.117***	0.106***	0.103***	0.127***
Part-time work only	0.055***	0.066***	0.054***	0.070***	0.058***	0.065***	0.060***	0.055***	0.045***
Full-time work only	0.108***	0.116***	0.105***	0.076***	0.079***	0.082***	0.086***	0.072***	0.084***
Net return to work while in high school[a]	0.006	0.006	−0.008	0.045***	0.046***	0.006	0.025***	0.022***	−0.005
Net return to work while in college[b]	−0.004	−0.006	−0.023*	0.050***	0.059**	−0.002	0.046***	0.051***	−0.026***

Asymptotic standard errors in parentheses

[a] Estimate is difference between "High School & Work (& Gain Add. Grade)" and "Full-Time School (& Gain Add. Grade)."

[b] Estimate is difference between "College & Work (& Gain Add. Grade)" and "Full-Time School (& Gain Add. Grade)."

* Denotes significant at 10% level

** Denotes significant at 5% level

*** Denotes significant at 1% level

small, decline with age for all three demographic groups. Finally, the wage returns to working while enrolled and to part-time employment from an additional year of high school employment are markedly reduced and imprecisely estimated.

The Dynamic Selection Control model also yields substantially different conclusions about the wage returns associated with working while enrolled in college. For black men, the net returns are very small and almost always statistically insignificant, with the exception of net wage returns associated with school and work. For Hispanic and white men, the estimated net returns to college employment are actually negative and precisely estimated. The meaning of these negative returns is unclear. As noted previously and revealed in the point estimates (available upon request), the net returns presented in table 6 are calculated from specifications for equations (1) and (2), in which polynomials in the work experience and schooling variables allow for nonlinear effects. Experimentation with these specifications indicates that the negative estimates of net returns to college work experience for Hispanic and white men result from using quadratic forms for the work and schooling experience variables.[32] Thus, we caution against drawing strong inferences based on the negative signs of the estimated returns to working while enrolled in school (high school or college) displayed in table 6.

In sum, the high returns to high school or college work experience claimed by prior studies are, at the very least, not robust to dynamic selection bias controls of the type we have employed. Whether we can conclude that the returns to high school and college work experience are, in fact, nonexistent hinges on the appropriateness of our econometric methodology for dealing with dynamic forms of selection bias. To be sure, our use of a person-specific, random-effects (or factor structure) specification to characterize the correlations of the errors in the wage and activity choice equations does impose restrictions on the across-age covariance matrix for these disturbances. Furthermore, the robustness of this procedure is potentially susceptible to the initial-conditions problem noted by Heckman and his collaborators. However, as noted, we minimize the latter issue by accounting for all of the educational and work choices made by young men from age 13 on in the empirical model. Moreover, we use the relatively robust, nonparametric methods to characterize the mixing distribution for the random effects. These two features of our econometric approach provide a relatively general framework for assessing the wage returns to early work experience. Thus, we conclude that our estimates of the net returns to experience acquired while enrolled in school are more plausible than those generated in previous studies.

As a final note about the plausibility of the Dynamic Selection Control specification, consider the differences in the estimated returns to full-time school enrollment produced by the three econometric specifications. The returns to full-time schooling are markedly larger based on the Dynamic Selection Control model as compared to those derived from the Selection on Observables and Contemporaneous Control specifications. Specifically, the annual wage returns to full-time schooling associated with full-time employment range from 9.9% to 14.0% for blacks, 14.1% to 18.2% for Hispanics, and 11.3% to 15.3% for whites in the first two model specifications. Moreover, the estimates based on the Dynamic Selection Control specification imply that devoting full-time to school has much bigger payoffs than working while in high school or college. This differential is especially large for both minority groups. In fact, the returns to full-time schooling, especially high school, tend to be as large, if not larger, than the returns to full-time work experience, even at older ages. Although not conclusive, the absolute and relative size of the returns to schooling associated with the Dynamic Selection Control model is consistent with recent empirical estimates in the returns to schooling literature.[33]

VI. Conclusion

In this paper, we assess the robustness of earlier findings about the effects of working while enrolled in school on subsequent wages of black, white, and Hispanic young men. Specifically, we examine how robust these findings are to a particular method of controlling for person-specific unobserved heterogeneity. Our findings clearly suggest that previous conclusions about the sizeable and persistent returns to young men's subsequent wages from working while enrolled in high school or college depend on how one accounts for dynamic forms of selection (and endogeneity) bias. To be sure, policies that encourage youth to acquire work experience to facilitate the transition from school to work may have positive benefits for some groups, particularly disadvantaged and/or non-college-bound youth. However, our evidence suggests that high wage benefits later in life are much less clear. Moreover, our results also indicate that policies to increase a young man's skills via full-time schooling will have greater payoffs to subsequent wage attainment than will policies that promote employment of enrolled youth. Finally, our findings lend further support to Cameron and Heckman's (1998, 1999) claims regarding the need to account for dynamic forms of selection bias when analyzing the returns to schooling or other forms of experience.

[32] When we omitted the quadratic terms for the in-school and other work experience variables, the resulting net returns estimates for Hispanic and white men were much smaller and not statistically significant when evaluated at ages 22 and 27. However, the coefficient on these quadratic terms tend to be precisely estimated and are jointly significant, which is why we include them in the empirical specification and, as a result, why we use them to calculate the net returns presented in table 6.

[33] See, for example, Card (1999) for a summary of estimates of rates of return to schooling.

REFERENCES

Ahituv, Avner, and Marta Tienda, "Employment Activity and School Continuation Decisions of Young Women," revised version of a paper presented at the 1997 Population Association of America Annual Meeting, Washington, DC (April 1999).

Ahituv, Avner, Marta Tienda, and V. Joseph Hotz, "Pathways from School to Work Among Black, Hispanic and White Young Men in the 1980's," University California–Los Angeles unpublished manuscript (December 1998).

Ahituv, Avner, Marta Tienda, Lixin Colin Xu, and V. Joseph Hotz, "Initial Labor Market Experiences of Black, Hispanic and White Men," University of Chicago unpublished manuscript (June 1994).

Barnow, Burt, Glen Cain, and Arthur Goldberger, "Issues in the Analysis of Selectivity Bias," *Evaluation Studies* 5 (1980), 42–59.

Barone, Frank, "The Effects of Part-Time Employment on Academic Performance," *NASSP Bulletin* 77 (1993), 67–73.

Cameron, Stephen, and James Heckman, "The Nonequivalence of High School Equivalents," *Journal of Labor Economics* 11:1, part 1 (1993), 1–47.

——— "Life Cycle Schooling and Dynamic Selection Bias: Models and Evidence for Five Cohorts of American Males," *Journal of Political Economy* 106:2 (1998), 262–333.

——— "The Dynamics of Educational Attainment for Blacks, Hispanics, and Whites," NBER working paper no. 7249 (July 1999).

Card, David, "The Causal Effect of Education on Earnings" in O. Ashenfelter and D. Card (eds.), *Handbook of Labor Economics,* vol. III, (Amsterdam: North-Holland Press, 1999), 1801–1863.

Carr, R., J. Wright, and C. Brody, "Effects of High School Work Experience a Decade Later: Evidence from the National Longitudinal Study," *Sociology of Education* 69 (January 1996), 66–81.

Chaplin, Duncan, and Jane Hannaway, "High School Employment: Meaningful Connections for At-Risk Youth," Urban Institute unpublished manuscript (1997).

D'Amico, Ronald, "Does Employment During High School Impair Academic Progress?" *Sociology of Education* 57:3 (1984), 152–164.

Donahoe, Debra, and Marta Tienda, "The Transition from School to Work: Is there a Crisis and What Can Be Done?" (pp. 231–263), in Sheldon Danziger and Jane Waldfogel (Eds.), *Securing the Future: Investing in Children from Birth to College* (New York: Russell Sage Foundation, 2000).

Eckstein, Zvi, and Kenneth Wolpin, "The Specification and Estimation of Dynamic Stochastic Discrete Choice Models," *Journal of Human Resources* 24 (1989), 562–598.

Ehrenberg, Ronald, and Daniel Sherman, "Employment While in College, Academic Achievement and Postcollege Outcomes," *Journal of Human Resources* 22:1 (1987), 1–24.

Flinn, Christopher, and James Heckman, "Models for the Analysis of Labor Force Dynamics" (pp. 35–95), in R. Basmann and G. Rhodes (Eds.), *Advances in Econometrics,* vol. 1 (Greenwich: JAI Press, 1982a).

Flinn, Christopher, and James Heckman, "New Methods for Analyzing Structural Models of Labor Force Dynamics," *Journal of Econometrics* 18:1 (1982b), 115–168.

Gade, Eldon, and Lois Peterson, "A Comparison of Working and Non-Working High School Students on School Performance, Socioeconomic Status and Self-Esteem," *Vocational Guidance Quarterly* 29:1 (1980), 65–69.

Greenberger, Ellen, and Laurence Steinberg, *When Teenagers Work: The Psychological and Social Costs of Adolescent Employment* (New York: Basic Books, 1986).

Gritz, Mark, and Thomas MaCurdy, "Participation in Low-Wage Labor Markets by Young Men," Stanford University unpublished manuscript (September 1992).

Heckman, James J., "Shadow Prices, Market Wages, and Labor Supply," *Econometrica* 42 (1974), 679–694.

Heckman, James J., "The Common Structure of Statistical Models of Truncation, Sample Selection and Limited Dependent Variables and A Simple Estimator for Such Models," *Annals of Economic and Social Measurement* 5:4 (1976), 475–492.

——— "Sample Selection Bias as a Specification Error," *Econometrica* 47:1 (1979), 153–161.

——— "Statistical Models of Discrete Panel Data" (pp. 114–178), in D. McFadden and C. Manski (Eds.), *Structural Analysis of Discrete Data with Econometric Applications* (Cambridge, MA: The MIT Press, 1981a).

——— "The Incidental Parameters Problem and the Problem of Initial Conditions in Estimating a Discrete Time-Discrete Data Stochastic Process" (pp. 179–197), in D. McFadden and C. Manski (Eds.), *Structural Analysis of Discrete Data with Econometric Applications,* (Cambridge, MA: The MIT Press, 1981b).

——— "Heterogeneity and State Dependence" (pp. 91–139) in S. Rosen (Ed.), *Studies in Labor Markets* (Chicago: University of Chicago Press, 1981c).

Heckman, James J., and Richard Robb, "Alternative Methods for Evaluating the Impact of Interventions" (pp. 156–245), in J. Heckman and B. Singer (Eds.), *Longitudinal Analysis of Labor Market Data* (New York: Cambridge University Press, 1985).

Heckman, James J., and Burton Singer, "A Method for Minimizing the Impact of Distributional Assumptions in Econometric Models of Duration Analysis," *Econometrica* 52:2 (1984), 271–320.

Hotz, V. Joseph, and Marta Tienda, "Education and Employment in a Diverse Society: Generating Inequality through the School-to-Work Transition," in *American Diversity: A Demographic Challenge for the Twenty-First Century,* JAI Press, ed. by S. Tolnay and N. Denton, forthcoming.

Hotz, V. Joseph, Robert Miller, Seth Sanders, and Jeffrey Smith, "A Simulation Estimator for Dynamic Models of Discrete Choice," *Review of Economic Studies* 61 (1994), 265–289.

Keane, Michael, and Kenneth Wolpin, "The Solution and Estimation of Discrete Choice Dynamic Programming Models by Simulation: Monte Carlo Evidence," this REVIEW 76:4 (1994), 609–632.

——— "The Career Decisions of Young Men," *Journal of Political Economy* 105:3 (1999), 473–522.

Light, Audrey, "In-School Work Experience and the Returns to Schooling," *Journal of Labor Economics* 19:1 (2001), 65–93.

Lillydahl, Jane, "Academic Achievement and Part-Time Employment of High School Students," *Journal of Economic Education* 21 (1990), 307–316.

Lynch, Lisa, "The Youth Labor Market in the 80s: Determinants of Re-Employment Probabilities for Young Men and Women," this REVIEW 71:1 (1989), 37–45.

Marsh, Herbert W., "Employment during High School: Character Building or a Subversion of Academic Goals?" *Sociology of Education* 64 (1991), 172–189.

Meyer, Robert, and David Wise, "High School Preparation and Early Labor Force Experience" (pp. 227–339), in R. Freeman and D. Wise (eds.), *The Youth Labor Market Problem: Its Nature, Causes and Consequences* (Chicago: University of Chicago Press, 1982).

Mortimer, Jaylon, and M. Finch, "The Effects of Part-Time Work on Adolescent Self-Concept and Achievement" (pp. 66–89), in K. Borman and J. Reisman (Eds.), *Becoming A Worker* (Norwood, NJ: Ablex, 1986).

Ruhm, Christopher, "Is High School Employment Consumption or Investment?" *Journal of Labor Economics* 14:4 (1997), 735–776.

Rust, John, "Structural Estimation of Markov Decision Processes" (pp. 3082–3143), in R. Engle and D. McFadden (Eds.), *Handbook of Econometrics,* vol. 4, (Amsterdam: North-Holland, 1994).

Sanders, Seth, "A Model of Welfare Dependence," unpublished doctoral dissertation, University of Chicago (1995).

Schoenhals, Mark, Marta Tienda, and Barbara Schneider, "The Educational and Personal Consequences of Adolescent Employment," *Social Forces* 77:2 (1998), 723–761.

Stephenson, Stanley, "In-School Labour Force Status and Post-School Wage Rates of Young Men," *Applied Economics* 13:3 (1981), 279–302.

Stern, David, and Yoshi-Fumi Nakata, "Characteristics of High School Students' Paid Jobs and Employment Experience after Graduation" (pp. 189–233), in David Stern and Dorothy Eichorn (Eds.), *Adolescence and Work: Influences of Social Structure, Labor Markets, and Culture* (Hillsdale, NJ: Erlbaum, 1989).

Stevenson, Wayne, "The Relationship between Early Work Experience and Future Employability" (pp. 93–124), in Arvil Adams and Garth Mangum (Eds.), *The Lingering Crisis of Youth Unemployment,* (Kalamazoo, MI: Upjohn Institute for Employment Research, 1978).

Tienda, Marta, and Avner Ahituv, "Ethnic Differences in School Departure: Does Youth Employment Promote or Undermine Educational

Achievement?" (pp. 93–110), G. Mangum and S. Mangum (Eds.), *Of Heart and Mind: Social Policy Essays in Honor of Sar Levitan,* (Kalamazoo, MI: Upjohn Institute for Employment Research, 1996).

Tienda, Marta, Avner Ahituv, V. Joseph Hotz, and M. Bellessa, "Employment and Wage Prospects of Black, White, and Hispanic Women: Evidence from the 1980s and Early 1990s," Princeton unpublished manuscript (March 1999).

Wolpin, Kenneth, "The Determinants of Black-White Differences in Early Employment Careers: Search, Layoffs, Quits, and Endogenous Wage Growth," *Journal of Political Economy* 100 (1992), 535–560.