High School Employment and Youths' Academic Achievement

Donna S. Rothstein

ABSTRACT

This paper asks whether employment during high school impacts youths' grade point average. Unlike much of the prior literature, it allows for the endogeneity of the hours and dropout decisions, uses ASVAB test scores, and tests whether youth employment is dynamic. The results indicate that high school employment and its lag have small, negative impacts on academic grade point average for both males and females. The hours effects diminish when a fixed person effect is included, and they become statistically insignificant when hours are instrumented.

I. Introduction

Working during high school is common among today's youth. According to the National Longitudinal Survey of Youth 1997 (NLSY97), 41 percent of males, and 34 percent of females work at some point while school is in session in the tenth grade. By the twelfth grade, about 70 percent of youths work during the school year. The net impact of youth employment on academic achievement is not clear. Two opposing factors may be at work. On one hand, employment while in school may help youths learn to allocate their time more efficiently, learn about workplace norms and responsibilities, and motivate them to study harder in their classes so that they can achieve a certain career goal. In other words, youth employment may be complementary with schooling. On the other hand, youth employment may actually cause them to come to school tired and less focused on schoolwork, diminish their time and energy for studying and completing homework, increase absenteeism, and thus adversely affect their academic achievement. The employment

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effect may be dynamic, in that work during the prior school year also may affect current grades. It could increase current grades through, for example, its potential positive effect on the students' ability to balance different demands on their time or decrease grades through crowding out study time and causing less knowledge to be gained in the prior school year.

Over time, policymakers have been very concerned with the relationship between high school employment and schoolwork. However, policy recommendations with respect to youth employment while in school have not been consistent over the years. For example, in the 1970s, three Federal Commissions recommended policies meant to encourage youth employment (see the National Commission on the Reform of Secondary Education 1973; the President's Science Advisory Committee 1974; the National Panel on High School and Adolescent Education 1976). However, in 1983 the National Commission on Excellence in Education recommended that youths focus more on their schoolwork and less on employment. In yet another shift, a goal of the 1994 School-to-Work Opportunities Act was to strengthen the relationship between schooling and work. In contrast, in 1998 the National Research Council recommended restrictions on 16- and 17-year-olds' hours of employment while in school.

This paper asks whether high school employment impacts youths' grade point average. The goal is to investigate whether employment during high school is complementary with schooling, or whether it adversely affects academic grades. Grade point average is one important piece of the puzzle of the link between youth employment and academic achievement. Another is the relationship between employment and high school course-taking, which we touch on at the end of the paper. These measures of academic achievement also help to determine longer-term achievement outcomes, such as whether one graduates from high school and the likelihood of progressing on to a two- or four-year college. Thus, we choose to focus on the more short-term potential impact of high school employment—its effect on grade point average each academic year of high school—which also is likely to be related to longer-term attainments.

II. Background

The choices and consequences of working while attending school are intertwined. This endogeneity problem complicates any attempt to evaluate a causal effect between youth employment and academic performance. Youths who choose to work may be systematically different from youths who do not work. The differences may be related to observable characteristics, such as family background or test scores, or to unobservable characteristics such as motivation and ability. Thus, school-year employment may not be the cause of particular positive or negative academic consequences. Rather, youths who choose to work may have some preexisting differences and would have had these outcomes anyway.

A second confounding issue in assessing the impact of school-year employment on grades involves the dropout decisions of youth. Grade point average is not observed for years after youths drop out of high school. Dropouts and nondropouts may have disparate work behaviors as well as differences in unobservable characteristics. This

sample selection issue also needs to be addressed in any empirical analysis of this type.

Most early work on the impact of youth employment did not account for the endogeneity of the decisions to work or to dropout of high school. Much of this work also generally measures high school employment as hours worked during the week of the survey interview, inferring that this description is valid for the entire school year. Thus, measurement error is a likely problem. The early findings on whether youth employment has a positive or negative impact on academic performance are mixed (see, for example, D'Amico 1984; Lillydahl 1990; Steinberg and Dornbusch 1991). Ruhm (1997) and the National Research Council (1998) provide excellent summaries of this literature. Four recent studies have examined the impact of youth employment on academic performance and taken into account that youths may self-select into employment.[1]

Tyler (2003), with data from the National Education Longitudinal Study of 1988 (NELS88), examines the impact of youth employment in twelfth grade on twelfth grade math and reading test scores (sometimes also controlling for scores in the tenth grade). The tests are specific to NELS88. He notes that "ideal data for estimating the effect of working on achievement would allow the construction of a continuous variable that captured the entire work history of individuals between the tenth and twelfth grades" (p. 389). However, a weakness of NELS88 data, in the context of studying youth employment, is the minimal employment information. Tyler (2003) uses the categorical hours of work data for the current/most recent job the youth reported at the twelfth grade interview (in 1992). He instruments hours of work with details of child labor laws, which vary across states. This increases the negative (OLS) coefficient on hours of work sixfold. However, the effect is still relatively small: A ten-hour decrease in youth employment results in one-fifth of a standard deviation increase in math scores.

Turner (1994) uses data from the 1980 sophomore cohort of High School and Beyond. This cohort was followed up in its senior year of high school (and beyond). As with NELS88, a weakness in High School and Beyond is the employment information. Turner uses employment status and categorical hours of work information at the current job at the survey dates in 1980 and 1982. Using either instrumental variables methods or fixed effects, Turner finds that hours of work have a very negligible effect on academic performance (grade point average in tenth and twelfth grade and test scores in both grades—measured as a combination of math, reading, and vocabulary scores on High School and Beyond-specific tests). Some of his instruments, such as receipt of allowance, are questionable, however. Allowance receipt is most likely related to family income, which is generally positively correlated with high school achievement.

Oettinger's (1999) study uses a third survey, the National Longitudinal Survey of Youth 1979 (NLSY79). His sample includes youths who were in the eleventh and

1. Recent studies of the longer-term impact of high school employment on wages are also concerned about potential unobserved heterogeneity (see, for example, Ruhm 1997; Light 1999). Light (1999), using male terminal high school graduates in the NLSY79, finds that high school employment has a positive effect on wages for the first six years after graduation from high school, which then dissipates by nine years after graduation. In contrast, Ruhm (1997), also using the NLSY79, finds that working during the senior year of high school is associated with positive labor market outcomes six to nine years later.

twelfth grades between 1979 and 1983, who did not dropout, and who have complete transcript and employment data. Including person fixed effects, Oettinger (1999) finds that grade point average is generally not associated with weeks or hours of employment during the entire school year. However, when estimated separately by race, he finds significant negative effects of high weeks of employment and working over 20 hours per week on grade point average for pooled black and Hispanic youths only. Attempts to use geographic variation in local employment conditions as instruments for youth employment prove unsuccessful.

Eckstein and Wolpin (1999) also use NLSY79 transcript data for their analysis. Unlike the previous papers, they present and estimate a structural model of grade progression through high school that incorporates the sequential decisions of dropping out and working full- or part-time during each year of school. Hours of work are inversely related to study time, and are expected to have a negative impact on grades, if any. Their sample consists of white males only. Their results suggest that working during high school reduces grade point average for white males, although the authors note that the effect is quantitatively small.

This study adds to the existing literature in a number of ways. First, it uses a data set of youths who are in high school from the mid 1990s to the mid 2000s, thus focusing on today's youth rather than on those from 20 years ago (see, for example, Turner 1994; Oettinger 1999). Second, employment information can be constructed for Grades 10, 11, and 12 which allows for a longer panel than most of the papers. Third, extensive school-year employment information is available as well as transcript data, test scores, and state and county identifiers, thus allowing more complete estimation opportunities. Fourth, this paper explores dynamic aspects of high school employment and the potential of dropping out, which most of the other work (except Eckstein and Wolpin 1999) do not consider.

III. Empirical Approach

The goal of this paper is to investigate the relationship between working while in high school and grades. Hours worked in this period and in the previous period might have an impact on a youth's grade point average. The effect could be positive or negative on net depending on the magnitude of the underlying effects. We begin by discussing the potential impact of hours worked in this period. Time spent working may crowd out study time, causing youths to come to school tired and less focused, or to have less time to prepare for school. Then hours worked in this period would have a negative effect on grade point average. On the other hand, working during school may motivate youths to study harder to achieve a certain career goal. Then one might find the opposite effect. Note that Eckstein and Wolpin's (1999) theoretical model of school progression and employment allows for the first effect, but not the second.

One also might worry about selection, which could occur simultaneously with the above effects. That is, youths who care less about school and/or have less ability may be more likely to work, and thus we might find a negative relationship between hours of work and grade point average. Of course, one could argue the opposite selection story, higher ability youths are both more likely to work while in school and have

higher grade point averages. In both of these selection stories, the worry is that the estimated impact of hours on grade point average is spurious.

Hours worked in the last period also might have an impact on this period's grade point average. For example, suppose that youths gain organizational skills from working that help them learn how to balance different demands on their time. Then we might expect hours worked in the last period to have a positive effect on this period's grade point average. Hours worked also may affect the knowledge youths gained from the last period of schooling, which could be positive or negative depending on which effects dominate the relationship between working and grade point average as described above (positive—higher ability youths work more; negative—less study time or youths who care less about school work more).

The empirical work employs the following general estimation equation:

$$(1) \quad GPA_{ig} = X_i\theta + T_i\gamma + E_{ig}\beta + E_{ig-1}\delta + \varepsilon_{ig}$$

i = person and g = grade in high school. GPA is the person's grade point average for each grade in high school and X is a vector of time-invariant person and family background variables. T, used in some specifications, is a composite measure of math and verbal aptitude constructed from the computer-adaptive version of the Armed Services Vocational Aptitude Battery (ASVAB). ε is a disturbance term.

E is a measure of high school employment during the school year of a particular grade, and describes the average hours per week youths work over the school year or prior school year. Some specifications will exclude lagged hours. This description of high school employment is a major improvement over the measures used in the majority of literature on this topic. Those studies generally define employment by the number of hours worked in the week of the survey (see, for example, Turner 1994; Tyler 2003).

If the disturbance term ε is uncorrelated with X, T, and E then ordinary least squares estimation can provide unbiased estimates. However, the disturbance term and hours and its lag are likely not orthogonal for a couple reasons. The first is due to dropouts. We only observe grades of those who stay in school, who tend to be high ε, and thus higher grade point average, individuals. This selection may cause the correlation between hours and ε and thus a bias in the hours coefficient estimates. If the correlation is positive, we would expect the estimated coefficient on hours to be biased upwards. The opposite is true if the correlation is negative.

The second reason that the disturbance term and hours may not be orthogonal is due to omitted variables. In the empirical work that follows, we try to include a number of background variables in X, but ability and motivation, as examples, may be unobservable to the econometrician. Higher ability individuals could be expected to have higher grades, on average. This unobservable may also affect the choice of hours of work. As before, the direction of the bias depends on whether the correlation between hours and unobserved ability is positive or negative.

We use four methods to address these estimations problems. Each approach has its limitations, and does not fully control for all sources of unobserved heterogeneity. However, the changes across the coefficients should be informative for this estimation problem, and the approach is more complete than that used in most of the previous literature.

The first method accounts for selection due to the decision to dropout of school using a Heckman (1979) selection model. Dropping out is identified by state laws regarding ages of compulsory school attendance and quarter of birth dummy variables

(Angrist and Krueger 1991). Although the selection terms are statistically significant in the empirical work that follows, the coefficients of interest barely change.

The second approach involves instrumental variables. If we can find instruments that are correlated with employment and its lag in the first stage but are not related to the outcome variable of the second stage except through their relationship with employment, then we can obtain consistent estimates. For instruments, we use county-level unemployment rate and its lag, average wage rate for teens in the region by gender and its lag, and state laws regarding teen employment while in school. These instruments are likely to affect employment, but not directly affect grade point average. However, if the relationship between the instruments and youth employment is weak, then the coefficients on the employment variables may not be estimated precisely, or will possibly be biased and inconsistent (Bound, Jaeger, and Baker 1995). In addition, this approach does not address the potential selection bias due to the decision to dropout of high school.

In the third method, we assume that a fixed person effect (α_i) is added to Equation 1, such that the disturbance term $\varepsilon_{ig} = \alpha_i + \upsilon_{ig}$. If the dependence of hours and ε_{ig} comes through α_i, and the dropout decision also depends only on α_i, then estimation with fixed effects captures the component of the error term that could result in biased estimates. Of course, if these assumptions do not hold, then the estimates will be biased.

The fourth method involves adding a math and verbal aptitude measure to the first two specifications, to try to further account for heterogeneity/ability across respondents. Details about the ASVAB, the timing of its administration relative to the sample youths' schooling, and the norming of the math and verbal aptitude test scores from the ASVAB are described in the following section.

IV. Data and Variables

The NLSY97 is a sample of nearly 9,000 youths who were born in the years 1980–84. Youths were first interviewed in 1997 when they were aged 12–17 and continue to be interviewed on an annual basis. There are a number of reasons why these data are very well suited for the study of youth employment and academic performance. First, the survey gathers a complete (week-by-week) employment history for youths beginning at the age of 14. Start and stop dates of jobs are gathered along with many job characteristics, such as hours of work. These data allow the construction of the percentage of weeks worked during the school year and average hours of work per week during this same period.[2] This paper defines the school year as the 28-week period from early September through early December, and early February through early May. This definition is similar to the one used by Oettinger (1999) and Ruhm (1997). The narrow time period chosen should capture weeks during the school term only, and not weeks during summer break or the winter holiday vacation when youths may work more.

2. Average hours worked per week is created using the following formula: [total hours worked over the school term]/[# of weeks in the school term = 28].

The NLSY97 is also well suited for this type of study because it includes youths' high school transcripts. The detailed transcripts enable the construction of academic credit-weighted grade point average by grade in school. The first wave of the high school transcript collection occurred in 2000, and a more expansive second wave occurred in 2004. 6,232 respondents, or nearly 70 percent of the NLSY97 sample, have high school transcript data. High school course catalogs and other school information allowed survey personnel to create both a standardized scale of course grades and earned course credits. The standardization allows for cross-school comparisons. Course credits were converted to Carnegie units, as was done in the NLSY79. One Carnegie unit is equal to a 50-minute course taken five times per week during the school year. Students generally need at least 20 Carnegie units to graduate.[3]

Courses in the transcript survey are classified according to the U.S. Department of Education's revised Secondary School Taxonomy of courses, which allowed us to separate the courses into broad categories. We formed a grade point average measure for academic courses only, and one for both academic and vocational courses combined. Respondents average about 4.5 academic Carnegie units per grade and less than one vocational Carnegie unit per grade. Results were similar with both grade measures, and for compactness, the tables only depict the academic grade point average. Credit-weighted grade point average is created as a four-point scale with four as the highest (A) grade.[4]

The NLSY97 also provides a rich array of background data. We use data on household income, household size, family structure, mother's education, race, ethnicity, self-reported eighth-grade grade point average, urban location, region, age, and grade in high school as background variables in the estimations.[5]

Another advantage of the NLSY97 is the presence of ASVAB test scores for about 80 percent of the sample. From the summer of 1997 through the spring of 1998, the computer-adaptive version of the ASVAB was given to NLSY97 youths. Four of the subtests were used to form a composite measure of verbal and math aptitude. This aptitude score is similar to the Department of Defense's Armed Forces Qualification Test (AFQT) measure in the NLSY79. These tests were internally normed by NLSY97 survey personnel, and used to create the composite math and verbal aptitude percentile score provided in the data set. The percentile score ranges from zero (lowest) to 99.[6] Schooling can affect aptitude test scores, and, as this paper investigates, high school employment may affect schooling. Thus, in analyses that include the aptitude composite score, we limit the sample to those born in 1982–84, and focus on only the eleventh and twelfth grades. The vast majority of this subsample took the ASVAB prior to entering the eleventh grade.

Finally, the NLSY97 geocode CD includes confidential state and county codes for NLSY97 respondents. We use this information to match state and county-level

3. See www.nea.org/webresources for more information.

4. Course grades in the transcript data file are standardized across schools to a scale of one to thirteen, with one as the highest (A+) and 13 as the lowest (F). This scale was converted to a four-point scale as follows: A+ or A=4, A-=3.7, B+ =3.5, B=3, B-=2.7, C+ =2.5, C=2, C-=1.7, D+ =1.5, D=1, D-=.7, F=0. F is also associated with no earned credits.

5. See Appendix Table 1 for variable definitions. Most youth and family background information and state and county of residence are obtained from the round one 1997 interview.

6. See the *NLSY97 User's Guide* (2005) for more information.

information to identify the dropout decision and to form instruments for current and lagged hours of work. The dropout decision is identified by state laws regarding ages of compulsory school attendance, which are entered as dummy variables for age, and by quarter of birth dummy variables (Angrist and Krueger 1991).

We form two instruments (and their lags) to describe local labor markets. Note that Oettinger (1999) and Ruhm (1997) also use local labor market characteristics to instrument youth employment. The first instrument is computed from the Outgoing Rotation Groups of the Current Population Survey. Real hourly wage by year is created for 16–18 year-olds enrolled in high school, by gender and region. We then match the current and lagged values to each respondent for each grade. A second instrument is county-level unemployment rate. We calculate county-level unemployment rate by year using Local Area Unemployment Statistics (LAUS) data available from the Bureau of Labor Statistics. These data (current and lagged values) are then matched to the NLSY97 respondents for each grade.[7]

We also use a second set of instruments that describe labor market opportunities—state labor laws (see Tyler 2003). The Fair Labor Standards Act (FLSA) regulates the hours of work of youths younger than 16, but not of older youths. However, many states have specific laws with respect to the employment of youths ages 16 and 17. Four indicator variables are created: Whether the state limits youths' work after 10 p.m. on a school night, whether the state imposes a 40 hour limit on the number of hours worked per week while school is in session, whether the state collects civil money penalties for child labor violations, and whether the state requires permits for minors in nonagriculture-related jobs.[8]

The subsample used here contains 4,712 youths who have complete transcript data for the tenth, eleventh, and twelfth grades (up until they dropout) and have complete employment histories.[9] They may repeat or skip a grade. We traced each respondent's progress through each grade, and formed a credit-weighted grade point average for each school year, whether completed or not. Respondents who repeat a grade have two separate grade point averages for that particular grade, and enter twice in the empirical equations.

Table 1 provides descriptive statistics of youth employment during high school, by grade and gender. Employment is prevalent during youths' high school years. In Grade 10, 41 percent of males and 34 percent of females work at some point during the school term, this number increases to about 60 percent for both males and females by Grade 11, and to 69 percent for males and 73 percent for females by Grade 12. On average, employed youths work a high percentage of weeks, ranging from a little over 60 percent in tenth grade to over 75 percent in twelfth grade. Youths also work a significant number of hours per week during the school term, which increases by grade. The data show some interesting gender differences in patterns

7. Tyler (2003) cautions that youths might adjust their academic effort in accordance with local labor market conditions, which would invalidate the instruments. Below, we also try the instruments that his static model suggests for hours (state youth labor laws) and find similar outcomes.

8. See Table 6-1 of National Research Council (1998) and The Child Labor Coalition (1997).

9. See Appendix Table 2 for the number of observations dropped due to incomplete data. Sometimes grade point average for the year prior to dropping out cannot be formed. I coded them as dropouts for the prior school year as well, rather than dropping the respondent due to incomplete data. The empirical results were similar with either method, however.

Table 1
Descriptive Statistics: Youth Employment During High School

	Grade Ten	Grade Eleven	Grade Twelve
Males			
Percent not working	0.591	0.398	0.312
Percent of school weeks worked (all)	0.252	0.420	0.521
	(0.377)	(0.426)	(0.432)
Percent of school weeks worked	0.616	0.698	0.757
(work at least one week)	(0.350)	(0.328)	(0.303)
Hours worked per school	4.775	8.780	12.914
week (all)	(8.687)	(10.598)	(12.822)
Hours worked per school week	11.672	14.592	18.771
(work at least one week)	(10.198)	(10.092)	(11.358)
N sample in school	2,068	1,923	1,891
Females			
Percent not working	0.661	0.411	0.274
Percent of school weeks worked (all)	0.206	0.419	0.570
	(0.350)	(0.426)	(0.428)
Percent of school weeks worked	0.607	0.712	0.785
(work at least one week)	(0.344)	(0.315)	(0.289)
Hours worked per school week (all)	3.454	8.056	13.033
	(6.947)	(9.892)	(12.224)
Hours worked per school week	10.188	13.687	17.951
(work at least one week)	(8.588)	(9.442)	(10.839)
N sample in school	2,221	2,100	2,073

Note: Means, standard deviations in parentheses. Statistics refer to first time in each grade. The school year is defined as the 28-week period from early September through early December, and early February through early May. Hours per school week are the total number of hours worked during the school year/number of weeks in the school year.

of youth employment. In tenth grade, males are more likely to work. However, by twelfth grade females overtake males in terms of the proportion working while school is in session and work about the same amount of hours per week, conditional on working. (See Bureau of Labor Statistics 2003 for a similar finding.)

Table 2 displays descriptive statistics for academic grade point average by work status. On average, males have an academic grade point average of about 2.5 and females 2.8—about a B-/C+. This average is similar to those found in Turner (1994) and Oettinger (1999) with the High School and Beyond and NLSY79 surveys. As they found, youths' grade point averages seem to go up slightly in twelfth grade. Females' grade point averages are about 0.3 points higher than males' during high school. Male nonworkers' grade point averages are about 0.10 higher than their working counterparts in eleventh and twelfth grades. For females, the academic grade point averages are nearly the same between workers and nonworkers.

Table 2
Descriptive Statistics: Academic Grade Point Average, by Work Status

	Males			Females		
	All	No Work	Work	All	No Work	Work
Grade 10						
Academic grade point average	2.491 (0.765)	2.503 (0.773)	2.474 (0.754)	2.803 (0.732)	2.815 (0.737)	2.780 (0.723)
N sample in school	2,068	1,222	846	2,221	1,468	753
Grade 11						
Academic grade point average	2.528 (0.760)	2.597 (0.752)	2.482 (0.761)	2.800 (0.731)	2.825 (0.751)	2.782 (0.717)
N sample in school	1,923	766	1,157	2,100	864	1,236
Grade 12						
Academic grade point average	2.601 (0.752)	2.673 (0.750)	2.568 (0.751)	2.945 (0.709)	2.974 (0.719)	2.935 (0.705)
N sample in school	1,891	590	1,301	2,073	568	1,505

Note: Means, standard deviations in parentheses. See Table 1 notes.

V. Results

This section presents estimates of the effect of high school employment on youths' grade point average. Table 3 shows panel estimates for tenth through twelfth graders. The first estimation technique (*A*) is simple OLS, the next (*B*) allows for selection due to dropping out, the third (*C*) involves instrumenting hours of work with local labor market variables as described in the previous sections, and the fourth (*D*) includes a fixed person effect. In all panels, the variable hours of work is measured as total hours worked over all school weeks divided by the number of school weeks. This hours measure, lagged for the previous school year, is added in the estimation shown in Table 5. Since employment data are generally not available in the NLSY97 before tenth grade, grade point average equations with current and lagged hours are estimated for the eleventh and twelfth grades only. Next, a series of estimates that include the math-verbal composite score of the ASVAB as a covariate are shown for eleventh and twelfth grade respondents in birth years 1982–84 only. These tests were taken before the eleventh grade for the vast majority of this group. All tables show robust standard errors that are clustered to account for multiple observations from the same individuals.

Turning first to Table 3, the results in Panel A suggest that youth employment has a significant and negative impact on grade point average in Grades 10–12 for both males and females. The effect is fairly small, however. For example, an increase in school employment by ten hours per week is associated with a 0.06 reduction in grade point

Table 3
Panel Estimates of Grade Point Average on High School Employment in Grades Ten, Eleven, and Twelve (all birth years)

	Males	Females
A. Ordinary least squares		
Hours worked per school week	–0.006	–0.006
	(0.001)	(0.001)
B. With selection for dropping out of high school		
Hours worked per school week	–0.006	–0.006
	(0.001)	(0.001)
λ	0.259	0.132
	(0.028)	(0.020)
C. Instrumental variables		
Hours worked per school week	–0.012	0.003
	(0.012)	(0.011)
Test of H_o: IV jointly zero	$F = 15.44$	$F = 29.69$
	($p = 0.001$)	($p = 0.001$)
D. Fixed effects		
Hours worked per school week	–0.002	–0.002
	(0.001)	(0.001)
Uncensored N	5,945	6,459
Censored N (dropouts)	2,330	1,643

Note: Robust standard errors that are clustered for multiple observations per individual are in parentheses. Sample size (N) refers to person x grades. Test statistics are shown for first-stage regressions.

average, on average.[10] Table 4 depicts the background variables for this specification. Of particular note are the much larger effects of race and ethnicity on grade point average for males than for females. Not surprisingly, the strongest predictor for both males and females is the youth's self-report of grades earned in the eighth grade.

Grade point average is only observed for youths who do not dropout. These youths are likely those with a high realized disturbance term in their grade point average equation. If nondroputs also tend to have systematically different hours of work than dropouts, we might expect the estimates for hours of work shown in Table 3 Panel A to be biased. Table 3 Panel B displays maximum likelihood estimates of grade point average on high school employment, which take into account selection for not dropping out of school. Quarter of birth and age of compulsory school attendance in the state identify the selection equation and are jointly statistically significant. The selection term (λ) is positive and highly significant. This suggests that individuals with higher unobservables (ε), and thus higher grades, are more likely to stay in school. However, the coefficients on hours of work remain essentially unchanged as those shown in Panel A of Table 3 for both males and females.

10. We experimented with splines with various cutoff points. They did not suggest significant differences in effects at various hours levels.

Table 4
Panel Estimates of Grade Point Average on High School Employment in Grades Ten, Eleven, and Twelve (all birth years)

	Males	Females
Black	–0.364 (0.034)	–0.246 (0.031)
Hispanic	–0.159 (0.034)	–0.093 (0.034)
Eighth grade grade point average (self-report)	0.440 (0.017)	0.466 (0.017)
Mother's years of education	0.025 (0.005)	0.022 (0.004)
Log of household income	0.013 (0.007)	0.006 (0.007)
Household size	0.018 (0.009)	0.001 (0.008)
Biological parent and step-parent	–0.084 (0.037)	–0.088 (0.033)
Biological mother only	–0.056 (0.033)	–0.063 (0.030)
Biological father only	0.023 (0.079)	–0.117 (0.064)
Other family structure	0.070 (0.072)	–0.068 (0.072)
Grade 10	–0.184 (0.038)	–0.197 (0.037)
Grade 11	–0.113 (0.023)	–0.177 (0.023)
R-squared	0.347	0.326

Note: Robust standard errors that are clustered for multiple observations per individual are in parentheses. Background variable estimates from OLS specification in Panel A of Table 3.

A second cause for concern regarding the effect of hours on grade point average is the potential endogeneity of hours of work during the school year. If an unobservable in the disturbance term, such as ability, is related to grade point average and also affects hours of work, the coefficient may be biased. The direction of the bias depends on whether the correlation between hours and the unobservable is positive or negative. Table 3 Panel C depicts instrumental variable estimates of the effects of current hours of work on grade point average. Two instruments, local unemployment and high school wage rate are used in this specification. The significant impacts of hours of work found in the OLS estimates shown in Table 3 essentially disappear in the instrumental variables specification. The magnitude of the coefficients also tends to increase and sometimes switch signs, and the standard errors rise by a much larger magnitude. First stage *F*-tests show one can reject the null that the instruments are jointly zero. The results are the same when state youth labor laws are used as additional instruments. These results are not shown here or throughout the paper. In general, the state labor laws tend not to be statistically significant as a group in the first stage.

If the unobserved heterogeneity is fixed over time, fixed effects estimation can produce unbiased estimates. Table 3, Panel D indicates that the effect of hours on grade point average becomes negligible for men and women when a fixed person effect is included in the specification. Using the same example as above, an increase in school employment by ten hours per week is associated with a .02 reduction in grade point average, on average.

Table 5 specifications allow youth employment to have a dynamic effect on grade point average. That is, hours worked in the prior school year can influence this year's

Table 5
Panel Estimates of Grade Point Average on High School Employment in Grades Eleven and Twelve, with and without Lag in Employment (all birth years)

	Males	Females
A. Ordinary least squares		
(A1) Hours worked per school week	–0.006	–0.005
	(0.001)	(0.001)
(A2) Hours worked per school week	–0.005	–0.004
	(0.001)	(0.001)
Hours worked per school week (lagged)	–0.004	–0.004
	(0.001)	(0.001)
B. With selection for dropping out of high school		
(B1) Hours worked per school week	–0.006	–0.005
	(0.001)	(0.001)
λ	0.231	0.099
	(0.036)	(0.025)
(B2) Hours worked per school week	–0.005	–0.004
	(0.001)	(0.001)
Hours worked per school week (lagged)	–0.004	–0.004
	(0.001)	(0.001)
λ	0.241	0.099
	(0.036)	(0.025)
C. Instrumental variables		
(C1) Hours worked per school week	–0.008	–0.002
	(0.011)	(0.010)
Test of H_o: IV jointly zero	$F = 12.85$	$F = 22.68$
	($p = 0.001$)	($p = 0.001$)
(C2) Hours worked per school week	–0.006	–0.034
	(0.013)	(0.025)
Test of H_o: IV jointly zero	$F = 9.38$	$F = 11.59$
	($p = 0.001$)	($p = 0.001$)
Hours worked per school week (lagged)	–0.004	0.053
	(0.022)	(0.040)
Test of H_o: IV jointly zero	$F = 6.03$	$F = 8.72$
	($p = 0.001$)	($p = 0.001$)
D. Fixed effects		
(D1) Hours worked per school week	–0.002	–0.002
	(0.001)	(0.001)
(D2) Hours worked per school week	–0.003	–0.002
	(0.001)	(0.001)
Hours worked per school week (lagged)	–0.002	–0.002
	(0.001)	(0.002)
Uncensored N	3,844	4,201
Censored N (dropouts)	1,568	1,123

Note: Robust standard errors that are clustered for multiple observations per individual are in parentheses. Sample size (N) refers to person x grades. Test statistics are shown for first-stage regressions.

grades, perhaps through the knowledge gained the last period. A negative effect, which is what we find initially, suggests that employment may crowd out study time and depress grade point average. We now estimate stacked grade point average equations for only eleventh and twelfth graders, due to lagging hours. For comparison purposes, we show a current hours only specification in the top panel for each estimation technique, and current and lagged hours specifications in the bottom panels.

The OLS (Panel A1) results are nearly the same with eleventh and twelfth graders only as the tenth through twelfth grade results displayed in Panel A of Table 3. Both current and lagged hours have a negative impact on grade point average for both males and females (Panel A2). The addition of selection effects for dropping out, although statistically significant, barely affects the hours and lagged hours coefficients (Panel B). We use two additional instruments, lagged local unemployment rate and lagged teenage wage rate, for the IV estimates with lagged hours. The IV results (Panel C2) suggest that hours and lagged hours do not have a significant impact on grade point average. The hours coefficients expand in magnitude as do the standard errors, particularly for women. First stage F-tests show that the null that the instruments are jointly zero can be rejected. IV results are similar when state laws regarding youth employment are added as instruments. The fixed effects results (Panel D) again show a very negligible effect of hours on grade point average; lagged hours are statistically insignificant for women.

We next add a measure of verbal and math aptitude to the grade point average equation estimations. Although the normed math/verbal composite score from the ASVAB is not a true measure of ability, it may capture some of the heterogeneity that we worry may affect the work behavior of youth and also impact grade point average. Table 6 displays the mean percentile composite scores by work status in grades eleven and twelve. Recall, due to the time period when the ASVAB was given, we limit our sample to eleventh and twelfth graders in birth years 1982 through 1984.

Scores are missing for about 15 percent of this subgroup. We do not exclude these observations, since test-taking behavior may be related to the outcomes of interest. Rather, in the estimation, we put in a dummy variable set equal to one for a missing score, and set the score to zero. With the exception of female twelfth graders, the percentile scores are similar for workers and nonworkers. Female twelfth graders who work at some point during the year have a percentile score that is about 0.06 higher than their nonworking counterparts.

Table 7 displays estimates without the percentile score in the top panel, for comparison purposes, and with the composite score in the lower panel. In addition, lagged hours are excluded in some specifications, and included in others. Even though the test score is a strong predictor for the likelihood of dropping out of high school, selection results do not differ from the OLS estimates, as was found in the other tables. In addition, because the test score is fixed over time, we do not use fixed effects estimation. For compactness, we only show OLS and IV estimates in the two panels.

OLS results (Panels A and C) for hours are similar both without and with the composite score. Note that the percentile score is positive and significant for both males and females in the grade point average equations. That is, a .15 percentage point increase in the composite score, about one half of a standard deviation, is associated with about a .09 point increase in grade point average for males and females, on average. IV results for specifications with current hours only show an increase in the magnitude of the hours coefficients, particularly for females when the composite

Table 6
Descriptive Statistics: Math and Verbal Percentile Composite Score, by Work Status

	Males			Females		
	All	No Work	Work	All	No Work	Work
Grade 11						
Math and verbal composite score	0.540 (0.287)	0.533 (0.300)	0.543 (0.280)	0.546 (0.268)	0.532 (0.273)	0.554 (0.265)
Math and verbal composite score missing	0.146	0.174	0.129	0.165	0.191	0.150
N sample in school	1,084	407	677	1,144	424	720
Grade 12						
Math and verbal composite score	0.543 (0.287)	0.540 (0.303)	0.544 (0.281)	0.551 (0.266)	0.507 (0.267)	0.566 (0.264)
Math and verbal composite score missing	0.142	0.177	0.126	0.165	0.173	0.162
N sample in school	1,066	322	744	1,129	284	845

Note: Means, standard deviations in parentheses.

score is included. However, they are not statistically significant at conventional levels. The lagged IV results are very imprecise, with both very large estimates and standard errors. [11]

VI. Conclusion

Youth employment during high school is widespread. According to data from the NLSY97, over a third of youth work at some point during tenth grade, about 60 percent work during eleventh grade, and over two thirds work during twelfth grade. Over time, enrolled youths also work more intensively. By grade twelve, employed youths average about 18 work hours per school week.

Recent research papers suggest youth employment has a negligible effect on grade point average (Turner 1994), small negative effects for white males (Eckstein and

11. Hours and grade point average may vary systematically with quality of school. We empirically investigate this possibility through matching Quality Education Data (QED) to the students' high schools. QED measures of whether the school is private, percentage of students that are college-bound, log of school size, and student/teacher ratio were added to the grade point average Equation 1. The results are quite similar to those reported in the tables, and are thus not shown here.

Table 7
Panel Estimates of Grade Point Average on High School Employment in Grades Eleven and Twelve, with and without Lag in Employment, with and without Math and Verbal Percentile Composite Score (birth years 1982–84)

	Males	Females
I. Excludes math and verbal composite score		
A. Ordinary least squares		
(A1) Hours worked per school week	–0.007	–0.004
	(0.001)	(0.001)
(A2) Hours worked per school week	–0.006	–0.002
	(0.001)	(0.001)
Hours worked per school week (lagged)	–0.003	–0.005
	(0.002)	(0.002)
B. Instrumental variables		
(B1) Hours worked per school week	0.010	–0.016
	(0.016)	(0.014)
Test of H_o: IV jointly zero	$F = 6.51$	$F = 9.65$
	($p = 0.002$)	($p = 0.001$)
(B2) Hours worked per school week	–0.055	0.120
	(0.074)	(0.159)
Test of H_o: IV jointly zero	$F = 4.16$	$F = 5.11$
	($p = 0.002$)	($p = 0.001$)
Hours worked per school week (lagged)	0.126	–0.179
	(0.146)	(0.201)
Test of H_o: IV jointly zero	$F = 1.81$	$F = 7.07$
	($p = 0.124$)	($p = 0.001$)
II. Includes math and verbal composite score		
C. Ordinary least squares		
(C1) Hours worked per school week	–0.007	–0.004
	(0.001)	(0.001)
(C2) Hours worked per school week	–0.006	–0.002
	(0.001)	(0.001)
Hours worked per school week (lagged)	–0.003	–0.005
	(0.002)	(0.002)
D. Instrumental variables		
(D1) Hours worked per school week	0.002	–0.022
	(0.015)	(0.014)
Test of H_o: IV jointly zero	$F = 6.99$	$F = 10.11$
	($p = 0.001$)	($p = 0.001$)
(D2) Hours worked per school week	–0.058	0.124
	(0.071)	(0.171)
Test of H_o: IV jointly zero	$F = 4.40$	$F = 5.30$
	($p = 0.002$)	($p = 0.001$)
Hours worked per school week (lagged)	0.118	–0.195
	(0.141)	(0.220)

Table 7 (*continued*)

	Males	Females
Test of H_o: IV jointly zero	$F = 1.90$ ($p = 0.109$)	$F = 7.17$ ($p = 0.001$)
N	2,168	2,285

Note: Robust standard errors that are clustered for multiple observations per individual are in parentheses. Sample size (N) refers to person x grades. Test statistics are shown for first-stage regressions.

Wolpin 1999), and a negative impact for black and Hispanic youths who work high hours per week (Oettinger 1999). Tyler (2003) examines test scores and finds small negative effects of hours worked in the twelfth grade. Despite different methodologies and data sets, for the most part this prior research points to no or a small negative impact of youth employment on academic achievement. The empirical results from this paper suggest this as well.

This paper adds to the current literature not only by updating prior results with data on a current generation of youths, but also by having more complete data, a longer panel, and pre-eleventh grade ASVAB scores. In addition, it considers both the effects of dropping out as well as the dynamics of the impact of employment on high school grade point average.

Overall, the basic results of the analyses in this paper point to a small negative impact of current and prior-year hours of employment on grade point average for both males and females. The negative effect of current hours becomes even smaller when a person fixed effect is included in the estimation. In addition, the hours effects become statistically insignificant when employment is instrumented.

Does this suggest that youth employment has no negative impact with respect to academic achievement? Not necessarily, youth employment may influence other academic pathways, such as courses taken or academic track. For example, student employment might reduce achievement by leading students to take less demanding classes. In this case, there could be a negative employment impact that does not appear in grade point average. When we substituted number of academic credits as the dependent variable in Equation 1, we did find a negative and significant effect of hours of work for both males and females. The effects become statistically insignificant when hours are instrumented due to a large increase in standard errors. However, it points to some interesting further research: Does youth employment impact the course progression of high school students, particularly with respect to their enrollment in courses with later labor market rewards, such as higher-level math and science classes?[12]

12. See, for example, Murnane and Willett (1995).

Appendix Table 1
Variable Definitions

Dependent variables	
Grade point average	Noncumulative academic credit-weighted grade point average for each school year (four-point scale)
Hours worked per school week	Total number of hours worked during the school year divided by the number of weeks in the school year
Hours worked per school week (lagged)	Total number of hours worked during the prior school year divided by the number of weeks in the school year
Independent variables	
Race, ethnicity, age, and grade	
Black	Dummy variable set equal to one if the youth is black, non-Hispanic
Hispanic	Dummy variable set equal to one if the youth is Hispanic
Age	Series of mutually exclusive dummy variables for age in particular grade
Grade	Series of mutually exclusive dummy variables for grade in high school
Youth and family background	
Math and verbal percentile composite score	Percentile composite score created from NLSY97-normed math and verbal scores of the ASVAB
Eighth grade grade point average	Self-reported eighth grade grade point average (four-point scale)
Mother's years of education	Biological mother's years of education
Log of household income	Log of household income in 1997
Household size	Number of people in household in 1997
Two biological parents	Dummy variable equal to one if youth lived with both biological parents in 1997
Biological parent and step-parent	Dummy variable equal to one if youth lived with one biological parent and one step-parent in 1997
Biological mother only	Dummy variable equal to one if youth lived with biological mother only in 1997
Biological father only	Dummy variable equal to one if youth lived with biological father only in 1997

Appendix Table 1 (*continued*)

Variables that identify dropout decision	
Quarter of birth	Mutually exclusive dummy variables that describe quarter of respondent's birth
Age of compulsory school attendance in state	Mutually exclusive dummy variables that describe whether the age is 16, 17, or 18
Instruments for hours and lagged hours	
Youth labor market hourly wage (and lag)	Average labor market hourly wage for employed youth ages 16–18 enrolled in high school, by gender, year, and region
County unemployment rate (and lag)	Unemployment rate in county, by year
State limits work after ten p.m. on school night	Dummy variable set equal to one if youth's state limits youth employment after ten p.m. on a school night (1996)
State limits hours per week to 40	Dummy variable set equal to one if youth's state imposes a 40-hour limit on the number of hours worked per week while school is in session (1996)
Civil money penalties for child labor violations	Dummy variable set equal to one if youth's state imposed civil money penalties for child labor violations (1996)
Permit required for nonagricultural jobs	Dummy variable set equal to one if youth's state requires a permit for youth working in nonagricultural jobs (1996)

Appendix Table 2
Sample Construction

Sample inclusion criteria	N
Total sample in 1997	8,984
Transcript survey data available	6,232
Complete transcript data	5,121
Complete employment data	4,770
Nonmissing background variables	4,712

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