Discussion Paper

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THE EARLY LABOR FORCE EXPERIENCE OF COLLEGE STUDENTS AND THEIR POST-COLLEGE SUCCESS

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The Early Labor Force Experience of College Students And Their Post-College Success*

by

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ABSTRACT

This paper uses National Longitudinal Survey data to examine the impact of college students' in-school work on their post-college employment and earnings. The empirical evidence from this study suggests that in-school work experience has a positive effect on post-college earnings. The results also show that the impact of in-school work on post-college earnings reaches its peak at about the third year after graduation and that the wage effect could be as high as 19.8 percent.

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INTRODUCTION

Research on the part-time employment of college students has concentrated on the effects of in-school employment on academic achievements and study persistence (completion of the degree program). However, none of the studies that address on-campus employment has examined the impact of college students' part-time employment on their post-college success. Studies that focus on college students' academic achievements or study persistence do not tell whether the students' part-time employment will ultimately affect their post-college success. In this study, I seek to fill this gap in the literature by examining the impact of college students' labor force experience on their post-college success.

In particular, I develop and estimate a model of college students' post-college earnings in which earnings depend upon the students' family income, family background, labor market experience, as well as on other observable and unobservable individual effects. Pooled time-series cross-section data from National Longitudinal Survey of Young Men 14-24, 1966-1975 (NLS) are used to estimate this model.

The results of the study provide insights into the answers to several related questions. What are the factors that significantly affect students' in-school work load? How does students' in-school work affect their post-college earnings and their post-college employment and how strong is this effect and how long will it persist?

In the next section of the paper a brief review of the literature is discussed. Section II presents the empirical model and its empirical results based on NLS data for 1966-1975. The final section summarizes the major findings.

1. Related Research

Many studies have focused on the youth employment problem among college students. They have addressed such questions as the effects of students' part-time work on their academic achievements and their study persistence. For example, studies by Apostal and Doherty [1], Kaiser and Bergen [13], Merritt [15], and Trueblood [20] have all concluded that part-time employment does not adversely affect students' college grade point averages. Similarly, Astin [2] found that on-campus employment did 'encourage' students' persistence. He found that having an on-campus job, particularly during the freshman year, significantly increased the chances of a student to finish college. However, working at an off-campus job, both during the freshman year and at other points in a student's career, was negatively associated with persistence. He also found that working more than twenty-five hours per week had a negative effect on persistence.

Although these studies have focused on the relations between college students' part-time employment and their academic achievements and study persistence, they are not fully satisfactory for two reasons. First, there are some methodological deficiencies. The most common method used to evaluate the effect of students' part-time jobs on their academic achievements is to separate college students into two groups — a control group and a treatment group. Students in the control group are students who did not work, while students in the treatment group are those who did. Then students in the control group are matched, student-for-student, with students in the treatment group. Researchers claim that through this careful matching students are equated on sex, on high school test scores, and on college semester hours completed. Finally, simple pairwise t tests, χ^2 tests or simple correlation measure are employed to find the differences in outcomes between these two groups.

The problem with these two-group-comparison studies is that there is only very limited control for the heterogeneity problem. Individual differences in behavior may not be fully captured through simple matching of sex, high school GPA, and college semester hours completed. Other important factors, for example, race, marital status, family income, and family background are typically not controlled.

Moreover, none of these studies has examined the impact of college students' part-time employment on their post-college success. Studies on youth unemployment, however, have concentrated on the long-term effects of teenage unemployment. For example, Stevenson [18, 19], Ellwood [9], and Corcoran [8] have all concluded that early unemployment was associated with lower earnings in subsequent years for all categories of youth. In particular, Meyer and Wise's [16] study found that there existed a strong relationship between hours of work in high school and weeks worked upon graduation for students not going to college. People who worked while studying in high school also received higher hourly wages than those who did not. It would be interesting to see, given the difference between the nature of high school and college education, whether college students' labor market experience also has had a significant impact on their post-college earnings.

2. The Estimation Model

To examine the impact of college students' in-school work on their post-college earnings, it is necessary to determine which factors are most important in inducing a college student to seek part-time employment and also how the college work experience influences subsequent earnings after college. An econometric model to capture the above relationship, suggested by the work of Ellwood [9], can be specified as

$$LnW_{ij} = X_{ij}\beta_j + \sum_{t=1}^{4} \alpha_{it}WH_{it} + G_j\lambda_{ij} + \varepsilon_{ij} \qquad j = 1, 3, 5 \tag{1}$$

$$WH_{it} = X_{it}\beta_t + A_{t-1}WH_{it-1} + D_tLnW_{it} + E_t\delta_{it} + C_t\Psi_{it} + U_{it} \qquad t = 1, 2, 3, 4 \tag{2}$$

where LnW_{ij}: natural log of wages of individual i at the start of post-college year j; X_{ij}: vector of exogenous variables; WH_{it}: total working hours for individual i at college year t, hence $t < j$; λ_{ij}: individual's ability in wage equation; δ_{it}: individual's ease of finding a job; Ψ_{it}: dummy variable to capture an individual's employment state at the beginning of college year t; and variables A_{t-1}, β_j, β_t, C_t, D_t, E_t, α_{it}, G_j, are the coefficients to be estimated. Equation (1), the post-college wage equation, simply states that an individual's wages are a function of a set of exogenous variables, X_{ij}, past labor-market experience, WH_{it}, and ability, λ_{it}. The employment equation states that an individual's total in-school working hours are a function of X_{it}, his wages while in-school, LnW_{it}, his working hours in the previous period, WH_{it}, his ability, δ_{it}, and his employment state at the beginning of period t, Ψ_{it}.

The variables δ_{it} and Ψ_{it} in the employment equation are designed to capture two types of Markovian persistence: the individual's ability to escape from one state to the other, δ_{it}, and his work attachment, Ψ_{it}. The reason why one's ability matters is obvious. An individual's state at the beginning of the preiod is included to capture his work-attachment effect. Once an individual is in a state (say working), it is always easier for him to stay in that state (remain working) than to move out of it (not working). Therefore, it is reasonable for us to expect that people who have a job at the beginning of a period are likely to have longer working hours than those who did not have a job initially. Variables δ_{it} and Ψ_{it} represent two different kinds of heterogeneity and they capture two types of Markovian persistence.

The easiest way to estimate equations (1) and (2) is to derive the reduced form of the two equations by assuming $\lambda_{it} = \lambda_i$, $\delta_{it} = \delta_i$, and $\Psi_{it} = \Psi_i$, i.e., to assume all heterogeneity parameters are invariant across time.[1] This fixed-effects assumption leads to equations of the form

$$LnW_{ij} = X_{ij}\beta_j + \alpha_{i4}WH_{i4} + \alpha_{i3}WH_{i3} + \alpha_{i2}WH_{i2} + \alpha_{i1}WH_{i1} + G_j\lambda_{ij} + \varepsilon_{ij} \quad (3)$$

$$WH_{i4} = X_{i4}\beta_4 + A_3WH_{i3} + D_4LnW_{i4} + E_4\delta_i + C_4\Psi_i + U_{i4} \quad (4)$$

$$WH_{i3} = X_{i3}\beta_3 + A_2WH_{i2} + D_3LnW_{i3} + E_3\delta_i + C_3\Psi_i + U_{i3} \quad (5)$$

$$WH_{i2} = X_{i2}\beta_2 + A_1WH_{i1} + D_2LnW_{i2} + E_2\delta_i + C_2\Psi_i + U_{i2}. \quad (6)$$

We can then condition variable WH in the first year by continuous substitution one obtained

$$LnW_{ij} = X_{ij}\beta_j + \sum_{t=2}^{4} X_{it}P_t + Q_1WH_{i1} + \sum_{t=2}^{4} LnW_{it}R_t + S_t\delta_i + \sum_{t=2}^{4} \Psi_iT_t + V\lambda_i + \sum_{t=2}^{4} F_tU_t + \varepsilon_{ij} \quad (7)$$

where β_j, P_t, Q_1, R_t, S_t, T_t, V and F_t, are coefficients to be estimated.

However, there are two problems in this formulation also as pointed out by Ellwood. First, the early experience variable, WH_{i1}, may be correlated with an individual's ability, λ_i, and bias the estimates of Q_1; moreover, the bias may become larger as we consider wages further into the future. Second, early experience is correlated with both work attachment Ψ_i and ease of finding a job δ_i; this will also bias the estimates of Q_1. Estimation of the effect of early labor-market experience WH_{i1} on LnW_{ij} may therefore be severely biased.

In addition to the potential bias in the estimates of the reduced form equations (1) and (2), there is a more fundamental correlation problem. The problem is that equations (1) and (2) are really two equations of a recursive model and not all the variables on the right-hand-side are turely exogenous. If the in-college employment variable is endogenous in the post-college wage equation, then it may be correlated with the error terms in that equation, which would lead to biased parameter estimates. A way to test the independence between the stochastic regressors and the disturbances is suggested by WU [23, 24].[2] Hence, before we do any estimation of the actual model we use the WU tests to determine if the disturbances between the two equations are correlated. If they are not, then we proceed to estimate the two equations separately. If the disturbances are correlated, then special estimation methods are used to estimate this model consistently.

Generally speaking, the way to surmount the problem of correlated disturbances in this model is to use a variant of two-stage least squares. The estimation proceeds in steps as follows:

(1) If it is assume $\delta_{it} = d_t \delta_i$, and $\Psi_{it} = d_t \Psi_i$, that is, the rates of change of individual's ability δ_i and employment attachment Ψ_i are steady (or even a constant such as $d_t = 1$), then equation (2) becomes

$$WH_{it} = X_{it}\beta_t + A_t WH_{it-1} + D_t LnW_{it} + E_t d_t \delta_i + d_t \Psi_i C_t + U_t \qquad (8)$$

So

$$\delta_i = -\frac{C_t}{E_t}\Psi_i + \frac{1}{E_t d_t}(WH_{it} - X_{it}\beta_t - A_t WH_{it-1} - D_t LnW_{it} - U_{it}). \qquad (9)$$

Lagging equation (9) by one period gives

$$\delta_i = -\Psi_i \frac{C_{t-1}}{E_{t-1}} + \frac{1}{E_{t-1}d_{t-1}}(WH_{it-1} - X_{it-1}\beta_{t-1} - A_{t-1}WH_{it-2} - D_{t-1}LnW_{it-1} - U_{it-1}) \qquad (10)$$

which may be substituted into (8) to give

$$WH_{it} = \frac{d_t(C_tE_{t-1}-E_tC_{t-1})\Psi_i}{E_{t-1}} + (A_t + \frac{1}{E_{t-1}d_{t-1}})WH_{it-1}$$

$$- \frac{A_{t-1}}{E_{t-1}d_{t-1}} WH_{it-2} + X_{it}\beta_t - \frac{\beta_{t-1}}{E_{t-1}d_{t-1}} X_{it-1}$$

$$+ D_t LnW_{it-1} - \frac{D_{t-1}A_{t-1}}{E_{t-1}d_{t-1}} LnW_{it-1} + U_t - \frac{1}{E_{t-1}d_{t-1}} U_{it-1}. \qquad (11)$$

(2) After we have eliminated the ability variable, δ_i, the first stage of estimation is to estimate equation (11). Estimates of WH_{i3} and WH_{i4} can then be used in the following equation in order to estimate the effects of WH_{it} on LnW_{ij}, i.e.,

$$LnW_{ij} = X_{ij}\beta_j + \sum_{t=3}^{4} \alpha_{it}\hat{WH}_{it} + G_j\lambda_{ij} + \varepsilon_{ij}. \quad j = 1, 3, 5 \qquad (12)$$

The advantage of using the instrumental variable is that it eliminates the correlation between WH_{it} and δ_{it}, λ_{it} and Ψ_{it}. Further, by using this method, we also obtain some preliminary results about how a student's family income, financial aid, and in-school wages affect his in-school employment decision.

2.2 The Data

In order to examine the effect of in-school employment on post-college success, we use pooled cross-section time-series micro data from the National Longitudinal Survey of Young Men 14-24, 1966-1975 (NLS). The NLS is a national longitudinal probability sample of 5225 young men who were initially interviewed in 1966 when they were between the ages of 14 and 24. Subsequently, person-to-person interviews occurred through 1971, and telephone interviews were conducted in 1973 and 1975.

The cross-section micro data from the NLS each year contains information on each student's employment status, hours of employment, financial aid, and a host of other personal and family characteristics. The data also provides information on the post-college earnings of each student for several years. The sample employed in this part of the study is limited to those males who graduated with a Bachelor of Arts (B.A.) degree in 1969, 1971, and 1973. Students who attended graduate school or joined one of the branches of the military after graduation are excluded from the sample since no earnings data is available for them.[3]

There are two major reasons why the sample is limited to students graduating with a B.A. in 1969, 1971, and 1973. First, we need complete information about students' in-school work experience throughout their college years. Students who graduated in 1969 typically finished their first year of college in 1966, which corresponded to the first year of the survey. However, there were only 52 students who graduated with a bachelor's degree in 1969 in the survey. In order to increase the sample size we pool these students with those who obtained their B.A.'s in 1971 and 1973. Students who graduated in 1970 and 1975 were excluded from the sample since there was no survey taken in 1972 and 1977 that contained third-year out-of-school earnings for these students. Pooling across years increases the sample size to 248 observations.

In studying the determinants of fifth-year post-college earnings, it is not possible to include 1973 graduates in the sample; no survey was conducted in 1977 that contained the required earnings data. I will therefore only include those students who graduated in 1969 and 1971; their fifth year post-college earnings correspond to their earnings in 1973 and 1975. This restriction reduces the sample to 102 observations for this particular case.

2.3 The Empirical Results

The empirical estimation strategy for the students' post-college earning model is as follows: first, we estimate the students' in-school employment equation (equation 11). Second, we use WU tests to determine if the disturbances between the wage and employment equations are independent. Third, if the disturbances are independent, we can estimate the wage equations directly. If they are not, then two-stage least squares (2SLS) is appropriate.

We begin our empirical work by estimating a few employment equations to determine which factors significantly affect students' in-school work load. Table 1 lists the variables used in the empirical models. Table 2 presents employment equations for students in their third and fourth years in college.

Insert Table 1 & Table 2

In this Table we find that increases in the students' financial aid (Fin-Aid) variable reduce students' in-school employment. T-statistics for Fin-Aid are only marginally significant in model 4, but they are clearly significant in models 1 and 2. An increase in the local area unemployment rate (local-U) also reduces students' work time in model 4, and students who live alone (L-Alone) tend to work more (models 1-2). In this model, we also find evidence that marriage and presence of children may increase students' work load.

The negative effect of financial aid on students' employment suggests student financial aid will alleviate students' work load. But before we fully explore the policy implications of this result, we must ascertain what the impact of student financial aid is on students' post-college earnings, and how students' in-school work experience affects their post-college earnings.

Insert Table 3

As explained earlier it is necessary to test the independence of the disturbances before the wage equations can be evaluated. In Table 3, WU tests are performed by including both the predicted weeks (or hours) worked variables and the actual values of weeks (or hours) worked variables for the post-college earnings in the first, the third, and the fifth years. The different specifications of models 1 to 4 suggest that the error terms between the wage and employment equations are not correlated for the first year out of college; the predicted weeks (or hours) worked variables are never significant, while the actual weeks (or hours) worked variables are generally significant. Based on the results of the tests, only the actual values of weeks (or hours) worked variables are included in the first year out-of-school wage equations. In models 5 to 8, the predicted weeks (or hours) worked variables are significant, while the actual weeks (or hours) worked variables are not. Therefore the error terms between the wage and employment equations are correlated and the 2SLS method should be used in the thrid-year wage equations. Similarly, WU tests in models 9 to 12 show that the error terms are correlated in the model and that the 2SLS method should, again, be used in the fifth-year wage equations.

Based on the results of the tests, the wage equations are estimated, and the results are presented in Table 4.[4]

Insert Table 4

In this table we find that students' in-school work experience significantly affects their first-year post-college earnings as total weeks worked in the fourth year in college (WW4) is significant in models 1 and 2; and total hours worked in the fourth year in college (WH4) is significant in models 4 and 5.

There are several other results in the table that warrant mention.

First, having first-year on-the-job training (Training1) appears to significantly lower earnings at that time; a result consistent with human capital theory. Second, financial aid, marriage, SMSA, IQ, and race do not appear to have any significant, direct impacts on first-year out-of-school earnings. Third, to examine explicitly the impact of in-school work on students' post-college earnings some experimentation was conducted by including both weeks (or hours) worked and its square in the model. The reuslts in model 3 suggest that the function of in-school work on post-college earnings may be concave from the origin, since the sign of variable WW441 is positive, while the sign of variable WW441S is negative (but neither are significant). In model 6, the concavity of in-school work on post-college earnings is confirmed, since the variables WH441 and WH441S have the expected positive and negative signs respectively and they are significant.

The results in Table 4 clearly show that students' in-school work experience favorably affect their post-college earnings. However, model 6 suggests that if the students devote, either voluntarily or involuntarily (due to financial exigency), increasing amount of their time to work, ultimately the experience may adversely affect their subsequent earnings.

More specifically, one can determine, from models 3 and 6, where the effect of in-school employment on post-college earnings reaches its maximum. Solving for the value of WH, where post-college earnings are maximized, and assuming that the typical student works 37.92 weeks per year,[5] model 6 shows that if students work over 27.2 hours per week then their in-school employment will have a negative effect on post-college earnings. This figure is consistent with Astin's findings that students who work over 25 hours per week will reduce their study persistence.

In models 7 to 10 the results of the 2SLS estimation are presented for the third-year post-college earnings. Here we find that students' in-school work experience not only affects their first-year out-of-school earnings, but also affects their third-year out-of-school earnings, the predicted weeks (or hours) variables are significant in all the models. Furthermore, models 9 and 10 also show that hours of on-the-job training in the first-year out-of-school has a positive effect on their third-year post-college earnings — the variable Training1 is significant in these two models. The positive impact of Training1 on LnW_{i3}, together with the negative impact of Training1 on LnW_{i1}, is perfectly consistent with human capital theory.

In models 11 to 14 the estimates from the 2SLS method are presented for the fifth-year out of college earnings. The results suggest that students' in-school work experience has a significant impact on their post-college earnings for at least five years. Due to the limitation of the data, the impact beyond the fifth year out of college cannot be evaluated.

Table 4 also shows that an additional week of in-school work will increase post-college earnings by about 3.6, 19.8, and 3.1 percent for the first, the third, and the fifth year out of college respectively. Clearly, the impact of in-school work has a maximum effect on post-college earnings around the third year out of school.

Having examined the impact of in-school work on students' post-college earnings, it is also important to evaluate its employment effect since both effects may be presented. One can examine the impacts of students' in-school work on their post-college employment by regressing students' in-school work on their post-college weeks (or hours) worked. These results are presented in Table 5.

Insert Table 5

Contrary to many studies of high-school students that concluded that the effects of in-school work on subsequent out-of-school employment were significant, this table finds no significant impact of in-school work on college students' post-college employment.

One possible explanation for this discrepancy is that the general skills high school students learned during their in-school work experience (reliability etc.) may be important or closely related to their jobs after graduation. However, for college students, the nature of their in-school part-time jobs may be unrelated to the skills required in post-college employment.

3. Conclusion

Previous studies of the effects of students' in-school work experience focused on high school students who did not go to college. Studies, for example, those by Ellwood [9], Corcoran [8], Meyer and Wise [16], all concluded that high school students' in-school work experience significantly and positively affects their subsequent earnings and employment. However, given the difference between high school students and college students, these previous studies do not necessarily imply that a similar conclusion should hold for college students' in-school work effect.

In this study, we explicitly examined the impact of college students' in-school work on their post-college employment and earnings. One significant finding is that college students' in-school work experience appears to have a significant positive effect on their post-college earnings for at least five years. Furthermore, the impact of in-school work on students' post-college earnings reaches its peak aroung the third year out of school and the wage effect could be as large as 19.8 percent. The empirical evidence, however, does not indicate that in-school work experience positively influences post-college employment levels. Hence, for college students, in-school work experience appears to have only a subsequent wage effect, not an employment effect.

The empirical evidence also shows that if college students work over 27.2 hours per week then the excess amount of work time may adversely affect their post-college earnings. This result is consistent with Astin's study on students' study persistence. Another factor, on-the-job training in the first year out of school, is also found to have a significant negative and positive effect on the first and third year out-of-school earnings respectively — results which are perfectly consistent with human capital theory.

Table 1

Means and Standard Deviations for Variables Used in Wage and Employment Equations

	Mean	S.D.		Mean	S.D.		Mean	S.D.
WW1	26.42	17.75	Dep	0.12	0.42	3rd Year Out of College		
WW2	28.60	18.55	SMSA	0.63	0.48	LnW3	300.62	128.14
WW3	23.31	19.92				PCWW3	45.21	13.04
WW4	22.38	15.00	4th Year in College			PCWH3	1925.58	701.94
WH1	857.33	628.09	Fin-Aid	213.28	595.03	Local-U	72.80	29.70
WH2	819.31	608.62	Local-U	51.03	19.70	Marital	0.83	0.37
WH3	938.20	606.62	Marital	0.41	0.42	Dep	0.30	0.53
WH4	891.57	600.92	Dep	0.18	0.49	SMSA	0.81	0.38
Duncan-F	42.98	25.22	SMSA	0.72	0.44	Training3	1599.94	2896.88
Duncan-M	45.06	22.83						
Race	0.86	0.34	1st Year Out of College			5th Year Out of College		
Health	0.04	0.20	LnW1	251.47	94.97	LnW5	359.52	286.36
IQ	112.41	13.30	PCWW1	13.46	8.23	PCWW5	48.46	9.93
Family-Y	10463.71	8703.16	PCWH1	441.86	399.07	PCWH5	2114.96	727.86
			Local-U	51.03	19.70	Local-U	71.57	26.62
3rd Year in College			Marital	0.41	0.42	Marital	0.87	0.33
Fin-Aid	375.10	519.14	Dep	0.18	0.49	Dep	0.56	0.77
Local-U	44.00	17.74	SMSA	0.72	0.44	SMSA	0.82	0.38
Marital	0.19	0.39	Training1	726.24	1595.79	Training5	695.16	898.75

WW4 weeks worked in the fourth year in college

WW3 weeks worked in the third year in college

WW441 average weeks worked over four years in college

Table 1 (continued)

WW441S	WW441 squared
WW331	average weeks worked over first three years in college
WH4	hours worked in the fourth year in college
WH3	hours worked in the third year in college
WH441	average hours worked over four years in college
WH441S	WH441 squared
WH331	average hours worked for the first three years in college
WW2	weeks worked in the second year in college
WW1	weeks worked in the first year in college
WH2	hours worked in the second year in college
WH1	hours worked in the first year in college
Fin-Aid	total financial aid received
Local-U	local rate of unemployment
Duncan-F	current Duncan occupation index of father
Duncan-M	current Duncan occupation index of mother
Family-Y	family income in 1966
L-Alone	L-Alone=1 if student lives alone, 0 otherwise
Race	Race=1 if white, 0 otherwise
Marital	Marital=1 if married, 0 otherwise

Table 1 (continued)

Dep	number of dependents
SMSA	SMSA=1 if reside in SMSA, 0 otherwise
Health	Health=1 if individual has health limintations, 0 otherwise
IQ	IQ score
Exp	age
Exp^2	age squared divided by 100
Training1	total hours of on-the-job training in the first year out of college
Training3	total hours of on-the-job training in the third year out of college
Training5	total hours of on-the-job training in the fifth year out of college
LnW_1	logarithm of the respondent's real hourly wage rate in the first year out of school
LnW_3	logarithm of the respondent's real hourly wage rate in the third year out of school
LnW_5	logarithm of the respondent's real hourly wage rate in the fifth year out of school
PCWW1	weeks worked in the first year out of college
PCWW3	weeks worked in the third year out of college
PCWW5	weeks worked in the fifth year out of college
PCWH1	hours worked in the first year out of college
PCWH3	hours worked in the third year out of college
PCWH5	hours worked in the fifth year out of college
M-Educ	mother education

Table 1 (continued)

Pd****	predicted value of variable****.

Note: Earning variables, such as LnW_1, LnW_3, and LnW_5, are deflated by the consumer price index in the corresponding year to convert all earning figures to real terms. All other nominal variables, such as tuition, financial aid, and family income, are similarly treated. Some variables, such as marital status, number of dependents, SMSA, age and age squared, are updated as the period changes, while others, like IQ score, remain constant over time.

Table 2

The Employment Equations — Weeks (Hours) Worked in the Third and Fourth Year in College (absolute value of t-statistics)

	(1) WW3	(2) WH3	(3) WW4	(4) WH4
Constant	-12.094	1113.12	-59.39	-3788.47
	(.14)	(.41)	(.56)	(.88)
Fin-Aid	-.009	-.322	-.004	-.242
	(2.26)	(2.29)	(1.31)	(1.71)
Local-U	.39	-3.221	-.066	-4.089
	(.56)	(1.41)	(1.22)	(1.82)
Duncan-F	-.050	-1.515	-.063	-1.573
	(1.32)	(1.21)	(1.42)	(.86)
Duncan-M	-.087	-.006	.037	.276
	(1.59)	(.003)	(.60)	(.10)
Family-Y	.27D-3	.005	.24D-3	.008
	(1.45)	(.91)	(2.09)	(1.69)
L-Alone	19.835	821.90	-.438	-92.460
	(3.41)	(4.38)	(.15)	(.79)
Race	4.434	32.177	-.358	-20.063
	(1.58)	(.35)	(.11)	(.15)
Marital	5.530	-236.483	4.752	201.207
	(.99)	(1.32)	(2.24)	(2.30)
Dep	9.487	257.516	.170	-38.196
	(2.09)	(1.76)	(.07)	(.42)
SMSA	3.325	90.001	1.103	72.039
	(1.29)	(1.08)	(.47)	(.75)
IQ	.005	.995	-.083	-4.526
	(.07)	(.34)	(1.01)	(1.32)
Exp	2.510	-71.365	8.195	460.779
	(.35)	(.30)	(.96)	(1.31)
Exp^2	-.047	1.972	-1.48	-8.803
	(.31)	(.40)	(.85)	(1.22)
DF	230	231	227	227
R^2	.567	.428	.161	.185

Note: All equations include dummy variables of Duncan-F, Local-U, Duncan-M, Fin-Aid to account for nonreporting.

Table 3

WU Tests on the Wage Equations for The First, The Third, and The Fifth Year OUt of College[a]

(absolute value of t-statistics)

	LnW_1				LnW_3				LnW_5			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
WW4	0.36 (4.13)		0.037 (4.03)		0.007 (.65)		0.38D-3 (0.03)		0.29D-3 (.09)		0.003 (0.74)	
WW3			-.008 (.78)				0.016 (1.29)				-.002 (.52)	
WH4		0.93D-3 (4.32)		0.89D-3 (3.95)		0.22D-3 (.91)		0.48D-4 (.71)		-.88D-4 (.88)		0.69D-5 (.07)
WH3				0.44D-3 (.46)				0.30D-3 (.79)				-.12D-4 (.11)
PdWW4[b]	0.015 (.33)		0.025 (.53)		0.150 (2.75)		0.191 (3.43)		0.033 (2.13)		0.035 (1.94)	
PdWW3			0.021 (1.52)				0.016 (0.98)				0.008 (.61)	
PdWH4		0.63D-3 (0.62)		0.12D-2 (1.03)		0.004 (4.67)		0.49D-2 (3.57)		.48D-3 (1.62)		0.43D-3 (1.82)
PdWH3				-.37D-4 (.07)				0.82D-3 (1.43)				0.13D-4 (.07)
DF	228	228	226	227	228	228	226	226	90	90	72	72
R^2	.208	.210	.217	.210	.120	.226	.156	.160	.123	0.12	.146	.135

a: All equations include Race, Marital, Dep, SMSA, Health, IQ, Exp, Exp^2, Fin-Aid, Duncan-F, Duncan-M, Family-Y, L-Alone, Trainingl, dummies for Trainingl, Duncan-F, and Duncan-M.

b: Variable Pd**** represents the predicted value of variable ****.

Table 4

Wage Equations For The First, The Third, and The Fifth Year Out of College

(absolute value of t-statistics)

	LnW_1^a						LnW_3^b				LnW_5^b			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Constant	1.999 (.14)	2.084 (.15)	-.575 (.04)	3.405 (.24)	3.330 (.24)	2.530 (.18)	25.328 (1.34)	22.905 (91.22)	34.23 (1.80)	32.172 (1.69)	13.510 (.93)	11.205 (.85)	14.582 (1.09)	15.399 (1.16)
Race	.651 (1.52)	.670 (1.56)	.653 (1.27)	.653 (1.53)	.653 (.39)	.498 (1.17)	.179 (.36)	.155 (.31)	.222 (.46)	.232 (.48)	-.132 (.57)	-.101 (.44)	-.134 (.60)	-.133 (.60)
Marital	.166 (.59)	.161 (.57)	.274 (.96)	.133 (.48)	.136 (.49)	.267 (.97)	1.091 (2.38)	-1.191 (2.67)	-1.096 (2.50)	-1.084 (2.47)	.295 (1.49)	.294 (1.49)	.268 (1.34)	.262 (1.32)
Dep	-.019 (.06)	-.004 (.01)	.065 (.21)	-.006 (.02)	-.014 (.05)	-.063 (.21)	-.035 (2.13)	-.036 (2.16)	-.030 (1.87)	-.031 (1.88)	-.131 (1.31)	-.119 (1.16)	-.118 (1.13)	-.103 (1.00)
SMSA	-.430 (1.49)	-.429 (1.48)	-.429 (1.44)	-.423 (1.47)	-.432 (1.50)	-.428 (1.50)	-1.019 (2.72)	-1.028 (2.74)	-.958 (2.60)	-.960 (2.61)	-.049 (.29)	-.047 (.27)	-.037 (.21)	-.043 (.25)
Health	1.047 (1.72)	1.010 (1.66)	1.103 (1.76)	1.061 (1.75)	1.053 (1.74)	1.032 (1.71)	-.806 (1.21)	-.863 (1.29)	-.705 (1.07)	-.758 (1.15)	.072 (.21)	-.074 (.22)	-.048 (.14)	-.075 (.22)
IQ	-.006 (.59)	-.006 (.59)	-.006 (.54)	-.005 (.47)	-.005 (.47)	.230-3 (.02)	-.004 (.37)	-.005 (.38)	.003 (.24)	.003 (.24)	-.001 (.29)	-.560-3 (.08)	-.002 (.32)	-.002 (.32)
Exp	.320 (.28)	.319 (.28)	.547 (.46)	.174 (.15)	.184 (.16)	.159 (.14)	-1.660 (1.13)	-1.428 (1.02)	-2.464 (1.66)	-2.282 (1.54)	-.621 (.59)	-.465 (.49)	-.650 (.67)	-.715 (.75)
Exp^2	-.007 (.32)	-.007 (.32)	-.012 (.48)	-.004 (.19)	-.005 (.20)	-.003 (.14)	.027 (.99)	.023 (.86)	.043 (1.54)	.038 (1.39)	1.110 (.60)	.862 (.51)	1.135 (.64)	1.276 (.73)
Fin-Aid	-.140-3 (.84)	-.140-3 (.84)	-.220-3 (1.25)	-.110-3 (.62)	-.100-3 (.62)	-.180-3 (1.07)	.930-4 (.48)	.100-3 (.52)	.230-3 (1.19)	.220-3 (1.13)	.460-5 (.05)	-.350-5 (.04)	.110-4 (.13)	.140-5 (.01)
Duncan-F	-.014 (2.41)	-.014 (2.43)	-.015 (2.48)	-.014 (2.52)	-.014 (2.52)	-.013 (2.36)	.400-3 (.05)	.001 (.20)	-.002 (.37)	-.002 (.31)	.002 (.54)	.001 (.35)	.001 (.37)	.001 (.33)
Duncan-M	.006 (.75)	.006 (.74)	.006 (.73)	.007 (.89)	.007 (.88)	.007 (.84)	-.015 (1.67)	-.018 (1.92)	-.010 (1.15)	-.012 (.27)	.002 (.40)	.002 (.41)	.470-3 (.10)	.001 (.03)
Training1	-.410-3 (2.42)	-.420-3 (2.47)	-.460-3 (2.62)	-.360-3 (2.12)	-.370-3 (2.19)	-.470-3 (2.79)	.260-3 (1.35)	.240-3 (1.29)	.490-3 (2.45)	.490-3 (2.46)	.270-3 (.82)	.250-3 (.79)	.300-3 (.87)	.270-3 (.28)
Training3							-.370-4 (.43)	-.340-4 (.40)	-.220-4 (.26)	-.210-4 (.24)	-.510-5 (.09)	-.560-5 (.10)	-.170-4 (.30)	-.150-4 (.28)
Training5											-.250-3 (.86)	-.230-3 (.79)	-.220-3 (.76)	-.230-3 (.79)
WW4	.036 (4.01)	0.037 (4.09)					.198 (5.05)	0.194 (4.99)			.031 (2.15)	.030 (2.11)		
WW3	.002 (.33)						0.23 (2.06)				.0027 (.21)			
WW441			0.053 (1.28)											
WW331		-.002 (.24)						0.048 (2.05)				-.003 (.30)		
WH4				.930-3 (4.30)	0.940-3 (4.30)				0.005 (5.22)	0.005 (5.55)			0.380-3 (1.74)	0.380-3 (1.76)
WH3				.130-3 (.54)					0.810-3 (1.91)				0.120-3 (.37)	
WH441						0.390-2 (4.68)								
WH331					0.100-3 (.39)					0.001 (2.02)				0.320-4 (.08)
WW441S			-.700-3 (.84)											
WH441S						-.180-5 (3.90)								
DF	229	229	229	229	229	229	227	227	227	227	54	54	54	54
R^2	.199	.199	.153	.210	.210	.218	.228	.228	.245	.247	.171	.172	.152	.150

Note: Dummy vaiables of Training1, Duncan-F, Duncan-M, and Fin-Aid are also included in all equations to account for nonreporting.

a: the actual weeks (or hours) worked variables are used in the models.

b: the predicted weeks (or hours) worked variables are used in the models.

Table 5

Employment Effect Equations

(absolute value of t-statistics)

Dependent Variable[a]

	(1) PCWW1	(2) PCWH1	(3) PCWW3	(4) PCWH3	(5) PCWW5	(6) PCWH5
WW4			.060 (.78)		-.002 (.06)	
WW3	-.005 (.19)		.017 (.27)		-.060 (1.34)	
WH4				.045 (.46)		.238 (1.59)
WH3		-.083 (1.71)		-.068 (.61)		.084 (.47)
DF	230	230	227	227	45	45
R^2	.088	.119	.180	.209	.391	.438

Note: Variables such as Race, Marital, Dep, SMSA, Health, IQ, Exp, Exp^2, Fin-Aid, Duncan-F, Duncan-M, Training, and Dummy Variables are included in the regression.

a: Variable PC**** represents post-college****.

Footnotes

1. Two qualifications are important here. First, since I am using annual data, the importance of Ψ_{it} may be reduced. Second, since the employment statuses of some individuals at the start of each period may change over the four years of college, assuming $\Psi_{it} = \Psi_i$ in the theoretical model may not be strictly valid.

2. Professor Nicholas Kiefer has shown that the WU test is equivalent to a Lagrange multiplier test for independence between disturbances and stochastic regressors. The test procedures can be simplified by including both WH_{it} and estimated WH_{it} in the wage equation, and then by seeing which one is significant. If the WH_{it} is significant while the estimated WH_{it} is not, then the WU test suggests no correlation between the stochastic regressors and error terms in the model. If, however, the estimated WH_{it} is significant while the WH_{it} is not, then the existence of a correlation between the error terms and the stochastic regressors is suggested.

3. Potentially, a sample selectivity bias problem exists because I have excluded those students who attended graduate school or joined the military service. To keep the econometrics managable. I will, however, ignore this problem.

4. The state dependent variable was not included in the final wage equations since it was not clear from the survey whether the individual acquired his work experience at the beginning, at the end of the period, or even on and off during the period. Therefore, it proved impossible to pursue the concept of state dependence.

5. This is the value of weeks worked from model 3, in which post-college earnings would be maximized.

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