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Abstract: College students may participate in market work to finance their college educations. Using data from the NLSY97, three hypotheses are tested. First, smaller parental transfers lead to more hours worked while in school. Second, an increase in the net price of schooling leads to an increase in hours worked. Finally, an increase in hours worked leads to a decrease in a student's GPA. The results indicate that the number of hours a student works per week is unaffected by the schooling-related financial variables and that the number of hours worked per week does not affect a student's GPA.

*Disclaimer: The views expressed are those of the authors and do not necessarily reflect the policies of the U.S. Bureau of Labor Statistics.

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I. Introduction

When college students lack adequate resources for college, perhaps due to the absence of parental altruism or financial aid, students may participate in market work as a means of financing their education. However, while students may benefit from early work experience in terms of future earnings and other labor market outcomes,[1] there is a tradeoff between time spent in market work and time spent in schooling-related activities. Thus, time spent in market work may hinder academic achievement, which potentially has larger positive benefits than early work experience on future earnings.

Most previous studies of the relationship between early market work and academic achievement have focused upon the effects of high school employment on schooling. Marsh (1991) finds that the number of hours worked during the sophomore year of high school is significantly and positively related to dropping out and that total hours worked unfavorably affects several other educational outcomes, including standardized test scores and the probability of going to college. Ruhm (1995, 1997) finds that high school employment reduces years of completed schooling. Carr, Wright, and Brody (1996) find that high school employment reduces the probability a student will attend college and lowers the level of completed schooling. McNeal (1997) finds that certain types of high school jobs are more likely to have negative effects than others. Schoenhals et al. (1998) show an increase in absenteeism due to high school

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[1] Stephenson (1981); Michael and Tuma (1984); Ruhm (1995, 1997); Carr, Wright, and Brody (1996); Light (1999, 2001); and Neumark and Joyce (2001) all find positive effects of student employment on future outcomes.

employment. More recently, Tyler (2003) finds a negative effect of high school employment on 12th grade math achievement.

Only a handful of studies (Paul 1982, Ehrenberg and Sherman 1987, Stinebrickner and Stinebrickner 2003) investigate the effects of employment while in college upon schooling. Paul (1982) finds that employment while in college negatively affects grades in macroeconomic principles courses. Ehrenberg and Sherman (1987) find that weekly hours of work have an adverse effect on the probability that a student would be enrolled in school the following year and, for those who did attend, it reduced their probability of graduating on time. Most recently, Stinebrickner and Stinebrickner (2003) provide evidence that working while in college has a harmful effect on a student's grade point average (GPA).

There are several limitations of these studies that we improve upon in this paper. First, these studies are not representative of all college students. Paul (1982) focuses only on grades in macroeconomics principles courses at one college, Ehrenberg and Sherman (1987) examine only male high school graduates that are enrolled in college full-time, and Stinebrickner and Stinebrickner (2003) examine students from only one college. This paper attempts to remedy this deficiency in the literature by using a nationally representative sample of first-year college students from Rounds 1-4 of the National Longitudinal Survey of Youth 1997 (NLSY97) to provide results applicable to the general college population with respect to the effect of college student employment upon students' academic achievement.

Secondly, these studies do not focus upon the motives for college student employment.[2] This paper attempts to address this gap in the literature by focusing on potential financial motives such as a lack of parental support or a high price of schooling.[3] To illustrate these plausible motives, a variant of a time allocation model with parental transfers is developed. In this model, a student allocates his time between schooling and market work. At the same time, parents make their own consumption and transfer decisions. Reaction functions are derived and solved to determine parental transfers and the student's labor supply (and thus, implicitly, the time spent in schooling-related activity and the student's academic achievement), and implications of the model are derived. The model allows us to test several hypotheses. First, smaller parental transfers lead to an increase in hours worked while in college, all else — including the price of schooling net of scholarships — held constant. Second, an increase in the net price of schooling, holding parental transfers and everything else constant, leads to an increase in hours worked. Finally, an increase in hours worked leads to lower student achievement, all else equal.

Thus, this paper attempts to answer two questions. First, do fewer parental resources or a higher net price of schooling result in greater labor supply by college students? Second, does college students' increased labor supply while in school result in

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[2] Dustmann and Micklewright (2001) and Pabilonia (2001) explore the effects of parental transfers on the employment of high school students.

[3] Students may work to support living expenses when setting up a new household in a dorm or apartment. This study will not consider these effects nor the costs of room and board due to lack of data.

lower academic achievement, as measured by their GPA? To answer these questions, single equation, instrumental variable estimation techniques that address sample selection and endogenous right hand side variables are used to estimate two primary equations: a) an hours worked equation in which the predicted parental transfer and the predicted net price of schooling enter as the key right hand side variables, b) a college GPA equation in which a predicted hours worked variable enters as the key right hand side variable. The results indicate that the data do not support the hypotheses that decreased parental transfers and an increased net price of schooling result in increased hours of work. Students may be working for extra spending money or to support general living expenses rather than for their postsecondary education. The data also do not support the hypothesis that increased work hours negatively affect a student's grades.

The next section presents the theoretical motivation for the analysis. Section III describes the data. Section IV presents the econometric model. Section V presents the results. Finally, Section VI concludes this paper.

II. Theoretical Framework

A simple theoretical model illustrates the potential financial motives behind student labor supply. Let L be the fraction of time a college student spends working, and let 1-L be the fraction of time the student spends in schooling-related activity. For simplicity, the model abstracts from leisure time. Let academic achievement, A, be given by the function

$$A = A(1-L, \mu), \qquad (1)$$

where $\partial A/\partial(1-L) > 0$ and μ is a vector of personal characteristics, such as the child's ability, that affect his productivity in producing academic achievement. There are two decision-makers in this model, a selfish child and an altruistic parent. The child's utility is given by

$$U_c = U_c(C_c, A), \qquad (2)$$

where C_c is the child's consumption. This utility function is assumed to be strictly concave in C_c and A. The child's budget constraint is given by

$$wL + t = P_s(1-L) + C_c, \qquad (3)$$

where w is the child's wage, t is the transfer the child receives from the parent, and P_s is the price per unit of schooling.

The parent's utility is given by

$$U_p = U_p(C_p, U_c), \qquad (5)$$

where C_p is the parent's consumption. The parent's budget constraint is given by

$$M_p = C_p + t, \qquad (6)$$

where M_p is the parent's income, which is taken as exogenous.

It is assumed that the parent and child make their decisions independently, given their knowledge about the other party's decision rule. Thus, the child will choose the amount of time spent in market work, L, in order to maximize his or her utility, given the parent's transfer function. At the same time, the parent chooses t to maximize his or her utility, given the child's labor supply function. The parent's transfer function and the child's labor supply function can then be solved to determine the Nash equilibrium, L* and t*.

For simplicity, assume that the academic achievement function is given by

$$A = k(1-L), \tag{7}$$

where k is a constant greater than zero, and that the child's utility function is Cobb-Douglas and is given by

$$U_c(C_c, A) = C_c^{\alpha} A^{1-\alpha}, \tag{8}$$

where α is a constant between 0 and 1 and measures the relative importance of own current consumption to the child. Similarly, assume that the parent's utility function is also Cobb-Douglas and is given by

$$U_p(C_p, C_c, A) = C_p^{\beta}[C_c^{\alpha} A^{1-\alpha}]^{1-\beta}, \tag{9}$$

where β is a constant between 0 and 1 and measures the relative importance of own current consumption to the parents.

Rearranging (3) and substituting into (8) along with (7) gives

$$U_c(L) = [wL + t - P_s(1-L)]^{\alpha}[k(1-L)]^{1-\alpha}. \tag{10}$$

The child chooses L to maximize (10). Rearranging the first order necessary condition for a maximum gives the student's labor supply (reaction) function:

$$L = [\alpha - t(1-\alpha) + P_s(1-\alpha)]/[w(1-\alpha) + P_s(1-\alpha) + \alpha]. \tag{11}$$

It can be shown that $\partial L / \partial t < 0$. That is, greater parental transfers mean less student labor supplied, all else equal. It can also be shown that $\partial L / \partial P_s > 0$. That is, given parental transfers, an increase in the price of schooling means more labor supplied, all else equal. Estimation of (11) in Section V will reveal whether the data support these predictions. Finally, it can be shown that the sign of $\partial L / \partial w$ is ambiguous, depending on the values of the parameters.

Rearranging (6) and substituting along with the rearranged (3) and (7) into (9) gives

$$U_p(t) = (M_p - t)^{\beta}[(wL + t - P_s(1\text{-}L))^{\alpha}(k(1\text{-}L))^{1-\alpha}]^{1-\beta}. \qquad (12)$$

The parent chooses t to maximize (12) given L. Rearranging the first order necessary condition for a maximum gives the parent's transfer (reaction) function:

$$t = [\alpha(1\text{-}\beta)M_p - L(\beta w + \beta P_s) + \beta P_s] / [\alpha(1\text{-}\beta) + \beta]. \qquad (13)$$

It can be shown that $\partial t / \partial L < 0$, $\partial t / \partial Ps > 0$, and $\partial t / \partial w < 0$. Thus, greater student labor supply leads to fewer parental transfers, a greater price of schooling leads to greater parental transfers, and a greater student wage leads to lower parental transfers.

The reaction functions (11) and (13) are then solved to determine the reduced form expressions for the optimal levels of L and t. In Section V, a reduced form equation for t is estimated and a predicted transfer is then generated and included as an explanatory variable in the regression for hours worked.

There are several potential ways of extending the model to account for multiple children. A crude way would be to redefine M_p as the portion of the parent's income that is available for this particular child and let it be a function of the number of siblings, e.g. $M_p = M_p(N)$, $dM_p/dN < 0$. Alternatively, consumption of siblings can be included as a separate term in the parents' utility function or it can be thought to be subsumed in the parents' consumption variable.

III. Data

The primary data used in this analysis come from the NLSY97 geocode file Rounds 1 through 4. The NLSY97 youth respondents and one of their parents were first surveyed for Round 1 between January and October, 1997 and between March and May, 1998. This cohort of the NLSY97 is representative of the non-institutionalized U.S.

population aged 12-16 on December 31, 1996 and included 8,984 youth respondents in the initial round. In subsequent years, only the youths were interviewed.

In 1997, only a few of the youth respondents had completed a term (either a semester, trimester, or quarter) in college. By Round 4, 1,784 of the youths had finished at least one term in college after receiving their high school diploma. After deleting observations with missing information on key variables, the sample is reduced to 6,943 individuals, 1,018 of whom have completed a college term. Only their first term college experience is examined in order to obtain the largest sample possible and to also insure that the college term dynamics are similar. Thus instead of a cross-section at one point in time, students' first college experience after high school over several years, from the fall term of 1996 through 2000, is examined.

The two primary dependent variables used in this analysis are the student's GPA, which is our measure of student academic achievement, and hours worked. GPA is measured on a 4.0 scale.[4] The hours worked variable is the number of hours worked during a specific week during the first college term. In each round, the youth respondent was asked how many hours he or she worked when his or her job began. If the youth held the position at least thirteen weeks, then he or she was also asked how many hours he or she was working when his or her job ended. From this retrospective data, variables were created by the Center for Human Resource Research to indicate how many hours during each week in the year a respondent worked. These hours variables were created using hours at the end of the job if reported; otherwise, hours reported at the start of the

[4] If the respondent reported his or her GPA on a scale of 100, it was converted to a 4.0 scale.

job are used. The week used for each term was chosen somewhere in mid-term to avoid the beginning of terms and final exams, when students are more likely to work fewer hours or not hold a job. The week chosen also depended upon the different college term systems reported. The weeks chosen were the first week in the months of February, May, October, and December.

Secondary dependent variables used in the selectivity correction procedures include three dichotomous variables for whether or not a respondent enrolled in college, whether or not a student received a parental transfer, and whether or not a student worked during his or her first term of college.

The independent variables used in this analysis come from the NLSY97 and other data sources which have been matched to the NLSY97 using either the respondent's state of residence while in high school or the college identification variable (UNITID) available in the geocode version of the NLSY97. One of the primary explanatory variables used in the analysis is the dollar value of schooling-related parental transfers measured in 1997 dollars.[5] This variable comes from a series of questions in the NLSY97 about the sources of financial assistance received by the student during the student's first term in college. Amounts that are included are financial aid received by a youth from both biological parents, his biological mother and stepfather, and/or his father and stepmother and that the youth was not expected to repay.[6] Sixty-eight percent of

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[5] The Consumer Price Index for All Urban Consumers (CPI-U) was used to convert all monetary values into 1997 dollars.

[6] A family transfer, which includes parental transfers and any transfers from other family members, was also explored but the results were virtually identical.

first-term college students received a parental transfer with an average transfer received of $3,716 per term (see Appendix Table A1). This variable is a potentially endogenous explanatory variable since parental transfers are simultaneously chosen with hours of work and schooling in the theoretical model; therefore, transfers must be predicted. An instrument used to predict parental transfers is the average in-state tuition for four-year public institutions in the respondent's high school state of residence over the academic years 1996-97 through 2000-01 and is converted to 1997 dollars. It was obtained from the Digest of Education Statistics. In-state tuition is expected to affect parental transfers because in-state public universities usually are the lowest cost option for students and this cost may be the baseline to which their parents compare tuition prices.

Another key explanatory variable provided in the NLSY97 is the net price of schooling. It is defined as tuition and fees minus scholarships for the first college term in which the student is enrolled and is measured in 1997 dollars. Information on tuition and fees is obtained from the Integrated Postsecondary Education Data System (IPEDS) provided by the National Center for Education Statistics and is matched into the NLSY97 data via the college identification variable available in the geocode version of the NLSY97. Information on scholarships comes directly from the NLSY97 and is constructed from responses to the same series of questions as the parental transfer variable. Instruments used to predict the net price of schooling include the number of siblings the respondent has and birth order indicators for whether or not the respondent is the firstborn, lastborn, or only child in the household. These variables are created from household roster information from Round 1 of the NLSY97. These variables are intended to measure parental resources available to support the respondent's postsecondary education and are considered when schools determine financial aid awards. A potential concern regarding these instruments, however, is that parents trade off quality and quantity of children. To the extent that the number and order of children are chosen simultaneously with parental expenditures on postsecondary education, these instruments are invalid. However, given the length of time between birth and postsecondary attendance and the uncertain nature of financial aid awards over such long time horizons, this concern appears to be minimized.[7]

Parents' income and net worth as measured in 1996 are provided in the NLSY97 and are included as categorical measures of the parents' financial resources. There are a large number of missing values for these variables. Missing values are recorded as zeros and missing data indicator dummy variables for parents' income and net worth are included. Missing values are an even bigger problem for the respondent's wage as wage information was missing for most respondents in the NLSY97. Thus, the average wage for the state of the respondent's high school residence over the period 1997-2000 converted to 1997 dollars is used as a proxy for the respondent's wage. This comes from the Bureau of Labor Statistics' Covered Employment and Wages (ES-202) program. As a measure of labor market conditions, the average unemployment rate for the state of the respondent's high school residence over the years 1996-2000 is included from the Bureau of Labor Statistics' Local Area Unemployment Statistics (LAUS) program. Another explanatory variable is an indicator for whether or not the state where the respondent's high school is located had a work study program over the period under study. This variable is constructed using historical information on state work study programs

[7] In an attempt to limit the number of instruments needed, a "cost to student" variable equal to the net price of schooling minus parental transfers was created and a predicting equation estimated. However, this variable was not well-predicted.

collected by the authors directly from relevant state agencies. All of these variables are used to identify hours in the GPA equation.

Personal background variables such as age, race, whether or not the respondent is Hispanic, mother's education, father's education, and the respondent's high school grades and ASVAB scores are included to control for heterogeneous preferences and productivity in producing academic achievement. Finally, the percent of the state population aged 18-24 averaged over 1996-2000 is included to identify the conditional bivariate probits estimated as part of the selectivity correction procedures. These data come from the State and County Quick Facts published online by the U.S. Bureau of the Census.

IV. Econometric Model

The theoretical model presented in Section II suggests several testable hypotheses. First, fewer parental transfers lead to an increase in hours worked while in college, all else – including the net price of schooling – held constant. Second, an increase in the net price of schooling, holding parental transfers and everything else constant, leads to an increase in hours worked. Finally, an increase in hours worked leads to lower student achievement, all else equal. To test these hypotheses, two primary equations are estimated:

$$h = X\beta_1 + \sigma_1 e_1 \tag{14}$$

$$A = h\beta_2 + Z\beta_3 + \sigma_2 e_2 \ , \tag{15}$$

where h is a student's weekly hours worked; A is the student's GPA; X is a vector of explanatory variables that includes parental transfers, the net price of schooling, measures of labor market conditions, and demographic characteristics to control for heterogeneous preferences; Z is a vector of personal and family characteristics that may affect individual productivity in producing academic achievement; β_1 and β_3 are vectors of coefficients; β_2 is the coefficient on hours worked; σ_1 and σ_2 are unknown scale parameters; and $e_i \sim N(0,1)$, i = 1, 2.

Although e_1 and e_2 are likely to be correlated since there are potentially unobserved personal characteristics that affect both hours worked and academic achievement, equations (14) and (15) are not jointly estimated due to the need to address selectivity concerns to be described below. Rather, single equation estimation techniques are used.

Assuming e_1 is uncorrelated with X and e_2 is uncorrelated with Z, equations (14) and (15) could be estimated using OLS. OLS estimates of β_1, β_2, and β_3 are likely to be biased, however, if the error terms in (14) and (15) are correlated with X and Z. One reason for concern is that, although the theoretical model treats the net price of schooling as exogenous, it is in reality endogenous to labor market conditions, the quantity of schooling, and the type of institution chosen. In addition, parental transfers are endogenous as they are chosen simultaneously with the student's hours of work in the model. Finally, the student's GPA is a direct function of chosen hours of work and so is simultaneously chosen with hours of work. Thus, the hours worked variable is endogenous in the GPA equation. To address all of these endogeneity issues, predicted variables replace these potentially endogenous right-hand-side variables in the relevant equations.

A second reason OLS coefficient estimates may be biased is that (14) and (15) must each be estimated using a selected sample. Equation (14) suffers from two sources of sample selection. The first source of selection is that the sample includes only those respondents who enroll in postsecondary school. Let s* be a latent variable measuring the benefits of attending postsecondary school. A postsecondary enrollment selection equation can be written:

$$s^* = V\theta_2 + v_2, \tag{16}$$

where V is a vector of explanatory variables that includes X plus one additional variable necessary for identification, θ_2 is a vector of coefficients, $v_2 \sim N(0,1)$ and $\text{corr}(v_1, v_2) = \rho$. Although s* is unobserved, if $s^* > 0$ then the child enrolls. Let S be an indicator variable equal to 1 if $s^* > 0$ and equal to 0 otherwise. S is observed for all respondents.

The second source of selection is that the sample includes only those enrolled respondents who work a positive number of hours. Let h* be a latent variable measuring the college student's desired hours of work:

$$h^* = X\theta_1 + v_1, \tag{17}$$

where X is the vector of explanatory variables found in equation (14), θ_1 is a vector of coefficients and $v_1 \sim N(0,1)$. Note that h* is unobserved. However, if the desired hours of work are positive ($h^* > 0$), then a positive number of hours are worked. Let H be an indicator variable equal to 1 if $h^* > 0$ and equal to 0 otherwise.

An observation is a member of the select sample used to estimate the hours equation (14) if H = 1 and S = 1. Thus, the regression function for the hours equation (14) for this subsample may be written as

$$E(h \mid X, \psi) = X\beta_1 + \sigma_1 E(e_1 \mid X, \psi) \tag{18}$$

where ψ denotes the joint outcome of the two selection rules given by (16) and (17). Following Tunali (1986), (18) can be rewritten

$$E(h \mid X, \psi) = X\beta_1 + \alpha_1\lambda_1 + \alpha_2\lambda_2 + \sigma_1 w_1 \qquad (19)$$

where α_1 and α_2 are regression coefficients, $w_1 = e_1 - \alpha_1\lambda_1 - \alpha_2\lambda_2$ with $E(w_1 \mid h^* > 0, s^* > 0) = 0$, and λ_1 and λ_2 are highly nonlinear functions of ρ, θ_1, and θ_2. As Tunali (1986) notes, λ_1 and λ_2 are the double-selection analogs of the inverse Mill's ratio that arises in the context of single-selection.

The GPA equation (15) suffers from only one source of selection because GPA is available for all enrolled students, whether or not they were working. Thus this equation needs only one selectivity correction term and can be written

$$E(A \mid h, Z, \gamma) = h\beta_2 + Z\beta_3 + \eta\lambda + \sigma_2 w_2 \qquad (20)$$

where η is a regression coefficient, λ is the inverse Mill's ratio, γ is the outcome of the selection rule given by (16), and $w_2 = e_2 - \eta\lambda$ with $E(w_2 \mid s^* > 0) = 0$.

In order to estimate (19) and (20), the potentially endogenous variables need to be replaced by predicted variables and estimates of λ_1, λ_2, and λ must be constructed. Let $\hat{X}$ denote the vector that includes these predicted variables. To construct $\hat{\lambda}_1$ and $\hat{\lambda}_2$, a two stage procedure is followed. First, a conditional bivariate probit model in which H and S are the dependent variables and V and X are the respective vectors of explanatory variables is estimated. This is where the additional variable in V is necessary to identify the model. The estimates $\hat{\rho}$, $\hat{\theta}_1$, and $\hat{\theta}_2$ are then substituted into the formulas for λ_1 and λ_2 to get the estimates $\hat{\lambda}_1$ and $\hat{\lambda}_2$. To construct an estimate of $\hat{\lambda}$ to include in the GPA equation, a similar two-stage procedure is followed. First a probit model in which S is the dependent variable and V is the vector of explanatory variables is estimated. The estimate of $\hat{\theta}_2$ is then substituted into the formula for λ to get $\hat{\lambda}$. Thus, (19) and (20) become

$$E(h \mid \hat{X}, \psi) = \hat{X}\beta_1 + \alpha_1\hat{\lambda}_1 + \alpha_2\hat{\lambda}_2 + \sigma_1 w_1. \qquad (19')$$

$$E(A \mid \hat{h}, \hat{Z}, \gamma) = \hat{h}\beta_2 + Z\beta_3 + \eta\hat{\lambda} + \sigma_2 w_2. \qquad (20')$$

Note that $\hat{\lambda}_1$ and $\hat{\lambda}_2$ are identified in equation (19′) and $\hat{\lambda}$ is identified in (20′) because of nonlinearities in the formulas used to construct them and by the inclusion of one additional variable in V that is not included in X. Note also that $\hat{h}$ is identified in equation (20′) due to the labor market, schooling-related financial, and parental resource variables included in $\hat{X}$ that are not included in Z. Finally note that the errors in both equations are heteroscedastic because of the inclusion of the selectivity correction terms. Thus, corrections for heteroscedasticity and for the substitution of predicted variables for potentially endogenous variables need to be made. To obtain appropriate standard errors, a bootstrapping technique is used.

It is important to note that the predicting equations estimated to obtain $\hat{X}$ are also estimated using selected samples. This is because the net price of schooling and parental transfers are observed only for enrolled respondents. In addition, positive values for parental transfers are observed only if students reported receiving them. Procedures similar to those used for estimating the GPA equation and the hours equation are used to estimate these predicting equations.

V. Results

Table 1 shows results from the predicting equation regressions for the net price of schooling and parental transfers. Means and standard deviations for key variables are included in Appendix Table A1. Recall that the net price of schooling is potentially endogenous as it varies with the quantity of schooling as well as the type of institution chosen and that the net price of schooling equation is estimated on the select sample of students who first enrolled in college during the period 1996-2000. Thus, a selectivity correction term, λ, is also included as a regressor in this equation. Appendix Table A2 gives the results of the enrollment probit estimation used to create this term. The selectivity correction term is identified in the net price of schooling equation by a variable measuring the percent of the population aged 18-24. It is included in the enrollment equation but excluded from the net price of schooling equation. It is also identified by nonlinearities in the formula used to construct it.

The instruments in this predicting equation are jointly significant at the 4% level, thus identifying the predicted net price of schooling in the hours equation. Several are also individually significant. The average in-state tuition for public four-year institutions is, as expected, a positive and significant predictor of the net price of schooling. If average in-state tuition were to rise by $1, the net price of schooling faced by the family would increase by 25 cents. Being the first born child results in a net price of schooling that is $908 higher than being a middle child and being the last born child results in a net price of schooling that is $727 higher. Colleges and universities take into account the number of siblings in college when awarding financial aid, so these results may be the result of first born and last born children being less likely than middle children to have siblings attending college concurrently, thus causing them to receive lower aid awards. In addition, first born children may be more ambitious and thus choose highly prestigious and expensive educational institutions.

Several family background variables are significant predictors of the net price of schooling. Having a mother with a four year degree or having parents with higher income or net worth positively affects the net price of schooling. These results are not surprising as more educated and well-off parents can afford and may be willing to pay more for their children's education. Also, their children are less likely to receive need-based financial aid.

Parental transfers are also endogenous as they are chosen simultaneously with hours of work in the theoretical model. The transfer equation is estimated on the select sample of students who enrolled in a first term of college during the period 1996-2000 and reported receiving a transfer. Thus, two selectivity correction terms, λ_1^t and λ_2^t, are included as regressors in this predicting equation. Appendix Table A3 provides the results of the estimated conditional bivariate probit used to create these terms. The conditional bivariate probit is identified by excluding the percent of the population aged 18-24 from the transfer receipt equation but including it in the enrollment equation. The two selectivity correction terms are identified on the basis of nonlinearities in the formulas used to construct them.

The results in Table 1 indicate that parental transfers are positively and significantly affected by having parents with high net worth. They are also positively affected by the average state wage. Given the theory, one would have expected a negative sign. However, it is possible that rather than measuring the wage available to the student, this variable may instead be capturing general economic conditions as it is an average over all occupations, ages, and skill levels. Under this interpretation the positive sign makes sense as one would expect parents to transfer more in good economic times. Finally, parental transfers are negatively affected by the presence of a state work study program, perhaps indicating that parents prefer their children to participate in work study programs to finance their college educations when the option is available.

The instruments in the parental transfer equation are jointly significant at the 1% level, thus identifying the predicted parental transfer in the hours equation. Average in-state tuition is also individually significant and positive, which supports the notion that parental transfers increase as the price of their child's lowest cost schooling option increases.

Table 2 presents the results of the structural hours of work regression that includes predicted variables and selectivity correction terms.[8] The results of an OLS regression are also provided for comparison purposes. In both specifications, neither the net price of schooling nor the amount of schooling-related parental transfers affects the number of hours a student works. Thus, student employment does not appear to be a serious method of financing a student's postsecondary education. Perhaps students are instead working to finance non-schooling-related consumption such as living expenses or entertainment.

Few personal or family background variables significantly predict hours of work in either specification. In the OLS specification, older students work more hours than

[8] Results of the estimated conditional bivariate probit used to construct the selectivity correction terms are reported in Appendix Table A4.

younger students. In both specifications, students whose fathers' highest educational attainment is a high school degree work fewer hours than students with fathers' who received less than a high school education. In the OLS specification, students who come from a family with higher net worth and who obtain higher grades in high school work fewer hours, although this result also does not hold in the structural specification. In the structural equation, students with higher ASVAB scores in arithmetic reasoning work longer hours. Finally, in the OLS specification, the existence of a state work study program has a positive effect on hours worked. However, this result does not hold up once corrections for selectivity and endogenous right hand side variables are made.

The coefficient estimates from the hours regression reported in Table 2 are used to obtain the predicted hours worked variable used in the estimation of the GPA equation. Table 3 shows the results of estimating the structural college GPA regression on the sample of students who enrolled in a college during the period 1996-2000 and the results of an OLS regression for comparison purposes. Several variables are excluded from these equations that are included in the hours equation. These include the parents' income and net worth variables, the predicted net price of schooling and predicted parental transfer variables and the labor market variables. The rationale for excluding these variables is that they are expected to affect a student's GPA only indirectly through their effects on the child's hours of work. However, these exclusion restrictions would not be valid if any of these variables were to have separate direct productivity effects.

As expected, high school grades and ASVAB scores that capture prior academic achievement, inherent ability, and student motivation are significant positive predictors of first-term college GPA in both specifications. However, neither the OLS nor the structural results show a relationship between hours and GPA, thus leading us to reject the negative relationship that was hypothesized.

VI. Conclusion

In this paper, several hypotheses regarding the financial determinants and academic effects of college student employment were tested. First, the study investigated whether the net price of schooling positively affects the number of hours a student works as student work is often proposed as a means of financing a student's postsecondary education. Regression results indicate, however, that the net price of schooling has no effect on the number of hours a student works. Next, the study tested whether the amount of schooling-related transfers received from parents negatively affects the number of hours a student works. Again, the results indicate that the amount of parental transfers received does not affect the number of hours a student works. Finally, this study tested whether an increase in hours worked negatively affects a student's GPA and finds that it has no effect. This finding is important as it contradicts previous evidence in the literature that suggests a detrimental effect. However, this research is the first such study that uses nationally representative data. It also only focuses on one measure of academic performance and included only the first-term of college experience. Thus, more research on the effects of college student employment using nationally representative data and exploring other measures of academic performance is needed.

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Table 1. Predicting Equations (Dependent variables in 1,000s)

Independent Variables	**Net Price of Schooling**	**Parental Transfers**
Age	0.609	-0.797
	(0.397)	(0.717)
Male	-0.243	0.790
	(0.346)	(0.516)
Hispanic	-0.429	-0.564
	(0.561)	(0.651)
Black	-0.295	-0.708
	(0.388)	(0.826)
Other race (nonwhite)	-1.497	-1.296
	(1.454)	(1.818)
Mother high school degree	0.360	0.077
	(0.515)	(0.405)
Mother 4 year degree	1.096*	0.444
	(0.651)	(0.613)
Father high school degree	-0.167	-0.247
	(0.348)	(0.823)
Father 4 year degree	0.364	0.168
	(0.437)	(0.841)
Parents' income (in 10,000s)	0.314***	0.028
	(0.105)	(0.299)
Parents' income squared	-0.011***	0.003
	(0.004)	(0.011)
Parents' net worth (in 10,000s)	0.045***	0.077 ***
	(0.016)	(0.028)
Parents' net worth squared	-0.000**	-0.000 **
	(0.000)	(0.000)
High school grades	-0.058	-0.159
	(0.191)	(0.590)
ASVAB – arithmetic reasoning	-0.082	-0.118
	(0.290)	(0.397)
ASVAB – word knowledge	0.260	-0.423
	(0.277)	(0.923)
ASVAB – paragraph comprehension	-0.233	0.025
	(0.263)	(0.533)
ASVAB – mathematical knowledge	0.226	-0.157
	(0.422)	(0.659)

Table 1 Continued. Predicting Equations

Independent Variables	Net Price of Schooling	Parental Transfers
State average unemployment rate	-0.008	-0.099
	(0.141)	(0.243)
State average wage	0.000	0.005**
	(0.002)	(0.003)
State work study program	0.263	-0.904**
	(0.304)	(0.387)
Avg. in-state tuition for public 4-year	0.254*	0.622**
institutions (in 1,000s)	(0.140)	(0.253)
Only child	0.278	-0.364
	(0.501)	(0.877)
First born	0.908**	-0.252
	(0.383)	(0.504)
Last born	0.727*	0.709
	(0.392)	(0.762)
Number of siblings	-0.310	-0.250
	(0.210)	(0.439)
λ	1.451	
	(1.095)	
λ_1^t		2.672
		(5.086)
λ_2^t		-2.352
		(2.313)
Number of observations	1,018	665
R-squared	0.10	0.23
F-statistic [5, 984] for joint sign. of instruments	2.37	
F-statistic [5,631] for joint sign. of instruments		4.07

Notes: Robust standard errors in parentheses. Significance levels: * = p<.10; ** = p<.05; *** = p<.01. Models also include an intercept and missing dummy variables.

Table 2. Hours Worked Regression Results

Independent Variables	OLS Coeff.	OLS S.E.	Structural Model Coeff.	Structural Model S.E.
Age	1.811**	0.799	-0.475	2.289
Male	0.577	1.348	3.218	2.419
Hispanic	0.473	2.023	0.941	2.791
Black	0.340	1.705	0.699	3.846
Other race (nonwhite)	-3.929	5.936	-7.698	7.279
Mother high school degree	2.955	1.945	2.511	2.511
Mother 4 year degree	-0.996	2.171	-1.619	3.153
Father high school degree	-4.209***	1.709	-4.066*	2.256
Father 4 year degree	-1.136	1.909	-0.460	3.759
Parents' income (in 10,000s)	0.026	0.472	-0.208	0.953
Parents' income squared	-0.001	0.017	0.012	0.034
Parents' net worth (in 10,000s)	-0.139*	0.079	-0.009	0.154
Parents' net worth squared	0.000	0.000	-0.000	0.001
High school grades	-1.171**	0.543	-2.041	1.487
ASVAB – arithmetic reasoning	0.844	1.469	1.856*	2.135
ASVAB – word knowledge	-0.386	1.279	-1.370	1.815
ASVAB – paragraph comprehension	-0.427	1.318	-1.172	1.766
ASVAB – mathematical knowledge	-1.897	1.391	-4.605	3.016
State average unemployment rate	-0.086	0.802	-0.506	1.131
State average wage	-0.007	0.007	-0.006	0.013
State work study program	3.182**	1.333	2.404	2.250
Predicted net price of schooling (in 1,000s)			-1.195	2.085
Predicted parental transfer (in 1,000s)			-0.265	1.353
Net price of schooling (in 1,000s)	0.292	0.246		
Parental transfer (in 1,000s)	0.000	0.000		
λ_1^w			-10.010	11.299
λ_2^w			-8.427	7.767
Number of observations	560		560	
R-squared	0.12		0.12	
F-statistic [11, 530] for joint sign. of instruments	1.53			
F-statistic [11, 528] for joint sign. of instruments			1.04	

Notes: Bootstrapped standard errors are presented for the structural specification. Significance levels: * = p<.10; ** = p<.05, *** = p<.01. Models also include an intercept and missing dummy variables.

Table 3. GPA Regression Results

Independent Variables	OLS Coeff.	OLS S.E.	Structural Model Coeff.	Structural Model S.E.
Age	0.009	0.030	0.010	0.057
Male	-0.151***	0.049	-0.147**	0.053
Hispanic	0.047	0.072	0.047	0.081
Black	-0.043	0.062	-0.038	0.069
Other race (nonwhite)	-0.119	0.207	-0.118	0.173
Mother high school degree	0.076	0.071	0.079	0.080
Mother 4 year degree	0.080	0.080	0.080	0.096
Father high school degree	0.015	0.062	0.015	0.072
Father 4 year degree	0.004	0.065	0.008	0.069
High school grades	0.177***	0.020	0.178***	0.027
ASVAB – arithmetic reasoning	0.090*	0.053	0.092	0.067
ASVAB – word knowledge	0.081*	0.046	0.081*	0.046
ASVAB – paragraph comprehension	-0.056	0.048	-0.057	0.049
ASVAB – mathematical knowledge	-0.001	0.052	-0.002	0.077
Predicted hours			-0.001	0.008
Hours	-0.002	0.001		
λ			-0.001	0.143
Number of observations	1,018		1,018	
R-squared	0.16		0.16	

Notes: Bootstrapped standard errors are presented for the structural specification. Significance levels: * = p<.10; ** = p<.05; *** = p<.01. Models also include an intercept and missing dummy variables.

Table A1. Key Variable Sample Statistics

Variable Name	No. Observations	Mean	S.E.
Hours of Work	560	24.87	0.76
Predicted Hours of Work	6940	21.21	0.09
College GPA	1018	2.95	0.03
Enrollment	6943	0.14	
Net price of schooling (in 1,000s)	1018	.36	131.33
Predicted net price of schooling (in 1,000s)	7003	.81	16.59
Parental transfer receipt	1018	0.68	
Parental transfer (positive values) (in 1,000s)	665	3.7	234.15
Predicted parental transfer (in 1,000s)	6940	1.3	31.81
Age	6943	13.86	0.02
Male	6943	0.52	
Hispanic	6943	0.13	
Black	6943	0.16	
Other race (nonwhite)	6943	0.01	
Mother's education missing	6943	0.21	
Mother high school degree	5485	0.47	
Mother 4 year degree	5485	0.22	
Father's education missing	6943	0.14	
Father high school degree	5971	0.29	
Father 4 year degree	5971	0.20	
Parents' income missing	6943	0.09	
Parents' income (in 10,000s)	6259	23.37	0.22
Parents' net worth missing	6943	0.24	
Parents' net worth (in 10,000s)	5255	15.89	0.70
High school grades missing	6943	0.49	
High school grades	3416	5.47	0.03
ASVAB scores missing	6943	0.16	
ASVAB – arithmetic reasoning	5689	-0.34	0.01
ASVAB – word knowledge	5689	-0.52	0.01
ASVAB – paragraph comprehension	5689	-0.25	0.01
ASVAB – mathematical knowledge	5689	-0.09	0.01
State average unemployment rate	6943	4.33	0.01
State average wage	6943	601.35	1.19
State work study program	6943	0.40	
Only child	6943	0.17	
First born	6943	0.39	
Last born	6943	0.26	
Number of siblings	6943	1.53	0.015

Note: Means and standard errors have been weighted.

Table A2. Enrollment Probit for Single Selection Correction

Independent Variables	Coefficient	S.E.
Age	0.504***	0.032
Male	-0.185***	0.056
Hispanic	-0.114	0.083
Black	0.290 ***	0.073
Other race (nonwhite)	0.404	0.260
Mother high school degree	0.168**	0.076
Mother 4 year degree	0.336***	0.097
Father high school degree	0.070	0.073
Father 4 year degree	0.270***	0.090
Parents' income (in 10,000s)	0.098***	0.020
Parents' income squared	-0.003***	0.001
Parents' net worth (in 10,000s)	0.008**	0.003
Parents' net worth squared	-0.000 **	0.000
High school grades	0.252***	0.021
ASVAB – arithmetic reasoning	-0.049	0.062
ASVAB – word knowledge	0.174***	0.057
ASVAB – paragraph comprehension	-0.007	0.057
ASVAB – mathematical knowledge	0.507***	0.058
State average unemployment rate	0.075**	0.038
State average wage	0.000	0.000
State work study program	0.002	0.058
Avg. in-state tuition for public 4-year institutions (in 1,000s)	-0.004	0.036
Only child	0.084	0.125
First born	0.108	0.082
Last born	0.152	0.095
Number of siblings	0.025	0.032
Avg. % of the population aged 18-24	-0.084*	0.048
Number of observations	6,943	
Wald chi-squared(33)	2898.11	
Pseudo R-squared	0.50	

Notes: Significance levels: * = p<.10; ** = p<.05; *** = p<.01. Model also includes an intercept and missing dummy variables.

Table A3. Transfer Receipt and Postsecondary Enrollment: Conditional Bivariate Probit for Double Selection Correction

	Transfer Receipt (probit)		Enrollment (selection)	
Independent Variables	**Coeff.**	**S.E.**	**Coeff.**	**S.E.**
Age	-0.106	0.139	0.503***	0.032
Male	0.082	0.094	-0.185***	0.056
Hispanic	-0.174	0.151	-0.116	0.083
Black	-0.201	0.123	0.293***	0.073
Other race (nonwhite)	-0.535	0.369	0.419	0.260
Mother high school degree	-0.009	0.144	0.169**	0.076
Mother 4 year degree	0.104	0.184	0.341***	0.096
Father high school degree	0.202	0.127	0.074	0.073
Father 4 year degree	0.217	0.156	0.269***	0.090
Parents' income (in 10,000s)	0.088	0.048	0.100***	0.020
Parents' income squared	-0.003	0.002	-0.003***	0.001
Parents' net worth (in 10,000s)	0.012*	0.006	0.008**	0.003
Parents' net worth squared	-0.000*	0.000	-0.000**	0.000
High school grades	-0.149	0.063	0.251***	0.022
ASVAB – arithmetic reasoning	-0.004	0.101	-0.051	0.062
ASVAB – word knowledge	-0.296***	0.086	0.172***	0.058
ASVAB – paragraph comprehension	0.120	0.090	-0.005	0.057
ASVAB – mathematical knowledge	0.130	0.185	0.507***	0.058
State average unemployment rate	0.020	0.058	0.073*	0.038
State average wage	-0.000	0.001	0.000	0.000
State work study program	-0.009	0.090	0.002	0.058
Average in-state tuition for public 4-year institutions (in 1,000s)	-0.048	0.051	0.005	0.037
Only child	-0.125	0.198	0.087	0.125
First born	-0.012	0.129	0.113	0.082
Last born	-0.072	0.152	0.145	0.095
Number of siblings	-0.103*	0.053	0.027	0.032
Avg. % of the population aged 18-24			-0.061	0.055
Number of observations	6,943			
Censored Observations	5,925			
Uncensored Observations	1,018			
Log Pseudo-Likelihood	-2037.32			
ρ	-0.43			
Wald test of independent equations (ρ = 0) chi-squared(1)	0.62		Prob>chi-squared = 0.43	

Notes: Significance levels: * = p<.10; ** = p<.05; *** = p<.01. Model also includes an intercept and missing dummy variables.

Table A4. Work and Postsecondary Enrollment: Conditional Bivariate Probit for Double Selection Correction

	Work (probit)		Enrollment (selection)	
Independent Variables	**Coeff.**	**S.E.**	**Coeff.**	**S.E.**
Age	-0.071	0.115	0.504***	0.032
Male	-0.226**	0.096	-0.185***	0.056
Hispanic	-0.046	0.144	-0.114	0.083
Black	-0.394***	0.124	0.289***	0.073
Other race (nonwhite)	-0.283	0.391	0.409	0.261
Mother high school degree	-0.093	0.138	0.168**	0.076
Mother 4 year degree	-0.041	0.166	0.335***	0.097
Father high school degree	-0.101	0.118	0.071	0.073
Father 4 year degree	-0.306**	0.133	0.272***	0.090
Parents' income (in 10,000s)	0.006	0.037	0.098***	0.020
Parents' income squared	-0.001	0.001	-0.003***	0.001
Parents' net worth (in 10,000s)	-0.013***	0.005	0.008***	0.003
Parents' net worth squared	0.000**	0.000	-0.000**	0.000
High school grades	-0.143**	0.060	0.252***	0.021
ASVAB – arithmetic reasoning	-0.110	0.099	-0.049	0.062
ASVAB – word knowledge	0.035	0.090	0.174***	0.058
ASVAB – paragraph comprehension	0.063	0.088	-0.008	0.057
ASVAB – mathematical knowledge	-0.020	0.141	0.507***	0.058
State average unemployment rate	-0.032	0.057	0.075**	0.038
State average wage	-0.000	0.001	0.000	0.000
State work study program	0.122	0.088	0.002	0.058
Avg. in-state tuition for public 4-year institutions (in 1,000s)	0.032	0.051	-0.00	0.036
Only child	0.464**	0.202	0.083	0.125
First born	0.254*	0.132	0.107	0.082
Last born	0.093	0.152	0.152*	0.095
Number of siblings	0.086	0.055	0.024	0.032
Avg. % of the population aged 18-24			-0.086*	0.048
Number of observations	6,943			
Censored Observations	5,925			
Uncensored Observations	1,018			
Log Pseudo-Likelihood	-2105.83			
ρ	-0.10			
Wald test of independent equations (ρ = 0) chi-squared(1)	0.09		Prob>chi-squared = 0.76	

Notes: Significance levels: * = p<.10; ** = p<.05; *** = p<.01. Model also includes an intercept, age, and missing dummy variables.