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Working Paper 401
November 2006

Parental Transfers, Student Achievement, and the Labor Supply of College Students*

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August 2006

Abstract: Using nationally representative data from the NLSY97 and a simultaneous equations model, this paper analyzes the financial motivations for and the effects of employment on U.S. college students' academic performance. The data confirm the predictions of the theoretical model that lower parental transfers and greater costs of attending college increase the number of hours students work while in school, although students are not very responsive to these financial motivations. They also show that increased hours of work lead to lower grade point averages (GPAs), at least for students attending four-year colleges.

JEL Classification: D1, I2, J2

Keywords: employment, transfers, GPA

*Please address all correspondence to Sabrina Wulff Pabilonia. The views expressed in this paper are those of the authors and do not necessarily reflect the policies of the U.S. Bureau of Labor Statistics. The authors would like to thank Tatevik Sekhposyan for her assistance in compiling the historical state work study program data and Anastasiya Osborne for editorial and research assistance. The authors would also like to thank Alison Aughinbaugh, Mike Giandrea, Mark Long, Peter Meyer, David Ribar, Donna Rothstein, Leslie Stratton, Leo Sveikauskas, Bruce Weinberg, and Cindy Zoghi for comments and suggestions. The authors are especially indebted to Stan Panis and David Ribar for their aML programming assistance.

I. Introduction

According to a press release by the U.S. Bureau of Labor Statistics, 52 percent of all four-year college students aged 16-24 and 62 percent of all two-year college students aged 16-24 were employed in October 2005 (U.S. Bureau of Labor Statistics 2006). Why do they work? One potential reason is that they lack adequate financial aid and parental transfers to cover their college-related expenses. Federal and state work study programs are designed to subsidize some of this employment in order to help more students afford college.

Yet, there is an ongoing debate as to whether college student employment is beneficial or detrimental to students. On the one hand, college student employment may be beneficial in the long run if it provides students with valuable work experience. Stephenson (1981), Michael & Tuma (1984), Ruhm (1995, 1997), Light (1999, 2001), and Neumark & Joyce (2001) find positive effects of student employment on future labor market outcomes such as future wages, fringe benefits, occupational status, and likelihood of employment, holding schooling constant. However, college employment may also have a detrimental effect on academic performance as time spent in market work reduces time available for attending classes, studying, or participating in other schooling-related activities. In addition, fatigue from spending long hours at work may negatively affect the quality of any schooling-related activity that does occur (Oettinger 1999). Loury and Gorman (1995), as well as Jones and Jackson (1990), find that college grades, one measure of academic performance, have a substantial positive effect upon early career earnings. Therefore, it is important to analyze the effect of employment on student achievement as measured by student grades.

Several studies have examined the relationship between market work and academic achievement in both high school and college, but no consensus has been reached. Of the high

school studies, Ruhm (1995, 1997) and Tyler (2003) find that employment while in high school has a negative effect on both the number of years of schooling completed and 12th grade math achievement. Oettinger (1999) similarly shows a decline in the grades of minority high school students who work long hours. Rothstein (2006), however, finds no significant effect of student employment on high school grades. Of the college studies, Ehrenberg & Sherman (1987) show that an increase in weekly hours worked decreases the probability that a student enrolls in college in a subsequent year and, for those who do enroll, reduces the probability that they graduate on time; however, they find only a small negative effect of working on two-year college students' first-year grade point averages (GPAs) and no effect of working on four-year college students' first-year GPAs. More recently, Stinebrickner & Stinebrickner (2003), Oettinger (2005), and Brennan et al. (2005) all provide evidence that working while in college has a harmful effect on students' grades.

This paper overcomes several limitations of the existing studies of college employment. First, earlier studies rely on small convenience samples. Of the U.S. studies, Ehrenberg & Sherman (1987) examine only male high school graduates that were enrolled in college full-time, while Stinebrickner & Stinebrickner (2003) and Oettinger (2005) each examine students from only one college. Similarly, the U.K. study by Brennan et al. (2005) only examines students attending a small number of universities in the U.K. This paper attempts to remedy this deficiency in the literature by using a recent sample of first-year U.S. college students from Rounds 1-6 of the National Longitudinal Survey of Youth 1997 (NLSY97), a nationally representative survey, to provide results more applicable to the general college student population.

Second, most existing studies of college employment pay little attention to the reasons why college students work. College students face borrowing constraints because guaranteed student loan maximums are set well below the full cost of college, and financial aid awards (including guaranteed student loan awards) do not depend on parents' willingness to pay.[1] Two studies that do investigate the relationship between parental transfers and college student employment provide mixed evidence. Oettinger (2005) observes that college students work more if parents provide less financial support, a result similar to those for high school students found by Pabilonia (2001) and Dustmann et al. (2004). Wolff (2006), however, finds that parental transfers have no effect on the employment of 16-22 year olds in France, although he makes no distinction between high school and college students. This paper attempts to address these gaps in the literature by focusing on financial motives for college employment.[2]

To illustrate these plausible motives, a simple variant of a time allocation model with parental transfers is presented. In this model, a student allocates his time between schooling and market work while his parents simultaneously make their own consumption and transfer decisions. Thus, parental transfers are treated as endogenous to schooling and work decisions as in Keane and Wolpin (2001) and Kalenkoski (2006), but in contrast to Oettinger (2005), who treats parental transfers as exogenous. The model motivates the testing of several hypotheses. First, smaller parental transfers result in longer hours worked while in college, all else ─ including the price of schooling net of financial aid that does not have to be repaid ─ held constant. Second, an increase in the net price of schooling, holding parental transfers and

[1] Kalenkoski (2005) shows that a substantial portion of parents transfer less than their Expected Parental Contribution (EPC) towards their child's postsecondary education, suggesting that students must either choose a lower cost schooling alternative or fund the higher-priced schooling some other way, perhaps through student employment.

[2] 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.

everything else constant, leads to an increase in hours worked. Finally, an increase in hours worked leads to lower student achievement.

To test these hypotheses, we use data from the National Longitudinal Survey of Youth 1997 (NLSY97) to estimate a simultaneous equations model consisting of a parental transfer tobit, an hours worked tobit, and a GPA regression equation via maximum likelihood. In this model, the endogenous determinant of a student's hours of work is the parental transfer and vice versa. Hours worked is the endogenous determinant of GPA. Estimates from this model show that the NLSY97 data do support the hypotheses that a decrease in parental transfers or an increase in the net cost of schooling increases the number of hours students work while in college, although students' hours of work are not very responsive to these financial motivations. They also support the hypothesis that an increase in hours worked negatively affects students' grades, at least for students attending four-year colleges. Therefore, it is plausible that while work study programs help students finance their college tuition and fees, they may be detrimental to students' academic achievement and thus their long-run outcomes. The next section presents the theoretical motivation for the analysis. Section III describes the data. Section IV presents the econometric model. Section V interprets the results. Finally, Section VI concludes this paper.

II. Theoretical Motivation

A simple theoretical model illustrates the potential financial motives behind a college student's labor supply. Let L be the fraction of time a student spends working, and let 1-L be the fraction of time the student spends in schooling-related activity, such as in-class time (credit

hours) and study time. 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 $\partial A/\partial(1-L) > 0$, that is, academic achievement is a positive function of the time a student spends in schooling-related activity[3], and μ is a vector of background characteristics including the child's ability and existing knowledge and his family's socio-economic characteristics, all of which may affect his production of academic achievement. There are two decision-makers in this model, a selfish child and an altruistic parent.[4] 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. Note that the child's utility is specified to depend directly on the child's academic achievement. There are several reasons that the child may care about academic achievement. First, higher achievement is likely to increase the child's future income. In this case A could be replaced with Y(A) in the utility function, where Y stands for future earnings and $Y'(A) > 0$. However, higher future earnings may not be the only reason the child may value academic achievement. Higher academic achievement in college may lead to more desirable future job characteristics or a better future quality of life. The child may also enjoy some current consumption value of a college education. Rather than sort through all these possibilities, we leave utility in this general form. Assuming no borrowing against future earnings, the child's budget constraint is given by

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

[3] Using time-use data on students from one college, Stinebrickner & Stinebrickner (2004) found a large positive relationship between study-time and first-year GPA.

[4] There are other possible models that could describe transfer behavior within families, such as an exchange model (Cox 1987).

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 that can be thought of as the cost per credit hour net of financial aid. While the assumption of no borrowing is not quite realistic, college students do face borrowing constraints given loan maximums that do not cover the full cost of schooling (Keane and Wolpin 2001) and loan awards that do not depend upon parental willingness to pay (Kalenkoski 2005). In addition, few respondents in the NLSY97 provide information on student loans so they will not be included in the empirical analysis.

The parent's utility is given by

$$U_p = U_p(C_p, U_c), \tag{4}$$

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

$$M_p = C_p + t, \tag{5}$$

where M_p is the parent's income, assumed to be exogenous.

The parent and child make their decisions independently, given their knowledge about the other person's decision rule. Thus, the child will choose the amount of time he or she spends 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*.[5]

In order to obtain reaction functions, it is assumed that the academic achievement function is given by

[5] There are several ways the model could be extended 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, siblings' consumption 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.

$$A = k(1-L) + \mu, \qquad (6)$$

where k is a constant greater than zero and the background factors, μ, enter additively. It is also assumed that the child's utility function is Cobb-Douglas and is given by

$$U_c(C_c, A) = C_c^{\alpha}A^{1-\alpha}, \qquad (7)$$

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

$$U_p(C_p, C_c, A) = C_p^{\beta}[C_c^{\alpha}A^{1-\alpha}]^{1-\beta}, \qquad (8)$$

where β is a constant between 0 and 1 and measures the relative importance of a parent's current consumption.

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

$$U_c(L) = [wL + t - P_s(1-L)]^{\alpha}[k(1-L) + \mu]^{1-\alpha}. \qquad (9)$$

The child chooses L to maximize (9). Rearranging the first order necessary condition for a maximum gives the student's labor supply (reaction) function:

$$L = [\alpha(w + P_s)(k + \mu) + (1-\alpha)k(P_s - t)]/[k(w + P_s)]. \qquad (10)$$

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 (10) 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. It is positive if parents transfer more than the cost of schooling and negative if parents transfer less than the cost of schooling.

Rearranging (5) and substituting along with the rearranged (3) and (6) into (8) gives

$$U_p(t) = (M_p - t)^{\beta}[(wL + t - P_s(1-L))^{\alpha}(k(1-L) + \mu)^{1-\alpha}]^{1-\beta}. \qquad (11)$$

The parent chooses t to maximize (11) given L. Rearranging the first order necessary condition for a maximum gives the parent's transfer (reaction) function:

$$t = [\alpha(1-\beta)M_p - L(\beta w + \beta P_s) + \beta P_s] / [\alpha(1-\beta) + \beta]. \qquad (12)$$

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

III. Econometric Model

While this paper does not estimate a structural model, the theoretical model presented in Section II provides the motivation for testing several 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 assumption of the model, based on previous empirical evidence, is that an increase in hours worked reduces student achievement, all else equal. To test these hypotheses, a system of simultaneous equations is estimated:

$$\begin{aligned} t^* &= \gamma_1 h + \beta_1 \cdot X_1 + u_1 \\ h^* &= \gamma_2 t + \beta_2 \cdot X_2 + u_2 \qquad (14) \\ A &= \gamma_3 h + \beta_3 \cdot X_3 + u_3 \quad , \end{aligned}$$

and

$$\begin{aligned} &t = t^* \text{ if } t^* > 0 \\ &t = 0 \text{ otherwise} \qquad (15) \end{aligned}$$

$h = h^*$ if $h^* > 0$

$h = 0$ otherwise

where t^* is the latent variable measuring the desired parental transfer (it may be negative), t is the observed transfer made (it may be zero or positive), h^* is the latent variable measuring the student's desired hours of work (which may be negative), h is the observed hours worked (which may be zero or positive), A is the student's GPA measured on a four-point scale, X_1, X_2, and X_3 are vectors of exogenous explanatory variables, γ_1, γ_2, and γ_3 are coefficients on the endogenous right-hand-side variables, and β_1, β_2, and β_3 are the coefficients on the exogenous explanatory variables. The residuals u_1, u_2, and u_3 follow a trivariate normal distribution such that:

$$\begin{bmatrix} u_1 \\ u_2 \\ u_3 \end{bmatrix} \sim N\left(\begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} \sigma_1^2 & \rho_{12}\sigma_1\sigma_2 & \rho_{13}\sigma_1\sigma_3 \\ \rho_{12}\sigma_1\sigma_2 & \sigma_2^2 & \rho_{23}\sigma_2\sigma_3 \\ \rho_{13}\sigma_1\sigma_3 & \rho_{23}\sigma_2\sigma_3 & \sigma_3^2 \end{bmatrix} \right). \quad (16)$$

This model is similar to the simultaneous equations model with latent variables discussed in Maddala (1983) but includes an additional equation, the GPA equation. As in Maddala's model, a logical consistency condition, $1 - \gamma_1\gamma_2 > 0$, must hold for the model to be estimable. The model is estimated via maximum likelihood using the aML software package. Standard errors are based upon the numerical Hessian matrix.[6]

Identification of the endogenous variables in this model requires at least one variable to be included in X_1 that is not in X_2, one variable in X_2 that is not in X_1, and one variable in X_2 that

[6] Similar to previous studies, this analysis assumes that the decisions to enroll in college and where have already been made. While one might wish to estimate an enrollment probit or ordered probit along with the other three equations estimated here, we are limited in the number of equations we are able to jointly estimate. Thus our results may also only apply to enrolled students.

is not in X_3. The specific exclusion restrictions that are made to achieve identification are similar to those used in other studies and are discussed in detail in the following sections.

IV. Data

The primary data used in this analysis come from the NLSY97 geocode file Rounds 1 through 6. The NLSY97 youth respondents and one of their parents were first surveyed for Round 1 between January and October, 1997 or between March and May, 1998. This cohort of the NLSY 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.

For those respondents with available college enrollment information, in 1997 only a few of the youth respondents had completed a college term (either a semester, trimester, or quarter) after finishing high school. By Round 6, 3,194 youths could be identified as having completed at least one term in college. Only respondents' first term college experience is examined in this paper in order to obtain the largest sample possible and to also insure that the college term dynamics are similar. The first term is important because students are more likely to drop out of college in the first year (Stratton, O'Toole, & Wetzel 2005) and college drop-outs have significantly lower earnings than college graduates. Thus, a pooled cross-section of students' first college experiences from the fall term of 1996 through the spring term of 2002 is examined. It is important to note, however, that the first college term is probably not representative of a student's entire college career.

Of those respondents that can be identified as having completed at least one college term, we have valid information on our dependent variables for 2,155. When we delete observations

for respondents with missing information on key independent variables, the sample is reduced to 1,750 (See Appendix Table A1 for more details). In order to analyze college students separately by the type of institution they attended, whether a four-year or a two-year college, as there may be distinct differences in the behavior of these two groups of students, we drop an additional 135 respondents whose school type cannot be identified. We can identify 1,048 students who attended four-year colleges and 567 students who attended two-year colleges. A comparison of the characteristics of these students with those from the full samples of four-year and two-year students indicates that our reduced sample is representative. For example, 43.7 percent of four-year students in our analysis sample are male compared to 45.7 percent of students in the full sample. Also, 6.1 percent of four-year students in our analysis sample are Hispanic compared to 6.8 percent in the full sample. Similarly, 11.2 percent of four-year students in the analysis sample are black compared to 11.7% of the full sample. The results for two-year students are similarly representative.

Both part-time and full-time students are included in the samples because hours spent on schooling-related activity are chosen simultaneously with hours spent in market work in the model. In addition, time spent in schooling-related activity is also more accurately captured as a continuous variable rather than a dichotomous one. Students have a wide range of credit hours for which they can register and can choose to study as much or as little as they like. According to the model, if one knows how many hours are spent in market work one also knows how many hours are spent in schooling-related activity.

Table 1 reports means and standard deviations for the variables used in our analyses. A comparison of respondent and family background characteristics for four-year and two-year college students highlights some unsurprising significant differences between the two samples.

Four-year college students are more likely to be white, non-Hispanics with higher high school grades and ASVAB test scores than two-year college students. They are also more likely to have wealthier parents and parents who have a four-year college degree.

The three key dependent variables used in our analyses - parents' transfers to the student, the number of hours the student works per week, and the student's GPA (our measure of achievement) - are measured as of the first college term. Parental transfers are the dollar value of schooling-related parental transfers measured in thousands of 1997 dollars.[7] 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. Assistance includes financial aid received by a youth from parents (both biological parents, his biological mother and stepfather, and/or his father and stepmother) that the youth was not expected to repay. Seventy-three percent of four-year-college students received a parental transfer in their first term (see Table 1), $4,120 on average.[8]

The hours worked variable is the number of hours worked during a specific week during the first college term. A mid-term week was chosen because students' work behavior may be different at the beginning and end of terms, when they are either newly searching for a job or are completing final examinations. The mid-term week selected depended upon the college term system reported and was one of the first weeks of February, May, October, or December. Table 2 shows the simple relationship between hours worked and parental transfers. On average, fewer hours worked is associated with greater average parental transfers.

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

[8] This is higher than the average transfer of $3,300 in Oettinger's (2005) single public university sample; however, our sample includes not only public universities and colleges but also private ones which are generally more expensive.

GPA is a continuous variable that is measured on a 0.0-4.0 scale. If the respondent self-reported his or her GPA on a different scale, his grade was converted to the 0.0-4.0 scale. Since the analysis uses first-term college students who are not yet familiar with the grading policies of specific professors and are most likely fulfilling core college requirements, students' choice of courses should not have a great effect upon GPA. On average, four-year college students achieved a slightly higher GPA than two-year college students – 3.02 versus 2.85 – but there was more variability among two-year college students. Table 3 shows the simple relationship between GPA and hours worked. Four-year college students who worked 20 hours or less had a slightly higher GPA on average than students who did not work. Those who worked more than 20 hours per week had the lowest GPA on average. However, two-year college students who worked any number of hours, including more than 20, earned higher GPAs than students who did not work, but those who worked 20 or fewer hours per week had the highest GPAs.

The explanatory variables used in this analysis come from the NLSY97 and other data sources which have been matched to the NLSY97 using the state or county where the college was located and the college identification variable (UNITID) available in the geocode version of the NLSY97. A key explanatory variable is the net price of schooling (and its square). This variable is defined to be tuition and fees minus grants, tuition or fee waivers or reductions, fellowships, and scholarships for the first college term in which the student was enrolled, and it is measured in 1997 dollars. Information on tuition and fees for full-time, full-year students at each institution comes from the Integrated Postsecondary Education Data System (IPEDS) maintained by the National Center for Education Statistics. IPEDS data are matched to the NLSY97 data using a college identification number. Per-term price is constructed by taking the standard tuition and fees for full-time full-year students and dividing by the relevant number of

terms for each institution. It does not depend on a respondent's actual credit hours and so is not endogenous to his or her schooling or work decisions. However, it is adjusted based on whether or not the student respondent was attending college in-state or out-of-state.

The dollar value of grants, tuition or fee waivers or reductions, fellowships, and scholarships received by students is constructed from the NLSY97 youths' responses to the same series of questions as the parental transfer variable. The amount of this financial aid is subtracted from the per-term price to obtain the per-term net price of schooling variable used in the analysis. Loans are ignored in the calculation of the net price of schooling measure for several reasons. First, they cannot theoretically be subtracted from tuition as are the other financial aid variables because they need to be repaid. Second, the number of respondents reporting positive loan amounts is quite small. The net price of schooling (and its square) is included in both the parental transfer and hours worked equations and is expected to positively affect both transfers and hours worked as suggested by the theoretical model. The exclusion of the net price variable and its square from the GPA equation helps to identify hours worked in the GPA equation.

At least one variable is needed to identify parental transfers in the hours worked equation. One variable that is included in the transfer equation but excluded from the hours worked equation is the respondent's number of siblings from Round 1 of the NLSY97. This variable is intended to capture the degree to which there is competition for parental resources. A similar variable has also been used for this purpose in Wolff (2006). There is some concern that the number of siblings is potentially endogenous as parents may trade off the quality and quantity of children (Becker 1976). 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.

Other variables that are included in the transfer equation but not the hours worked equation are parents' income and net worth (and their squares) as measured in 1996. These variables can be excluded from the hours worked equation because parental resources only affect the hours worked by the student through the parental transfer in the theoretical model. Wolff (2006) makes a similar parental income exclusion restriction. They are also excluded from the GPA equation as they do not directly affect the child's GPA. Many respondents had missing values for these parental financial variables. Therefore, missing values are recorded as zeros and missing data indicator dummy variables for parents' income and net worth are included in the regression analysis.

Missing values are an even bigger problem for the respondent's wage as wage information is missing for most respondents in the NLSY97. Therefore, the effective minimum wage is used as a proxy for the respondent's wage and is permitted to affect both the number of hours a student chooses to work and the parental transfer as suggested by the theoretical model. It is not included in the GPA equation as it should not directly affect the student's GPA. The effective minimum wage is defined as the maximum of the state and federal minimum wages. The minimum wage seems to be an appropriate proxy for a student wage because most of the jobs students hold while attending college are temporary and require a low level of skills, i.e., jobs likely to pay the minimum wage or a wage correlated with the minimum wage (Wolff 2006, Dustmann 1997).

At least one variable needs to be included in the hours worked equation that is not in the transfer equation and is not in the GPA equation in order to identify the effects of hours of work

on transfers and GPA. For this purpose, we include a measure of labor market conditions, the unemployment rate in the county where the student attended college, which was obtained from the Bureau of Labor Statistics' Local Area Unemployment Statistics (LAUS) program. A similar variable is used in Wolff (2006). We also include an indicator for whether or not there was a state-supported work study program in the state where the respondent attended college over the period 1996-2002, the period covered by these data. This variable is constructed using historical information on state work study programs collected by the authors directly from the relevant state agencies.

Additional personal background variables such as age on December 31, 1996, whether or not the respondent is Hispanic, race (black and other nonwhite, with white as the omitted variable), mother's highest level of education as of 1997, father's highest level of education as of 1997, the respondent's high school grades from transcripts, and the respondent's ASVAB scores, are included in all equations to control for heterogeneous preferences and productivity in producing academic achievement. [9]

V. Results

To demonstrate the importance of estimating the simultaneous equations model discussed in Section III, we first present results from estimating the transfer, hours worked, and GPA equations separately for comparison purposes. The results for four-year college students are presented in Table 4 and the results for two-year college students are in Table 5. In both tables, the maximum likelihood coefficient estimates from the transfer tobit model are reported in the first column, the maximum likelihood coefficient estimates from the hours worked tobit

[9] High school grades are self-reported and measured on a 8.0 scale with 1.0 being mostly below D's and 8.0 being mostly A's. ASVAB scores have a mean latent ability score of 0 and a standard deviation of 1.

model are reported in the second column, and the OLS estimates for the GPA equation are reported in the third column. Only the GPA estimates may be interpreted as marginal effects. For the four-year and two-year college samples, we find a significant negative relationship between parental transfers and hours worked per week. However, contrary to our model's predictions, we do not find a negative relationship between hours worked and GPA. In fact, we find no relationship for the four-year college student sample and a marginally significant positive relationship for the two-year student sample. Stinebrickner and Stinebrickner (2003) also show a positive relationship when they do not control for the endogeneity of hours worked.

Our preferred simultaneous equations estimates are shown in Tables 6 and 7, and the marginal effects for one unit changes in key variables are in Table 8. In Table 6 we find the expected significant negative effect of hours worked per week on first term GPA for four-year college students, consistent with the results of single university studies (Stinebrickner and Stinebricker 2003, Oettinger 2005). Four-year college students who increase their hours of work by 15.80 hours (a one standard deviation increase) have on average a .22 lower GPA, a result similar to that found by Oettinger (2005), but one much smaller than that found by Stinebrickner and Stinebrickner (2003). Table 7 shows that there is also an estimated negative effect for students who work while attending two-year colleges, but this coefficient estimate is statistically insignificant and its magnitude is much smaller. The difference in the sign of the effect between these results and single-equation estimates emphasizes the importance of controlling for the endogeneity of hours worked.

Also in Table 6, the coefficient of correlation between hours worked and GPA, ρ_{23}, is positive and significant at the 1% level, indicating that there is some unobserved variable, such as student motivation, that affects both the number of hours a four-year student works and the

student's GPA in the same way. For example, the greater the level of student motivation the greater is the number of hours the student works and the higher is his GPA. Similarly, in Table 7, the coefficient of correlation between transfers and hours worked, ρ_{12}, is positive and significant at the 10% level, indicating that there is some unobserved variable, again perhaps student motivation, that affects both parental transfers and the number of hours a two-year student works in the same way. In other words, a more motivated student receives both greater transfers from his parents and works more. These statistically significant correlation coefficients indicate that it is better to estimate these equations simultaneously rather than separately. The logical consistency condition, $1 - \gamma_1\gamma_2>0$, is also satisfied.

In Table 8 we present marginal effects for the other key predictions of the model. These are calculated for a one unit change in the explanatory variable for each observation and then averaged over all observations. However, it may be more illustrative to focus on standard deviation changes in the explanatory variables. Therefore, for the remainder of the discussion, the marginal effects for one unit changes presented in the table are multiplied by one standard deviation of the relevant explanatory variable. For the four-year student sample, the estimated effect of an increase of 15.80 hours worked is a $395 decrease in parental transfers, although the estimate is not statistically significant. For two-year students, however, the effect of an increase of 21.92 hours worked, a one standard deviation increase, is a statistically significant decrease of $504 in parental transfers. Transfers also affect the hours that students work. Parents of a four-year college student who increase their transfers by $5,000 can expect their child to work nearly five fewer hours per week. Parents who give their two-year student an additional $1,580 for schooling can expect their child to work almost three fewer hours per week. These are small effects for both samples of students as earnings from the additional hours worked would not

replace the amount of the transfer that was lost. However, four-year students' hours of work are more responsive to changes in parental transfers than two-year students' – with elasticities calculated at the mean of .31 and .05, respectively.[10]

As expected, the net price of schooling is a significant positive predictor of both parental transfers and hours worked per week in both samples.[11] An increase of $4,490 in the net price of schooling for four-year college students increases their parental transfers by $1,118 and a $3,002 increase in the net price of schooling for two-year college students increases their parental transfers by $519. With respect to hours worked, a one standard deviation increase in the net price of schooling causes two-year college students to increase their hours worked by over four and a half hours and four-year college students to increase their hours worked by just under an hour and twenty minutes. Similar to the effects of reductions in parental transfers, the effects of increases in the net price of schooling on hours of work are small and would cover only a small portion of the increased cost. However, contrary to the results for the effects of transfers, two-year students are more responsive to net price changes than four-year students with respect to their hours of work – the elasticity of hours with respect to net price of schooling is .03 for two-year students and .01 for four-year students.

We next discuss the effects of other control variables on our dependent variables for both samples. Among the coefficients on the respondent's characteristics, we find that black students receive significantly fewer transfers from their parents than white students for both samples. Hispanic students attending two-year colleges receive fewer parental transfers than non-Hispanic students. In both samples, students with higher mathematical knowledge scores receive greater

[10] The elasticities were calculated by multiplying the marginal effect of a one unit change in parental transfers on hours of work by the ratio of the mean transfer to the mean hours of work for the relevant student samples.

[11] The marginal effect for the net price of schooling accounts for both the linear and the squared term.

transfers. Among family background variables, we find that more educated mothers, but not fathers, have a significant positive effect on parental transfers for four-year college students but not for two-year students. As expected, both parental income and net worth have highly significant positive effects on parental transfers for four-year college students while only parental income has a significant positive effect on parental transfers for two-year college students. These results are not surprising as more educated and well-off parents can afford and thus may be willing to pay more for their children's education. The significance of these effects is important given that these parental financial variables help identify parental transfers in the hours worked equation.

As expected, the number of siblings has a negative effect upon parental transfers in both samples. However, it is statistically insignificant. Contrary to the model's predictions for the effect of the student's wage on parental transfers, the state minimum wage has a positive and significant effect on parental transfers for four-year college students. However, it is not an actual measure of the student's wage and it is possible that it is capturing something other than the student's wage opportunities, such as general economic conditions. If this is the case, we might expect a positive coefficient as better economic conditions may lead parents to transfer more to their children.

With respect to the effect of respondent characteristics on hours worked, being male, being nonwhite, and having higher high school grades all have significant negative effects upon hours worked per week in the four-year college sample. In the two-year college sample, only being Hispanic has a negative effect upon hours worked per week. With respect to family background variables, having a father who has earned at least a four-year degree has a significant negative effect upon hours worked per week for both samples. However, having a mother who

has earned a high school degree has a significant positive effect upon hours worked per week for the four-year sample but no effect for the two-year sample. Finally, among the labor market variables, only the county unemployment rate has a significant negative effect upon hours worked per week for both samples. The statistical significance of this estimate is important because this variable helps to identify hours worked in both the GPA equation and parental transfer equation. The other variable that was included to identify hours, the existence of a state work study program in the state in which the student is in college, is never significant.

Among all the variables in the college GPA equation, high school grades have a sizeable and highly statistically significant effect upon first-term GPA. A one standard deviation increase in high school grades results in a .24 point increase in first-term college GPA for four-year college students and a .29 point increase in first-term college GPA for two-year college students. In addition, for four-year students, a one standard deviation increase in a student's ASVAB standardized test score in word knowledge increases first-term college GPA by .08 points, and for two-year students, a one standard deviation increase in a student's ASVAB standardized test score in arithmetic reasoning increases first-term college GPA by .17 points. All of these results suggest that student academic ability and/or skills prior to the start of college have a significant impact on how well the student does in college. None of the parental background variables are statistically significant in the GPA equation.

VI. Sensitivity Analyses

We perform two sensitivity analyses to determine whether or not our results are robust to alternative specifications. First, we divide the sample by full-time and part-time enrollment status instead of by four-year versus two-year college enrollment. These results are presented in Appendix Tables A2 and A3. For our key coefficients it appears that the results for the full-time

students are similar to those for the four-year students and that the results for the part-time students are similar to those for the two-year students.

Then we estimate only the hours worked and GPA equations jointly, treating transfers as an exogenous determinant of hours as does Oettinger (2005). The results are shown in Appendix Table A4 for four-year students and in Appendix Table A5 for two-year students. For four-year students, the estimate of the effect of parental transfers on students' hours of work when transfers are treated as exogenous is quite different from the estimate obtained in the simultaneous equations model where transfers are treated as endogenous. In addition, the estimates of the effects of net price and net price squared are also affected by treating transfers as exogenous, suggesting that one must control for the endogeneity of transfers when investigating the financial motivations for student employment. However, whether or not transfers are treated as endogenous does not substantially affect the estimate of the effect of hours worked on GPA. For two-year students, none of the key estimates are substantially affected by treating transfers as exogenous.

VII. Conclusion

Student work is often proposed as a means of financing a student's postsecondary education, and sometimes it is subsidized via state and federal work study programs. In this paper, we use a simultaneous equations model and nationally representative data from the NLYS97 to test several hypotheses regarding the financial motives and academic effects of college student employment. Results indicate that the net price of schooling faced by a student and his family positively affects both the number of hours a student works and the transfers he or she receives from his or her parents. They also show a negative effect of parental transfers on

students' hours of work and vice versa. Two-year college students' hours of work are much more responsive to increases in the net price of schooling and less responsive to reductions in parental transfers than four-year students.

We also find that an increase in hours worked negatively affects a student's academic performance as measured by first-term college GPA. This result is important as it is the first to find a detrimental effect of working while in college on student grades using data from a large nationally representative survey. However, our analysis only focuses on grades during the first college term. Thus, more research is needed on the effects of college student employment that uses nationally representative data and explores other measures of academic performance.

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Table 1. Sample Means and Standard Deviations

	Four-Year Students (N = 1,048)		Two-Year Students (N = 567)	
Variables	**Mean**	**S.D.**	**Mean**	**S.D.**
Worked	.45		.70	
Hours of work (all values)	9.44	15.80	21.38	21.92
Hours of work (positive values)	21.04	15.80	30.44	17.00
College GPA	3.02	.79	2.85	1.37
Parental transfer received	.73		.52	
Parental transfer (all values) (in 1,000s)	3.02	5.00	.60	1.58
Parental transfer (positive values) (in 1,000s)	4.12	5.26	1.16	1.94
Age on December 31, 1996	14.63	1.20	14.73	1.71
Male	.44		.48	
Hispanic	.06		.14	
Black	.11		.13	
Other race (nonwhite)	.01		.02	
High school grades (0-8 scale)	6.75	1.32	5.85	2.18
ASVAB scores missing	.10		.13	
ASVAB – arithmetic reasoning	.39	.82	-.12	1.07
ASVAB – word knowledge	.17	.75	-.19	1.13
ASVAB – paragraph comprehension	.45	.73	.03	1.10
ASVAB – mathematical knowledge	.82	.85	.25	1.18
Net price of schooling (in 1,000s)	.36	4.49	.38	3.02
Mother's education missing	.22		.24	
Mother high school degree	.34		.45	
Mother 4 year degree	.34		.13	
Father's education missing	.14		.14	
Father high school degree	.27		.45	
Father 4 year degree	.34		.13	
Parents' income missing	.07		.09	
Parents' income (in 10,000s)	9.97	8.89	8.06	12.26
Parents' net worth missing	.27		.25	
Parents' net worth (in 10,000s)	24.27	68.10	11.00	46.65
Number of siblings	1.40	1.18	1.53	67.08
State work study program	.38		.47	
County unemployment rate	4.00	1.60	4.63	2.96
State minimum wage	4.92	.37	4.98	.64

Note: Means and standard deviations have been weighted.

Table 2. Parental Transfers, by Type of College and Hours Worked

	Four-Year College Students			Two-Year College Students		
		Hours worked			Hours worked	
	Not Working	1-20	More than 20	Not Working	1-20	More than 20
Average Parental Transfer (in 1,000s)	3.45 (7.07)	2.79 (7.84)	2.00 (12.45)	.73 (3.17)	.71 (3.86)	.46 (1.94)
Number of Observations	576	279	193	178	120	269

Note: Standard deviations are in parentheses.

Table 3. Grade Point Average, by Type of College and Hours Worked

	Four-Year College Students			Two-Year College Students		
		Hours worked			Hours worked	
	Not Working	1-20	More than 20	Not Working	1-20	More than 20
Average College GPA	3.00 (1.08)	3.10 (1.34)	2.95 (2.11)	2.76 (1.94)	2.91 (1.97)	2.88 (1.45)
Number of Observations	576	279	193	178	120	269

Note: Standard deviations are in parentheses.

Table 4. Single Equations Estimates for First-term Parental Transfers, Hours Worked, and College GPA for Four-Year College Students

	Equation I Tobit Dependent Variable: Parental Transfers (in 1,000s)		Equation II Tobit Dependent Variable: Hours Worked Per Week		Equation III OLS Dependent Variable: GPA (4 point scale)	
Independent Variables	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Hours worked per week	-0.024**	0.012			0.001	0.001
Parental transfers (in 1,000s)			-0.715***	0.240		
Respondent's characteristics						
Age on December 31, 1996	-0.108	0.164	1.160	0.933	0.013	0.019
Male	0.185	0.350	-6.158***	2.006	-0.085**	0.042
Hispanic	-0.762	0.560	4.070	3.086	0.015	0.066
Black	-1.130**	0.471	-7.048***	2.621	-0.034	0.055
Other race (nonwhite)	-1.660	1.850	-30.910**	14.475	-0.067	0.210
High school grades (8 point scale)	-0.171	0.157	-3.040***	0.866	0.210***	0.019
ASVAB – arithmetic reasoning	-0.590	0.391	0.514	2.198	0.001	0.047
ASVAB – word knowledge	-0.524	0.340	0.198	1.893	0.075*	0.040
ASVAB – paragraph comprehension	0.311	0.366	-0.203	2.040	0.021	0.043
ASVAB –mathematical knowledge	0.814**	0.368	0.760	2.063	0.032	0.044
Net price of schooling (in 1,000s)	0.403***	0.049	0.104	0.281		
Net price of schooling squared	0.008***	0.002	-0.014	0.017		
Family background variables						
Mother high school degree	1.781***	0.582	6.084*	3.130	0.055	0.067
Mother 4 year degree	1.664***	0.612	2.511	3.310	0.052	0.071
Father high school degree	-0.105	0.462	-1.777	2.474	-0.032	0.054
Father 4 year degree	0.382	0.484	-6.434**	2.633	0.012	0.056
Parents' income (in 10,000s)	0.344***	0.122				
Parents' income squared	-0.010**	0.004				
Parents' net worth (in 10,000s)	0.065***	0.018				
Parents' net worth squared	-0.000***	0.000				
Number of siblings	-0.113	0.152				
Labor market variables matched to location in which respondent attended college						
State work study program available			0.848	1.943		
County unemployment rate			-0.741	0.602		
State minimum wage	1.089**	0.522	2.444	2.875		
σ	4.872***	0.130	25.46***	.939		
Log-likelihood	-2,476.95		-2,561.56			
Adjusted R-squared					.18	
Number of Observations			1,048			

Significance levels: * = p<.10;**=p<.05;***=p<.01. Each equation also includes an intercept and missing variable indicators.

Table 5. Single Equations Estimates for First-term Parental Transfers, Hours Worked, and College GPA for Two-Year College Students

	Equation I Tobit Dependent Variable: Parental Transfers (in 1,000s)		Equation II Tobit Dependent Variable: Hours Worked Per Week		Equation III OLS Dependent Variable: GPA (4 point scale)	
Independent Variables	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Hours worked per week	-0.014***	0.005			0.004*	0.002
Parental transfers (in 1,000s)			-2.435***	.928		
Respondent's characteristics						
Age on December 31, 1996	-0.081	0.084	-0.970	1.032	0.041	0.035
Male	-0.219	0.181	0.115	2.216	-0.086	0.076
Hispanic	-0.319	0.245	-6.028*	3.020	0.015	0.099
Black	-0.338	0.245	-3.193	2.882	-0.081	0.100
Other race (nonwhite)	-0.371	0.774	9.338	9.207	-0.449	0.210
High school grades (8 point scale)	-0.068	0.072	0.629	0.867	0.135***	0.030
ASVAB – arithmetic reasoning	-0.080	0.203	1.780	2.455	0.135	0.085
ASVAB – word knowledge	-0.269	0.199	0.770	2.352	-0.012	0.081
ASVAB – paragraph comprehension	-0.069	0.191	1.646	2.333	-0.025	0.080
ASVAB –mathematical knowledge	0.378**	0.189	1.065	2.304	-0.008	0.080
Net price of schooling (in 1,000s)	0.330***	0.063	2.194***	0.816		
Net price of schooling squared	0.015***	0.005	-0.034	0.115		
Family background variables						
Mother high school degree	0.257	0.246	-3.853	2.893	0.058	0.101
Mother 4 year degree	0.282	0.333	-3.788	4.048	0.074	0.140
Father high school degree	0.125	0.230	-3.577	2.692	0.014	0.094
Father 4 year degree	0.035	0.293	-9.150**	3.617	0.013	0.123
Parents' income (in 10,000s)	0.200***	0.064				
Parents' income squared	-0.006**	0.002				
Parents' net worth (in 10,000s)	0.017	0.011				
Parents' net worth squared	-0.000	0.000				
Number of siblings	-0.064	0.069				
Labor market variables matched to location in which respondent attended college						
State work study program available			0.801	2.289		
County unemployment rate			-1.078*	0.612		
State minimum wage	0.024	0.217	0.193	2.761		
σ	1.748***	0.079	23.460***	0.914		
Log-likelihood	-714.07		-1,940.15			
Adjusted R-squared					.05	
Number of Observations	567					

Significance levels: * = p<.10;**=p<.05;***=p<.01. Each equation also includes an intercept and missing variable indicators.

Table 6. Maximum Likelihood Estimates of the Simultaneous Equations Model for the Relationship between First-term Parental Transfers, Hours Worked, and College GPA for Four-Year College Students

	Equation I Dependent Variable: Parental Transfers (in 1,000s)		Equation II Dependent Variable: Hours Worked Per Week		Equation III Dependent Variable: GPA (4 point scale)	
Independent Variables	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Hours worked per week	-0.041	0.049			-0.014**	0.006
Parental transfers (in 1,000s)			-1.987***	0.638		
Respondent's characteristics						
Age on December 31, 1996	-0.090	0.168	0.996	0.911	0.026	0.021
Male	0.126	0.365	-5.880***	1.999	-0.120***	0.046
Hispanic	-0.671	0.560	3.518	3.206	0.044	0.070
Black	-1.176***	0.480	-8.104***	2.604	-0.075	0.059
Other race (nonwhite)	-1.712	1.859	-28.395**	13.219	-0.192	0.224
High school grades (8 point scale)	-0.187	0.173	-2.909***	0.852	0.184***	0.022
ASVAB – arithmetic reasoning	-0.551	0.390	0.079	2.151	0.018	0.049
ASVAB – word knowledge	-0.554	0.333	-0.178	1.868	0.075*	0.042
ASVAB – paragraph comprehension	0.309	0.361	-0.091	1.998	0.008	0.045
ASVAB –mathematical knowledge	0.750**	0.363	1.374	2.039	0.026	0.046
Net price of schooling (in 1,000s)	0.384***	0.048	0.609*	0.363		
Net price of schooling squared	0.007***	0.002	-0.007	0.019		
Family background variables						
Mother high school degree	1.849***	0.588	8.066***	3.182	0.098	0.072
Mother 4 year degree	1.661***	0.602	4.976	3.391	0.067	0.074
Father high school degree	-0.146	0.453	-1.266	2.453	-0.046	0.057
Father 4 year degree	0.292	0.487	-4.708*	2.748	-0.029	0.060
Parents' income (in 10,000s)	0.329***	0.117				
Parents' income squared	-0.009**	0.004				
Parents' net worth (in 10,000s)	0.077***	0.017				
Parents' net worth squared	-0.000***	0.000				
Number of siblings	-0.190	0.143				
Labor market variables matched to location in which respondent attended college						
State work study program available			0.061	1.781		
County unemployment rate			-1.018*	0.603		
State minimum wage	1.039**	0.512	3.429	2.711		
σ	4.801***	0.127	25.400***	1.112	0.647***	0.029
Coefficients of correlation ρ						
ρ_{12}			0.353	0.221		
ρ_{13}			0.051	0.057		
ρ_{23}			0.368***	0.128		
Log-likelihood			-6,013.52			
Number of Observations			1,048			

Significance levels: * = p<.10;**=p<.05;***=p<.01. Each equation also includes an intercept and missing variable indicators.

Table 7. Maximum Likelihood Estimates of the Simultaneous Equations Model for the Relationship between First-term Parental Transfers, Hours Worked, and College GPA for Two-Year College Students

	Equation I Dependent Variable: Parental Transfers (in 1,000s)		Equation II Dependent Variable: Hours Worked Per Week		Equation III Dependent Variable: GPA (4 point scale)	
Independent Variables	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Hours worked per week	-0.050**	0.024			-0.009	0.014
Parental transfers (in 1,000s)			-2.454***	2.112		
Respondent's characteristics						
Age on December 31, 1996	-0.085	0.085	-0.879	1.016	0.038	0.036
Male	-0.204	0.183	0.159	2.178	-0.079	0.078
Hispanic	-0.411*	0.256	-5.393*	2.959	-0.036	0.114
Black	-0.411*	0.249	-2.678	2.844	-0.112	0.106
Other race (nonwhite)	-0.115	0.805	8.262	9.147	-0.348	0.351
High school grades (8 point scale)	-0.056	0.073	0.608	0.850	0.135***	0.030
ASVAB – arithmetic reasoning	-0.010	0.208	2.023	2.412	0.153*	0.088
ASVAB – word knowledge	-0.231	0.202	0.834	2.302	-0.003	0.083
ASVAB – paragraph comprehension	-0.018	0.195	1.439	2.298	-0.003	0.085
ASVAB –mathematical knowledge	0.373**	0.191	1.023	2.272	-0.003	0.081
Net price of schooling (in 1,000s)	0.360***	0.067	2.089**	0.878		
Net price of schooling squared	0.015***	0.006	-0.102	0.149		
Family background variables						
Mother high school degree	0.149	0.256	-4.029	2.867	-0.094	0.109
Mother 4 year degree	0.124	0.351	-4.228	3.993	-0.120	0.150
Father high school degree	0.002	0.243	-3.425	2.662	-0.023	0.103
Father 4 year degree	-0.198	0.335	-9.011***	3.554	-0.067	0.150
Parents' income (in 10,000s)	0.184***	0.064				
Parents' income squared	-0.006**	0.002				
Parents' net worth (in 10,000s)	0.016	0.010				
Parents' net worth squared	-0.000	0.000				
Number of siblings	-0.059	0.064				
Labor market variables matched to location in which respondent attended college						
State work study program available			-0.751	2.056		
County unemployment rate			-1.342***	0.554		
State minimum wage	0.001	0.217	0.316	2.597		
σ	1.805***	0.146	23.076***	0.985	0.870***	0.066
Coefficients of correlation ρ						
ρ_{12}			0.482*	0.273		
ρ_{13}			0.139	0.111		
ρ_{23}			0.280	0.266		
Log-likelihood			-3,361.72			
Number of Observations			567			

Significance levels: * = p<.10;**=p<.05;***=p<.01. Each equation also includes an intercept and missing variable indicators.

Table 8. Marginal Effects for Key Variables in Simultaneous Equations Model

Independent Variables	Four-Year College Students		Two-Year College Students	
	Dependent Variable: Parental Transfers (in 1,000s)	Dependent Variable: Hours Worked Per Week	Dependent Variable: Parental Transfers (in 1,000s)	Dependent Variable: Hours Worked Per Week
Hours Worked per week	-0.025		-0.023	
Parental Transfers (in 1,000s)		-0.954		-1.833
Net Price of Schooling (in 1,000s)	0.249	0.291	0.172	1.495
Number of Observations	1,048		567	

Appendix

Table A1. Sample Construction

Stepwise deletions	N = 8,894
Didn't complete a term in college	-5700
Missing GPA data	-723
Missing parental transfer data	-202
Missing hours worked data	-114
Missing college code for matched data	-74
Missing net price of schooling data	-291
Missing valid state of residence	-7
Unmatchable county code	-1
Missing number of siblings	-16
Missing interviews so can't determine first term in college	-6
Missing high school grades	-10
Missing type of college term	-135
Sample in four-year college	1,048
Sample in two-year college	567

Table A2. Maximum Likelihood Estimates of the Simultaneous Equations Model for the Relationship between First-term Parental Transfers, Hours Worked, and College GPA for Full-time College Students

	Equation I Dependent Variable: Parental Transfers (in 1,000s)		Equation II Dependent Variable: Hours Worked Per Week		Equation III Dependent Variable: GPA (4 point scale)	
Independent Variables	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Hours worked per week	-0.106**	0.042			-0.014**	0.007
Parental transfers (in 1,000s)			2.096***	0.627		
Respondent's characteristics						
Age on December 31, 1996	-0.011	0.132	0.860	0.717	0.014	0.019
Male	-0.033	0.294	-4.103**	1.638	-0.125***	0.043
Hispanic	-0.857**	0.436	-1.794	2.494	-0.003	0.062
Black	-1.010**	0.410	-9.012***	2.060	-0.115*	0.059
Other race (nonwhite)	-2.010	1.362	-10.839	7.657	-0.351*	0.191
High school grades (8 point scale)	-0.166	0.141	-2.679***	0.680	0.162***	0.021
ASVAB – arithmetic reasoning	-0.186	0.312	-0.463	1.728	-0.013	0.045
ASVAB – word knowledge	-0.559**	0.280	0.084	1.539	0.072*	0.040
ASVAB – paragraph comprehension	0.376	0.287	1.082	1.572	-0.003	0.041
ASVAB –mathematical knowledge	0.642**	0.300	0.009	1.697	0.029	0.043
Net price of schooling (in 1,000s)	0.392***	0.043	0.718**	0.353		
Net price of schooling squared	0.008***	0.002	-0.039	0.024		
Family background variables						
Mother high school degree	1.308***	0.437	3.414	2.389	0.013	0.062
Mother 4 year degree	1.362***	0.482	2.234	2.723	0.012	0.068
Father high school degree	0.032	0.388	-3.218	1.996	-0.070	0.055
Father 4 year degree	0.171	0.431	-5.917**	2.426	-0.013	0.063
Parents' income (in 10,000s)	0.337***	0.093				
Parents' income squared	-0.010***	0.003				
Parents' net worth (in 10,000s)	0.061***	0.014				
Parents' net worth squared	-0.0002***	.00004				
Number of siblings	-0.220**					
Labor market variables matched to location in which respondent attended college						
State work study program available			-0.116	1.401		
County unemployment rate			-0.338	0.412		
State minimum wage	0.536	0.395	1.244	2.116		
σ	4.477***	0.140	24.272***	0.952	0.694***	0.034
Coefficients of correlation ρ						
ρ_{12}			0.529**	0.212		
ρ_{13}			0.074	0.049		
ρ_{23}			0.340**	0.151		
Log-likelihood			-7,878.20			
Number of Observations			1,347			

Significance levels: * = p<.10;**=p<.05;***=p<.01. Each equation also includes an intercept and missing variable indicators.

Table A3. Maximum Likelihood Estimates of the Simultaneous Equations Model for the Relationship between First-term Parental Transfers, Hours Worked, and College GPA for Part-time College Students

	Equation I Dependent Variable: Parental Transfers (in 1,000s)		Equation II Dependent Variable: Hours Worked Per Week		Equation III Dependent Variable: GPA (4 point scale)	
Independent Variables	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Hours worked per week	-0.061*	0.037			-0.014	0.010
Parental transfers (in 1,000s)			-0.898	0.969		
Respondent's characteristics						
Age on December 31, 1996	-0.182	0.233	-0.170	1.458	0.083	0.053
Male	-0.432	0.438	-2.297	2.744	-0.141	0.101
Hispanic	0.623	0.620	-6.495*	3.714	0.064	0.139
Black	0.352	0.654	-7.581**	3.764	-0.197	0.147
Other race (nonwhite)	-	-	-	-	-	-
High school grades (8 point scale)	0.149	0.173	-0.834	1.098	0.108***	0.040
ASVAB – arithmetic reasoning	0.236	0.478	-3.564	3.004	0.317***	0.109
ASVAB – word knowledge	-0.733	0.471	1.472	2.971	-0.026	0.107
ASVAB – paragraph comprehension	0.428	0.512	-2.915	3.212	-0.065	0.117
ASVAB –mathematical knowledge	0.581	0.446	1.496	2.845	-0.032	0.102
Net price of schooling (in 1,000s)	0.382***	0.098	-0.988*	0.681		
Net price of schooling squared	0.049***	0.013	-0.184***	0.087		
Family background variables						
Mother high school degree	1.199*	0.627	-1.518	3.803	0.080	0.137
Mother 4 year degree	1.814**	0.813	-13.552***	4.865	-0.100	0.195
Father high school degree	-0.388	0.553	-0.771	3.366	0.006	0.121
Father 4 year degree	1.285*	0.678	-8.176*	4.209	-0.172	0.155
Parents' income (in 10,000s)	0.347**	0.146				
Parents' income squared	-0.010*	0.005				
Parents' net worth (in 10,000s)	0.025	0.024				
Parents' net worth squared	-0.0001	0.0001				
Number of siblings	0.178	0.165				
Labor market variables matched to location in which respondent attended college						
State work study program available			-0.725	2.478		
County unemployment rate			-2.422***	0.859		
State minimum wage	-0.222	0.574	6.916**	3.340		
σ	3.659***	0.274	24.437***	1.148	0.927***	0.070
Coefficients of correlation ρ						
ρ_{12}			-0.491***	0.163		
ρ_{13}			-0.074	0.097		
ρ_{23}			0.370**	0.180		
Log-likelihood			-2,574.94			
Number of Observations			402			

Significance levels: * = p<.10;**=p<.05;***=p<.01. Each equation also includes an intercept and missing variable indicators.

Table A4. Maximum Likelihood Estimates of the Simultaneous Equations Model for the Relationship between Hours Worked and College GPA for Four-Year College Students, Treating Transfers as Exogenous

	Equation I		Equation II	
	Dependent Variable: Hours Worked Per Week		Dependent Variable: GPA (4 point scale)	
Independent Variables	Coef.	S.E.	Coef.	S.E.
Hours worked per week			-0.012*	0.006
Parental transfers (in 1,000s)	-0.752***	0.229		
Respondent's characteristics				
Age on December 31, 1996	1.042	0.925	0.025	0.021
Male	-6.334**	1.995	-0.116**	0.046
Hispanic	4.975	3.092	0.040	0.070
Black	-7.174**	2.602	-0.070	0.059
Other race (nonwhite)	-28.725**	13.907	-0.178	0.223
High school grades (8 point scale)	-3.011***	0.860	0.187***	0.022
ASVAB – arithmetic reasoning	0.525	2.178	0.016	0.049
ASVAB – word knowledge	0.223	1.878	0.075*	0.041
ASVAB – paragraph comprehension	-0.391	2.022	0.009	0.045
ASVAB –mathematical knowledge	0.791	2.051	0.027	0.045
Net price of schooling (in 1,000s)	0.109	0.269		
Net price of schooling squared	-0.017	.0179		
Family background variables				
Mother high school degree	6.464**	3.129	0.093	0.072
Mother 4 year degree	3.076	3.309	0.066	0.073
Father high school degree	-1.801	2.459	-0.045	0.056
Father 4 year degree	-6.258**	2.616	-0.024	0.060
Labor market variables matched to location in which respondent attended college				
State work study program available	-0.005	1.893		
County unemployment rate	-1.187*	0.607		
State minimum wage	2.133	2.726		
σ	25.420***	0.937	0.640***	0.028
Coefficient of correlation ρ	0.335**	0.148		
Log-likelihood	-3,536.52			
Number of Observations	1,048			

Significance levels: * = p<.10;**=p<.05;***=p<.01. Each equation also includes an intercept and missing variable indicators.

Table A5. Maximum Likelihood Estimates of the Simultaneous Equations Model for the Relationship between Hours Worked and College GPA for Two-Year College Students, Treating Transfers as Exogenous

	Equation I		Equation II	
	Dependent Variable: Hours Worked Per Week		Dependent Variable: GPA (4 point scale)	
Independent Variables	Coef.	S.E.	Coef.	S.E.
Hours worked per week			-0.008	0.010
Parental transfers (in 1,000s)	-2.496***	0.903		
Respondent's characteristics				
Age on December 31, 1996	-0.953	1.032	0.037	0.036
Male	0.098	2.210	-0.079	0.077
Hispanic	-5.746*	3.013	-0.031	0.107
Black	-3.025	2.875	-0.109	0.103
Other race (nonwhite)	9.140	9.249	-0.357	0.342
High school grades (8 point scale)	0.624	0.863	0.135***	0.030
ASVAB – arithmetic reasoning	1.958	2.454	0.150*	0.086
ASVAB – word knowledge	0.799	2.344	-0.003	0.082
ASVAB – paragraph comprehension	1.608	2.325	-0.005	0.083
ASVAB –mathematical knowledge	0.974	2.298	-0.002	0.080
Net price of schooling (in 1,000s)	2.176**	0.800		
Net price of schooling squared	-0.032	0.109		
Family background variables				
Mother high school degree	-3.925	2.890	-0.090	0.105
Mother 4 year degree	-3.850	4.040	-0.116	0.145
Father high school degree	-3.605	2.686	-0.019	0.098
Father 4 year degree	-9.269**	3.610	-0.061	0.137
Labor market variables matched to location in which respondent attended college				
State work study program available	0.292	2.253		
County unemployment rate	-1.233**	0.600		
State minimum wage	0.071	2.672		
σ	23.433***	0.912	0.863***	0.047
Coefficient of correlation ρ	0.258	0.194		
Log-likelihood	2,645.29			
Number of Observations	567			

Significance levels: * = p<.10;**=p<.05;***=p<.01. Each equation also includes an intercept and missing variable indicators.