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

Charlene Marie Kalenkoski
Ohio University
Department of Economics
Bentley Annex 351
Athens, OH 45701
Phone: (740) 593-2022
Fax: (740) 593-0181
kalenkos@ohio.edu

Sabrina Wulff Pabilonia
Bureau of Labor Statistics
Division of Productivity Research and Program Development
2 Massachusetts Avenue, NE Rm. 2180
Washington, DC 20212
Phone: (202) 691-5614
Fax: 202-691-5664
Pabilonia.Sabrina@bls.gov

August 2008

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 provide some evidence that greater hours of work lead to lower grade point averages (GPAs).
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 Kweku Opoku-Agyemang, Anastasiya Osborne, Tatevik Sekhposyan, and Judy Yang for research assistance. The authors would also like to thank Alison Aughinbaugh, Michael Giandrea, Mark Long, Peter Meyer, David Ribar, Larry Rosenblum, Donna Rothstein, Leslie Stratton, Leo Sveikauskas, Bruce Weinberg, Cindy Zoghi, and three anonymous referees 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 news release by the U.S. Bureau of Labor Statistics, 49 percent of all four-year college students aged 16-24 and 61 percent of all two-year college students aged 16-24 were employed in October 2006 (U.S. Department of Labor 2007). 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 and Tuma (1984), Ruhm (1995, 1997), Light (1999, 2001), and Neumark and 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, when using a life cycle model that controls for unobserved individual heterogeneity and sample selection bias, Hotz et al. (2002) find that the positive effects of employment while in college on males' future full-time wages are significantly diminished and may, in fact, be negative for some demographic groups. Hotz et al. (2002) further find that the return to full-time schooling in terms of wages is greater than any return to work while in school, suggesting that work that detracts from schooling reduces future wages. Indeed, college employment may 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 Garman (1995), as well

as Jones and Jackson (1990), find that college grades 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. 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 12^{th} grade math achievement. Oettinger (1999) similarly shows a decline in the grades of minority high school students who work long hours. Dustmann and van Soest (2007) find that part-time employment while in school has a small negative effect on males' exam performance in the U.K. 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 the first-year grade point averages (GPAs) of male two-year college students and no effect of working on the first-year GPAs of male four-year college students. More recently, Stinebrickner and 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 existing research on the effects of college students' employment on their academic achievement. First, earlier studies tend to rely on small samples. Of the U.S. studies, Ehrenberg and Sherman (1987) examine only male high school graduates that were enrolled in college full-time, while Stinebrickner and 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 1-8 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 student employment pay little attention to the reasons why such students work. One reason college students might work is that they might face borrowing constraints. Federally guaranteed student loan maximums are set well below the full cost of college, and credit cards available to college students often have high interest rates and low spending limits. Another reason is that financial aid awards (including guaranteed student loan awards) assume that parents will pay a certain amount towards their child's education, their Expected Parental Contribution (EPC), but there is no mechanism to force reluctant parents 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 (2001a) and Dustmann et al. (2008). 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, in

[1] Kalenkoski (2005) shows that a substantial portion of parents transfer less than their 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.

particular the net price of schooling (tuition minus financial aid that does not need to be repaid) faced by a student and the transfers s/he receives from her/his parents.[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 (2008), but in contrast to Oettinger (2005), who treats parental transfers as exogenous. The model motivates the testing of several key hypotheses. First, smaller parental transfers will result in longer hours worked while in college, all else, including the net price of schooling, held constant. Second, because we treat transfers as endogenous in the model, an increase in student work hours will reduce parental transfers. Third, an increase in the net price of schooling, holding parental transfers and everything else constant, will lead to an increase in hours worked. Finally, an increase in hours worked will 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 parental transfer is an endogenous determinant of a student's hours of work, the student's hours of work is an endogenous determinant of the parental transfer, and hours worked is an endogenous determinant of the student's GPA. Estimates are presented separately for four-year and two-year college students because students attending these different types of colleges are likely to have different preferences regarding their postsecondary education and also because

[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.

they face different returns to work. Molitor and Leigh (2005), for example, show a larger wage return to working while attending a community college than while attending a four-year college, suggesting that work and schooling are more complementary for two-year than for four-year college students. In fact, many two-year colleges make an effort to coordinate class times with student work schedules by offering evening classes and courses that provide for the training needs of local employers (Kane and Rouse 1999). Therefore, the magnitude of the effect of employment during college on student achievement may vary by type of institution.

Estimates from this model show that the NLSY97 data do support the hypotheses that a decrease in parental transfers increases the work hours of four-year college students. They also show that an increase in the net cost of schooling increases the number of hours worked by students at both four-year and two-year institutions. However, these effects are quite small. The estimates also support the hypothesis that an increase in hours worked negatively affects students' grades, with larger negative effects for two-year students than four-year students. 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 empirical analysis. Section III describes the data. Section IV presents the econometric model. Section V interprets the main results and those of several sensitivity analyses. Finally, Section VI concludes this paper.

II. Theoretical Motivation

To motivate our empirical analysis, we present a simple, stylized theoretical model that 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. However, adding leisure to the theoretical model would not change any of the predictions that we use to motivate our empirical analysis.[3] Derivations are provided in an appendix available from the authors upon request. Let academic achievement, A, be given by the function

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

where $\partial A/\partial(1\text{-}L) > 0$, that is, academic achievement is a positive function of the time a student spends in schooling-related activity[4], 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.[5] 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

[3] Including leisure directly in the model would add another endogenous variable and hence another simultaneous equation to our empirical analysis. However, we are unable to estimate a system of four simultaneous equations where some of the variables are censored and we do not have data on leisure time.

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

[5] There are other possible models where parental altruism is not assumed that could describe transfer behavior within families, such as an exchange model (Cox 1987).

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

$$wL + t = P_s(1-L) + C_c, \tag{3}$$

where w is the child's wage, t is the transfer the child receives from the parent, and P_s is the net price of full-time schooling.[6]

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.[7] 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.

[6] In reality, some students do take out student loans and incur credit card debt to finance their postsecondary education. However, as discussed in the introduction, students may not be able to borrow enough to completely cover the cost because they face federally guaranteed student loan maximums and high credit card interest rates. Thus, amounts not covered by parental transfers would need to be paid by the student through his or her own earnings. However, if one were to add loans as a choice variable in the model described here, it would not change the signs of the predictions that we test in the empirical analysis. (Derivations are available from the authors upon request.) Hence, we abstract from this complexity here. One should note, however, that incorporating loans into the theoretical model would require adding a loan equation to our simultaneous model and would generate the expected additional prediction that students work less when loans increase. However, we are limited in the number and types of regressions we can estimate simultaneously in aML.

[7] 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. $M_p = M_p(N)$, $dM_p/dN < 0$.

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*. Note that the assumption of simultaneous moves by the parent and child makes transfers endogenous to the child's decisions in this model. If the parent were to move first, parental transfers could be treated as an exogenous determinant of the child's hours of work. In the empirical analysis we also estimate a specification where transfers are treated as exogenous.

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

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

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.[8]

[8] For the most part using these specific functional forms does not change the predictions of the model that we use to motivate our empirical analysis. However, in a model with general functional forms and the assumptions of positive and diminishing marginal utility and marginal product, one is unable to determine the sign of the effect of the student's hours of work on parental transfers. One is also unable to determine the sign of the effect of the student's wage on his/her hours of work. However, this is also true in the model with specific functional forms, unless we make the assumption that the cost of full-time schooling is greater than the parental transfer amount.

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:

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

If P_s is greater than t, then L is positive. In other words, a student will work if the cost of full-time schooling is greater than the parental transfer. 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. Finally, it can be shown that the sign of $\partial L / \partial w$ is negative.[9]

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 $\partial t / \partial M_p > 0$, $\partial t / \partial L < 0$, $\partial t / \partial P_s > 0$, 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.

Potential Endogeneity of the Net Price of Schooling

[9] This depends on the assumption that the net price of schooling is greater than the parental transfer.

The model we have just described treats the net price of schooling as exogenous. However, this variable may be endogenous to the child's work and parental transfer decisions if a higher price of schooling reflects a choice of higher "quality" schooling (which is plausible given that a student who is willing to pay more must believe that he or she is getting more) and the student chooses how much he or she is willing to pay for quality jointly with his or her decision regarding how much to work in the market (perhaps because he or she will need to pay for a portion of the price with own earnings). Therefore, we modify the above model to treat the price of schooling as endogenous. We assume that a higher price of schooling reflects higher quality and that the student just chooses P_s directly along with L. We also assume that a higher price of schooling (reflecting higher quality) leads to higher achievement. Thus, the new achievement production function is given by

$$A = kP_s(1-L) + \mu. \qquad (13)$$

In addition to the work and transfer reaction functions, we also derive a net price of schooling reaction function for this model. It can be shown for the net price of schooling reaction function that, assuming $P_s > 0$, $\partial P_s / \partial L > 0$, $\partial P_s / \partial t > 0$, and $\partial P_s / \partial w > 0$. That is, an increase in student hours of work leads to a higher net price of schooling, an increase in the parental transfer increases the net price of schooling, and an increase in the student wage increases the net price of schooling. For the work reaction function $\partial L / \partial t < 0$ and $\partial L / \partial w < 0$ as before. However, the sign on $\partial L / \partial P_s$ is no longer positive but ambiguous.[10] The relationships among the variables in the transfer reaction function retain the same signs as before. Derivations are available from the authors upon request.

[10] If it is instead assumed that the student's ability positively affects the marginal product of schooling-related time, i.e., μ enters the achievement function multiplicatively rather than additively, it would give the same key results with one exception. It would allow us to positively sign $\partial L / \partial P_s$ as in the model that treats price as exogenous.

III. Econometric Model

We do not estimate a structural model. However, the exogenous price model we 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 student hours worked leads to reduced parental transfers. Third, 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:

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

and

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

where t^* is the latent variable measuring the parent's desired 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, 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 error terms 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.[11]

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 is not in X_3. To identify parental transfers we use the respondent's number of siblings as this variable should capture the degree to which there is competition for parental resources. A similar variable has been used for this purpose by Wolff (2006). We also include parents' income and net worth (and their squares) in the transfer equation but exclude them from the other equations. These variables can be excluded from the hours worked equation because, according to the theoretical model, parental resources affect the hours worked by the student only through their transfer. Wolff (2006), Pabilonia (2001b), and Dustmann et al. (2008) make a similar parental income exclusion restriction. All of these variables used to identify parental transfers in

[11] Similar to previous studies, this analysis assumes that the decisions whether and where to enroll in college 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 apply only to enrolled students.

the hours equation are also excluded from the GPA equation as they do not directly enter the production function in the theoretical model.

With respect to identifying hours of work in both the transfer Tobit and GPA regression, we include several variables in the work equation that we exclude from the other equations. These include the county unemployment rate as a measure of local labor market conditions and an indicator for the existence of a state work study program in addition to the federal work study program. Wolff (2006) used an unemployment rate variable for similar purposes. We are unaware of any other study that uses a state work study program variable to identify hours. However, it makes sense to include it because such a program's existence is exogenous to the student's decisions and represents an additional outlet for student employment. A proxy for the student wage, the effective minimum wage in a student's state, is also included in the hours of work equation but excluded from the GPA equation to identify hours in the GPA equation. The effective minimum wage may be excluded from the GPA equation because the student's wage does not enter into the GPA production function in the theoretical model and we already control for student ability in the GPA equation.

IV. Data

The primary data used in this analysis come from the NLSY97 geocode file Rounds 1 through 8. 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. Subsequently, youth

respondents were interviewed annually. By Round 8, all respondents were between the ages of 19 and 25 and thus were old enough to have completed a first term in college.

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 8, 3,520 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. Thus, a pooled cross-section of students' first college experiences from the fall term of 1996 through the spring term of 2004 is examined. Note that the first term is also important for us to analyze because students are more likely to drop out of college in the first year (Stratton et al. 2005), and college drop-outs have significantly lower earnings than college graduates. However, we will still miss students who drop out before finishing their first term. These students are perhaps the poorest performers and thus may be the most negatively affected by work. Therefore, excluding them from the analysis potentially biases our results against finding a negative effect of work on GPA. This provides additional support for any statistically significant negative effects we do find.

Of those respondents that can be identified as having completed at least one college term, we have valid information on our dependent variables for 2,356. When we delete observations for respondents with missing information on key independent variables, the sample is reduced to 2,049 (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, we drop an additional 18 respondents whose school type cannot be identified. We can identify 1,282 students who attended colleges that offer a four-year bachelor's degree or higher and 749

students who attended colleges that offer at most a two-year degree, using data on colleges and universities provided by the U.S. Department of Education's Integrated Postsecondary Education Data System (IPEDS).[12] 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, 43.8 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, 11.9 percent of four-year students in the analysis sample are black compared to 11.7 percent 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, in the theoretical model, hours spent in schooling-related activity are chosen simultaneously with hours spent in market work. 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 non-Hispanics and to have 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.

[12] IPEDS data are matched to the NLSY97 data using a college identification number (UNITID code) available in the geocode version of the NLSY97.

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.[13] 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-two percent of four-year college students received a parental transfer in their first term (see Table 1), $4,180 on average.[14]

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 the first week 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.

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. Because 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'

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

[14] This is higher than the average transfer of $2,944 (converted by the authors to 1997 dollars) in Oettinger's (2005) single public university sample; however, our sample includes not only public universities and colleges but also private ones that are generally more expensive.

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 – 3.05 versus 2.90. 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. 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 IPEDS. 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 used to construct this net price variable is created 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.

Other key explanatory variables are parents' income and net worth (and their squares) as measured in 1996. 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. Another variable intended to measure parental resources available to the respondent is the respondent's number of siblings from Round 1 of the NLSY97. There is some concern that the number of siblings is potentially endogenous, as parents may trade off the quality and quantity of children (Becker & Tomes 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.

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 minimum wage is used as a proxy for the student's wage. The legal minimum wage is defined as the maximum of the state and federal minimum wages. The minimum wage seems to be an appropriate proxy for the 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 et al. 1997).

We include several other variables that are expected to affect work hours. One of these is 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. 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 1996-2004, the period covered by these data. A state work study program is a program similar to the federal work study program that subsidizes the employment of needy college students but is funded by the state rather than the federal government. This variable is constructed using historical information on state work study programs collected by the authors directly from the relevant state agencies. Seventeen states had a state-supported work study through most of the period under study.[15]

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, and the respondent's ASVAB percentile score, are included in all equations to control for heterogeneous preferences and productivity in producing academic achievement. [16]

V. Results

In Table 4, we present coefficient estimates and standard errors from our simultaneous model for key variables, separately for four-year and two-year college students.[17] A likelihood ratio (LR) test confirms that the coefficients for these two groups are, indeed, significantly different. With respect to the financial motivation variables we find that increased parental

[15] These states include California, Colorado, Florida, Idaho, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Nevada, New Mexico, Ohio, Pennsylvania, Rhode Island, Utah, and Washington. California discontinued their program in August 2003 and Rhode Island and Iowa in July 2001. Iowa's program was restarted in June 2005.

[16] 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 are a composite measure of math and verbal aptitude percentile score constructed by NLSY97 staff from the computer adaptive form of the Armed Services Vocation Aptitude Battery. This composite measure is similar to the AFQT score.

[17] Full coefficient estimates are available from the authors upon request.

transfers reduce the hours worked per week, although the effect is statistically significant only for four-year students. This may be because the higher cost of four-year institutions on average may make four-year students rely more on parental transfers. The estimated negative coefficients representing the effect of hours worked on transfers are not statistically significant for either the four-year or two-year students, suggesting that parents' transfer decisions do not depend on how much their children work in the market. We also find that the net price of schooling positively affects parental transfers and is statistically significant for both four-year and two-year students, suggesting that parents will provide more support for a child's schooling the more it costs. Note that this positive effect is increasing in the price of schooling for four-year students but decreasing for two-year students. Again this may reflect the fact that four-year students are more reliant on their parents to fund their schooling than two-year students. The net price of schooling also has a positive effect on student work hours, although the effect is statistically significant only for two-year students. In fact, the effect on work hours is increasing in the net price of schooling for two-year students. Thus, it appears that students in four-year programs are more reliant on parents' transfers and two-year students are more reliant on their own earnings to obtain funding. Together, these results suggest that financial considerations do play a role in how much students work, although differently for four-year and two-year students.

With respect to the question of whether this work is harmful to students' achievement, we find the expected significant negative effect of hours worked per week on first term GPA for both four-year and two-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 15.20 hours (a one standard deviation increase) have on average a 0.18 lower GPA, a result similar to that found by Oettinger (2005), but one much smaller than

that found by Stinebrickner and Stinebrickner (2003). Two-year college students who increase their hours of work by 19.78 hours have on average a 0.53 lower GPA. Single equation estimates (available from the authors) do not show this significant negative effect, emphasizing the importance of controlling for the endogeneity of hours worked.

For both the four-year and two-year samples, the correlation between the unobserved determinants of hours worked and GPA, ρ_{WG}, is estimated to be positive and significant at the 1% level, indicating that there is some unobserved variable, perhaps student motivation, that affects both the number of hours a student works and the student's GPA in the same way. These statistically significant correlation coefficients provide support for our joint estimation of the hours worked and GPA equations. However, a likelihood ratio test that compares the simultaneous model and a restricted model where all of the correlation coefficients are constrained to be equal to zero results in marginal p-values of 0.18 for the four-year sample and 0.25 for the two-year sample. Indeed, a likelihood ratio test comparing the fully simultaneous model to one where ρ_{TG} and ρ_{TW} and the coefficient on hours in the transfer equation are constrained to be equal to zero does not reject the simpler model with p-values of 0.39 for four-year students and 0.29 for two-year students. These results taken together suggest that perhaps the transfer Tobit need not have been estimated jointly with the work and GPA equations (i.e. transfers could be treated as an exogenous determinant of hours of work), although work and GPA should be estimated jointly. However, the key results do not change between the models where transfers are treated as exogenous and where they are treated as endogenous. Therefore, we present the fully simultaneous results.[18]

We now discuss our exclusion restrictions. As expected, both parental income and net worth have highly significant positive effects on parental transfers for four-year college students

[18] The logical consistency condition for this model, $1 - \gamma_1\gamma_2>0$, is satisfied.

and parental income has a significant positive effect on parental transfers for two-year college students. These results are not surprising as wealthier 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.[19] We have also excluded them from the GPA equation as parents' financial status does not enter the achievement production function in the theoretical model. However, as a robustness check, we also estimated a specification that includes income and net worth in the GPA equation because it is possible that students from wealthier families may have unobserved characteristics that affect academic outcomes, even after we control for parental education and student grades and test scores. These variables were insignificant in the GPA equation and our key results remained the same.

The county unemployment rate helps to identify hours worked in both the transfer and GPA equations and is a negative and statistically significant determinant of hours worked in the two-year sample. Unfortunately, however, it is not statistically significant for the four-year sample. The net price of schooling also helps to identify hours worked in the GPA equation.[20] This variable is also significant and positive for the two-year sample only. Another variable that was included to identify hours in both the transfer and GPA equations, the existence of a state work study program in the state in which the student is in college, is not statistically significant

[19] The number of siblings in the household is also used to help identify parental transfers in the hours of work equation, although it is not statistically significant.

[20] As a robustness check, we estimated a specification with the net price of schooling included in the GPA equation. This was done because the net price of schooling may reflect the quality of the institution attended and this quality may affect student GPAs. However, the net price of schooling was statistically insignificant in the GPA equation and the other key results remained unchanged.

for either sample.[21] Finally, the minimum wage, a variable intended to proxy for the student wage, should also have helped to identify hours of work in the GPA equation, but it is not a statistically significant determinant of hours of work for either four-year or two-year college students.[22] A test for the joint significance of all four of these variables in the hours of work equation indicates joint significance for the two-year sample only. However, the county unemployment rate and net price of schooling variables are jointly significant in the hours of work equation with a p-value of 0.10 for the four-year sample.

In Table 5 we present key marginal effects based on the coefficient estimates in Table 4. 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.

With respect to the magnitude of the negative effect of parental transfers on a four-year college student's hours of work, a reduction of $5,000 in parental transfers results in the student working almost three hours more per week. This is a small effect, as the earnings from the three additional hours worked per week would be less than $5,000 at typical college student wages.

[21] We also estimated a version of this simultaneous model where household siblings and the state work study program indicator are included in all equations rather than excluded from their respective transfer and work equations. This was done because one might challenge the former variable as previously discussed while the latter variable has not been used by other researchers. In the model using two-year college students, the effect of hours on GPA was insignificant and work study had a positive significant effect on GPA.

[22] Curiously, the estimated effect of the state minimum wage on parental transfers is positive and statistically significant, rather than negative, as expected. It is possible, however, that even though we intended for this variable to proxy for the student wage, it is capturing something else, perhaps economic conditions or general state support for youth.

With respect to the magnitude of the positive effect of the net price of schooling on parental transfers, an increase of $4,260 in the net price of schooling for four-year college students increases their parental transfers by $988.32, and a $1,380 increase in the net price of schooling for two-year college students increases their parental transfers by $51.06.[23] With respect to the positive effect of the net price of schooling on hours worked per week by two-year college students, a one standard deviation increase in the net price of schooling increases their hours worked per week by over two and a half hours. Similar to the effect of a reduction in parental transfers, the effect of an increase in the net price of schooling on these students' hours of work are small; earnings from the increased hours would cover only a small portion of the increased cost. All of these results taken together imply that, while students' work behavior is influenced by financial motivations, the effects are small.

VI. Sensitivity Analyses

We perform several sensitivity analyses to determine whether or not our results are robust to alternative specifications. One concern is that our model does not allow for the possibility that students can cover some of their schooling costs by taking out loans instead of using current earnings. While ideally we would like to add a loan regression to our model, we are limited in the number and types of regressions we can estimate simultaneously in aML. Therefore, in one sensitivity analysis (results not shown), we account for a student's loans per term by subtracting them from the current net price of schooling variable to obtain an alternative that reflects the cost

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

of schooling that must be paid now rather than later.[24] For our key estimates, whether or not we subtract loans from the net price of schooling does not affect our results.

An alternative, however, is to look at separate subsamples of students according to whether or not they receive loans, keeping in mind that such results should be treated with caution because whether or not a student receives a loan is a potentially endogenous variable and because these subsamples suffer from small sample sizes. In Tables 6 and 7 we provide the coefficient estimates and marginal effects for these subsamples. Results for students without loans are very similar to those for all students (our main specification), although the effect of hours on GPA is negative and statistically significant for the full sample of four-year students but not statistically significant for four-year students who do not receive loans. The magnitude and sign of the coefficient estimated for the four-year no loan subsample is consistent, however, with the sign on the coefficient for the full four-year sample. Other differences relate to the correlation coefficients. For four-year students without loans, ρ_{TW} is negative and significant while it is not statistically significant for the full sample of four-year students. For the full sample of four year students ρ_{WG} is positive and significant but it is not for the no-loan subsample.

Results for students with loans do, however, appear to be different from the results for the full samples of four-year and two-year students, although many of the estimated coefficients are statistically insignificant. In particular, the estimated effects of hours of work on GPA are not statistically significant for either the four-year or two-year students who receive loans, although the estimated effects were significant for the full samples of four-year and two-year students.

[24] Students were asked to provide information on loans from relatives and friends as well as government-subsidized and other types of loans. We include all types of loans.

Such results are likely due to the small sample sizes and the fact that four-year and two-year students who receive loans are select samples.

Another sensitivity analysis we perform is to estimate our model for full-time students only.[25] We do this because full-time and part-time students may behave differently in response to various personal and household characteristics and constraints. However, we caution the reader that, because of the time constraint, hours of schooling (and thus full-time student status) is an endogenous variable in our model. As for our main results, we provide estimates separately for four-year, full-time students and two-year, full-time students in the last two columns in each of Tables 6 and 7. For four-year, full-time students, the effect of transfers on hours of work is negative and significant as it is for all four-year students, suggesting that a reduction in parental transfers causes these students to work more in the market. The effect of hours on transfers is also negative and significant as predicted by the model. Note, however, that this is the only specification where we find empirical support for this prediction of the theoretical model. The four-year, full-time student specification also gives support for the joint estimation of the transfers and work tobits, as ρ_{TW} is significant and positive. As for all four-year students, the net price of schooling positively affects parental transfers and the effect of hours on GPA is estimated to be negative and statistically significant. For two-year, full-time students, as for all two-year students, the estimated coefficients for hours worked in the transfer equation and transfers in the hours worked equation are both statistically insignificant, suggesting no relationship between parental transfers and work hours for these students. As for all two-year students, the effect of hours worked on GPA is negative and significant.

[25] There were two few students (279) who attended school part-time to provide separate estimates.

Finally, in Tables 8 and 9 we consider a model in which the net price of schooling is treated as endogenous. In this model, we estimate an equation for the net price of schooling jointly with the hours worked and GPA equations. In this model, the net price of schooling now enters the GPA equation. We do not estimate a transfer equation (and thus treat transfers as exogenous) because, as previously discussed, our likelihood ratio tests suggest it may be unnecessary to estimate transfers jointly with hours of work and GPA. In addition, estimating four equations jointly in aML is not possible. However, it may be the case that transfers should be jointly estimated with the price of schooling and we are ignoring this quite likely possibility. Hence, we need to treat these results with caution.

In order to identify the effect of the net price of schooling in the hours of work and GPA equations, we include the average in-state tuition for public four-year institutions and the average state grant per 18-24 year old (in the state where the respondent's high school was located) in the net price of schooling equation but not in the other equations. These variables were obtained from the Digest of Education Statistics and converted to 1997 dollars (U.S. Department of Education 2007). Both variables are highly significant in the net price of schooling equation, suggesting their value for identification.

As in our preferred, exogenous price, specification, transfers negatively affect a four-year student's hours of work. However, while transfers are not a statistically significant determinant of a two-year student's hours of work in the preferred specification (although the sign on the coefficient is negative), they are a highly significant determinant of hours of work in the endogenous price specification, having a strong negative effect. Perhaps this difference in the estimated effect of transfers on work hours is the result of a high correlation between parental transfers and the net price of schooling for two-year students and the differential treatment in

terms of the endogeneity or exogeneity of parental transfers across the specifications. Nevertheless, the signs on the estimated effects of transfers on work hours are consistently negative across student type and model estimated.

An additional difference between the specifications is that, unlike the preferred specification where the net price of schooling increases the hours worked by two-year students at an increasing rate, the net price of schooling does not affect their hours worked in the endogenous price specification. One possible explanation is that a squared net price term is included in the preferred specification but cannot be included in the endogenous price specification. However, another explanation may be due to the fact that the estimate of ρ_{PW} for two-year students is negative and statistically significant, indicating that there is some unobserved factor, perhaps the quality of institution attended, that is positively associated with the net price of schooling and negatively associated with a student's hours of work. Higher quality schools cost more and, because they are more academically demanding, have students who work less in the market. Thus, the estimate of the effect of the net price of schooling on hours of work could be biased upward in the exogenous price model, reflecting the school quality choice rather than an actual causal effect of the net price of schooling on two-year students' work hours. An alternative unobserved factor is a student's relative preference for academic achievement. Such an unobserved factor could also be positively associated with the price of schooling as more elite schools cost more and negatively associated with hours of work as such schools require more study time, again leading to an upwardly biased coefficient on price in the hours worked equation in the exogenous price model.

Finally, another key difference across the specifications is that, while students' hours of work are estimated to negatively affect students' GPAs in the preferred specification, hours of

work are estimated to have no statistically significant effect on students' GPAs in the endogenous price specification. Note that a key difference between these specifications is that the net price of schooling does not enter into the GPA equation in the preferred specification but does in the endogenous price specification. If an unobserved determinant, such as school quality or a student's relative preference toward academic achievement, is positively associated with the net price of schooling but negatively associated with work hours, then omitting the net price of schooling from the GPA equation in the exogenous price model may have biased the effect of hours worked on GPA downward. However, because this model does not take into account the potential endogeneity of transfers, we urge caution in interpreting these results.

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. Thus it is important that we analyze the motivations for and the effects of such employment. In this paper, we motivate and estimate a model using data from the NLSY97, a nationally representative survey, that treats parental transfers, student work hours, and student GPA as simultaneously determined and that accounts for censoring in parental transfers and work hours. We test several hypotheses regarding the financial motives for and academic effects of college student employment and find empirical support for the hypothesis that a decrease in parental transfers increases the work hours of four-year college students. We also find that an increase in the net price of schooling increases the number of hours worked by two-year college students. Finally, we find evidence that an increase in hours worked negatively affects students' grades, with larger negative effects for two-year students than four-year students. This result is important, as it is

the first using data from a large, nationally representative survey to find a detrimental effect on student grades of working while in college. However, this result is not robust to all alternative specifications. In addition, our results are based only on the first-term experiences of college students and we focus on only one measure of academic performance. More research that explores student experiences beyond the first term as well as other measures of academic performance is needed.

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Table 1. Sample Means and Standard Deviations

	Four-Year Students (N = 1,282)		Two-Year Students (N = 749)	
Variables	**Mean**	**S.D.**	**Mean**	**S.D.**
Worked	.46		.72	
Hours of work	10.08	15.20	21.86	19.78
Hours of work (conditional on working)	21.98	14.68	30.39	15.51
College GPA	3.05	0.72	2.90	0.91
Parental transfer received	.72		.50	
Parental transfer (in 1,000s)	3.01	4.99	.50	1.08
Parental transfer (conditional on any) (in 1,000s)	4.18	5.28	0.99	1.27
Age on December 31, 1996	14.43	1.33	14.45	1.40
Male	.44		.45	
Hispanic	.06		.15	
Black	.12		.12	
Other race (nonwhite)	.01		.02	
High school grades (0-8 scale)	6.76	1.25	5.83	1.44
ASVAB	63.13	32.70	43.77	32.61
ASVAB scores missing	.12		.17	
Net price of schooling (in 1,000s)	.56	4.26	.41	1.38
Mother's education missing	.22		.28	
Mother high school degree	.33		.39	
Mother 4 year degree	.33		.15	
Father's education missing	.15		.18	
Father high school degree	.26		.28	
Father 4 year degree	.34		.16	
Parents' income missing	.08		.10	
Parents' income (in 10,000s)	5.98	5.97	4.35	4.56
Parents' net worth missing	.26		.27	
Parents' net worth (in 10,000s)	22.39	59.50	13.24	46.86
Number of siblings	1.40	1.20	1.48	1.27
State work study program	.43		.44	
County unemployment rate	4.14	1.52	4.90	2.09
State minimum wage	4.88	0.37	4.96	0.49

Note: Survey weights used.

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)	3.59 (5.58)	2.64 (3.81)	1.89 (4.37)	.52 (1.10)	.69 (1.56)	.40 (0.77)
Number of Observations	699	323	260	227	157	365

Note: Standard deviations are in parentheses. Survey weights used.

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	3.04 (0.74)	3.13 (0.64)	2.95 (0.76)	2.82 (1.04)	2.93 (0.78)	2.94 (0.90)
Number of Observations	699	323	260	227	157	365

Note: Standard deviations are in parentheses. Survey weights used.

Table 4. Maximum Likelihood Estimates of the Simultaneous Tobit Model for the Relationship between First-term Parental Transfers, Hours Worked, and GPA for College Students

	Four-Year Students	Two-Year Students
Dependent Variable: Parental Transfers (in 1,000s)		
Hours worked per week	-0.005	-0.018
	(0.033)	(0.017)
Net price of schooling (in 1,000s)	0.364***	0.119*
	(0.037)	(0.068)
Net price of schooling squared	0.008***	-0.035**
	(0.001)	(0.016)
Parents' income (in 10,000s)	0.449***	0.152***
	(0.119)	(0.056)
Parents' income squared	-0.011***	-0.006**
	(0.004)	(0.003)
Parents' net worth (in 10,000s)	0.055***	0.015
	(0.017)	(0.010)
Parents' net worth squared	-0.000***	-0.000
	(0.000)	(0.000)
Number of siblings	-0.197	-0.059
	(0.149)	(0.059)
State minimum wage	1.013**	0.098
	(0.478)	(0.164)
Dependent Variable: Hours Worked Per Week		
Transfers	-1.186***	-0.058
	(0.521)	(2.495)
Net price of schooling (in 1,000s)	0.290	2.237***
	(0.311)	(0.712)
Net price of schooling squared	-0.018	0.313*
	(0.025)	(0.184)
State work study program available	0.620	-1.850
	(1.724)	(1.784)
County unemployment rate	-0.670	-1.103**
	(0.565)	(0.481)
State minimum wage	1.786	0.117
	(2.477)	(1.875)
Dependent Variable : GPA (4 point scale)		
Hours worked per week	-0.012***	-0.026***
	(0.004)	(0.005)
Coefficients of correlation ρ		
ρ_{TW}	0.072	0.123
	(0.141)	(0.248)
ρ_{TG}	-0.047	0.089
	(0.045)	(0.137)
ρ_{WG}	0.302***	0.606***
	(0.079)	(0.060)
Log-likelihood	-7,333.36	-4,362.85
Number of Observations	1,282	749

Notes: Significance levels: * = p<.10;**=p<.05;***=p<.01. Standard errors are in parentheses. Each equation also includes age, gender, race/ethnicity, high school grades, ASVAB percentile scores, parents' education levels, and an intercept, and missing variable indicators.

Table 5. Marginal Effects for Key Variables in Simultaneous Equations Model

	Four-Year College Students		Two-Year College Students	
Independent Variables	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	-0.003 (0.00003)		-0.008 (0.0001)	
Parental Transfers (in 1,000s)		-0.567 (0.004)		-0.044 (0.002)
Net Price of Schooling (in 1,000s)	0.232 (0.003)	0.132 (0.002)	0.037 (0.001)	1.870 (0.024)
Number of Observations	1,282		749	

Notes: Marginal effects are calculated for each observation using the unconditional expected value and then averaging across observations. Bootstrapped standard errors are in parentheses.

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

	I. Four-year students		II. Two-year students		III. Full-time students	
	Loans	**No Loans**	**Loans**	**No Loans**	**Four-year**	**Two-Year**
Dependent Variable: Parental Transfers (in 1,000s)						
Hours worked per week	-0.023	0.169***	0.052	-0.019	-0.060*	0.000
	(0.046)	(0.036)	(0.055)	(0.015)	(0.035)	(0.022)
Net price of schooling (in 1,000s)	0.192***	0.552***	-0.386	0.281***	0.386***	0.127
	(0.062)	(0.065)	(0.398)	(0.089)	(0.036)	(0.088)
Net price of schooling squared	0.016***	0.011***	-0.026	-0.111**	0.009***	-0.036*
	(0.005)	(0.003)	(0.121)	(0.038)	(0.001)	(0.021)
Parents' income (in 10,000s)	0.439**	0.470**	-0.474	0.158***	0.419***	0.106
	(0.217)	(0.184)	(0.488)	(0.054)	(0.115)	(0.073)
Parents' income squared	-0.008	-0.013**	0.051	-0.006**	-0.010**	-0.003
	(0.008)	(0.006)	(0.042)	(0.002)	(0.004)	(0.004)
Parents' net worth (in 10,000s)	-0.059	0.063**	0.035	0.015	0.052***	0.024*
	(0.034)	(0.025)	(0.056)	(0.009)	(0.016)	(0.013)
Parents' net worth squared	-0.000	-0.000**	-0.000	-0.000	-0.000***	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Number of siblings	-0.268	-0.164	0.183	-0.059	-0.226*	-0.049
	(0.247)	(0.213)	(0.381)	(0.059)	(0.141)	(0.078)
State minimum wage	0.668	1.178	1.090	0.065	0.991**	0.199
	(0.775)	(0.720)	(1.123)	(0.152)	(0.464)	(0.215)
Dependent Variable: Hours Worked Per Week						
Parental Transfers (in 1,000s)	0.148	-1.518**	-1.587	1.157	-1.547***	1.783
	(1.06)	(0.603)	(7.060)	(2.612)	(0.541)	(2.758)
Net price of schooling (in 1,000s)	0.332	0.160	5.887*	1.649**	0.480	2.531**
	(0.554)	(0.461)	(3.216)	(0.742)	(0.313)	(0.930)
Net price of schooling squared	-0.020	-0.011	0.990	0.202	-0.016	0.477*
	(0.052)	(0.032)	(1.024)	(0.187)	(0.025)	(0.299)
State work study program available	1.333	-0.860	11.975	-2.205	0.028	-1.045
	(3.058)	(2.520)	(7.856)	(1.784)	(1.574)	(3.645)
County unemployment rate	-0.118	-1.463*	-0.837	-1.060**	-0.499	-0.768
	(0.968)	(0.845)	(1.656)	(0.499)	(0.522)	(0.538)
State minimum wage	-1.410	0.629	-9.951	1.006	2.531	-2.828
	(4.528)	(1.853)	(8.473)	(1.909)	(2.362)	(2.353)
Dependent Variable : GPA (4 point scale)						
Hours worked per week	0.005	-0.007	0.011	-0.036***	-0.017***	-0.022***
	(0.009)	(0.005)	(0.015)	(0.005)	(0.003)	(0.006)
Coefficients of correlation ρ						
ρ_{TW}	0.007	-0.412***	-0.523	0.108	0.301**	-0.177
	(0.217)	(0.121)	(0.427)	(0.239)	(0.148)	(0.270)
ρ_{TG}	-0.042	-0.075	0.199	0.106	-0.001	-0.031
	(0.059)	(0.081)	(0.296)	(0.160)	(0.053)	(0.135)
ρ_{WG}	-0.055***	0.137	-0.271	0.720***	0.416***	0.523***
	(0.216)	(0.137)	(0.421)	(0.042)	(0.059)	(0.092)
Log-likelihood	-2,938.82	-4,205.38	-663.48	-3,600.64	-10,349.06	-1,604.40
Number of Observations	509	746	118	627	1,234	542

Notes: Significance levels: * = p<.10;**=p<.05;***=p<.01. Standard errors are in parentheses. Each equation also includes age, gender, race/ethnicity, high school grades, ASVAB percentile scores, parents' education levels, and an intercept, and missing variable indicators.

Table 7. Marginal Effects for Key Variables in Simultaneous Equations Models

	I. Four-year Students		II. Two-year Students		III. Full-time students	
	Loans	**No Loans**	**Loans**	**No Loans**	**Four-year**	**Two-year**
Dependent Variable : Parental Transfers (in 1,000s)						
Hours Worked Per week	-0.014 (0.0002)	-0.071 (0.002)	0.022 (0.001)	-0.008 (0.0002)	-0.037 (0.0004)	0.0001 (0.0000)
Net Price of Schooling (in 1,000s)	0.121 (0.004)	0.245 (0.004)	-0.176 (0.008)	0.071 (0.003)	0.251 (0.003)	0.044 (0.001)
Dependent Variable: Hours Worked Per Week						
Parental Transfers (in 1,000s)	-0.421 (0.003)	-0.027 (0.0001)	-0.741 (0.005)	1.311 (0.008)	-0.741 (0.005)	1.311 (0.008)
Net Price of Schooling (in 1,000s)	-0.042 (0.001)	1.770 (0.018)	0.224 (0.002)	2.021 (0.047)	0.224 (0.002)	2.021 (0.047)
Number of Observations	509	746	118	627	1,234	542

Notes: Marginal effects are calculated for each observation using the unconditional expected value and then averaging across observations. Bootstrapped standard errors are in parentheses.

Table 8. Maximum Likelihood Estimates of the Simultaneous Equations Model for the Relationship between First-term Net Price of Schooling, Hours Worked, and GPA for College Students

	Four-Year Students	Two-Year Students
Dependent Variable: Net price of Schooling (in 1,000s)		
Hours worked per week	-0.015	0.028***
	(0.016)	(0.008)
Parental Transfers (in 1,000s)	0.163***	0.045
	(0.011)	(0.050)
Avg. in-state tuition for public 4-year institutions (in 1,000s)	0.342***	0.226***
	(0.072)	(0.037)
Average state grant per 18-24 year old	0.002**	0.002***
	(0.001)	(0.0004)
State minimum wage	-0.119	-0.367***
	(0.207)	(0.086)
Dependent Variable: Hours Worked Per Week		
Parental Transfers (in 1,000s)	-1.650***	-3.509***
	(0.567)	(1.269)
Net price of schooling (in 1,000s)	1.298	-2.110
	(2.523)	(4.107)
State work study program available	1.840	-5.931**
	(2.342)	(2.298)
County unemployment rate	-0.685	-1.185
	(0.814)	(0.752)
State minimum wage	3.249	-1.617
	(3.484)	(3.090)
Dependent Variable : GPA (4 point scale)		
Hours worked per week	0.0001	0.002
	(0.002)	(0.003)
Net price of schooling (in 1,000s)	-0.005	-0.048
	(0.006)	(0.037)
Coefficients of correlation ρ		
ρ_{PW}	0.045	-0.525***
	(0.219)	(0.147)
ρ_{PG}	0.076	0.013
	(0.048)	(0.069)
ρ_{WG}	0.001	0.063
	(0.064)	(0.085)
Log-likelihood	-4,936.30	-3,351.73
Number of Observations	1,282	749

Notes: Significance levels: * = p<.10;**=p<.05;***=p<.01. Standard errors are in parentheses. Each equation also includes age, gender, race/ethnicity, high school grades, ASVAB percentile scores, parents' education levels, and an intercept, and missing variable indicators.

Table 9. Marginal Effects for Key Variables in Simultaneous Equations Model for the Relationship between First-term Net Price of Schooling, Hours Worked, and GPA for College Students

	Four-Year Students		Two-Year Students	
Independent Variables	Dependent Variable: Net Price of Schooling (in 1,000s)	Dependent Variable: Hours Worked Per Week	Dependent Variable: Net Price of Schooling (in 1,000s)	Dependent Variable: Hours Worked Per Week
Hours Worked Per Week	-0.013 (0.00004)		0.021 (0.0002)	
Parental Transfers (in 1,000s)	0.137 (0.0005)	-0.744 (0.006)	0.035 (0.0003)	-1.680 (0.007)
Net Price of Schooling (in 1,000s)		0.585 (0.005)		-2.793 (0.011)
Number of Observations	1,282		749	

Notes: Marginal effects are calculated for each observation using the unconditional expected value and then averaging across observations. Bootstrapped standard errors are in parentheses.

Appendix

Table A1. Sample Size

NLSY97 Round1	8,894
Completed academic year college term (i.e. not including summer classes)	3,520
College GPA	2,614
Parental transfer data	2,396
Hours worked data	2,356
Valid net price of schooling data	2,086
Number of siblings	2,069
High school grades	2,050
Matchable county code for colleges	2,049
Sample in four-year college	1,282
Sample in two-year college	749
Sample of four-year, full-time students	1,234
Sample of two-year, full-time students	542
Sample of four-year college students with loans	509
Sample of four-year college students without loans	746
Sample of two-year college students with loans	118
Sample of two-year college students without loans	627

Note: Sample constructed using stepwise deletion.