THE SOUTHERN BUSINESS AND ECONOMIC JOURNAL

Volume 37, Number 1 2014

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Determinants of Students' Relative Time Allocation Decisions

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Abstract

This study examines the relationship between various student characteristics and student's time use. In particular, we use ordered probit models to estimate relative time use (work time vs. studying; work time vs. time in extracurricular activities; studying vs. time in extracurricular activities) using data from undergraduate students at a Southern four-year college. Our findings confirm some of the widespread beliefs that a higher grade point average (GPA) is associated with relatively more time spent studying than working or in extracurricular activities, and that higher financial support from family is associated with relatively more time spent in extracurricular activities than both working and studying. On the other hand, our findings also show that the HOPE scholarship and student ability, measured by SAT or ACT scores, do not influence time allocation.

Introduction

The study of time allocation can be traced to Gary Becker's (1965) seminal work. Since then economists have studied a wide variety of time allocation choices, ranging from the tradeoff between child care activities and education or work (Hill and Stafford 1974; and Kimmel and Connelly 2007) to church-related and other non-market activities (Clain and Zech 2008) and to even illegal activities and education (Leung 2004). This paper examines the tradeoff that occurs for college students between work time and other time uses (class time, study time, and extracurricular time). This paper extends the time allocation literature by analyzing how students allocate their time between various activities with a focus on the relative amount of time spent in each of these activities.

Research on the education production function can be classified into two streams (Bratti and Staffolani 2002). One research stream focuses on the effect of characteristics of educational institutions and school systems on student performance. These works often attempt to measure the impact of class size, student-teacher ratios, expenditures per pupil, etc. on student academic performance, usually measured using a student's grade point average (GPA) or test scores (SAT or ACT). The other research stream tends to focus on the impact of student behavior on academic performance. In particular, this stream of research primarily focuses on the negative impact of college student employment on grades, academic progress, or college social life (Kalenkoski and Pabilonia 2006; Stinebrickner and Stinebrickner 2003; Watts and Pickering 2000; Ford, Bosworth, and Wilson 1995; Paul 1982) or the impact of study time on academic performance (Schmidt 1983, Stinebrickner and Stinebrickner 2008, and Grave 2011). Even though it is of primary interest to policy makers to know how individuals may respond to changes in educational policy, little is known about students' decision processes on how to allocate their time. Knowing how students allocate their time in relative terms allows university officials to know before designing curriculum changes that may involve a work-study component, or that may involve the minimum GPA requirements for admission to a particular school or college within the university. The knowledge of how policies may affect different types of students is stated clearly by Idson and Clark (1991), who argue that "In order to achieve social goals, it is critical that policy makers possess knowledge concerning the behavior of the subjects of their policy, and their likely responses to variations in policy" (p. 89).

Economic theory suggests that optimal resource allocation happens when the extra benefit generated by the last dollar spent is equal regardless of where it is spent. This suggests that students' time use can be analyzed as a trade-off between different allocations of time by estimating the marginal productivities of certain time uses. If, for example, the marginal productivity of study time is greater than the marginal productivity of work time, then the rational student will choose to allocate more time to studying. However, students face different constraint intensities; some students are forced to work to help pay for college whereas others do not have to support themselves financially. Chen (2007) suggests that student outcomes (persistence and degree completion rates) are negatively impacted by part-time status, which is directly impacted by work status while enrolled.

Also, higher education costs are certainly a concern for students and their parents or guardians. The Higher Education Price Index (HEPI), which tracks the main cost drivers in higher education,

suggests that the cost of attending college tends to increase at a rate higher than inflation (Commonfund Institute). However, while education costs are important, some argue that the time constraint facing students is more important. Robinson and Godbey (1999) label that feeling the "time famine" and argue that lack of time is a bigger problem than the lack of money. This "time famine" drives the ways in which different students allocate their time to different activities.

Table 1: Time use on an average weekday for full-time university and college students

	Hours
Sleeping	8.3
Leisure and sports	3.9
Educational activities	3.2
Working	3.0
Other	2.2
Traveling	1.5
Eating and drinking	1.1
Grooming	0.8
Total	24.0

Note: Data include individuals, ages 15 to 49, enrolled full-time at a university or college. Data include non-holiday weekdays and are averages for 2003-2007. Source: Bureau of Labor Statistics

Regardless of how one chooses to shape the discussion or dissect the data on time use, some general trends are worth mentioning. Table 1 presents estimates from the American Time Use Survey, administered by the U.S. Bureau of Labor Statistics, which debuted in 2003. It shows average weekday time use allocations for full-time university and college students over the 2003-2007 period. The data indicate that, on average, college students spend more time in leisure and sports activities (what we call extracurricular in this research) than in both educational activities and working; however, the data also report that 53 percent of all college students ages 16 to 24 are employed during the academic term. The average college student spends approximately the same absolute number of hours in extracurricular activities, educational activities, and working. To combat some of the problems of using absolute hours, such as inaccurate estimation of the number of hours engaged in a particular activity or problems with recall (Juster and Stafford 1991), this work focuses on an analysis of the relative number of hours students spend in various activities.

College students today go through a totally different experience than college students did several decades ago. Babcock and Marks (2008) analyzed college students' time use over 50 years. They set up a two-period model in which students make decisions on time studying (acquiring human capital), time spent in leisure, and time spent in work in period 1. Analyzing four datasets (Project Talent, the National Longitudinal Survey of Youth, Higher Education Research Institute, and the National Survey of Student Engagement), they draw conclusions about college students' time spent on studying, leisure and work in 1961, 1981, 1987-89, and 2003-2005. Their empirical results suggest that over the past half century, changes in students' time allocations do not follow what the theory suggests. They find that full-time college students in the analyzed period increased work and leisure, but decreased academic time investment. For instance, study time dropped by about 10 hours per week between 1961 and the early-to-mid 2000s. This presents a puzzle in labor economics because for the same time period, returns to education have increased. Theoretical models suggest that when this returns to education increase, the optimizing behavior is to substitute into studying and thus to take time away from both leisure and work. The authors provided possible explanations of why studying time might have dropped. Their first explanation was that improved instructional technologies might have improved student effectiveness. Alternatively, declining academic standards might have also contributed to a decrease in time spent studying.

Since their goal was to explain overall trends, Babcock and Marks' theoretical model did not include controls for individual heterogeneity. Idson and Clark (1991) created a theoretical model where students make decisions about allocating time between school work and leisure in a static environment. Then they used SAT and ACT scores to control for ability and estimate models of time allocation via ordinary least squares (OLS) along three margins - studying, market work, and leisure. Their empirical results, which are based on students at two research universities, University of Miami (UM), and The University of Tennessee (UT), suggest that students with higher SAT scores (suggesting greater academic ability) allocate more time to studying and less time to leisure. At the same time, students with higher ability are less likely to hold jobs at UM, while the opposite was true for students at UT.

In this paper, we develop a theoretical model of relative time allocation for students. Then, we construct and test an empirical model that examines the trade-offs between students' various uses of time. Finally, we utilize the empirical results to analyze policy implications

for universities to help students maximize their academic performance.

Theoretical Model

Following Babcock and Marks (2011), consider an individual's utility maximization problem over two periods. Utility in the first period is a function of consumption (C_1) and leisure (L), and is represented by the utility function $U(C_1,L)$. Utility in the second period is merely a function of consumption (C_2), and is represented by the utility function $V(C_2)$. Time preference by the individual is represented by a discount factor, β. The individual can invest time into schooling in period 1, which is based on the individual's ability to produce human capital $f(S,\theta)$; and the return to this human capital is r. The individual can also decide to allocate some time (H) to work, which allows earnings to be spent, $H \cdot w$, on consumption. The individual also has an endowment of E that can also be spent on consumption during period 1. In addition, the individual spends all time in either work, leisure, or studying: $L + H + S = 1$.

Therefore, the individual's consumption during period 1 is $C_1 = wH + E$, and consumption during period 2 is $C_2 = w + rf(1 - L - H, \theta)$; that is, the individual consumes income and the returns of investment in schooling, and spends all period 2 time working. The utility and production functions are assumed to be continuously differentiable, strictly increasing, and strictly concave.

The individual's goal is then to choose L and H to maximize the following utility over a lifetime:

$$\max U(wH + E, L) + \beta V[w + rf(1 - L - H, \theta)] \quad (1)$$
$$\text{Subject to } L + H \leq 1$$

The first order conditions are:

$$U_L(wH + E, L) = \beta V_{C_2}[w + rf(1 - L - H, \theta)]rf'(1 - L - H, \theta) \quad (2)$$
$$U_{C_1}(wH + E, L)w = \beta V_{C_2}[w + rf(1 - L - H, \theta)]rf'(1 - L - H, \theta) \quad (3)$$

The left side of Equation 2 is the marginal benefit of leisure in period 1, and the right side is its marginal cost (or the marginal benefit of schooling, which is lost if the individual spends time in leisure instead). The left side of equation 3 is the marginal benefit of extra work and the right side is its marginal cost.

Since the right side of 2 and 3 are identical, this means that the marginal benefit of leisure has to equal the marginal benefit of work:

$$U_L(wH + E, L) = U_{C_1}(wH + E, L)w$$

The demand for H and L depend on the specific nature of the utility function, the human capital production function, the rate of return, r, and the individual's ability.[1] Due to the nature of our data (see the next section), we follow Clain and Zech (2008) in our empirical approach and estimate relative time use with an ordered probit model.

Data and Methods

Data

The data for this study come from a survey administered to students at a regional university in the State of Georgia in the spring 2005 term. This research project was approved by university's Institutional Review Board. College students were asked to respond to 65 questions covering demographic information, high school performance (e.g., high school grade point average, SAT or ACT scores), employment, parental income, parental influence, parental support, parental occupation, college academic data (e.g., credit hours completed, grade point average, and major), college employment (e.g., hourly earnings and hours worked), and other government or institutional financial support, including the merit-based Georgia HOPE ("Helping Outstanding Pupils Educationally") scholarship. The total sample size is 1,480 students. All university questions pertained to the fall 2004 term.

The sample is well distributed by academic level, gender, race, age, SAT scores, marital status, and choice of major. The sample is very representative of the total student population at the university.

- Students are uniformly distributed by academic level based on credit hours.
- 54 percent are female and 46 percent are male.
- 73 percent of the respondents are white and 21 percent are black.
- 90 percent are between the ages of 18 and 25.
- 81 percent of students have SAT scores between 800 and 1200.
- 92 percent are single and 8 percent are married.

[1] Babcock and Marks (2011) show that assuming log utility functions results in the following comparative statics: $\frac{\partial L}{\partial E} > 0, \frac{\partial H}{\partial E} < 0, \frac{\partial S}{\partial E} > 0, \frac{\partial H}{\partial w} > 0, \frac{\partial L}{\partial r} < 0,$ $\frac{\partial H}{\partial r} < 0$, and $\frac{\partial S}{\partial r} > 0$.

- Students selected a variety of majors: 22 percent science and math; 18 percent education and psychology; and 32 percent business and economics.

Additional sample descriptive statistics are presented in Table 2. Approximately 60 percent of students (847 students) in the sample were employed in the fall 2004 term. The mean wage of students was between \$7.01 and \$8.00 (in 2004 dollars). Approximately 57 percent of students in the sample were receiving the Georgia Lottery-funded HOPE scholarship in the fall 2004 term. The mean financial support from family members was between \$2,001 and \$3,000 (in 2004 dollars); the mean financial support from Federal, State, and other non-family members was between \$1,001 and \$2,000 (in 2004 dollars). As it relates to time allocation, 51 percent of parents were in favor of their child being employed while attending classes. Forty-four percent of students were working between 1 and 20 hours per week in their senior year in high school; while 26 percent worked more than 20 hours per week.

Of particular interest are variables that address the time students spend working for income (Question 42), time spent in class (credit hours – Question 56), time spent studying outside of class (Question 59), and time spent in extracurricular activities (Question 60) during the fall 2004 term. It is assumed that any unobservable differences in students, such as academic aptitude or motivation, are adequately captured by the variables used in the ordered probit models described below. The survey instrument is available upon request.

Table 2: Descriptive Statistics

Variable	Definition	Mean	Standard Deviation
HOURSWOR	= 1 if student worked 1-5 hours in Fall 2004 semester; = 2 if 6-10 hours; = 3 if 11-15 hours; = 4 if 16-20 hours; = 5 if 21-25 hours; = 6 if 26-30 hours; = 7 if ≥ 31 hours; = 0 otherwise	4.77	1.71
FTSTUDY	= 1 if student averaged 1-5 hours of study per week outside of class; = 2 if 6-10 hours; = 3 if 11-15 hours; = 4 if 16-20 hours; = 5 if 21-25 hours; = 6 if 26-30 hours; = 7 if ≥ 31hours; = 0 otherwise	1.95	1.23
FTEXTRA	= 1 if student averaged 1-5 hours of extracurricular activity per week; = 2 if 6-10 hours; = 3 if 11-15 hours; = 4 if 16-20 hours; = 5 if 21-25 hours; = 6 if 26 -30 hours; = 7 if ≥ 31 hours; = 0 otherwise	1.58	1.55
AGE	= 1 if student is < 18 years old; = 2 if 18-20; = 3 if 21-25; = 4 if 26-30; and = 5 if ≥ 31	2.64	0.79
GENDER	= 1 if student is male; = 0 if female	0.46	0.49
BLACK	= 1 if student is Black; = 0 otherwise	0.21	0.40
WHITE	= 1 if student is White; = 0 otherwise	0.73	0.44
OTHER	= 1 if student is not White or Black; = 0 otherwise	0.05	0.22
TOTALINC	= 1 if student parental total income was $1-$20,000; = 2 if $20,001-$40,000; = 3 if $40,001-$60,000; = 4 if $60,001-$80,000; = 5 if $80,001-$100,000; = 6 if $100,001-$200,000; = 7 if ≥ $200,001	4.09	1.67
HOURLYEA	= 1 if student average hourly earnings in Fall 2004 term $5.15-$6.00; = 2 if $6.01-$7.00; = 3 if $7.01-$8.00; = 4 if $8.01-$9.00; = 5 if $9.01-$10.00; = 6 if $10.01-$15.00; = 7 if $15.01-$20.00; = 8 if ≥ $20.01	3.03	1.91
RENTFREE	= 1 if student was living rent-free in family home; = 0 otherwise	0.20	0.40
OGPA	= 1 if student GPA at start of Fall 2004 term is < 2.00; = 2 if GPA is 2.00-2.49; = 3 if GPA is 2.50-2.74; = 4 if GPA is 2.7-2.99; = 5 if GPA is 3.00-3.24; = 6 if GPA is 3.25-3.49; and = 7 if GPA is 3.50-4.00	4.65	1.74
CRHOURS	= 1 if student earned 1-29 college credit hours by start of Fall 2004 term; = 2 if hours 30 to 59; = 3 if hours 60 to 89; = 4 if hours ≥ 90; = 0 otherwise	2.21	1.32
HSEMPH	= 1 if student was paid for 1-5 employment hours per week in high school senior year; = 2 if 6-10 hours; = 3 if 11-15 hours; = 4 if 16-20 hours; = 5 if 2-25 hours; = 6 if 26-30 hours; = 7 if ≥ 31 hours; = 0 otherwise	2.76	2.24
DEPCHILD	= 1 if student has one dependent child; = 2 if two; = 3 if three; = 4 if ≥ four; = 0 otherwise	0.15	0.57
MARITAL	= 1 if student was married in fall semester 2004; = 0 otherwise	0.08	0.27
HOPE	= 1 if student is receiving the HOPE scholarship in the Fall 2004 term; = 0 otherwise	0.57	0.49
CAROWN	= 1 if student had a car for personal use; = 0 otherwise	0.90	0.30

Table 2 (Continued): Descriptive Statistics

Variable	Definition	Mean	Standard Deviation
FSPARENT	= 1 if student received family financial support of $51- $500; = 2 if $501-$1,000; = 3 if $1,001-$2,000; = 4 if $2,001-$3,000; = 5 if $3,001-$4,000; = 6 if $4,001-$5,000; = 7 if $5,001-$6,000; = 8 if $6,001-$7,000; = 9 if ≥ $7,001; = 0 otherwise	3.05	2.52
FSGPA	= 1 if student received financial support dependant on keeping a GPA of ≥ 3.00 of $51-$500; = 2 if $501-$1,000; = 3 if $1,001-$2,000; = 4 if $2,001-$3,000; = 5 if $3,001-$4,000; = 6 if $4,001-$5,000; = 7 if $5,001-$6,000; = 8 if $6,001-$7,000; = 9 if ≥ $7,001; = 0 otherwise	1.26	2.04
FSFED	= 1 if student received federal or state grants or loans of $51-$500; = 2 if $501-$1,000; = 3 if $1,001-$2,000; = 4 if $2,001-$3,000; = 5 if $3,001-$4,000; = 6 if $4,001-$5,000; = 7 if $5,001-$6,000; = 8 if $6,001-$7,000; = 9 if ≥ $7,001; = 0 otherwise	2.60	2.51
MILITARY	= 1 if student served in the military or ROTC during Fall 2004 term; = 0 otherwise	0.02	0.14
GRADSCH	= 1 if student planned to enter graduate school within 5 years of graduation; = 0 otherwise	0.63	0.48
EXPEARN	= 1 if student expects $1-$20,000 annual salary ten years after graduation; = 2 if $20,001-$40,000; = 3 if $40,001-$60,000; = 4 if $60,001-$80,000; = 5 if $80,001-$100,000; = 6 if $100,001-$200,000; = 7 if ≥ $200,001	4.40	1.40
COMSAT	Combined score on SAT or ACT = 0 if not taken; = 1 if SAT score 501-800 or ACT score 11-16; = 2 if SAT 801-1010 or ACT 17- 21; = 3 if SAT 1011-1200 or ACT 22-26; = 4 if SAT 1201-1400 or ACT 27-31; = 5 if SAT 1401-1600 or ACT 32-36	2.58	0.88
EARN	= 1 if student expects, or is currently earning (hourly) $5.15-$6.00 per hour; = 2 if $6.01-$7.00; = 3 if $7.01-$8.00; = 4 if $8.01-$9.00; = 5 if $9.01-$10.00; = 6 if $10.01-$15.00; = 7 if $15.01-$20.00; = 8 if ≥ $20.01	2.86	1.80
FTMAJOR	College major = 1 if student chose or intended to choose Pre-Medical as major; = 2 if Pre-Pharmacy; = 3 if Engineering or Architecture; = 4 if Biology; = 5 if Physical Science; = 6 if Mathematics, Statistics, or Computer Science; = 7 if Nursing or Health Technology; = 8 if Economics; = 9 if Pre-Law; = 10 if Psychology; = 11 if Social Science; = 12 if Humanities or Fine or Applied Arts; = 13 if Agriculture/Forestry; = 14 if Accounting, Finance, Management Information Systems; = 15 if Business or Management; = 16 if Education; = 17 if Other	12.30	4.86

Methods

Several data challenges had to be overcome. First, the interval nature of the time variables precludes the use of the ordinary least squares (OLS) regression method. Second, the failure of the survey to distinguish a true zero number of hours engaged in an activity from nonzero values precludes the use of the Tobit regression model. So, conforming to household production theory presented above related to the relative number of hours allocated to the various activities being measured, the ordered probit model is used to estimate the models. The dependent variable in each of the three pair-wise comparisons (work time vs. time spent studying outside of class; work time vs. time spent in extracurricular activities; and time spent studying outside of class vs. time spent in extracurricular activities) takes on the values 0 (if $t_i < t_j$), 1 (if $t_i = t_j$), and 2 (if $t_i > t_j$), where i (and j) is one of the three time use variables in the survey (HOURSWOR, FTSTUDY, and FTEXTRA), and t is the value that of this variable, with values ranging from 0 to 7. These results are reported in Tables 3, 4, and 5, respectively.

Results

The model specification was based on variables that are hypothesized to influence students' relative time allocations. Due to missing responses from some students, the number of observations used in the ordered probit regression models varies slightly. In preliminary regressions, a series of 21 independent variables were included to explain variation in the dependent variables; these independent variables capture elements of students' demographic characteristics (AGE, GENDER, BLACK, WHITE[2]), financial support for college (TOTALINC, RENTFREE, CAROWN, HOPE, FSPARENT, FSGPA, FSFED), family situation (DEPCHILD, MARITAL, GENDER*MARITAL), and work or school characteristics (HSEMPH, HOURLYEA, EXPEARN, OGPA, CRHOURS, MILITARY, GRADSCH). Preliminary models indicated that total income (TOTALINC), hourly earnings (HOURLYEA), living rent-free (RENTFREE), federal/state financial support (FSFED), and expected earnings after graduation (EXPEARN) were not significant

[2] The OTHER variable was omitted from the regression models and used as the baseline case when WHITE = 0 and BLACK = 0, simultaneously, for a particular observation. OTHER = 1 only for 77 observations in the data.

predictors of any dependent variable. So, to maintain degrees of freedom, EXPEARN and HOURLYEA were combined into the EARN variable. We included combined SAT (COMSAT) and full-time major (FTMAJOR) in the model to control for individual unobserved heterogeneity. FTMAJOR was implemented as a series of dummy variables.

One potential complication was that the variable measuring a student's overall GPA (OGPA) may not be truly exogenous. To test for endogeneity, an instrumental variable (IV) approach was utilized. A good instrumental variable for OGPA satisfies two conditions:

1. The instrumental variable z is not correlated with the error term [Cov (z, e_i)] = 0.
2. The instrumental variable z is correlated with the endogenous variable OGPA [Cov(OGPA, z) ≠ 0].

From the pair-wise correlation coefficients and preliminary regressions, a student's high school GPA (HSGPA) was correlated with the potentially endogenous variable OGPA but not highly correlated with the error term.[3] To test for endogeneity, the first stage of the two-step IV estimation was to regress overall GPA on all other covariates used to explain variation in the ordered dependent variables plus the variable used as an instrument for OGPA (HSGPA). The residuals from this equation were computed and used as a regressor in the second stage of the IV estimation using an ordered probit model. The null hypothesis is that the coefficient estimate on the residual variable is equal to zero. If the null hypothesis is rejected, possibly the error term from the ordered probit model is correlated with the residual variable from the first-stage of the IV estimation process, or overall GPA is endogenous. Detailed results (available upon request) suggested that overall GPA is not endogenous in any of the ordered probit models.[4]

[3] The pair-wise correlation coefficients between the error terms from the ordered logit models and HSGPA are '-0.018', '-0.031', and '-0.027', respectively. This suggests that high school GPA is a decent instrument for overall GPA.

[4] Hypothesis tests for the residual variable are insignificant in all three models. For the work time vs. study time model, the residual variable Z-statistic is -0.34 ($p = 0.73$); for the work time vs. extracurricular time model, the residual variable Z-statistic is -0.96 ($p = 0.34$); for the study time vs. extracurricular time model, the residual variable Z-statistic is 0.32 ($p = 0.74$). Also, to test the validity of the instrumental variable HSGPA, the overall F-statistic from a regression of

Assuming overall GPA is not endogenous, ordered probit models were estimated using the same set of explanatory variables. Results were grouped according to the pair-wise comparisons of student relative time allocation mentioned above. In addition to predicted probabilities and marginal effects, evidence was provided of each model's predictive power.

Work Time vs. Study Time

Table 3 has the marginal effects (elasticities) on the probability of work time versus study time. Only 1,064 of the 1,125 observations had no missing values; so 1,064 was the comparison number of observations. The ordered probit model predicted all 1,064 observations to have more relative work time than study time; 969 observations actually had more relative work time. Therefore, the percentage age of observations predicted correctly by the model is 91 percent (969/1,064).

Table 3: Marginal Effects on the Probability of Work Time vs. Study Time

Variable	(1) Work Time < Study Time	(2) Work Time = Study Time	(3) Work Time > Study Time
OGPA	.003†	.003†	-.006†
AGE	-.003	-.003	.006
GENDER	.004	.006	-.010
CRHOURS	.004	.005†	-.009†
HSEMPH	-.001	-.002	.003
DEPCHILD	-.007	-.009	.017
MARITAL	.025	.027	-.052
HOPE	.005	.007	-.012
CAROWN	.005	.006	-.011
FSGPA	.002†	.003†	-.005†
FSPARENT	.000	.000	-.000
MILITARY	.030	.031	-.062
GRADSCH	.013**	.016**	-.029**
BLACK	.003	.004	-.006
WHITE	.006	.008	-.013
GENDER*MARITAL	.016	.017	-.033
COMSAT	-.001	-.002	.003
EARN	.000	.000	-.000
FTMAJOR (significant at 95% level)	2-10, 12-17	3,5,9,15,17	2-10, 12-17
Pseudo R-squared		0.07	
AIC		782.67	
BIC		956.62	

† p = .10; * p = .05; ** p=.01; (n = 1,064)

OGPA on HSGPA is 175.52, which is much greater than the rule of thumb (F > 10) mentioned by Woolridge (2000).

Table 3 indicates that:

- A higher overall GPA (OGPA) corresponds to a higher probability of spending relatively more time studying than working (column 1). Plus, a lower overall GPA corresponds to a lower probability of spending relatively more time working than studying (column 3).
- The more hours a student worked in high school (HSEMPH), the lower the probability of spending relatively more time studying than working (column 1). Also, more hours worked in high school corresponds to a higher probability of spending relatively more time working than studying (column 3).
- The more money for school that depends on the student maintaining a 3.0 GPA (FSGPA), the higher the probability (.3 percent) that student spends relatively more time studying than working (column 1). Also, the more money for school based on maintaining a 3.0 GPA, the lower the probability that students spend relatively more time working than studying (column 3).
- For those hoping to attend graduate school (GRADSCH = 1), the students on average have a 1.3 percent higher probability of spending relatively more time studying than working compared to those not desiring to attend graduate school (column 1). The magnitude of this effect seems stronger for students who reported that they spend relatively more time working than studying (column 3).
- The HOPE Scholarship (HOPE) does not significantly influence how a student allocates there relative time to working and studying (columns 1, 2, and 3).

Conventional wisdom suggests that higher grades are correlated with more relative time spent studying; the empirical results support that relationship in the significant elasticities reported for OGPA. Interestingly, the magnitude of this effect is stronger for students who report that they spend more time working than studying. The results for the GRADSCH variable also showed this large change in magnitude for students who spend more time working than studying. For students who already allocate more relative time to working than studying, their probability of allocating relative time in this way decreases 2.9 percent if they wish to attend graduate school. These results illustrate the tension between working and studying that faces university students.

As expected, the magnitudes of the coefficients on the number of hours worked during a student's senior year of high school (HSEMPH) attenuated with higher values of the dependent variable and changed signs while maintaining significance. This suggests that working during high school contributes positively to the relative number of hours worked rather than spent studying. This may be because high school employment increases the productivity of those students; when they acquire more job skills in high school, these students have a higher opportunity cost of not working.

As expected, when financial support is tied to a student's GPA (FSGPA), these students show a significantly higher probability of spending relatively more time studying than working (or lower probability of spending relatively more time working than studying (column 3). In addition, we find no significant impact of the HOPE Scholarship on students' relative time allocations. These results may seem contradictory as the HOPE Scholarship is arguably the primary source of in-state student tuition scholarship that is tied to a student's college GPA (after the student passes the 30-credit hour mark). To ensure that this result is not spurious (due to multicollinearity), an ordered probit model was run with an interaction term (HOPE*FSGPA). First, the correlation coefficient between HOPE and FSGPA is .22, suggesting that these two variables are not highly collinear. Second, the interaction term is not a significant predictor of the dependent variable in the ordered probit model (Z-statistic = 1.19, p-value = 0.23). Therefore, the result is not spurious and all sources of financial aid generally, not necessarily the HOPE Scholarship, explained the variation in students' relative time allocations.

Work Time vs. Extracurricular Time

Table 4 has the marginal effects (elasticities) on the probability of work time versus time spent in extracurricular activities. Of the 1,125 total observations, 1,065 have no missing values and are included in the ordered probit model. All 1,065 observations are predicted to have more work time than extracurricular time; so the percentage of observations predicted correctly by the model is 91 percent (970/1,065). Table 4 indicates that:

- An increase in a student's overall GPA (OGPA) corresponds to a lower probability of spending relatively more time in extracurricular activities than working.
- The more credit hours (CRHOURS) taken, the lower the probability that a student will spend relatively more time in extracurricular activities than working (column 1).
- The higher the family financial support (FSPARENT), the higher the probability that a student will spend relatively more time in extracurricular activities than working (Column 1).

These results conform to expectations. Also, a similar pattern arises in Table 4 that was first observed in Table 3, specifically that the coefficient magnitudes are stronger in column 3, which analyzes students who reported higher relative time allocations to working than to extracurricular activities.

Finally, the results in Table 4 illustrate the tradeoff students face between engaging in more work hours or more extracurricular activities. In particular, the more credit hours taken, the lower the probability that students engage in relatively more extracurricular time (or, conversely, the higher the probability that students engage in relatively more work time). But, the opportunity cost of working more may be lower social capital development that comes from less extracurricular activities and lower human capital development that comes from less studying. In the next section, the relative time allocation between studying and extracurricular activity participation is examined.

Study Time vs. Extracurricular Time

Table 5 states the marginal effects (elasticities) on the probability of study time versus time spent in extracurricular activities. The model predicts a large majority of the 1,065 complete observations to have relatively more extracurricular time than study time; so the predictability of the model is weaker than the other two models presented above. Relatively more extracurricular time than studying time is reported in 50.8 percent of the observations (541/1,065). The model predicts that 92.2 percent of the observations (982/1,065) would have relatively more extracurricular time than studying time. Also, the model predicts that only 7.8 percent (83/1,065) of students would spend relatively more time studying than in extracurricular activities whereas the actual responses indicate 25.0 percent (267/1,065). Table 5 indicates that:

- A student with a higher overall GPA (OGPA) will have a lower probability of spending relatively more time in extracurricular activities than studying (column 1), however, this result is not significant at conventional levels.
- The higher the family financial support (FSPARENT), the higher the probability that a student will spend relatively more time in extracurricular activities than studying (column 1).
- A student in the military in the fall 2004 term (MILITARY = 1) has a 22.7 percent higher probability of spending relatively more time in extracurricular activities than studying (column 1).
- A married male student (GENDER*MARITAL = 1) has a 12.4 percent lower probability of spending relatively more time in extracurricular activities than studying (column 1).

Again, the results are not that surprising. We expect students with higher overall GPAs to spend relatively more time studying; we expect students taking more credit hours to spend relatively more time studying; and we expect that higher amounts of family financial support free up students to spend relatively more time in extracurricular activities. However, what is somewhat unexpected about these results is that a student in the military has a higher probability of spending more time in extracurricular activities than studying. A difference of means test suggests that military students do not have significantly different overall GPAs from the other students in the survey (t = 0.49; p-value = 0.61). So, one implication is that students in the military may have different, more intense, study habits so they can take advantage of extracurricular opportunities, some of which are likely related to their military service. This difference in the intensity of study between military and non-military students may suggest a possible violation of the time homogeneity assumption (Schmidt, 1983). But, given that our study focuses on relative time allocations, we do not view this as problematic.

Table 4: Marginal Effects on the Probability of Work Time vs. Time Spent in Extracurricular Activity

Variable	(1) Work Time < Extra. Time	(2) Work Time = Extra. Time	(3) Work Time > Extra. Time
OGPA	-.004†	-.003†	.008*
AGE	-.004	-.003	.007
GENDER	-.003	-.002	.006
CRHOURS	-.007†	-.006†	.013†
HSEMPH	-.002	-.002	.004
DEPCHILD	-.007	-.005	.012
MARITAL	.010	.007	-.018
HOPE	-.003	-.003	.007
CAROWN	.011	.009	-.021
FSGPA	.001	.001	-.003
FSPARENT	.003†	.002†	-.005†
MILITARY	.070	.043	-.113
GRADSCH	.003	.003	-.007
BLACK	.026	.019	-.046
WHITE	.024	.020	-.045
GENDER*MARITAL	.015	.011	-.027
COMSAT	.002	.002	-.004
EARN	.000	.000	-.001
FTMAJOR (significant at 95% level)	11	11	11
Pseudo R-squared		0.05	
AIC		804.67	
BIC		978.64	

† p= .10; * p = .05; (n = 1,065)

Table 5: Marginal Effects on the Probability of Study Time vs. Time Spent in Extracurricular Activity

Variable	(1) Study Time < Extra. Time	(2) Study Time = Extra. Time	(3) Study Time > Extra. Time
OGPA	-.008	-.002	.010
AGE	-.002	-.000	.002
GENDER	.002	.000	-.002
CRHOURS	-.020	-.005	.025
HSEMPH	.003	.000	-.003
DEPCHILD	-.019	-.005	.025
MARITAL	.058	.012	-.070
HOPE	.003	.000	-.004
CAROWN	.017	.005	-.022
FSGPA	.006	.001	-.008
FSPARENT	.004	.001	-.006
MILITARY	.227*	.008	-.235**
GRADSCH	.008	.002	.010
BLACK	.054	.012	-.067
WHITE	.045	.013	-.059
GENDER*MARITAL	-.124*	-.058	.182†
COMSAT	-.017	-.005	.021
EARN	.003	.001	-.004
FTMAJOR (significant at 95% level)	2, 4	8	2
Pseudo R-squared		0.02	
AIC		2218.67	
BIC		2392.64	

† p = .10; * p = .05; ** p = .01; (n = 1,065)

Conclusions

Efficient student time use is crucial for academic success which translates into better labor market outcomes. It is, therefore, clear that better student time management should be a goal of young adults investing in their human capital. This research presents evidence of the student characteristics that influence how students allocate their relative time. From our results emerge several policy implications. First, higher ability students, proxied using combined SAT/ACT scores, do not influence the results in any significant way, which seems to contradict previous empirical results as in Idson and Clark (1991). Second, our results suggest that working during high school contributes positively to the relative number of hours worked during university studies. One policy implication is a possible change to the number of hours that high school seniors can work, if being supervised through a high school work-study program. Third, a scholarship to cover tuition (a pure income effect) might reduce the number of hours a student works, which influences the students' relative time allocation decisions (e.g., allocate more time to extracurricular activities or studying relative to work). Fourth, our results suggest that the HOPE Scholarship does not influence relative time allocation decisions of students at this university. Finally, results from Table 3 suggest that a relative balance between work time and study time will lead to a favorable outcome for students, as higher overall GPA is positively and significantly related to the relative equalization of work time and study time; students with dependent children have a higher probability (although insignificant) of spending relatively more time working than studying; and married students have a significantly lower probability of spending relatively more time working than studying.

There are several shortcomings of this study. Given that the sample is drawn from a single regional college, the findings may not be generalizable. The institution our survey participants attended at the time of the survey may differ from other schools in that its share of first-generation college students is higher (above 28 percent) than the national average of 15.9 percent in 2005 (Pryor et al. 2005). This is relevant to our study due to the following reasons. First-generation college students are more likely to expect working full time to support themselves while in college. In addition, they are also more likely to live off campus during their studies. These two factors may translate into a totally different college experience for these students than that experienced by others. Therefore, future work needs to investigate whether these findings also hold at other institutions.

Another potential shortcoming is that we use data from a fairly old survey, in which students report on their behavior during the previous semester. However, using more recent data could be problematic since in the aftermath of the recent Great Recession the recovery is slower than anticipated and the economy continues to show signs of weakness. This may put today's college student in an unusual environment that may be uncharacteristic to long-run trends.

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International Currency Exchange Rates and Gasoline Prices

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Abstract

This study examines the relationship between China's open-up policies and the effect on exchange rates and gasoline prices. In this study, the focus is on the impact on gasoline prices from currency appreciation. Our finding is that production, supply, and demand are all positively correlated with currency appreciation. The impact on demand is much more affected by currency appreciation than are supply and production.

Introduction

Since implementing reform and open-up policies in late 1970s, China obtained significant economic development and became one of the fastest growing economies in the world. Real GDP of China grew annually at an average rate of about ten percent (Morrison, 2013). Following the economic growth, average disposable income of Chinese households and consumption of durable goods including cars increased rapidly. According to statistics reported by the National Bureau of Statistics of China (NBSC, 2013), civil car parc of China increased from 5.54 million at the end of 1990 to 120.89 million at the end of 2012. As China's vehicle market and automobile industry grew to be the largest in the world in recent years, the gasoline price became a popular topic for the public and raised the concern of Chinese policy makers.

To satisfying rapid economic growth, China's consumption of energy products increased dramatically during the last decade. In 2009, China became the world's second-largest consumer and net importer of oil. According to statistics from the Ministry of Industry and Information Technology of China released as of August 2011, more than 55.2 percent of oil consumption in China is from external sources.