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Time to Work or Time to Play: The Effect of Student Employment on Homework, Housework, Screen Time, and Sleep

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Abstract: Recent research suggests that working while in high school reduces the amount of time students spend doing homework. However, an additional hour of work leads to a reduction in homework by much less than one hour, suggesting a reduction in other activities. This paper uses data from the 2003-2007 American Time Use Surveys (ATUS) to investigate the effects of market work on the time students spend on homework, sleeping, household work, and screen time. Results show that an increase in paid work reduces time spent in all of these activities by 84%, with the largest effect found for screen time.

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I. Introduction

Although student employment may have some positive effects on students' future earnings by providing work experience, some researchers have documented a small negative relationship between working while in high school and a student's academic achievement. For example, Ruhm (1995, 1997) and Tyler (2003) found that student employment has a negative effect on both the number of years of schooling that students complete and their 12th grade math achievement. Oettinger (1999) found a decline in the grades of minority students who work long hours. Using U.K. data, Dustmann and Van Soest (2007) found that part-time work has a small negative effect on males' exam performance. However, less emphasis has been placed on the mechanisms through which these effects occur. One hypothesis is that working students get less sleep. Oettinger (1999) suggested that students' grades may suffer if they are fatigued from working long hours. Another hypothesis is that high school students who work do less homework, as found by Kalenkoski and Pabilonia (2009a). The latter may be particularly important given that Stinebrickner and Stinebrickner (2004) found a strong positive relationship between first-year college students' study time and their grade point averages and Betts (1997) found that high school students who were assigned more homework had higher math scores.

This paper uses data on high school students aged 15-18 from the 2003-2007 American Time Use Surveys (ATUS) to examine the effects of doing paid work on students' major activities. Because class time is mandatory for enrolled students and because very little variation in such time is observed, we focus on activities outside of the classroom. In particular, we explore the effects of market work on the time students spend doing homework and sleeping (as time spent in these activities may affect their academic achievement), the time they spend doing household work (including care for younger siblings), and the time they spend using the

computer and watching TV (screen time). Using a simultaneous equations approach, we account for individuals' time use being jointly determined and control for unobserved person-specific factors that affect time spent on different activities. We find that an additional hour of market work reduces time spent on homework by five minutes, sleep by almost 10 minutes, household work by over 11 minutes, and screen time by 24 minutes. Reductions in time spent on these activities account for 84 percent of a one-hour increase in teens' paid work time.

II. Econometric Model

Because time spent on paid work and in each of the other activities we consider is recorded as zero for a substantial number of respondents, we model time spent in each activity as a Tobit.[1] In addition, the amounts of time a student allocates to each activity are potentially

[1] To the extent that these zero values represent no participation in these activities, a simultaneous continuous regression model would give biased results. On the other hand, if zero values represent infrequent activity and the day we observe the student's time use is random, then a simultaneous continuous regression model will provide consistent estimates. Other surveys provide evidence for the extent of non-participation in some of these activities. For example, in the October 2006 CPS, about 69 percent of high school students were not employed in the reference week (Bureau of Labor Statistics 2007). According to the NLSY97, 26 percent of seniors did not work at any point during the school year. Even larger percentages in the lower grades did not work (Bureau of Labor Statistics 2005). In addition, in a typical school week in the NLYS97, 11 percent of enrolled students aged 12-16 did not spend any time doing homework (authors' own calculation).

made jointly. Therefore, we ideally would like to estimate a system of simultaneous Tobit equations that includes all activities. However, this would require us to make many exclusion restrictions, which would require data we are unable to obtain. Therefore, as we are particularly interested in the effects of paid work on time spent in different activities, we instead estimate simultaneous Tobit pairs in which a paid work Tobit is always included. For each pair of activities, we estimate the following system of simultaneous Tobit equations:

$$z^* = \gamma_1 w + \beta_1' X_1 + u_1$$
$$w^* = \gamma_2 z + \beta_2' X_2 + u_2 \quad (1)$$

and

$$z = z^* \text{ if } z^* > 0$$
$$z = 0 \text{ otherwise} \quad (2)$$
$$w = w^* \text{ if } w^* > 0$$
$$w = 0 \text{ otherwise}$$

where z* is the latent variable measuring the amount of time a student desires to spend doing some activity other than paid work; z is the observed amount of time the student spends doing this activity; w* is the latent variable measuring the student's desired hours of paid work; w is the observed hours worked; X_1 and X_2 are vectors of exogenous explanatory variables; γ_1 and γ_2 are coefficients on the endogenous right-hand-side variables; and β_1 and β_2 are vectors of coefficients on the exogenous explanatory variables. The residuals u_1 and u_2 follow a bivariate normal distribution such that:

$$\begin{bmatrix} u_1 \\ u_2 \end{bmatrix} \sim N\left(\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} \sigma_1^2 & \rho_{12}\sigma_1\sigma_2 \\ \rho_{12}\sigma_1\sigma_2 & \sigma_2^2 \end{bmatrix}\right). \quad (3)$$

A logical consistency condition, $1 - \gamma_1\gamma_2 > 0$, must hold for the model to be estimable (see Maddala 1983). We estimate this model via maximum likelihood using the aML software package. For sleep, z=z* (all respondents reported some time sleeping on the diary day) and so a continuous regression for sleep is estimated with the market work Tobit for this activity.

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 and one variable in X_2 that is not in X_1.

III. **Data**

Our primary data source is the pooled 2003-2007 ATUS. The ATUS is a nationally representative survey of the U.S. civilian non-institutionalized population aged 15 years and over. Each person selected for the ATUS was randomly drawn from a sample of outgoing households in the Current Population Survey (CPS). The key feature of the ATUS is its 24-hour time diary in which the respondent describes how he or she spends his or her time over the designated period. Although in reality teens may be engaging in multiple activities at the same time, the ATUS only records time spent in the primary activity for most activities.[2] The survey also collects household roster and demographic information and is matched to the CPS

[2] The exceptions are secondary child care and, in 2006 and 2007, time spent eating and drinking. While secondary child care may be of interest to include in our analysis, we do not do so for two reasons. First, secondary child care by teenagers may actually be time spent "playing" or "socializing" with their siblings and thus may not be "work". Second, if we include time spent in any secondary activity we may actually explain more than 100% of the reduction in time spent in other activities, due to an increase in a student's work time by one hour.

household data. One of the advantages of using time diary data is that it is less sensitive to the recall bias that is associated with broader survey questions capturing average time (Bianchi et al. 2006).

We focus on the subsample of ATUS respondents aged 15-18 who attended high school, were interviewed during the typical school year (September through May), and did not have children of their own living in their households. From this subsample we excluded low quality diaries (those missing more than 60 minutes of time) and diaries that captured atypical days (those where teens reported either sleeping more than 20 hours or were sick for more than four hours on their diary day) (Juster 1985). In addition, we dropped 16 respondents who were missing information on whether they lived in a standard metropolitan statistical area (SMSA), information that is used to match the time-diary data to other data used to identify our models. These restrictions excluded less than half a percent of diaries, leaving us with a sample of 2,673 teens.

Our dependent variables measure minutes spent on paid work, homework, sleeping, household work (including child care), and watching TV or using the computer for leisure except for video games (screen time).[3] These variables do not account for all of a teen's uses of time but do account for a substantial portion of their out-of-class time. We do not model the residual time because we are unable to make an appropriate exclusion restriction. Table 1 reports the percent of zero values recorded for each of our dependent variables. More than half of all

[3] Video games are coded with other games, such as board games, and thus we exclude them from this category. For additional details on the specific ATUS codes included in each of these activities, see the Data Appendix.

students reported not working (86%) or doing homework (60%) on their diary day. All students reported sleeping. Some students reported not doing any household work (30%) while a smaller number reported no screen time (19%). Table 2 reports means and standard deviations for select variables used in our analyses.

Table 3 reports the average minutes spent on each activity that we examine by daily working status. Respondents who were working on their diary day worked 274 minutes on average. These students also spent significantly less time on average in each of the other activities than students who did not work (both among all students and among those with positive time spent in an activity). Specifically, students who did not work spent 51 minutes doing homework, but working students spent only 30 minutes. Students who did not work slept about 50 minutes more than those who worked. Students who did not work spent 62 minutes helping around the house or watching younger siblings, but those who worked spent only 40 minutes doing household chores. Students who did not work spent 152 minutes watching TV or using the computer, but working students spent only 88 minutes in these activities.

Indicator variables for whether the mother and/or father have a bachelor's degree are used to identify homework time, household work, and screen time in the paid work equations. Parents' education levels may be excluded from the paid work equation, as parents' education level (after controlling for parental income) is not directly related to the amount of time a student spends working in the market. Parents' education levels partially reflect preferences toward education that are perhaps passed on to children by their parents, hence their inclusion in the homework time equation. Parents' education is also included in the household work equation in order to account for possible differences in household production technology by education level. Finally, parents' education is included in the screen time equation, because parental education

may affect how much TV and computer time a student is allowed. Parents are currently encouraged by the American Academy of Pediatrics (2007) to limit the time their children devote to watching TV and playing video games to no more than two hours per day.

Using the ATUS roster, we constructed variables representing the number of siblings under age 15 and the number of siblings aged 15-18. These variables help to identify homework, household work, and screen time in the paid work equations. The more siblings a teen has, the less available time a parent has to help with his/her homework and perhaps the less parental supervision of homework that occurs. The number of siblings and their ages may also affect the amount of household chores that need to be done. Specifically, additional siblings may create additional chores, such as caring for one's younger siblings, and/or they may help share the work, especially if they are older (Gager et al. 1999). Finally, a teen may spend more time watching TV or using a computer to e-mail friends if there are no siblings to play with in the home.

Weather conditions, as measured by both state average monthly precipitation in inches and temperature in degrees Fahrenheit, are used to identify screen time in the market work equation. These variables were obtained from the National Climatic Data Center of the U.S. Department of Commerce. Connolly (2008) recently used daily changes in the weather to examine how individuals substitute future leisure for current leisure. Huysmans (2002) found that weather variables have had significant effects on various leisure activities in the Netherlands over time. We include these variables because rain and colder temperatures may encourage a teen to stay inside and watch TV or use the computer rather than engage in outdoor activities.

Sunrise and sunset time are used to identify sleep in the market work equation. Biologists have found that humans sleep longer when the day length is shorter (Lehnkering and

Siegmund 2007). An economic study by Hamermesh et al. (2008) also found evidence that sunset time affects adults' timing of sleep.[4] As in this study, we obtained our data from the U.S. Naval Observatory website and matched sunrise and sunset time to the diary day and respondent's location using SMSA or state.[5]

Finally, the state monthly unemployment rate is used to identify paid work time in each of the other equations. These data come from the U.S. Bureau of Labor Statistics' Local Area Unemployment Statistics (LAUS) program. Unemployment rates have been used by other researchers to identify hours worked by students (e.g., Rothstein 2007; Kalenkoski and Pabilonia 2009b). As a measure of labor market conditions, the unemployment rate is likely to affect the amount of time a student spends at work and whether s/he even has a job, but not directly the amount of time s/he spends on other activities.

Other explanatory variables that enter all equations are constructed using the ATUS data. They include indicator variables for whether the diary day is a Friday, Saturday, or Sunday[6]; an

[4] We also estimated a specification where we included sunrise and sunset time in the screen equation. However, these variables were not statistically significant in this equation.

[5] Non-SMSA residents were assigned the sunrise and sunset times at the mid-point of their states.

[6] Other time use researchers have divided their samples into weekdays and weekend days. We initially divided our sample this way but were unable to get models for all pairs of activities to converge. For consistency across activities, we present combined results. Note that our results for the Friday, Saturday, and Sunday indicator variables suggest that the weekday versus weekend day approach may be inappropriate.

indicator variable for whether or not the teen respondent is female; indicators for ages 16, 17, and 18 (with age 15 being the omitted category); indicators for being black or Hispanic; indicators for whether a father or mother is present in the household; indicators for whether the respondent and his/her father or mother were born in the U.S.; household income category indicator variables ($20,000-$40,000; $40,000-$75,000; and over $75,000; with less than $20,000 as the omitted category); indicators for region of residence and SMSA status; and indicators for the year in which the diary day fell.

IV. **Results**

In Tables 4–7, we report the estimated coefficients and standard errors from each of the simultaneous models we estimated on the pooled 2003-2007 ATUS data using aML software. For comparison purposes, we also report the estimated coefficients and standard errors from simple Tobits that do not control for endogeneity. Table 4 shows the results from estimating paid work hours and homework simultaneously; Table 5 shows the results from the simultaneous estimation of paid work hours and sleep time; Table 6 shows the results from the simultaneous estimation of paid work hours and household work; and Table 7 shows the results from the simultaneous estimation of paid work hours and screen time. Table 8 reports the key marginal effects, including the effects of an additional minute spent doing paid work on time spent doing each of the alternative activities, and the effects of an additional minute spent in each of these activities on time spent doing paid work.[7] The marginal effects are generally much larger for the simultaneous model than for the simple Tobits. The estimated marginal effects of paid work on

[7] Marginal effects presented in this table are the averages of individual marginal effects.

these non-paid activities from the simultaneous models account for 84 percent of a change in paid work.

According to the simultaneous Tobit results, an increase of 60 minutes of paid work reduces time spent on homework by only five minutes, providing evidence that while paid work does reduce the amount of time high school students spend on homework, the effect is small. Even a one standard deviation increase in time spent on paid work (a change of over two hours) reduces homework time by only about 12 minutes. The results from the simple Tobit indicate an even smaller effect of less than two minutes per hour of paid work. However, Betts (1997) found that as little as 15 extra minutes of math homework a night in the grades 7-11 would increase student math achievement by about one full grade equivalent by grade 11, suggesting that even small reductions in homework may have large effects upon students' achievement over time. The effect of homework minutes on paid work minutes is much stronger, as an increase of one hour in homework time reduces time spent on paid work by almost a half hour. These differing effects suggest that homework time is given priority over time spent doing paid work. Again, this simultaneous Tobit effect is much larger than the single Tobit effect of 5 minutes.

With respect to the relationship between sleep and paid work, we find that an increase of 60 minutes in paid work decreases sleep time by about 10 minutes in either model, an apparently small effect. However, a one standard deviation increase in paid work (a change of over two hours) results in more than 20 minutes of reduced sleep, a concern if a lack of sleep reduces a student's ability to do well in school, as suggested by Oettinger (1999). In addition, recent research on sleep has shown that shorter sleep duration is also associated with an increased risk of obesity in children aged 9–12 (Lumeng et al. 2007). We do not find that sleep has any effect

on minutes of paid work once we control for endogeneity. Thus, it appears that work time has priority over sleep time.

With respect to household work, we find that an increase of 60 minutes in paid work reduces unpaid household work by more than 11 minutes in the simultaneous Tobit model (5 minutes in the simple Tobit model), although household work does not have a significant impact on paid work once we control for endogeneity. This suggests that time spent in household chores is secondary in priority to time spent in paid work.

Finally, we find that an increase of 60 minutes in paid work reduces screen time by 24 minutes and that screen time has an almost equivalent negative effect upon paid work. This suggests that both screen time and paid work time are of equal priority to teens. The effects are smaller in the simple Tobit model, with estimated effects of 13 minutes and just under 10 minutes, respectively.

Tables 4–7 also show the estimated correlations, ρ, between the unobserved determinants of each activity and paid work hours. They are all positive and statistically significant with the exception of the correlation between the error terms in the sleep and paid work equations, which is estimated to be zero. Thus, except for the relationship between sleep and paid work, there is some unobserved variable that positively affects both each non-work activity and market work. Likelihood ratio tests that compare the simultaneous models against restricted models where the correlation coefficients are fixed at zero provide significant p-values of less than 0.001 for all activity pairs except for sleep and paid work. Thus, it is important to estimate simultaneous rather than independent models in most cases.

Recall that identification of each of the models relies on exclusion restrictions; therefore, it is important to examine the significance of the identifying variables. With respect to the

model of paid work and homework in Table 4, having either a mother or father with a bachelor's degree is a highly significant positive predictor of homework time, and the unemployment rate is a significant negative predictor of paid work time. However, the sibling variables are not significant in the homework specification at conventional levels.

With respect to the model of paid work and sleep in Table 5, time of sunrise, but not sunset, is found to have a significant positive effect on sleep. Thus, students sleep longer when the sun rises later in the autumn and winter months. The unemployment rate is again statistically significant in the paid work equation.

With respect to the model of paid work and household work in Table 6, the number of siblings under age 15 has a significant and positive effect on household work, and the unemployment rate is a significant negative determinant of paid work.

Finally, with respect to the model of paid work and screen time in Table 7, we find that the number of siblings under age 15, temperature, and precipitation are all individually significant predictors of screen time. Both the number of siblings under age 15 and the temperature have a negative effect on screen time while precipitation has a positive effect on screen time. The unemployment rate is again statistically significant in the minutes of paid work equation.

The effects of our other explanatory variables on teens' major activities are generally consistent with what we would expect from other research on teen behavior (Kalenkoski et al. 2007, Price et al. 2007). In terms of paid work, we find students working more when the diary day is a Friday, Saturday, or Sunday compared to other days (Tables 5 and 6). We also find that students spend significantly fewer minutes on homework on Fridays and Saturdays when they do not have to attend school the following day than on Monday through Thursday. Comparing

Sundays to non-Friday weekdays, the difference is more modest (Table 4). Students sleep more than 1 hour longer on Saturdays and 2 hours longer on Sundays than they do Monday through Thursday (Table 7).[8]

Students aged 16–18 work significantly more than 15-year-olds, which is not surprising, because 15-year-olds are not allowed to engage in many types of paid work and their hours are restricted under the Federal Fair Labor Standards Act of 1938 (see Pabilonia 2001 for a more detailed description of the types of jobs teens hold and the laws affecting teens). Girls spend significantly more time on homework and housework than do boys and less time in front of the screen (TV or computer). Black and Hispanic teens work fewer minutes and do less homework than non-black, non-Hispanic teens. Black teens also do less household work and sleep more. There are no significant racial or ethnic differences in screen time. Teens with no mother in the household do significantly less homework, perhaps due to lack of supervision, and do significantly more housework. Non-native teens spend more time on homework. None of the household income indicators has a statistically significant independent effect on teens' time use.

V. **Sensitivity Analyses**

We performed several sensitivity analyses to determine the robustness of our results. The first change we made was to restrict the sample to 16–18-year-olds, as many 15-year-olds face working restrictions. We were unable to get the models examining housework and screen time

[8] These Friday, Saturday, and Sunday differences also suggest that breaking the sample by weekend/weekday diary day would not be appropriate.

to converge, perhaps due to the smaller sample size. However, the estimated effects of paid work on homework and sleep are virtually unchanged.

A second sensitivity analysis that we performed was to use only the sibling variables to identify homework in the market work equation. In our main analysis, we had also used parental education, which some may argue should be included in the market work equation if parental education directly affects the number of hours a student works apart from its effect through decreased homework time. For example, more educated parents who are probably also more likely to be employed may be able to provide their children with better access to jobs. However, the estimated effects of paid work on homework and of homework on paid work are virtually unchanged, and the number of siblings under age 15 was a significant predictor of homework time in this specification.

A third analysis that we performed was to use only the number of siblings under age 15 to identify homework in the market work equation, because it is possible that having a working older sibling may increase one's chances of finding a job. However, the number of siblings aged 15–18 is statistically insignificant in the minutes worked equation. The estimated effects of paid work on homework and of homework on paid work are similar to those reported in Table 4.

Finally, we added commuting time to paid work time. We did not do this in our primary analysis because of the way commuting time is coded in the ATUS. In the ATUS, if a person stops at a coffee shop on the way to work, only the time between the coffee shop and work is counted as commuting time. Travel to the coffee shop is not coded as commuting. In addition, some respondents to the ATUS reported commuting time even though they did not do any paid work. While we do not attempt to recode travel to capture the missing commuting time, we do recode commuting time as zero for those who did not engage in paid work on the diary day.

When we count our measured commuting time as part of market work time, the effects of paid work on all of the other activities are similar. Tables for these additional analyses are available upon request from the authors.

VI. **Conclusion**

Using pooled time diary data from the ATUS, this paper examines the effects of teens' paid work time on the time that they spend in their other major activities. Results from the estimation of several simultaneous equations models show that an increase in paid work time reduces the time teens spend on homework, sleep, household work, and screen time. In fact, reductions in these activities due to a one-hour increase in paid work time account for 84% of this hour. Paid work has the smallest effect on homework time — an increase in paid work time of one hour reduces homework time by only 5 minutes. An increase in paid work time of one hour results in 10 minutes less sleep. The small magnitudes of these effects may be the reason for the small negative effect of paid work on student achievement that has sometimes been found in the literature. The largest effect of paid work is on screen time, with an hour of additional paid work reducing a teen's screen time by 24 minutes. If screen time is viewed as time that is relatively unproductive, then, combined with the small effects of paid work on homework and sleep, there may be little reason to be concerned about teen employment.

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Table 1. Percentage of Observations Recorded as Zero

Dependent Variables	Percent
Paid Work	86
Homework	60
Sleep	0
Household Work	30
Screen time	19
Number of observations	2,673

Table 2. Selected Descriptive Statistics

Variable	Mean	Standard Deviation
Minutes worked per day	37.61	128.34
Minutes of homework per day	47.71	88.52
Minutes of sleep per day	551.56	173.61
Minutes of housework per day	58.62	99.77
Minutes of screen time per day	143.30	165.47
Mother has bachelor's degree	0.26	
Father has bachelor's degree	0.25	
Number of siblings under age 15	0.73	1.21
Number of siblings aged 15–18	0.32	0.71
State monthly precipitation (inches)	3.00	2.37
State monthly temperature (Fahrenheit)	49.42	17.98
Sunrise (minutes since midnight)	385.11	64.84
Sunset (minutes since midnight)	1073.74	64.39
State monthly unemployment rate	5.17	1.30
Friday	0.14	
Saturday	0.14	
Sunday	0.14	
Female	0.49	
Age 15	0.26	
Age 16	0.31	
Age 17	0.30	
Age 18	0.13	
Non-black, Non-Hispanic	0.67	
Black	0.15	
Hispanic	0.18	
No mother in household	0.08	
No father in household	0.25	
Born in U.S.	0.92	
Mother born in U.S.	0.70	
Father born in U.S.	0.58	
Household income missing	0.12	
Household income <$20K	0.11	
Household income $20-40K	0.18	
Household income $40-75K	0.25	
Household income >$75K	0.32	
Number of Observations	2,673	

Note: Survey weights were used.

Table 3. Average Minutes per Day Spent in Each Activity, by Daily Working Status

	Working	Not Working	P-value
Paid Work	273.59		
	(369)		
Homework	29.50	50.61	0.00
	(369)	(2,304)	
Homework if Homework >0	86.50	112.87	0.00
	(131)	(932)	
Sleep	508.04	558.49	0.00
	(369)	(2,304)	
Household Work	39.72	61.63	0.00
	(369)	(2,304)	
Household Work if Household Work >0	57.09	91.10	0.00
	(258)	(1,616)	
Screen Time	87.51	152.20	0.00
	(369)	(2,304)	
Screen Time if Screen Time >0	124.59	184.13	0.00
	(259)	(1,909)	

Note: Survey weights were used. Numbers of observations are in parentheses.

Table 4. Tobit Models of Minutes Spent Doing Homework and Paid Work

	Simple Tobits		Simultaneous Tobits	
Variable	**Homework**	**Paid Work**	**Homework**	**Paid Work**
Minutes paid work	-0.08**		-0.21***	
	(0.03)		(0.06)	
Minutes of homework		-0.66***		-2.33***
		(0.21)		(0.46)
Mother has bachelor's degree	41.09***		35.17***	
	(8.96)		(8.22)	
Father has bachelor's degree	34.19***		35.03***	
	(9.71)		(8.52)	
Number of siblings under age 15	-6.70*		-5.41	
	(3.86)		(3.35)	
Number of siblings aged 15–18	-4.29		-4.72	
	(7.59)		(6.47)	
State monthly unemployment rate		-42.61***		-26.39**
		(15.70)		(12.32)
Friday	-127.32***	50.37	-116.71***	-81.24
	(13.87)	(51.21)	(14.43)	(59.05)
Saturday	-118.30***	58.89	-106.06***	-53.49
	(10.03)	(37.51)	(10.69)	(49.60)
Sunday	-23.99***	70.94*	-21.63***	32.17
	(8.61)	(36.81)	(9.09)	(34.91)
Female	55.36***	-10.17	51.56***	49.14
	(7.16)	(29.24)	(7.26)	(29.93)
Age 16	7.64	270.16***	12.71	209.78***
	(9.26)	(46.78)	(9.74)	(47.27)
Age 17	4.09	367.36***	15.77	291.26***
	(9.41)	(46.90)	(10.52)	(54.09)
Age 18	-45.81***	471.32***	-23.69	332.73***
	(13.98)	(56.24)	(15.52)	(71.76)
Black	-39.55***	-87.12*	-38.41***	-109.59***
	(13.03)	(52.22)	(13.16)	(46.75)
Hispanic	-47.99***	-77.50	-49.69***	-134.58***
	(12.53)	(55.01)	(12.26)	(52.05)
No mother in household	-38.52**	-36.55	-35.20**	-60.22
	(17.08)	(74.45)	(16.60)	(61.32)
No father in household	-18.70	-23.91	-18.47	-55.91
	(14.20)	(61.12)	(13.42)	(52.22)
Born in U.S.	-33.26**	17.26	-28.20**	-23.42
	(15.04)	(68.12)	(14.21)	(55.36)
Mother born in U.S.	-41.69***	95.86*	-35.36***	39.33
	(12.21)	(55.06)	(12.53)	(48.90)
Father born in U.S.	-11.82	-49.15	-14.95	-73.96
	(13.44)	(59.18)	(13.02)	(52.64)
Household income $20-40K	-13.54	-29.50	-16.11	-40.27
	(14.16)	(57.82)	(14.03)	(49.27)
Household income $40-75K	8.61	26.41	5.55	28.35
	(13.99)	(56.23)	(13.46)	(48.71)
Household income >$75K	18.22	6.91	14.09	52.84
	(15.09)	(59.45)	(14.47)	(53.20)
σ_H	152.45		148.82***	
	(3.69)		(2.96)	
σ_W		478.35		446.11***
		(21.68)		(42.80)
ρ				0.70***
				(0.12)
Log-likelihood	-7667.16	-3423.56		-11,086.09
Pseudo R2	.03	.02		
Number of Observations	2,673		2,673	

Note: *** indicates significance at 1% level; ** indicates significance at the 5% level; * indicates significance at 10% level. Standard errors are in parentheses. Regressions also include a constant term, an indicator for missing household income, indicators for region, an indicator for whether the respondent resides in a SMSA, and survey year indicators.

Table 5. Models of Minutes of Sleep and Paid Work

			Simultaneous Model	
	OLS	**Simple Tobit**	**Continuous**	**Tobit**
Variable	**Sleep**	**Paid Work**	**Sleep**	**Paid Work**
Minutes paid work	-0.17*** (0.02)		-0.16** (0.08)	
Minutes of sleep time		-0.77*** (0.11)		0.28 (1.93)
Sunrise	0.20** (0.08)		0.21*** (0.08)	
Sunset	0.03 (0.08)		0.04 (0.08)	
State monthly unemployment		-36.38** (15.50)		-44.81* (24.53)
Friday	-44.51*** (9.36)	31.59 (50.49)	-44.54*** (8.66)	87.32 (121.21)
Saturday	63.21*** (6.74)	110.04*** (37.21)	62.94*** (6.95)	59.34 (106.75)
Sunday	139.26*** (6.64)	168.39*** (39.49)	139.03*** (7.14))	30.07 (252.99)
Female	-7.80 (5.25)	-21.00 (28.68)	-7.77 (5.31)	-19.42 (33.10)
Age 16	-3.84 (6.92)	256.59*** (46.08)	-4.15 (7.36)	278.15*** (107.80)
Age 17	-15.28** (7.03)	344.14*** (46.09)	-15.77** (7.89)	385.14** (158.50)
Age 18	1.21 (9.76)	462.22*** (55.46)	0.46 (10.56)	500.05*** (170.29)
Black	27.10*** (9.01)	-51.76 (51.42)	27.20*** (7.74)	-89.13 (97.09)
Hispanic	-5.24 (9.16)	-71.05 (54.09)	-5.18 (9.43)	-64.48 (61.31)
No mother in household	-15.61 (12.30)	-20.80 (73.20)	-15.61 (12.19)	-17.30 (80.27)
No father in household	13.42 (10.47)	-19.36 (60.19)	13.48 (10.45)	-26.95 (72.46)
Born in U.S.	-17.94 (11.49)	4.86 (67.01)	-18.06 (11.30)	35.48 (83.09)
Mother born in U.S.	-16.09* (9.27)	103.55* (54.37)	-16.24 (9.46)	118.61 (85.66)
Father born in U.S.	12.39 (10.26)	-45.55 (58.34)	12.46 (10.59)	-54.97 (74.44)
Household income $20-40K	1.82 (10.01)	-18.73 (57.22)	1.88 (9.65)	-28.09 (63.91)
Household income $40-75K	-0.62 (9.98)	26.41 (55.65)	-0.60 (9.66)	23.85 (61.71)
Household income >$75K	-13.07 (10.50)	-6.59 (58.65)	-12.99 (10.39)	-0.95 (69.58)
Adjust R2	0.19			
σ_S			134.39** (1.60)	
σ_W		468.48*** (21.18)		504.10*** (178.92)
ρ			-0.09 (0.49)	
Log-likelihood		-3404.32		-20320.84
R-Squared	0.20			
Number of Observations			2,673	

Note: *** indicates significance at 1% level; ** indicates significance at the 5% level; * indicates significance at 10% level. Standard errors are in parentheses. Regressions also include a constant term, an indicator for missing household income, indicators for region, an indicator for whether the respondent resides in a SMSA, and survey year indicators.

Table 6. Tobit Models of Minutes Spent Doing Household Work and Paid Work

	Simple Tobits		Simultaneous Tobits	
Variable	**Household work**	**Paid Work**	**Household Work**	**Paid Work**
Minutes of paid work	-0.14***		-0.30***	
	(0.02)		(0.08)	
Minutes of household work		-1.06***		-1.03
		(0.19)		(0.87)
Mother has bachelor's degree	-7.63		-5.51	
	(6.33)		(6.51)	
Father has bachelor's degree	-11.68*		-7.70	
	(6.90)		(6.95)	
Number of siblings under age 15	6.04**		5.67**	
	(2.59)		(2.54)	
Number of siblings aged 15–18	3.91		2.80	
	(5.23)		(5.15)	
State monthly unemployment rate		-43.64***		-27.04*
		(15.52)		(15.53)
Friday	25.88***	79.66	27.57***	80.02*
	(8.65)	(50.45)	(9.91)	(44.30)
Saturday	70.06***	111.57***	73.25***	119.47**
	(6.21)	(37.46)	(6.51)	(47.37)
Sunday	49.23***	92.71**	51.89***	92.70**
	(6.15)	(36.63)	(6.52)	(36.71)
Female	45.67***	2.81	44.43***	24.23
	(4.85)	(29.04)	(5.07)	(44.92)
Age 16	10.17	262.82***	15.30**	213.68***
	(6.40)	(46.04)	(7.04)	(71.65)
Age 17	5.13	352.57***	13.47*	284.66***
	(6.52)	(46.06)	(7.98)	(94.94)
Age 18	30.71***	482.42***	42.90***	391.57***
	(8.94)	(55.66)	(10.48)	(103.09)
Black	-29.47***	-90.50*	-30.18***	-77.31*
	(8.53)	(51.93)	(8.28)	(43.06)
Hispanic	5.13	-62.75	4.67	-37.99
	(8.53)	(54.31)	(8.30)	(48.40)
No mother in household	21.17*	-11.19	21.03*	5.52
	(11.47)	(73.61)	(10.96)	(61.18)
No father in household	1.89	-22.54	2.33	-19.90
	(9.89)	(60.10)	(10.21)	(50.00)
Born in U.S.	-7.83	18.56	-6.52	17.15
	(10.61)	(67.66)	(9.83)	(53.97)
Mother born in U.S.	6.72	108.05**	9.36	94.43*
	(8.52)	(54.17)	(8.72)	(49.32)
Father born in U.S.	-1.21	-51.62	-2.30	-43.05
	(9.47)	(58.28)	(9.87)	(50.72)
Household income $20-40K	4.12	-25.67	3.62	-17.57
	(9.29)	(57.35)	(9.18)	(47.02)
Household income $40-75K	4.96	21.61	4.19	15.34
	(9.33)	(55.63)	(9.22)	(46.69)
Household income >$75K	6.37	-9.56	3.21	-8.52
	(10.21)	(58.76)	(10.17)	(49.28)
σ_H	118.40***		119.43***	
	(2.03)		(2.24)	
σ_W		471.48***		403.19***
		(21.33)		(71.12)
ρ			0.51*	
			(0.29)	
Log-likelihood	-12232.271	-3411.55	-15657.22	
Pseudo R2	0.01	0.03		
Number of Observations			2,673	

Note: *** indicates significance at 1% level; ** indicates significance at the 5% level; * indicates significance at 10% level. Standard errors are in parentheses. Regressions also include a constant term, an indicator for missing household income, indicators for region, an indicator for whether the respondent resides in a SMSA, and survey year indicators.

Table 7. Tobit Models of Minutes of Screen Time and Paid Work

	Simple Tobits		Simultaneous Tobits	
Variable	**Screen Time**	**Paid Work**	**Screen Time**	**Paid Work**
Minutes paid work	-0.29***		-0.51***	
	(0.03)		(0.09)	
Minutes of screen time		-1.11***		-1.34***
		(0.13)		(0.25)
Mother has bachelor's degree	-19.12**		-6.77	
	(8.58)		(6.69)	
Father has bachelor's degree	-5.85		4.91	
	(9.34)		(7.16)	
Number of siblings under age 15	-13.52		-8.88***	
	(3.55)		(3.31)	
Number of siblings aged 15–18	5.10		1.04	
	(7.09)		(5.42)	
Temperature	-0.55**		-0.40*	
	(0.26)		(0.22)	
Precipitation	2.93		2.81*	
	(1.86)		(1.60)	
State monthly unemployment rate		-35.61**		-15.14*
		(15.23)		(9.09)
Friday	27.74**	85.05*	29.06**	70.01**
	(11.71)	(49.66)	(11.96)	(30.33)
Saturday	77.95***	127.70***	80.60***	129.27***
	(8.39)	(36.77)	(8.56)	(23.68)
Sunday	70.78***	110.14***	74.17***	120.68***
	(8.28)	(36.24)	(8.68)	(24.45)
Female	-31.39***	-45.32	-31.92***	-49.34***
	(6.54)	(28.50)	(6.65)	(16.92)
Age 16	-3.86	246.17***	3.18	106.00**
	(8.59)	(45.30)	(9.32)	(46.62)
Age 17	-12.13	334.64***	0.28	143.03**
	(8.76)	(45.29)	(9.73)	(60.42)
Age 18	-12.84	447.06***	8.02	200.42***
	(12.22)	(54.40)	(13.42)	(77.69)
Black	7.14	-84.60*	4.40	-27.38
	(11.27)	(51.46)	(10.56)	(28.95)
Hispanic	-1.74	-61.13	-1.58	-32.47
	(11.55)	(53.00)	(12.06)	(30.29)
No mother in household	-4.47	-4.96	-1.76	-6.11
	(15.47)	(72.35)	(14.90)	(37.68)
No father in household	-4.42	-21.88	-0.94	-9.11
	(13.30)	(59.41)	(13.19)	(31.78)
Born in U.S.	-10.49	23.16	-7.27	0.43
	(14.29)	(66.37)	(13.60)	(33.35)
Mother born in U.S.	-12.28	101.74	-8.26	34.02
	(11.49)	(53.90)	(11.99)	(33.26)
Father born in U.S.	-6.46	-60.35	-6.81	-25.75
	(12.75)	(57.77)	(13.05)	(32.16)
Household income $20-40K	-7.74	-29.47	-7.67	-19.75
	(12.47)	(56.48)	(12.05)	(29.98)
Household income $40-75K	-9.05	10.44	-9.73	-0.49
	(12.53)	(54.88)	(12.46)	(30.63)
Household income >$75K	5.50	-3.80	-4.05	-6.90
	(13.73)	(57.77)	(13.30)	(31.84)
σ_H	164.22***		164.14***	
	(2.60)		(2.80)	
σ_W		458.84***		313.15***
		(20.68)		(32.87)
ρ				0.82***
				(0.14)
Log-likelihood	-14625.19	-3382.62		-18045.63
Pseduo-R2	0.01	0.03		
Number of Observations				2,673

Note: *** indicates significance at 1% level; ** indicates significance at the 5% level; * indicates significance at 10% level. Standard errors are in parentheses. Regressions also include a constant term, an indicator for missing household income, indicators for region, an indicator for whether the respondent resides in a SMSA, and survey year indicators.

Table 8. Marginal Effects of Key Variables

Panel A: Homework and Paid Work

	Simple Tobits		*Simultaneous Tobits*	
	Dependent Variables		*Dependent Variables*	
Independent Variable	Minutes of Homework	Minutes of Paid Work	Minutes of Homework	Minutes of Paid Work
Minutes of Paid Work	-0.03		-0.09	
Minutes of Homework		-0.09		-0.48

Panel B: Sleep and Paid Work

	Non-simultaneous Model		*Simultaneous Model*	
	Dependent Variables		*Dependent Variables*	
Independent Variable	Minutes of Sleep	Minutes of Paid Work	Minutes of Sleep	Minutes of Paid Work
Minutes of Paid Work	-0.17		-0.16	
Minutes of Sleep Time		-0.11		0.04

Panel C: Household Work and Paid Work

	Simple Tobits		*Simultaneous Tobits*	
	Dependent Variables		*Dependent Variables*	
Independent Variable	Minutes of Household Work	Minutes of Paid Work	Minutes of Household Work	Minutes of Paid Work
Minutes of Paid Work	-0.09		-0.19	
Minutes of Housework		-0.15		-0.18

Panel D: Screen Time and Paid Work

	Simple Tobits		*Simultaneous Tobits*	
	Dependent Variables		*Dependent Variables*	
Independent Variable	Minutes of Screen Time	Minutes of Paid Work	Minutes of Screen Time	Minutes of Paid Work
Minutes of Paid Work	-0.22		-0.40	
Minutes of Screen Time		-0.16		-0.41

Note: Reported marginal effects are averages of individual marginal effects rather than effects calculated at the average of the explanatory variables.

DATA APPENDIX

Table A1. Time Variables and ATUS codes

Time Variable	Activities	Codes
Paid Work	Working at main or other job	0501xx
Homework	Research/homework for a class for degree	060301
Household Work	Housework, Food and Drink Prepartion, Interior Decoration, Exterior cleaning, lawn care, pet care, car repair, caring for household members, caring for non-household members, shopping	02xxxx,03xxxx,04xxxx,07xxxx
Screen	Watching television and movies, using the computer for leisure (except games), surfing the web, participating in a chat room	1230303,120308
Sleep	sleeping	0101xx

Note: The codes correspond to the variables TUTIER1CODE, TUTIER2CODE, and TUTIER3Code in the ATUS activity file.