

What can time-use data tell us about hours of work?

Estimates of hours worked from the CPS are very close to estimates from the ATUS for CPS reference weeks; however, CPS reference weeks are not representative of the entire month

Harley Frazis
and
Jay Stewart

The number of hours people work for pay is an important economic measure. In addition to being a measure of labor utilization, it is a component of other economic statistics. For example, productivity measures are computed by dividing total output by total hours worked, and hourly wages are often computed by dividing usual weekly earnings by usual weekly hours worked.¹ There are two major sources of hours data for the United States—the BLS Current Population Survey (CPS) and the BLS Current Employment Statistics survey (CES)—and estimates of weekly hours from these two surveys behave differently for a variety of reasons. The goal of this article is to use data from the new American Time Use Survey (ATUS) to shed light on the accuracy of hours-worked reports in the CPS. Because the purpose of this study is to determine whether respondents report hours correctly in CPS, it does not examine other factors that could result in differences in estimates of hours worked from CPS and ATUS. In addition to differences in the reporting of hours, differences in estimates can be due to differences in sample composition and differences in the reporting of other variables.² We control for these other factors, but do not analyze their effects on differences in estimates. We examine the effect of these other factors on comparisons of weekly hours from CPS and ATUS in a forthcoming publication.³

Previous studies

Previous studies that assess the accuracy of hours data from establishment surveys either

compare hours data for the same industries across surveys, or evaluate accuracy using cognitive methods such as focus groups and interviews with respondents.⁴ The former approach allows researchers to document differences between surveys (after accounting for differences in concepts), while the latter provides information on how respondents compile their data. Studies that are directed at verifying hours measures from household surveys such as the CPS typically take one of two approaches: they compare weekly hours reports from a CPS-like question either to (1) records from the individual's employer or (2) data collected from the individual using a time diary.

Studies by Wesley Mellow and Hal Sider⁵ and Willard L. Rodgers, Charles Brown, and Greg J. Duncan⁶ took the first approach. Both studies assumed that employer-reported hours were correct, and that any difference between the two measures was due to respondent error. The Mellow and Sider study found that, compared with employer reports, respondents overreported hours by 3.9 percent on average, and that overreporting was greater for self respondents than when a proxy provided the information (4.3 percent versus 3.4 percent). They also found that overreporting was greater among managerial and professional workers (11 percent). However, because these workers tend to be salaried, it seems unlikely that their employers kept records of their actual hours worked and instead reported the hours of a standard workweek.

Harley Frazis
and Jay Stewart
are research
economists on the
Employment
Research and
Program
Development Staff,
Office of Employment
and Unemployment
Statistics,
Bureau of Labor
Statistics.
E-mail:
Frazis.Harley@bls.gov
Stewart.Jay@bls.gov

In contrast, Rodgers, Brown, and Duncan found very little measurement error on average. However, differences in the samples provide the most likely explanation for the different results. The sample in the Rodgers, Brown, and Duncan study was restricted to hourly-paid workers at a single firm. Further, all of the workers in their study were unionized, and most were full time. All of these characteristics would lead to more stable work schedules, which should reduce reporting errors. In contrast, the data in the Mellow and Sider study came from a special supplement to the CPS in which respondents' employers were contacted and asked to provide hours and earnings information. Thus, their sample is representative of the entire employed civilian population.

The study that most closely resembles the one in this article was done by John Robinson and Ann Bostrom in 1994.⁷ They compared time-diary estimates of hours worked from surveys conducted during 1965, 1975, and 1985, to estimates from CPS-like questions about hours worked last week asked during the same surveys. One drawback of using time-diary data from these surveys is that the data were collected only for a single day. To overcome this, they constructed synthetic weeks by combining diaries of demographically similar respondents. Another drawback is that the reference periods for the two measures of hours worked do not cover the same time period. The reference day for the time diary is the day prior to the interview, while the reference period for the CPS-like question is the week prior to the interview. Their results indicated that respondents overreport hours in the CPS-like question, that women tend to overreport more than men, and that the extent of this overreporting has increased over time. These authors also found that overreporting was greater among those who reported the longest hours in the CPS-like question. However, Jerry A. Jacobs in 1998 argued that the relationship between overreporting and reported hours worked is due to regression to the mean.⁸ Regression to the mean arises because people who worked unusually long hours during the previous week (the reference period for the CPS-like question) were more likely to work more-normal hours during the week in which the time diary was collected. Jacobs's analysis indicates that estimates of time spent at work are very close to estimates of work hours from a retrospective question, suggesting that self-reported hours are fairly accurate.⁹

One possible explanation for the disagreement on the extent of overreporting between these two studies is that they used different measures of work. The Robinson and Bostrom study used actual work time as collected in the time diary, whereas Jacobs used time spent at work. If respondents take time off in the middle of the day to eat lunch or run errands, then the time-spent-at-work measure will overstate time spent working. On the other hand, work that is done at home after hours will be missed by this measure, but will be captured by the actual-time-worked measure.

The current study contributes to this literature by using ATUS data to examine the accuracy of reporting in the CPS. Because the ATUS sample is drawn from households that recently completed their participation in the CPS, it is possible to link ATUS respondents' interviews to their final CPS interviews. Thus, we can compare estimates of hours worked generated from ATUS time diaries to those generated from the actual CPS questions, rather than from a CPS-like question.

One difference between ATUS and CPS survey methods turns out to be unexpectedly important in this comparison. CPS respondents report their labor force activity for the week containing the 12th of the month. This reference week was chosen to avoid holidays. In contrast, ATUS interviews are conducted over the entire month. We find that CPS hours reports are, on average, quite similar to those from ATUS for the CPS reference week, but the reference week is not representative of the entire month.

About the data

The data used in this study are from the new American Time-Use Survey. The ATUS sample is a stratified random sample that is drawn from households that have completed their participation in the CPS and is representative of the U.S. civilian population. The data cover the January–December 2003 period. Interviews were conducted every day during the year except for a few major holidays. Thus, the data cover the entire year, except for the days before these holidays. About 1,725 diaries were collected each month for a total sample size of 20,720. The response rate for 2003 was about 58 percent. Interviews with fewer than five activity spells or more than 3 hours of uncodeable activities were dropped from the sample.

As in other time-use surveys, respondents are asked to sequentially report their activities on the previous day. The diary day starts at 4 a.m. and goes through 4 a.m. of the following day (the interview day), so each interview covers a 24-hour period. The respondent describes each activity spell, which the interviewer either records verbatim or, for a limited set of common activities (such as sleeping or watching television), enters a numerical code. These responses are translated into 3-tier activity codes.¹⁰ For each episode, the ATUS collects the start and stop times along with other information.¹¹ The ATUS does not collect information about secondary activities (for example, listening to the radio while driving) in the time diary. This lack of information on secondary activities should have only a minor impact on time spent in paid work, because most paid work is done as a primary activity.

The ATUS also contains labor force information about the respondent that was collected using a slightly modified version of the basic CPS questionnaire. These questions allow analysts to determine whether the respondent is employed, unemployed, or not in the labor force.¹² One notable differ-

ence between ATUS and CPS employment questions is that the reference period in ATUS is the 7 days prior to the interview—the last day being the diary day—instead of the previous calendar week as in CPS. The sample for this study is respondents 16 years and older who worked at a job during the 7 days prior to their ATUS interview and reported usual hours.

The ATUS collects usual hours worked on respondents' main and other jobs, but does not collect actual hours. Having data on actual hours would be an advantage, because the time diary collects actual hours—and because using actual hours would make our results more comparable to those of other studies. But there is a potential problem with using time-diary estimates of actual hours collected during the ATUS interview: the procedure used for contacting respondents in ATUS could impart bias into estimates of actual hours for the previous 7 days. Each designated person is assigned an initial calling day. If he or she is not contacted on that day, the interviewer makes the next call 1 week later, thus preserving the assigned day of the week. Individuals who are unusually busy during a particular week (perhaps because they worked long hours) are less likely to be contacted during that week, making it more likely that they are contacted the following week (and asked to report hours for the busy week). Hence, long work weeks would tend to be oversampled, resulting in a correlation between hours worked during the previous week and the probability that that week is sampled.

Definitions of hours worked

For our comparisons, we consider three alternative measures of hours worked and one measure of time at work from the time diary data:

- definition 1: Time spent in activities coded as paid work in the time diary.
- definition 2: Definition 1 plus breaks of 15 minutes or less and work-related travel (travel between work sites).
- definition 3: Definition 2 plus time spent in work-related activities.
- definition 4: Total elapsed time between the start time of the first episode of paid work and the stop time of the last episode of paid work.¹³

These definitions were chosen for comparison because they represent possible ways that respondents might report hours of work, although, conceptually, one can make a strong argument for using any of definitions 1-3. Of these three definitions, definition 1 is the most restrictive and, based on the descriptions in John Robinson and Ann Bostrom and John Robinson and Geoffrey Godby,¹⁴ is the one used in the earlier

studies to verify hours. This definition was also used by BLS in its recent ATUS press release. Definition 2 corresponds to the definition of hours used for productivity measurement. The inclusion of breaks is appropriate because, as Daniel Hamermesh¹⁵ argues, breaks are productive.¹⁶ On a more practical level, not all respondents report breaks as separate episodes, so definition 2 imposes more consistency across respondents. Definition 3 includes work-related activities—activities that are done for the respondent's job or business, but may have a leisure component and take place outside normal work hours (for example, dining or playing golf with clients or customers). Empirically, there is very little difference between definitions 2 and 3. Definition 4, which is similar to Jacobs's 1998 time-at-work measure,¹⁷ is potentially problematic because it could include time spent doing nonwork activities, such as running personal errands during work hours. Abraham, Spletzer, and Stewart¹⁸ speculated that the pattern of overreporting found in Robinson and Bostrom¹⁹—that hours are overreported in retrospective questions and that overreporting has increased over time—could be due to the increased flexibility and variability of work schedules. For example, a worker who arrives at work at 8 a.m. and leaves at 6 p.m. might report working a 50-hour week, even though he or she usually takes a 2-hour break each day to run personal errands. Under definition 4, these workdays would be 10 hours long. Jacobs's result of very little difference between the time-at-work measure and the CPS-like measure is consistent with Abraham, Spletzer, and Stewart's speculation.

Comparing ATUS and CPS hours measures

We compare the four definitions of time-diary measures of hours worked from the ATUS to retrospective measures from these respondents' final CPS interview. First, hours worked in the time diary are compared to usual hours worked per week from the employment section of the ATUS questionnaire. The advantages of this comparison are that the questions were asked in the same interview and that reference periods for the different measures are close in time. For each of the time-diary estimates, responses were reweighted so that each day of the week receives equal weight (1/7 of the total) and used these reweighted responses to compute the average number of hours worked per day for workers. In order to make the time diary measure—which records hours worked per day—comparable with hours worked per week, these estimates were multiplied by 7. Thus, sample averages should be an unbiased estimate of average hours worked per week for the population.

Row (a) of table 1 shows the comparisons for our base sample. Usual hours worked per week reported in the ATUS (using a slightly modified version of the CPS question) are, on average, about 2-3 hours higher than the diary-based measures. The closest figure is 40.9 hours using definition 4—

Table 1. Comparison of time-diary estimates of average weekly hours to estimates from CPS questions

Respondent	ATUS definitions of paid work				CPS definitions of paid work		
	Definition 1: Work only (ATUS definition)	Definition 2: Work plus breaks plus work-related travel	Definition 3: Work plus breaks plus work-related travel plus work-related activities	Definition 4: Start time minus stop time	Usual hours in ATUS	Usual hours in CPS	Actual hours in CPS
(a) Worked last week, usual hours reported in ATUS (N = 11,988)	37.6	38.0	38.2	40.9	40.3
(b) (a) and worked during CPS reference week and reported usual hours reported in CPS (N = 10,036)	38.7	39.2	39.3	42.2	41.3	40.0	39.4
(c) (b) and usual hours in CPS and ATUS were within 5 hours of each other (exclusive). (N = 6,268)	37.3	37.8	37.9	40.7	39.3	39.3	38.6
(d) (c) and ATUS diary day not during CPS reference week (N = 4,767)	36.8	37.3	37.4	40.2	39.2	39.2	38.3
(e) (c) and ATUS diary day during CPS reference week (N = 1,501)	38.8	39.3	39.5	42.3	39.7	39.7	39.3
(f) (d) and ATUS diary day not a holiday ¹ (N = 4,703)	37.4	37.9	38.0	40.8	39.3	39.2	38.4

¹ Holidays include New Year's Day, Easter, Memorial Day, Independence Day, Labor Day, Thanksgiving, and Christmas. Interviews were collected for all except Thanksgiving and Christmas.

the time work stopped minus the time work started. This definition yields an estimate 0.6 hours greater than the usual hours worked figure.

Another interesting, and possibly more appropriate, comparison is to compare the time-diary measures with retrospective reports of actual hours worked per week. The ATUS does not collect such a measure. However, the CPS does; so, if a respondent worked during the period covered by his or her last CPS interview, his or her reported actual weekly hours from CPS can be compared with hours worked from the ATUS time diary. The results of this comparison are shown in row (b). Actual hours reported in the CPS are much closer to diary hours for definitions 1-3, but are about 3 hours less than the diary hours for definition 4.

One problem with comparing actual CPS hours to ATUS hours from the time diary is that the CPS interviews occurred, on average, 3 months before the ATUS interview, and respondents' work schedules may have changed during that time.²⁰ Indeed, usual weekly hours reported in ATUS are on average 1.3 hours greater than usual hours reported in the last CPS interview. This change in usual hours presents problems in interpreting the comparison of CPS actual hours to the time-diary measures, because one would expect that actual hours may have changed as well. Looking at the CPS as a whole (not just the sample matched with ATUS), there is no evidence that usual (or actual) hours worked increased between October 2002 (the period that the January 2003 ATUS sample was drawn) and the end of 2003.²¹ Together, these facts suggest either

that persons whose work hours increased were more likely to respond in ATUS, or that persons were more likely to report a high number of hours in ATUS than in CPS for the same jobs despite the fact that the questions are the same in both surveys.²² If the first explanation is correct, the two measures are not comparable because they were reported at different times.

To control for changes in usual hours, the sample is further restricted to individuals whose reported usual hours in the CPS and in ATUS were within 5 hours (exclusive) of each other.²³ This comparison is shown in row (c). The results show a greater difference between definitions 1-3 and CPS actual hours than in row (b). Diary hours corresponding to definition 1 are less than CPS actual hours by 1.3 hours, whereas they are only 0.8 and 0.7 hours less than CPS actual hours for definitions 2 and 3. All of these differences are statistically different from CPS actual hours at the 10-percent level using a 2-tailed test.

One factor that could affect these comparisons is that the reference week for the CPS (the week containing the 12th of the month, as mentioned above) was chosen to avoid holidays. Therefore, one might expect hours of work to be greater, on average, in CPS reference weeks than in nonreference weeks. Rows (d) and (e) show that this is indeed the case: for all measures, diary hours in reference weeks exceed diary hours in nonreference weeks by approximately 2 hours. Using the entire base sample (as in row (a)), rather than the restricted sample (as in row (c)), shows an even larger difference: about 2.6 hours for definitions 1-3 and 2.9 hours for definition 4. Thus, it is more appropriate to compare actual hours from CPS

to time-diary estimates that include only diaries that are in the 12 CPS reference weeks.

Comparing the CPS measure of actual hours to the time-diary measures in row (e) indicates that they are quite close for definitions 1-3 when the diary day is in a CPS reference week. Except for definition 4, none of the diary measures are statistically different from the CPS measure. In contrast, when the diary day is not in a CPS reference week, CPS actual hours exceed time-diary hours for definitions 1-3 by 0.9 to 1.5 hours (all of these differences are statistically significant at the 5-percent level using a 2-tailed test). To illustrate the effect of holidays, we recomputed the time-diary estimates for nonreference weeks excluding major holidays and reweighting the remaining diaries so that each day of the week is weighted the same. This exclusion reduced the difference between CPS actual hours and the diary measure by about half an hour, with only the definition 1 difference remaining significant.

In summary, estimates of hours worked from time diaries are significantly lower than estimates of *usual* hours worked. However, when the sample is restricted to respondents whose usual hours did not change much between their final CPS interview and their ATUS interview, average time-diary hours are close to average *actual* hours as reported in CPS. These estimates are indistinguishable from each other when the ATUS diary day falls in a CPS reference week. When the diary day falls outside the CPS reference week, time-diary estimates are significantly lower than estimates of actual hours worked from CPS. The implications of these results are discussed later.

Table 2 shows comparisons for individuals whose usual hours changed by less than 5 hours (the sample in rows (c)

through (f) of table 1), tabulated by sex, education, and full- or part-time status. Men's diary hours are quite close to actual hours reported from CPS, with definition 2 hours being equal to CPS actual hours to one decimal place. Women report fewer hours in the time diary than in CPS for definitions 1-3 (all differences are statistically significant at the 5-percent level). This pattern of differential overreporting is also found in Robinson and Bostrom.²⁴ They argue that women may be more likely to work part time and have variable schedules, which would make it harder to report their work hours. Although we do not know why women's hours are overreported, we can rule out differences in reporting behavior between men and women. The difference between CPS hours and diary hours is virtually identical between women who self-reported hours in CPS and those whose hours were reported by proxy respondents (who are often spouses). Table 2 also shows comparisons between measures for different educational groups. The sample is further restricted to those ages 25 and older in order to minimize the influence of respondents who are still in school. The results show a consistent pattern, although the differences between CPS actual hours and diary hours are not very precisely estimated. More education is associated with more overreporting of hours in CPS relative to the diary. For high school dropouts, diary hours are slightly higher than CPS actual hours, although the difference is not significant. For high school graduates and those with some college, diary hours are quite close to CPS actual hours, at least for definitions 2 and 3. For college graduates, diary hours are less than CPS actual hours by 1.6 to 2.0 hours per week for definitions 1-3; these differences are statistically significant at the 5-percent level.

Table 2. Comparison of time-diary estimates of average weekly hours to estimates from CPS questions, by selected demographic characteristics

Respondent	ATUS definitions of paid work				CPS definitions of paid work		
	Definition 1: Work only (ATUS definition)	Definition 2: Work plus breaks plus work- related travel	Definition 3: Work plus breaks plus work-related travel plus work-related activities	Definition 4: Start time minus stop time	Usual hours in ATUS	Usual hours in CPS	Actual hours in CPS
Sex							
Men (N = 2,874)	40.4	40.9	41.0	43.9	41.6	41.5	40.9
Women (N = 3,394)	34.2	34.6	34.7	37.4	37.1	37.1	36.2
Education (age 25 and older)							
No high school diploma (N = 417)	38.5	39.1	39.2	41.9	39.6	39.6	39.0
High school diploma (N = 1,678)	37.5	38.2	38.2	40.7	39.4	39.4	38.7
Some college (N = 1,793)	37.8	38.3	38.4	41.2	39.7	39.6	38.9
College graduates (N = 1,989)	37.8	38.1	38.2	41.7	41.0	41.0	39.8
Full-/Part-time status							
Full time (N = 5,408)	39.4	39.9	40.0	43.0	42.0	42.0	41.2
Part time (N = 860)	23.0	23.2	23.3	24.5	21.8	21.8	21.3

NOTE: The universe for this table is the restricted sample as defined in row (c) of table 1 (individuals who worked during the reference week in ATUS and the reference week in CPS, and whose usual hours in CPS and ATUS were within 5 hours of each other (exclusive). For the education

comparisons, the sample was restricted to respondents age 25 and older. Full- / part-time status is determined using the response to usual hours worked in CPS. Respondents who usually work 35 or more hours per week are full time.

Finally, table 2 compares work hours by full-time and part-time status based on the usual-hours question in ATUS (full time is defined as 35 hours or more usually worked). Time-diary hours for part-timers are above actual hours reported in CPS, while for full-timers they are below. Differences between ATUS hours and CPS actual hours are significant at least at the 10-percent level for definitions 1-3 for part-timers, and at the 1-percent level for full-timers. One obvious explanation for this is regression to the mean, as those with unusually high or low hours in CPS revert to more typical values. However, note that our procedure of limiting the sample to those with similar usual hours in CPS and ATUS should help limit this problem. By way of comparison, performing a similar procedure with CPS data by comparing actual hours 3 months apart for those whose usual hours have changed less than 5 hours shows no increase in hours for part-timers or decrease for full-timers.

Implications. Our results indicate that, for ATUS respondents, estimates of actual hours worked from the CPS are very close to time-diary estimates for the CPS reference week. On the other hand, it also appears that the CPS reference week is not representative of the month as a whole, as there is a significant difference in hours between reference and nonreference weeks. The fact that CPS reference weeks avoid holidays simplifies the task of tracking employment and hours trends using CPS data. However, a measure of monthly hours worked constructed from CPS average weekly hours data would overstate actual hours worked during the month.

The fact that hours for some groups (such as women and college graduates) are significantly overreported has implications for measuring differences in hourly wages between groups. Typically, studies that examine between-group differentials use usual hours worked in the denominator of their hourly earnings measure.²⁵ To illustrate the effect of overreporting by college graduates, if actual hours from the time diary (under definition 2) are used instead of

usual hours from the CPS, the college-high school hourly earnings ratio would be 4.1 percent higher. Performing a similar experiment, the female-male hourly earnings ratio would increase by 5.4 percent. It is worth noting that, unless reporting patterns have changed over time, this differential overreporting should have a relatively small impact on trends.

Various important economic indicators, including the BLS average hourly earnings series and productivity measures, use data on work hours from the BLS CES program. The CES collects data from establishments for the pay period that includes the 12th of the month; unlike the CPS, this period is longer than the week including the 12th. In addition, the CES measures hours paid rather than hours worked. Thus, the CES hours paid will be much more representative of hours paid over the entire month than the CPS is of hours worked over the entire month—both because the CES covers a longer period and because much of the time off for holidays is paid.²⁶

OUR COMPARISON OF HOURS WORKED IN ATUS AND CPS indicates that the CPS measure of actual hours is, on average, fairly close to all three of the time-diary definitions of hours worked when the diary day is in the CPS reference week (the week that includes the 12th of the month). However, for the other 3 weeks of each month, the CPS measure of actual hours is approximately 5 percent higher than the hours collected in the ATUS. There is variation in this correspondence between groups: for women and college graduates, reported hours of work are higher in CPS than in ATUS. Analysts should also keep in mind that judging by ATUS, workers work longer hours on CPS reference weeks than other weeks.

Because we have only 1 full year of data, we are unable to report on trends in the reporting of hours worked. In the future, as ATUS data accumulate over several years, we will determine to what extent there are changes in hours reporting in CPS causing them to diverge from ATUS reports. □

Notes

¹ For a discussion of the importance of hours data for measuring real hourly wages, see Katharine G. Abraham, James R. Spletzer, and Jay C. Stewart, “Divergent Trends in Alternative Wage Series,” in John Haltiwanger, Marilyn E. Manser, and Robert Topel, eds., *Labor Statistics Measurement Issues*, NBER Studies in Income and Wealth, Vol. 60, (Chicago, University of Chicago Press, 1998) pp. 293–324; Katharine G. Abraham, James R. Spletzer, and Jay C. Stewart, “Why Do Different Wage Series Tell Different Stories?” *American Economic Review Papers and Proceedings*, Vol. 89, No. 2, 1999, pp. 34–39; and Lucy P. Eldridge, Marilyn E. Manser, and Phyllis Flohr Otto, “Hours Data and Their Impact on Measures of Productivity Change.” Paper presented to the NBER Productivity Program meeting, Boston, March 2004.

² For example, the ATUS has a higher multiple jobholding rate than does CPS, which would tend to result in ATUS hours exceeding CPS hours.

³ Harley Frazis and Jay Stewart, “Where Does the Time Go? Concepts and Measurement in the American Time-Use Survey,” in Ernst Berndt and Charles Hulten, eds., *Hard to Measure Goods and Services: Essays in Memory of Zvi Griliches*, NBER Studies in Income and Wealth (Chicago, University of Chicago Press, forthcoming).

⁴ Sylvia Fisher, Karen Goldenberg, Eileen O’Brian, Clyde Tucker, and Diane Willimack, “Measuring Employee Hours in Government Surveys.” Paper presented to the Federal Economic Statistics Advisory Council, Washington, DC, June 2001; and Karen L. Goldenberg and Jay Stewart, “Earnings Concepts and Data Availability for the Current Employment Statistics Survey: Findings from Cognitive Interviews,” in *Proceedings of the Section on Survey Research Methods*, American Statistical Association, 1999.

⁵ Wesley Mellow and Hal Sider, "Accuracy of Response in Labor Market Surveys: Evidence and Implications," *Journal of Labor Economics*, Vol. 1, No. 4, 1983, pp. 331–44.

⁶ Willard L. Rodgers, Charles Brown, and Greg J. Duncan, "Errors in Survey Reports of Earnings, Hours Worked, and Hourly Wages," *Journal of the American Statistical Association*, December 1993, pp. 1208–18.

⁷ John Robinson and Ann Bostrom, "The overestimated workweek? what time diary measures suggest," *Monthly Labor Review*, January 1994, pp. 11–23.

⁸ Jerry A. Jacobs, "Measuring time at work: are self-reports accurate?" *Monthly Labor Review*, December 1998, pp. 42–53.

⁹ The dataset that Jacobs used, the 1992 National Survey of the Changing Workforce, collected information on when respondents typically left for and returned from work, typical commute times, and number of days worked per week.

¹⁰ The verbatim responses are coded by coders, while the numerical codes are translated into activity codes during processing. See a forthcoming issue of the *Monthly Labor Review* for a description of coding procedures.

¹¹ Frazis and Stewart, "Where does the time go?"; Michael Horrigan and Diane Herz, "Planning, designing, and executing the BLS American Time-Use Survey," *Monthly Labor Review*, October 2004, pp. 3–19.

¹² ATUS distinguishes between "At Work" and "With Job But Absent From Work" for the employed, and between "Looking" and "On Lay-off" for the unemployed. It does not distinguish between different reasons for being not in the labor force.

¹³ If the respondent reported that the first and last activities of the day are paid work (the first activity begins at 4 a.m. and the last activity ends 4 a.m. the following day) or if the respondent reported more than 4 hours of nonwork activities between the start and stop times, then we assume that the respondent is doing shift work and calculate hours worked using Definition 3 instead.

¹⁴ John P. Robinson and Geoffrey Godbey, *Time for Life: The Surprising Ways Americans Use Their Time*, 2nd edition (State College, PA, Pennsylvania State University Press, 1997).

¹⁵ Daniel Hamermesh, "Shirking or Productive Schmoozing: Wages and the Allocation of Time at Work," *Industrial and Labor Relations Review*, Vol. 43, No. 3, 1990, pp. 121S–133S.

¹⁶ An episode is considered to be a break if it is less than 15 minutes in duration, occurs at the respondent's workplace, and the episodes immediately preceding and immediately following the break are coded as paid work. The two episodes of work that surround the break must also pertain to the same job (either main job or other jobs).

¹⁷ Jacobs, "Measuring Time at Work."

¹⁸ Abraham, Spletzer, and Stewart, "Divergent Trends in Alternative Wage Series."

¹⁹ Robinson and Bostrom, "The Overestimated Workweek?"

²⁰ Seasonality is not an issue because both hours measures cover an entire year. The ATUS data cover calendar year 2003, while the CPS data approximately cover October 2002 through September 2003.

²¹ To determine the expected change in usual hours between the final CPS interview and the ATUS interview, we examined both usual and actual hours in the CPS data between October 2002 and December

2003 (inclusive). To replicate the effect of the 3-month interval between the final CPS interview and the ATUS interview, we examined a sample of individuals who reported hours in CPS interviews 3 months apart. This is possible because households are in the CPS for 4 consecutive months (Months-in-Sample 1 through 4), then out for 8 months, then in for another 4 months (Months-in-Sample 5 through 8), so we can match responses from Month-in-Sample (MIS) 4 to MIS 1 and responses from MIS 8 to MIS 5. We found that, in this matched sample, both usual and actual hours worked declined by about half an hour.

However, we need to account for rotation group effects, the well-known phenomenon that responses to certain questions vary systematically with the length of time that the respondent has been in the survey. (For example, the unemployment rate is higher for respondents in their first month of the CPS than those in their second and subsequent months. See Barbara A. Bailar, "The Effects of Rotation Group Bias on Estimates from Panel Surveys," *Journal of the American Statistical Association*, Vol. 70, No. 349, 1975, pp. 23–30.) We estimate that the average difference in both usual and actual hours between MIS 1 and MIS 4, and between MIS 5 and MIS 8, within the same survey month is about half an hour—virtually identical to the observed decline in the matched sample. Thus, after adjusting for rotation group effects, the expected change in hours between CPS and ATUS is essentially zero.

²² One partial explanation for the change in usual hours is that CPS accepts proxy responses (responses from someone else in the household), whereas ATUS is strictly self-response. Persons whose CPS response was by proxy show a slightly greater increase in reported usual hours worked than do CPS self-responders.

²³ This restriction also helps control for differences between CPS and ATUS in the reporting of other variables that might affect estimates of hours worked. For example, this restriction controls for the difference in multiple jobholding rates that was noted in footnote 3.

This restriction to respondents whose usual hours changed by fewer than 5 hours resulted in a 38-percent drop in the sample from 10,036 observations to 6,268. This drop was larger than expected, which led to further investigation. Several patterns emerged, although the decline was large for all groups. The sample restriction was more likely to exclude men and individuals whose MIS 8 CPS response was given by a proxy. Compared with individuals whose usual hours were in the 35–44 hour range in the MIS 8 CPS interview, part-time workers and those who usually worked 45 or more hours were more likely to be excluded. The greater the length of time between the final CPS interview and the ATUS interview the more likely it was that the observation was excluded. Finally, people who reported having more than one job in ATUS, but not in CPS, were more likely to be excluded.

²⁴ Robinson and Bostrom, "The Overestimated Workweek?"

²⁵ See three recent studies: Steve G. Allen, "Technology and Wage Structure," *Journal of Labor Economics*, Vol. 19, No. 2, 2001, pp. 440–83; John W. Budd and In-Gang Na, "The Union Membership Wage Premium for Employees Covered by Collective Bargaining Agreements," *Journal of Labor Economics*, Vol. 18, No. 4, 2000, pp. 783–807; and Harley Frazis and Jay Stewart, "Tracking the Returns to Education in the Nineties: Bridging the Gap Between the New and Old CPS Education Items," *Journal of Human Resources*, Vol. 34, No. 3, pp. 629–41.

²⁶ In constructing hours measures for productivity estimates, BLS uses, where possible, information on the ratio of hours worked to hours paid from other BLS surveys to adjust CES hours paid data.