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Where Does the Time Go?
Concepts and Measurement in the American Time Use Survey

Harley Frazis and Jay Stewart

> [T]his is the single most important statistical initiative of the federal government currently underway.
> —William Nordhaus, referring to the American Time Use Survey in his testimony before the Joint Economic Committee on July 24, 2002

3.1 Introduction

Time use surveys have been around for eighty years. They were conducted in the Union of Soviet Socialist Republics (U.S.S.R.) and by the U.S. Department of Agriculture (USDA) in the 1920s and in Finland in the 1930s and 1940s. The Szalai International Study, which was the first multinational effort, was conducted in 1965–1966 in twelve countries including the United States. The 1970s saw a large increase in the number of time use surveys worldwide, but relatively few have been conducted in the United States. In addition to the 1965–1966 time use survey, there have been surveys in 1975–1976 (with a follow-up in 1981), 1978, 1985, 1992–1994, and 1998–1999. All of these surveys have relatively small sample sizes, and none were conducted by the federal government (see Harvey and St. Croix 2003). The American Time Use Survey (ATUS) is the first time use survey conducted by the U.S. government since the USDA studies of the 1920s. It is the only ongoing time use survey, and with the release of the 2004 data, its sample size exceeds that of any other time use survey.

The Bureau of Labor Statistics (BLS) started looking into measuring time use in 1991 after the Unremunerated Work Act was introduced. That bill, which did not pass, specifically named BLS as the responsible agency. Since then, the BLS has engaged in many activities—most importantly the BLS Time Use Pilot Study and the MacArthur Conference in 1997 and a

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report to the National Academy of Sciences in 1999—to assess the feasibility of collecting time use data on an ongoing basis. These activities provided the foundation for the eventual funding and subsequent development of the ATUS.

In the following we describe the ATUS, review some of the uses of time use data, and discuss how specific features of the ATUS affect two key applications—valuing household work and estimating hours worked for pay.

3.2 The American Time Use Survey

This section briefly describes the key elements of the ATUS. For a fuller description and the rationale behind many of the decisions that were made, see Herz and Horrigan (2004, 2005).

3.2.1 Data Collection

The ATUS sample is a stratified random sample that is drawn from households that have completed their participation in the Current Population Survey (CPS). The CPS households (more strictly, addresses, because movers are not followed) are in the CPS sample for eight months over a sixteen month period (four months in the survey, eight months out, and four months in). Each month, about 7,500 of these are completing their participation in CPS—that is, are in their eighth month in sample, hereafter referred to as "MIS 8." The pool of eligible households is smaller than the MIS 8 sample size because the CPS oversamples smaller states, and these oversample households are eliminated from the pool of eligible households.[1] Sample households are selected based on the characteristics of the reference person, and then the respondent is randomly selected from the list of adult (fifteen or older) household members. All adults within a household have the same probability of being selected. During 2003, ATUS interviewed about 1,725 individuals per month, but beginning in January 2004 the sample size was reduced to about 1,100 per month.

The ATUS is administered using computer assisted telephone interviewing (CATI), rather than paper diaries as many other countries do. The cost of collecting paper diaries would be prohibitive for an ongoing survey. (The Canadian time use survey also uses telephone data collection.) Respondents are asked about their activities on the day before they are interviewed. If the respondent is unavailable on his or her initial calling day, then subsequent contact attempts are made on the same day of the week. This insures that the reference day is always the same day of the week as the initial reference day and allows more control over the distribution of the sample over days of the week. Field testing showed that allowing the respondent more flexibility did not improve response rates.

1. Thus, the ATUS sample is nationally representative but cannot be used to generate state-level estimates.

3.2.2 Demographic Information

Because the ATUS uses the CPS as a sampling frame, it contains the same demographic information as the CPS—most prominently age, race, sex, relationship to the respondent, education, and marital status. For household members that were present during the CPS MIS 8 interview, all demographic information is carried over. For new household members, the ATUS collects only age, sex, and relationship to the respondent.

3.2.3 Labor Force Information

The ATUS updates labor force information using a modified version of the basic CPS questionnaire. The reference period for ATUS employment questions is slightly different from that in the CPS. To ascertain the respondent's employment status on the reference day, the ATUS asks about work activities during the previous seven days (i.e., the last day is the reference day). This differs from the CPS, which asks about the week that contains the twelfth of the month, which is the calendar week prior to the interview. It was believed (and examination of gross flows data confirm this belief—see Stewart 2004) that there would be too many transitions between labor force states if the previous calendar week was used. Of course, it is still possible that the respondent was employed at the beginning of the seven-day period and had lost or left the job by the reference day. But these transitions should be relatively rare.

The labor force questions allow us to determine whether the respondent is Employed, Unemployed, or Not in Labor Force (NILF) but do not allow one to distinguish between the three categories of NILF (Retired, Disabled/Unable, and Other) as in the CPS.[2] Nor does the ATUS ask the CPS questions that permit classification of NILF respondents as "discouraged workers" who have given up the job search or questions on the respondent's job history. Job history information can be obtained by matching the ATUS interview to the respondent's MIS 8 interview.

For respondents who are employed, the ATUS asks questions about hours, earnings, and industry and occupation. The ATUS asks respondents to report usual hours, but does not collect actual hours. Actual hours are highly correlated with usual hours, and, for most purposes, usual hours are more relevant.[3] The earnings questions are asked of everybody who has

2. The ATUS does distinguish between "At Work" and "With Job but Absent from Work" for the employed, and between "Looking" and "On Layoff" for the unemployed.

3. There are two problems with collecting hours for the previous seven days. First, respondents may have a difficult time determining hours for a seven-day period that does not correspond to a calendar week. Second, asking about hours for the previous seven days would result in a biased estimate of actual hours worked. For example, an individual who worked unusually long hours during a week would be less likely to be contacted during that week, making it more likely that he or she is contacted the following week (and asked to report hours for the busy week). Hence, long work weeks tend to be oversampled. However, the direction of this bias is indeterminate because vacation weeks also tend to be oversampled.

a new job in the ATUS. This includes people who changed jobs between the MIS 8 interview and the ATUS interview and people who made a nonemployment-to-employment transition. We also ask the earnings questions if the MIS 8 earnings data were allocated. The earnings data for all other respondents are carried over from the MIS 8 interview.

The ATUS does not collect as much information about other household members. For the respondent's spouse or unmarried partner, the ATUS collects basic labor force information—employment status (employed or not employed) and total hours usually worked per week. And for other household members, the ATUS does not collect any labor force information.

3.2.4 Time Diary

The core time diary of the ATUS is very similar to those of other time use surveys. The respondent is asked to take the interviewer through his or her day via a conversational interview. The diary day starts at 4:00 a.m. and goes through 4:00 a.m. of the following day (the interview day), so each interview covers a twenty-four-hour period. The respondent describes each activity, which the interviewer either records verbatim or, for a limited set of common activities (such as sleeping or watching television), hits a precode button. For activities that are not precoded, the verbatim responses are coded according to a three-tier scheme so that each activity has a six-digit code (two digits per tier). Coders are also interviewers, which means that when interviewing respondents, they know what level of detail is required for coding. For example, when the respondent reports that they were reading without giving more detail, the interviewer asks: "Was that for your current job, to get a degree, pleasure, or something else?"

For each episode, the ATUS collects either the stop time or duration of the activity (the start time is simply the stop time of the previous activity). For the last activity of the day (the one that spans 4:00 a.m. the morning of the interview), the ATUS records the actual stop time, even though the episode "ends" at 4:00 a.m. for official estimates.[4] Respondents are also asked to report where they were and who they were with, unless the activity is sleeping or grooming (neither is asked) or working at a job (only where is asked). If the respondent was at home, he or she is asked to report who else was in the room. If the respondent was away from home, he or she is asked to report who accompanied them. The "who" codes for household members refer to specific individuals, which is particularly useful for researchers who are interested in estimating the amount of time that parents spend with their children. The "where" code for an activity specifies either a location or a mode of transportation.

4. This gives us the completed duration of the final activity, which is usually sleeping. Otherwise, for most respondents, we would have information on two truncated episodes of sleep. For official estimates of the time spent sleeping, we will use the two truncated episodes because the total time in all episodes must sum to 1,440 minutes each day.

It is important to note that the ATUS data only contain information about the respondent's primary activity. The BLS is looking into the feasibility of systematically collecting secondary activities. Currently, if the respondent reports two activities, both are recorded by the interviewer, but only the primary activity (as determined by the respondent) is coded. Analysis of these simultaneous activities will allow the BLS to determine how often and under what conditions respondents spontaneously report secondary activities and will provide information about how often interviewers will need to probe for this information.

3.2.5 Summary Questions

In addition to the labor force questions and the time diary, the ATUS asks several summary questions that are designed to obtain information that cannot readily be obtained from the core time diary.

Childcare as a Secondary Activity

In the course of developing the survey, the BLS determined that the most important activity missed by not collecting secondary activities is child care. Examination of data on secondary activities from the Australian National Time Use Survey indicates that individuals spend three to four times as much time in child care as they do in other household work. Further, attendees at the MacArthur Conference and the National Academy of Sciences (NAS) Workshop expressed a strong preference that the ATUS collect child care as a secondary activity (henceforth, we will refer to this as secondary child care). To capture secondary child care, the ATUS asks respondents to identify the activities during which a child under thirteen was "in your care."

Cognitive testing revealed significant variation in how respondents answered the childcare summary questions (see Schwartz 2001). Specifically, some respondents reported only times when both the respondent and the child were awake, while others included activities and times when either the respondent or the child was sleeping. To mitigate the impact of this inconsistent reporting, it was necessary to put limits on when secondary childcare can occur. For official estimates of secondary childcare, the ATUS only includes activities that occurred when the respondent and at least one child under thirteen were awake.[5]

Paid Work

The paid work summary questions are designed to do two things. First, they are designed to identify income generating activities. These are typi-

5. We begin the child care questions by asking the respondent when the first child under thirteen woke up and when the last child under thirteen went to bed. However, we do not collect any other information about the children's activities, so secondary child care estimates include time when children are taking naps.

cally things like arts and crafts that are not done as part of the respondent's main or secondary job but may generate income. Second, and more important, they are designed to identify activities that are done for the respondent's main or secondary job. This could include things like bringing work home or grading papers. It could also include things like taking clients out to dinner. Ideally, the respondent would report these activities as paid work, but that is not always the case. Furthermore, for self-employed workers who work at home, the distinction between work and home life can be blurred. Although most self-employed workers report to work just like wage and salary workers, some work at home and intermix work and nonwork activities. For example, a respondent may report that he or she spent thirty minutes doing e-mail correspondence at home, but it may not be clear whether this was for work. Like the child care questions, the three paid-work questions ask respondents to identify activities that were done for their main job, their other job(s), or that were done for pay (other income).

The ATUS asks a similar summary question that asks respondents to identify activities that were done for a volunteer organization. This is necessary because it may not be clear that, for example, baking cookies for a bake sale is volunteer work if the respondent does not say for whom the cookies are being baked in the time diary.

Absences from Home

Because the ATUS calls respondents at their homes, it does not obtain any information about what people do when they are absent from home. To fill this gap, the ATUS asks "missed days" questions that allow us to estimate the amount of time people spend away from home and to find out the purpose of the absence. We do not envision using these data to augment official time use estimates, but they should help us better understand what we are missing because we cannot contact respondents while they are away from home. The ATUS asks respondents to report the number of absences from home that lasted two nights or longer during the month prior to the initial calling date.[6] For each absence, the respondent is asked to report the purpose of the absence and the number of nights the respondent was away from home. Unfortunately, due to programming difficulties, these data are not available for 2003 and 2004.

Although the BLS does not adjust official estimates for time away from home, other analysts may want to adjust their estimates. For example, if one is willing to make some assumptions, estimates of hours worked could be adjusted to account for vacation time and business trips.

6. We do not call these absences "trips," because they could be hospital stays or jail time. We do not ask about one-night absences, because these are captured by the core time diary.

Table 3.1 **Where does the time go? Time spent in major activities, by sex and employment status (in hours per day)**

	Total		Employed		Not Employed	
Activity	Men	Women	Men	Women	Men	Women
Personal care activities[a]	9.13	9.54	8.81	9.29	9.93	9.87
Eating and drinking	1.24	1.18	1.22	1.16	1.30	1.20
Household activities[b]	1.33	2.30	1.16	1.88	1.76	2.89
Purchasing goods and services	0.68	0.94	0.64	0.91	0.80	0.97
Caring for and helping household members	0.34	0.75	0.38	0.72	0.23	0.79
Caring for and helping nonhousehold members	0.26	0.31	0.25	0.27	0.30	0.36
Working and work-related activities[c]	4.57	2.87	6.26	4.88	0.25	0.11
Educational activities[d]	0.45	0.50	0.25	0.33	0.95	0.72
Organizational, civic, and religious activities[e]	0.29	0.35	0.26	0.30	0.38	0.42
Leisure and sports	5.41	4.83	4.53	3.89	7.66	6.12
Telephone calls, mail, and email[f]	0.13	0.24	0.11	0.20	0.18	0.31
Other activities, not elsewhere classified[g]	0.18	0.20	0.14	0.16	0.27	0.26

[a]Sleeping, bathing, getting dressed, etc.

[b]Housework; cooking; yard care; home maintenance, repair, renovation, and decoration, etc.

[c]Includes job search activities.

[d]Taking classes, doing homework, taking care of administrative matters, etc.

[e]Includes time spent doing work for volunteer organizations.

[f]Does not include purchases of goods and services.

[g]Uncodeable activities, Don't Know, Refused.

3.2.6 Where Does the Time Go? A Look at the Data

Table 3.1 presents a sample of the types of estimates that can be generated using ATUS data. It shows the amount of time (in hours per day) spent in twelve major activities on an average day by sex and employment status. Estimates are for men and women age fifteen and older and were generated using sample weights that account for ATUS sample design, nonresponse, and the fact that the ATUS assigns half the sample to weekends. The first two columns of table 3.1 show the time spent by men and women in each of the major activities. Women spend more time doing nonmarket work (4.0 versus 2.4 hours per day),[7] while men spend more time in market work and work-related activities (4.6 versus 2.9 hours per day). Adding market and nonmarket work together, we find that men and women do the same amount of work overall—about 6.9 hours per day. The

7. Nonmarket work includes Household Activities, Purchasing Goods and Services, and Care of Household Members.

time spent in other activities is very similar for men and women, except that men spend 0.6 of an hour more in leisure activities, while women spend 0.4 of an hour more in personal care activities. In the third and fourth columns of table 3.1, we see the same pattern for employed men and women. The main difference is that the total amount of time spent in market and nonmarket work is 8.4 hours per day.

Turning to nonemployed men and women, we see notable differences. Men do significantly less nonmarket work than women (2.8 versus 4.7 hours per day). They spend more time in work-related activities, mainly job search, but this is not enough to offset the difference in nonmarket work. Thus, nonworking women spend 1.7 hours more per day in market and nonmarket work. The time spent in other activities is very similar for men and women, except that nonworking men spend 1.6 hours more per day in leisure activities.

3.2.7 Comparability to Other Time Use Surveys

Researchers will undoubtedly want to compare estimates from the ATUS to those from earlier time use surveys. For these comparisons to be valid, it will be necessary to make the data sources as comparable as possible. This will require accounting for differences in coding systems, samples, and survey methods.

There is research currently under way that will shed light on these differences. A report by Ann Gauthier compared the ATUS coding system to those used in other time use surveys and made recommendations, most of which were followed, on how to make the coding systems more compatible. Andrew Harvey and Jonathan Gershuny are examining the impact of methodological differences between the ATUS and earlier U.S. time use surveys and other countries' time use surveys. Table 3.2 summarizes some of the important differences in the major U.S. time use surveys.[8]

As can be seen, there are some significant differences across surveys. The 1965–1966 survey sampled individuals in small cities, while the others were nationwide. The 1965–1966 and 1975–1976 surveys contacted respondents in person, while the 1985 survey used several interview modes. The quota sample of days in the 1965–1966, 1975–1976, and 1985 surveys means that individuals were not randomly assigned to days of the week, but that days were assigned to distribute interviews across the days of the week. Respondents in these surveys were generally contacted using a convenient-day approach, where they are called on consecutive days until they are reached. The "yesterday" diaries were collected either in person or over the telephone, and the diary day was the day before the interview. The reference day for "tomorrow" diaries was the day following the interview.

8. The information in this table is from Robinson and Godbey (1997) and Harvey and St. Croix (2003).

Table 3.2 **Comparison of major U.S. time use surveys**

	Survey			
Description	Americans' Use of Time	Time Use in Economic and Social Accounts	Americans' Use of Time	American Time Use Survey
Dates survey was conducted	Nov. 15–Dec. 15, 1965 March 7–April 29, 1966	Oct.–Nov. 1975, and reinterviewed in Feb., May, and Sept. of 1976	Jan. 1–Dec. 30, 1985	Continuous beginning in January 2003
Data collection mode	Self-administered diary collected through personal interviews and leave-behind diaries; quota sample of days	Personal interviews; quota sample of days	Self-administered diary collected through mailbacks, telephone, and personal interviews; quota sample of days	Computer assisted telephone interviewing
Sample description	Nationwide: 44 cities with population of 30,000–280,000; 18–65 year-olds; at least one household member must have been employed in the nonfarm sector	37 states and Washington, D.C.; 18+ year-olds	Nationwide; 12+ year olds; restricted to urban population	Nationwide; 15+ year-olds
Diary type and sample size	Yesterday (130) Tomorrow (1,244)	Yesterday (2,405)	Yesterday (1,468) Tomorrow (3,890)	Yesterday (approx. 1,850/month in 2003 and 1,250/month thereafter)

Respondents filled out a paper diary, which either was picked up by the interviewer or mailed back by the respondent. It is not known how differences in interview mode affects response although it has been shown that contacting respondents using the convenient-day approach for "yesterday" diaries results in systematic underestimates of activities done at home and overestimates of activities done away from home.[9] In contrast, the designated-day approach does not generate any bias.

3.3 What Can We Learn from Time Use Data?

Time use data can shed light on many questions. In the following, we discuss two questions that may be of interest to readers of this volume and then briefly describe several other potential uses of the data.

3.3.1 Household Production and National Income and Product Accounts

Economists' recognition of the importance of household production goes back at least to Reid (1934). She defined household production as an activity that could be done by a third person with the same result. In his influential article, Becker (1965) modeled households as combining time and market goods as inputs to produce the goods that are ultimately consumed by the household. This approach to modeling does not permit one to distinguish between leisure activities and those that satisfy the "third-person" criterion. An alternative approach taken by Gronau (1986) models households as consuming goods and leisure, as in traditional models, but the goods can either be purchased in the market or produced at home. The key innovation of these models is that households are viewed as factories with goods and time being combined via a production function to produce an output (utility).

Yet household production is ignored in standard national income accounting, which is oriented toward valuing goods and services that are exchanged between economic units—most prominently those exchanged in markets. For example, the United Nations's (1993, paragraph 1.20) *System of National Accounts 1993* (SNA) states:

> The System includes within the production boundary all production actually destined for the market, whether for sale or barter. It also includes all goods or services provided free to individual households or collectively to the community by government units or [nonprofit institutions serving households].

This definition of *production* excludes some economic activity from national income accounts. While both the SNA and the U.S. National In-

9. More specifically, the convenient-day schedule systematically overestimates activities that are negatively correlated with the probability of contacting the respondent and underestimates activities that are positively correlated with the contact probability. See Stewart (2002).

come and Product Accounts (NIPA) include within-household production of goods for household use (such as food for farm households), they both exclude nonmarket services produced within the household (with the major exception of owner-occupied housing).[10]

For many purposes, the exclusion of within-household services can be justified. The SNA (United Nations 1993, paragraph 1.22) cites "the need to prevent flows used for the analysis of market behavior and disequilibria from being swamped by non-monetary values." However, some questions require accounting for household production. For example, the increasing labor force participation rate of women has led to growth in measured production, but one might want to know to what extent this represents a shift from household to market production.

One way to incorporate household production into the national income accounts is to create a satellite account (examples include Landefeld and McCulla 2000; Australian Bureau of Statistics 2000, appendix 1). The first step is to define household production. The usual approach is to apply a third-person test (Reid 1934, cited in Landefeld and McCulla 2000): *household production* is defined as the output of activities where the same result could be achieved by hiring a third person. For example, cooking a meal is household production, but eating it is not.

Household production (as with other production) can be valued either directly, as the value of output, or indirectly, as the sum of the costs of inputs. The United Kingdom has an experimental household satellite account based on output measures (Holloway, Short, and Tamplin 2002). Drawing on a number of data sources, these accounts estimate the volume and value of such items as clean, warm, furnished, maintained accommodation; total distance traveled; meals and hot drinks prepared in the home; and informal child care and adult care. Under this output approach, time use data can be used to estimate productivity in household production, but they are not used to value output. Most satellite account proposals use the input approach, which tends to require fewer data sources.

As noted by Landefeld and McCulla (2000), the costs of household production include the cost of purchased goods and services that are inputs to household production, the cost of capital services, and the cost of labor input. Purchased goods and services are already part of conventional income accounts. Accounting for capital services would involve imputing rental rates to consumer durables (and reclassifying durables purchases as household-sector investment). Data on labor input must come from time use surveys.

The literature discusses two approaches to valuing labor input. The opportunity-cost approach uses the individual's market wage to value the time spent in household production. This approach has some conceptual

10. This is the only exception in the NIPA; the SNA also includes major repairs and storage (United Nations 1993, 6.24, 6.27). Several countries (Australia, New Zealand, Canada) include volunteer work in their measure of unpaid work. However, Landefeld and McCulla (2000) argue that volunteer work should be excluded from household satellite accounts.

and practical difficulties associated with it. On a conceptual level, the implicit assumption that hours of paid work are freely variable at the margin may not hold; workers, at least in the short run, may have little choice in their working hours. Perhaps more important, the opportunity-cost approach assumes that people who are highly productive in market work are just as productive doing household work. It is hard to imagine that lawyers are five times more productive building a deck than a carpenter. On a practical level, it would be necessary to impute a wage for nonworkers.

The other approach to valuation is the replacement-cost approach, which uses the wage rate that would be paid to a third party. Within the replacement-cost approach, one can use either a generalist or a specialist wage. If specialist wages are used, the labor cost of each task is the wage of specialists in that task. For example, the time spent caring for children is valued according to the rate of pay for child care workers, food preparation is valued at the wage of cooks, and so on. One issue here is that specialists may be more productive than persons working at a variety of tasks in their own household. This shortcoming motivates the generalist-wage approach, which uses the wages for general household workers, namely housekeepers, as the cost of an hour of unpaid work.

Simultaneous activities complicate the valuation of household production because, depending on the specific activities and the valuation approach used, it may be necessary to determine how much time was devoted to each activity. To illustrate, consider a respondent who spent one hour looking after children and doing laundry at the same time. If the generalist-wage approach is used, then valuation is straightforward, with the entire hour being valued at the generalist wage. If the specialist-wage approach is used, then one must determine how to value that hour of time: value the entire hour at the housekeeper wage, value the entire hour at the child care worker wage, or value part of the hour at the housekeeper wage and part at the child care worker wage. If the latter valuation is used, the analyst must determine how to apportion time to the two activities. The treatment of simultaneous activities is much simpler if a generalist wage is used although both valuation approaches require disentangling the activities when one of the simultaneous activities is not household work.

Australia apparently does not include secondary activities in its measure of unpaid work. New Zealand (Statistics New Zealand 2001) presents some estimates that include secondary activities but excludes passive child care (being "available for care" in their terminology). Conceptually, one might argue for its inclusion on the basis of the third-party test. One could value time spent in passive child care at a housekeeper's wage (under the generalist-wage approach) or by wages for child care workers or babysitters (under the specialist-wage approach).

As long as passive child care is the only secondary activity collected in the ATUS, one can take one of two approaches to incorporating simultaneous activities in valuing household work. The easiest approach would be

Table 3.3 Alternative valuations of nonmarket production: 2003

		Aggregate value of nonmarket production using (in $billions):	
	Aggregate hours (in billions)	Specialist wage	Generalist wage
Activity			
Housework	51	461	461
Meal preparation/Clean-up	44	376	397
Interior/Exterior repair	13	178	121
Yard work	16	183	149
Purchasing goods and services	67	609	609
Other housework	27	374	243
Child care (as primary activity)	39	373	359
Adult care	6	52	52
Total (excluding secondary child care)	263	2,605	2,391
Child care (as secondary activity)	85	746	777
Total (including secondary child care)	348	3,351	3,167
Paid work[a]	277	4,888	
Gross Domestic Product[b]		11,004	

[a]The estimated number of paid work hours are the authors' tabulations of ATUS data. The value of paid work was derived by multiplying total paid work hours by the hours-weighted mean wage computed from the CPS Outgoing Rotation Group files.

[b]The GDP estimate is from the Economic Report of the President.

to value only primary activities and ignore secondary child care. There is some logic to this approach in that it treats all secondary activities the same. But data from the 1992 Australian National Time Use Survey, which collects secondary activities, indicates that individuals spend very little time (nine minutes per day for women and five minutes per day for men) doing "domestic activities" (household work) as a secondary activity. In contrast, men spend seventeen minutes per day doing child care as a secondary activity and women spend thirty-nine minutes.[11] The magnitudes of these differences suggest that more is lost by ignoring secondary child care than by treating secondary activities asymmetrically. This leads us to the alternative approach, which is to value the time spent in secondary child care when the primary activity is not household work.[12]

Table 3.3 presents estimates of the time spent in nonmarket production, broken down by activity, plus four estimates of the total value of this pro-

11. These estimates exclude times when the primary activity was housework, child care, or sleeping. Also keep in mind that the child care estimates are averages over the entire population, not just parents.

12. The implicit assumption is that it is possible to hire someone to do household chores and look after household children. Alternatively, one could assume that it would be necessary to hire two people—one to do the housework and one to look after the children. Given that individuals routinely perform these tasks simultaneously, the former assumption makes more sense.

duction in the United States in 2003. We apply the generalist wage and the specialist wage to two alternative definitions of nonmarket work. Our first definition includes household activities (including purchasing goods and services) and care of household members done as a primary activity. We exclude volunteer activities and care and helping activities for nonhousehold members. The second definition is the same as the first but includes child care as a secondary activity. As described in the preceding, we exclude secondary child care that was done at times when the respondent was engaged in nonmarket work as a primary activity. The specialist wages were generated using the Outgoing Rotation Group (ORG) files for 2003 from the CPS. We computed the hours-weighted average wage for each three-digit occupation. The time spent in each nonmarket activity was valued at the wage for the occupation that most closely resembles the activity.[13] For the generalist wage, we used the (hours-weighted) average wage for Maids and Housekeepers.

Using the specialist wage rather than the generalist wage adds between 6 and 9 percent to the value of nonmarket work although there is some variation across activities. Differences in the valuations of individual components are as expected. It is worth noting that the valuation of Child Care (as a primary activity) is higher using the specialist wage, while secondary child care is valued more highly using the generalist wage. The difference arises because primary childcare includes high-skill tasks such as helping children with their homework and home schooling. The lower valuation of secondary child care under the specialist wage arises because the wage for Child Care Workers is less than the wage for Maids and Housekeepers. Other Household Activities, which include household management and other high-skill activities, are valued more highly using the specialist wage. Finally, it is clear from table 3.3 that secondary child care is an important activity. Secondary child care accounts for about one-quarter of the total amount of time spent in nonmarket production (and slightly more than one-fifth of the value of nonmarket production when the specialist wage is used).

The results in table 3.3 indicate that nonmarket production is economically significant regardless of which estimate is used. For comparison, we present two alternative measures of market output. The gross domestic product (GDP) figure is the published estimate from the Bureau of Economic Analysis, while the Paid Work estimate was calculated by multiplying hours worked from the ATUS by the hours-weighted average wage of all workers in the United States from the CPS ORG files. We can see that nearly as much time was spent doing nonmarket work as was spent doing market work—more if secondary child care is included—but that the value of nonmarket work was significantly less than that of market work. Even though the per-hour value attached to nonmarket work is significantly lower than the value attached to market work, the total value of nonmarket work is still

13. This crosswalk is available from the authors upon request.

large, ranging from 49 to 69 percent of the value of market work. If the values of market and nonmarket work were added together, nonmarket work would comprise between 33 and 41 percent of that total. Nonmarket work is a smaller, though still significant, fraction of GDP. Depending on the definition and valuation approach used, nonmarket production is equal to between 22 and 30 percent of GDP, or, if nonmarket production were included in GDP estimates, would comprise between 18 and 23 percent of the combined value of market and nonmarket production.

Although these estimates serve as an example of the type of calculation necessary to incorporate nonmarket production into the NIPAs, the lack of a time series means that we cannot examine trends in nonmarket production. One approach, which has been taken by a number of studies, would be to use data from a single time use survey and assume that there are no within-group changes in the time spent in nonmarket production. Under this assumption, any changes in nonmarket production come through changes in the composition of the population (see Eisner 1988). Of course, once enough ATUS data become available it will be possible to generate a consistent time series that allows within-group changes in household production, enhancing our ability to examine long-term trends. Just as important, ATUS data will permit the first analysis of the cyclical behavior of household production.

3.3.2 Measuring Hours of Work

Statistics on hours worked are inputs into estimates of productivity and hourly wages, two numbers of great interest to economists. Differences in measured hours between surveys can lead to substantial differences in trends in productivity and wages. For example, Abraham, Spletzer, and Stewart (1998) show that the different trends in hours account for all of the divergence between hourly wages derived from the NIPA, which use hours from the establishment-based Current Employment Statistics program (CES), and estimates from the CPS.

In this section, we describe the uses of ATUS measures of hours worked and compare hours worked measures from the CPS with those derived from the ATUS. Comparison of ATUS data with CES measures of hours worked is beyond the scope of this paper.

How can the ATUS be used to help measure hours of work? The ATUS sample sizes are too small to compute monthly, or even quarterly, estimates of aggregate hours for the purpose of estimating productivity. Because the ATUS collects time diaries only for a single day, diary-based hours data cannot be used to compute hourly wages for ATUS respondents.[14] How-

14. It will be possible to use ATUS data to construct an hours-weighted average hourly wage, which would be comparable to hourly wage estimates from the CES and the NIPA, and the CPS estimates in Abraham, Spletzer, and Stewart (1998).

ever, time use data can be used to estimate biases of other sources of data. To do this, analysts typically construct synthetic weeks that are representative of the group of interest (usually the entire population or a specific subgroup). For example, it would be possible to compute average weekly hours worked for everyone who is employed or for major industry groups.

Data from the ATUS have a number of advantages for measuring hours worked and evaluating the biases in existing measures. Respondents need not try to recall over periods longer than a day, and, by reporting individual episodes of work, they avoid having to add the lengths of different episodes. Paid work can include work at home or otherwise not at the workplace, so off-the-clock work is collected. Moreover, as mentioned previously, after the core time-diary summary questions are asked giving the respondent additional chances to identify an activity as paid work. This improves identification of paid work activities for self-employed respondents who work at home and others who do not "go to work" in the traditional sense. The ATUS interviews are conducted nearly every day of the year, with most holidays being covered (because the telephone centers are open the day after most holidays).[15]

The ATUS data allow analysts to exclude paid breaks from hours worked if they choose.[16] Interviewers prompt respondents by asking "Did you take any breaks of fifteen minutes or longer?" whenever a work episode is reported.[17] Paid leave presents a more difficult challenge. Workers who travel away from their home are unavailable for interviewing, which means that these trips are missed in the time diary. This biases estimates of hours worked, but the direction of the bias is not clear. Missed business trips bias hours downward, while missed vacations bias hours upward. The ATUS allows analysts to correct for this missed-days bias by collecting information about the amount and purpose of absences from home as described in section 3.2. This missed-days correction requires an assumption about the hours worked during business travel because they are not collected.

For purposes of illustration, we now compare measures of work hours derived from the ATUS to measured hours from the CPS. There are many differences between the ATUS and the CPS that may affect such a comparison. The most obvious difference is that the questions used to estimate hours of work are different. There also turn out to be differences in responses to other variables, such as employment and multiple jobholding,

15. Reference days before major holidays will be missed, as the telephone centers will be closed. The remaining days in the month that fall on the same day of the week as the missing day will have their weights inflated to make up for the missing day, in effect making the assumption (which we make in the absence of other information) that the activities on the missing day are similar to those on other days with the same day of the week.

16. Hamermesh (1990) is one attempt we have seen to examine the effect of paid breaks on wages.

17. Beginning in 2004, this prompt was incorporated into the instrument. The prompt automatically pops up whenever work episodes of four hours or longer are reported.

even though the relevant questions are similar in the two surveys. The reference periods are also different—the CPS asks about the week containing the twelfth of the month, while the ATUS covers almost every day of the year. Nonresponse implies that there may be systematic differences in the sample. We attempt to identify the effects of all of these differences between the two surveys.

We calculate three different measures of hours worked using ATUS data.[18] Each of these definitions corresponds to a different concept of hours worked. Going from the most restrictive measure to the least restrictive measure, these are:

1. Time spent in activities coded as "Working at job."
2. Definition (1) plus activities identified as breaks and time spent in work-related travel (not commuting).[19]
3. Definition (2) plus activities that were coded as being done for the respondent's job.

Table 3.4 compares estimates of hours worked from the ATUS (the first three columns) and the CPS (the last column) for calendar year 2003. Depending on the definition used for the ATUS estimates, average weekly hours worked in the ATUS are 1.1 to 1.7 hours less than in the CPS over the same period. (All differences mentioned in the text are statistically significant at the 5 percent level unless otherwise noted.)

As noted, part of this difference may be due to differences in the composition of the ATUS and CPS samples due to ATUS nonresponse rather than due to differences in reporting. To aid in analyzing this possibility, we decomposed the difference into four terms as follows:

$$
\begin{aligned}
(1)\qquad E(H_{i,t}^{\mathrm{ATUS}}) - E(H_{i,t}^{\mathrm{CPS}}) = {} & [E(H_{i,t}^{\mathrm{ATUS}}) - E(H_{i,t-3,\mathrm{MIS8}}^{\mathrm{CPS}} \mid i \text{ in ATUS})] \\
& + [E(H_{i,t-3,\mathrm{MIS8}}^{\mathrm{CPS}} \mid i \text{ in ATUS}) - E(H_{i,t-3,\mathrm{MIS8}}^{\mathrm{CPS}})] \\
& + [E(H_{i,t-3,\mathrm{MIS8}}^{\mathrm{CPS}}) - E(H_{i,t-3}^{\mathrm{CPS}})] \\
& + [E(H_{i,t-3}^{\mathrm{CPS}}) - E(H_{i,t}^{\mathrm{CPS}})]
\end{aligned}
$$

where H denotes hours of work, i denotes an individual observation, t denotes the reference month for the estimate, the superscript denotes the survey, and the MIS8 subscript indicates that the observation is in MIS 8 (absence of a third subscript indicates that all Months in Sample are included).

The first term in brackets is the difference between the time-diary estimate of hours worked from the ATUS and the CPS estimate of hours

18. When computing these measures, we reweight the data so that for the subpopulation we are estimating over each day of the week receives equal weight. (For large samples, this will be approximately true when the original ATUS weights are used; the reweighting is relevant in the following, when we restrict the sample to CPS reference periods.)

19. We defined work-related travel as travel between work sites and identified travel spells as work-related by looking at the surrounding activities.

Table 3.4 **Hours of paid work in the ATUS and the CPS**

	Jan. 2003–Dec. 2003			Oct. 2002–Sept. 2003			Jan. 2003–Dec. 2003
	Definition 1	Definition 2	Definition 3	Actual CPS	Actual CPS	Actual CPS	Actual CPS
Survey—Hours response from:	ATUS	ATUS	ATUS	CPS	CPS	CPS	CPS
Sample—Respondents participated in:	ATUS	ATUS	ATUS	ATUS	MIS 8	CPS	CPS
Average weekly hours	37.3	37.7	37.9	38.5	38.8	39.0	39.0
Difference from CPS actual hours	–1.7**	–1.3**	–1.1**				
Adjusted difference from CPS actual hours	–1.4**	–1.0**	–0.8**				
Average weekly hours in CPS reference weeks	38.6	39.0	39.1	38.7	38.8	39.0	39.0
Difference from CPS actual hours	–0.5	–0.1	0.1				
Adjusted difference from CPS actual hours	–0.3	0.1	0.3				
Total annual hours (in billions)	270	273	274	270	266	267	269
Difference from CPS actual hours	1	4	5*				
Adjusted difference from CPS actual hours	–3	0	1				

*Significantly different from zero at .05 level.

**Significantly different from zero at .01 level.

worked from the CPS MIS 8 interview (usually three months prior to the ATUS interview) for ATUS respondents. This term represents changes in the responses of ATUS respondents between the last CPS interview and the ATUS interview. These changes include the effects of differences in data collection mode on reporting of hours of work; differences in the reporting of other variables such as employment and multiple job holding; and differences in reference period coverage (the week of the twelfth versus most days of the year).

The second term is the difference between ATUS respondents and the entire MIS 8 CPS sample in the CPS estimate of hours worked at time $t - 3$ (three months prior to the ATUS reference period). This term represents the effect of differences in sample composition between the CPS and the ATUS due mainly to nonresponse in the ATUS. Note that if the propensity to respond to the ATUS is a function of current hours of work, this is an imperfect proxy for the effect of sample composition—changes in hours of work in the months between the CPS and the ATUS may affect the propensity to respond but are not reflected in this term.

The third term is the difference between the MIS 8 sample and the entire CPS sample in the CPS estimate of hours worked at time $t - 3$. This term captures rotation-group effects—the well-known phenomenon that responses to certain questions vary systematically with their month in sample.[20] Note that the first term only accounts for differences in responses between the ATUS and the CPS MIS 8. The sum of the first and third terms can be thought of as an estimate of the average difference in responses between the ATUS and the entire CPS.

The fourth term is the negative of the change in the CPS estimate of hours worked between three months prior to the ATUS reporting period and the ATUS reporting period and can be thought of as a correction of the first term for the actual change in hours worked between $t - 3$ and t.

In summary, the sum of the first, third, and fourth terms is an estimate of the difference in hours reporting between the CPS and the ATUS, corrected for the change in actual hours between the time ATUS respondents were in the CPS and when they responded to the ATUS. Put differently, the effect of differing survey methods between the CPS and the ATUS on average reported hours can be estimated by taking the difference in reported hours for the same period and subtracting out the sample composition term. The sample composition effect is –0.3, which yields an adjusted difference between ATUS and CPS hours of between –1.4 and –0.8, depending on the definition of paid work used.

We now control for differences in reference periods by restricting the ATUS sample to CPS reference weeks. The results are shown in the second

20. For example, the unemployment rate is higher for respondents in their first month of the CPS than it is for respondents in their second and subsequent months. See Bailar (1975).

set of rows of table 3.3. The difference between ATUS and CPS hours estimates changes dramatically. The overall difference between ATUS and CPS hours estimates ranges from –0.5 to 0.1 (and not significantly different from zero) when the ATUS sample is restricted to CPS reference weeks, compared to the –1.7 to –1.1 range when the entire sample is used. Adjusting for sample composition makes the difference more positive: between –0.3 and 0.3 hours, also not significant.

Employment and multiple jobholding rates are higher in ATUS than they are in CPS, and this may affect hours of work comparisons. We can directly estimate the importance of these higher rates in the ATUS and thereby arrive at an indirect estimate of the pure effect of survey mode on hours reports. The higher employment rate should have an effect on average hours only to the extent that hours differ between people who were employed in both the CPS and ATUS interviews, and people whose reported employment status changed between the CPS and ATUS interviews.[21] To illustrate this effect, we compared responses to the "usual hours worked" question by ATUS respondents in the CPS with responses to the equivalent question in the ATUS. We adjust for changes in hours between the CPS and the ATUS and possible mode effects by subtracting the change in usual hours for respondents who were employed in both the CPS and the ATUS (0.8 hours) from ATUS usual hours for all respondents employed in the ATUS. For these calculations, we restricted our attention to hours on the respondents' main jobs to eliminate the effects of the differential multiple jobholding rates. Usual hours worked on main job was 38.8 for respondents who were working at the time of their CPS interview. The adjusted estimate of usual hours worked from the ATUS also was 38.8,[22]

21. The ATUS employment for ages sixteen+ is 144.8 million, while CPS employment for 2003 is 137.7 million. Part of this difference is because, somewhat surprisingly, employed persons are more likely to respond to the ATUS than the nonemployed. If ATUS respondents retained their CPS MIS 8 employment status, the ATUS weighted employment count would be 140.9 million. Performing a decomposition analogous to (1), approximately 50 percent of the difference between CPS and ATUS employment counts can be attributed to differences in responses to the employment questions between the CPS and the ATUS.

A substantial proportion of this can be attributed to differences in reporting teenage employment. The ATUS measured employment of sixteen-to-nineteen-year-olds was 8.1 million in 2003, while CPS employment was 5.9 million. Almost all of the difference was due to differences between CPS and ATUS responses, possibly because most CPS responses were by proxy.

22. The 55.5 percent of respondents who were employed at both interviews reported that they usually worked 39.2 hours per week at their main job in their CPS interview and 40.0 hours in their ATUS interview, which implies that usual hours on main job increased by 0.8 of an hour between the CPS and ATUS interviews. About 7.3 percent of respondents changed from nonemployment in the CPS to employment in the ATUS, while 5.9 percent made the opposite transition. Usual hours worked (in their respective interviews) were 36.7 for respondents who were employed in the CPS but not the ATUS and 34.0 for respondents who were employed in the ATUS but not the CPS. Thus, respondents with new jobs reported longer hours than respondents who were about to leave their jobs, even if one were to subtract the 0.8 hour increase in hours. The adjusted usual hours for the ATUS interview were calculated as follows: $\{[.555 \times 39.2 + 0.073 \times (36.7 - 0.8)]/(.555 + 0.073) = 38.8\}$.

which implies that the higher employment rate had a negligible effect on average hours worked.

To estimate the effect of differential multiple jobholding rates, we simply multiplied the difference in multiple jobholding rates (10.0 percent – 5.8 percent) by the average number of hours usually worked on second jobs (13.4) in the ATUS.[23] This yields a multiple jobholding effect of 0.6, which, combined with the employment effect of zero, implies that the mode effect ranges from –0.9 to –0.3 hours depending on the definition used. These back-of-the-envelope type calculations complicate the calculation of standard errors; however, the mode effect is small for definitions 2 and 3. To summarize our results, actual hours of work reported in the CPS appear to be quite close to those reported in the ATUS during CPS reference weeks. However, CPS reference weeks appear to have greater hours of work than do nonreference weeks.

Frazis and Stewart (2004) also found no evidence of significant mode effects using a somewhat different approach. They compared ATUS hours worked estimates to estimates for the same respondents from their CPS MIS 8 interview. By matching respondents, they eliminated the sample composition effects. Their restriction to respondents whose usual hours changed very little between their CPS MIS 8 and ATUS interviews was designed to restrict the sample to individuals who worked the same or similar hours at each interview, but it eliminated most differences that arose because of the higher multiple jobholding rate in the ATUS. After adjusting for differences in the treatment of rotation-group effects between Frazis and Stewart (2004) and the current paper, their findings were equivalent to a mode effect of –0.7 to 0 hours, which are quite close to the current results.

We note that these results contrast with Robinson and Bostrom's (1994) findings that hours reported from CPS-style questions have increasingly diverged from those reported in time use surveys. Abraham, Spletzer, and Stewart (1998) cited Robinson and Bostrom's results as a potential explanation of the divergence between CPS and CES hours trends alluded to in the preceding; our evidence casts doubt on this explanation.

For productivity measurement, analysts may also be interested in total population hours of work. After adjusting for differences in the sample, total hours in the ATUS are quite close to those in the CPS, with no statistically significant differences. The effects of differences in employment and in average hours per worker in the two surveys offset each other.[24]

23. The corresponding average from the CPS was 13.2. As in the preceding calculation, we used the average number of hours on second job for respondents who were single jobholders in the CPS and multiple jobholders in the ATUS. Average usual hours on second job for respondents who were multiple jobholders in both the CPS and the ATUS were 15.3 in the CPS and 14.3 in the ATUS.

24. This ignores a small amount of measured hours of work for persons not counted as working in the seven days preceding the interview. Including these hours adds about 3 billion hours to total hours worked, and the response change effects are statistically significant at the 5 percent level for definitions 2 and 3.

Analyzing trends in paid work using the ATUS, either by itself or in comparison with other surveys, will clearly not be possible for some time. However, the ATUS will offer the advantages of relatively large sample sizes and consistent survey methods over time.

3.3.3 Other Uses for Time Use Data

In addition to measuring nonmarket work and improving measurement of market work, time use data can be used for a variety of other purposes of interest to economists. We mention a few here.[25]

Intrahousehold Allocation of Time

The household production models mentioned previously also have implications for the intrahousehold allocation of resources as do more recent household bargaining models. Both types of models yield testable implications about how husbands and wives spend their time. The ATUS's collection of time use data from only one household member places some limits on the types of questions—mainly questions regarding the temporal coordination of activities by spouses—that can be answered using ATUS data, but research questions regarding average time spent by spouses in given activities, and how these averages vary with the spouses' characteristics, can be answered (see Friedberg and Webb [2005] for an example). Because the survey sample is drawn from the CPS, which gathers demographic and labor market information for the entire household, analysts have available a rich set of controls for household members other than the respondent. Most of this information was collected in prior months, but, as noted previously, the ATUS updates the spouse's labor force status and usual hours of work.

One can examine mean hours of time spent in a given activity by individuals in given living arrangements and compare means across different individuals in that same arrangement. For example, one can examine the hours spent in leisure activities for married men and married women. More complicated examples include comparing the leisure time (and difference in leisure time) of husbands and wives when both work full time to leisure time when the husband works full time and the wife works part time. Because the CPS collects data on wages,[26] it is also possible to estimate the average difference in time spent in an activity between husbands and wives with a given wage rate for the wife or a given difference in wage rates between the husband and wife.

Income and Well-Being

It is widely known that income inequality has increased over the past two decades (Gottschalk and Smeeding 1997). But as with national income,

25. See also Hamermesh, Frazis, and Stewart (2005).

26. Note that the analyst will have information on the respondent's wages as of the previous CPS month and as of the current ATUS month if he or she has changed jobs. The analyst will have information on the spouse's wages as of the previous CPS month.

money income tells only part of the story. Given that the value of nonmarket production is equal to about one-quarter of GDP and that household production models predict a negative relationship between money income and time spent doing household work, we would expect the inclusion of nonmarket work to reduce measured inequality. With ATUS data, it is possible to determine the effect of incorporating household production on measured inequality[27] and, once we have more years of data, determine how this affects trends.

With ATUS data it is possible to examine how incorporating household production affects comparisons across education groups either using CPS MIS-8 earnings data (which ignores unearned income) or (for some months) March Income Supplement data. Similarly, it is possible to compare differences in this broader measure of income inclusive of household production among racial groups or among other demographic categories. Differences in leisure between demographic groups could be analyzed in a similar fashion.

Activities of Nonworkers

While prime-age males have higher labor force participation rates than prime-age females, an increasing percentage of prime-age males is not in the labor force (see Juhn 1992, 2003; Welch 1997; Stewart 2004). The Gronau model predicts that nonworkers will spend the time freed up by not working in both leisure and household production activities. But time use data is needed to tell us how the freed-up time is divided between these types of activities. This question is important from a resource-utilization point of view. But it can also shed light on the extent to which time spent in household production is sensitive to macroeconomic conditions.

Stewart (2004) examines this question using data from a 1992–1994 time-diary study conducted by the University of Maryland. He compares how male workers and nonworkers use their time. He finds that full-time workers spend about 6.6 hours more per day in work and work-related activities than do nonworkers. Put another way, nonworkers have about 6.6 hours more per day to "spend" in activities other than paid work. How do they spend this time? Stewart finds that they spend just over 30 percent of this time in productive activities such as education and household work. The remaining 70 percent is spent in leisure (mainly watching TV) and personal care (mainly sleeping).

The ATUS data could add to our understanding of male nonworkers in two ways. First, the sample size is significantly larger. Stewart had 1,833 observations, of which only 151 were nonworkers. A larger sample would generate more precise estimates (although the differences found by Stewart were significant at the 5 percent level) and would allow more detailed

27. See Frazis and Stewart (2005) for an example using 2003 ATUS data.

comparisons. Second, the ATUS has more detailed information about labor market activities. For example, by matching to previous CPS interviews, it is possible to distinguish between long-term and short-term nonworkers.

3.4 Concluding Remarks

Economists have been aided by time use surveys in seeking to understand the behavior of hours worked, the extent of household production, and other issues. However, existing surveys have been conducted infrequently, with small sample sizes and with differences in methods between surveys. As a result, analysts have used data from a single survey and assumed that all changes in time use over time were due to compositional changes. Or they have constructed a time series from several surveys that use different methods.

The ATUS will allow analysts to track trends in time use. The survey can also track trends in differences between hours in an activity (such as paid work) as shown in a time diary and hours as shown in other surveys using simpler questions. The sample size over periods of a year or more will allow more detailed analyses of time use than has been possible in the past.

References

Abraham, Katharine G., James R. Spletzer, and Jay C. Stewart. 1998. Divergent trends in alternative wage series. In *Labor statistics measurement issues,* ed. John Haltiwanger, Marilyn E. Manser, and Robert Topel, 293–324. Studies in Income and Wealth, vol. 60. Chicago: University of Chicago Press.

Australian Bureau of Statistics. 2000. *Unpaid work and the Australian economy 1997.* Catalog no. 5240.0. Canberra, AU: Australian Bureau of Statistics.

Bailar, Barbara A. 1975. The effects of rotation group bias on estimates from panel surveys. *Journal of the American Statistical Association* 70 (349): 23–30.

Becker, Gary. 1965. A theory of the allocation of time. *Economic Journal* 75 (299): 493–517.

Eisner, Robert. 1988. Extended accounts for national income and product. *Journal of Economic Literature* 26:1611–84.

Frazis, Harley, and Jay Stewart. 2004. What can time-use data tell us about hours of work? *Monthly Labor Review* 127 (12): 3–9.

———. 2005. How does household production affect earnings inequality? Evidence from the American Time Use Survey. Paper prepared for conference, Time Use and Economic Well-Being, Annandale-on-Hudson, NY.

Friedberg, Leora, and Anthony Webb. 2005. The chore wars: Household bargaining and leisure time. Paper prepared for American Economic Association meetings, Boston.

Gottschalk, Peter, and Timothy M. Smeeding. 1997. Cross-national comparisons of earnings and income inequality. *Journal of Economic Literature* 35 (2): 633–87.

Gronau, Reuben. 1986. Home production—A survey. In *Handbook of labor economics,* ed. Orley Ashenfelter and Richard Layard, 273–304. Amsterdam: North Holland.

Hamermesh, Daniel. 1990. Shirking or productive schmoozing: Wages and the allocation of time at work. *Industrial and Labor Relations Review* 43 (3): 121S–133S.

Hamermesh, Daniel S., Harley Frazis, and Jay Stewart. 2005. Data watch—The American Time Use Survey. *Journal of Economic Perspectives* 19 (1): 221–32.

Harvey, Andrew, and Aimee St. Croix. 2003. Time-use program. St. Mary's University. Unpublished Table.

Herz, Diane, and Michael Horrigan. 2004. Planning, designing, and executing the BLS American Time Use Survey. *Monthly Labor Review* 127 (10): 3–19.

———. 2005. A study in the process of planning, designing and executing a survey program: The BLS American Time-Use Survey. In *The economics of time use,* ed. D. Hamermesh and G. Pfann, 317–50. Amsterdam: Elsevier.

Holloway, Sue, Sandra Short, and Sarah Tamplin. 2002. Household satellite account (experimental) methodology. London: Office for National Statistics, April.

Juhn, Chinhui. 1992. Decline of male labor market participation: The role of declining market opportunities. *Quarterly Journal of Economics* 107:79–121.

———. 2003. Labor market dropouts and trends in the wages of black and white men. *Industrial and Labor Relations Review* 56 (4): 643–62.

Landefeld, J. Steven, and Stephanie H. McCulla. 2000. Accounting for nonmarket household production within a national accounts framework. *Review of Income and Wealth* 46 (3): 289–307.

Nordhaus, William. 2002. An economist's view of the statistical state of the nation. Testimony before the Joint Economic Committee of the U.S. Congress, 107th Cong., 2nd sess., July 24, 2002.

Reid, Margaret G. 1934. *Economics of household production.* New York: Wiley.

Robinson, John, and Ann Bostrom. 1994. The overestimated workweek? What time diary measures suggest. *Monthly Labor Review* 117 (1): 11–23.

Robinson, John P., and Geoffrey Godbey. 1997. *Time for life: The surprising ways Americans use their time.* 2nd ed. State College, PA: Pennsylvania State University Press.

Schwartz, Lisa K. 2001. Minding the children: Understanding how recall and conceptual interpretations influence responses to a time-use summary question. Bureau of Labor Statistics. Mimeograph.

Statistics New Zealand. 2001. *Measuring unpaid work in New Zealand 1999.* Wellington, NZ: Statistics New Zealand.

Stewart, Jay. 2002. Assessing the bias associated with alternative contact strategies in telephone time-use surveys. *Survey Methodology* 28 (2): 157–68.

———. 2004. What do male nonworkers do? BLS Working Paper no. 371. Washington, DC: Bureau of Labor Statistics.

United Nations. 1993. *System of national accounts 1993.* New York: United Nations.

Welch, Finis. 1997. Wages and participation. *Journal of Labor Economics* 15 (1, pt. 2): S77–S103.