

Bringing work home: implications for BLS productivity measures

About 8 percent of nonfarm business employees bring some work home, mostly to finish or catch up on their work; those who bring work home work more hours per week, on average, than those who work only at the workplace, but there is no evidence that this difference leads to an overstatement in measures of productivity growth

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Advances in information technology have created new opportunities for workers to perform their jobs away from their traditional workplaces. One implication of this change—and the subject of an ongoing debate surrounding U.S. Bureau of Labor Statistics (BLS, the Bureau) productivity data—is that official estimates of productivity growth may be overstated because estimates of hours worked may not include unpaid hours worked at home. To shed light on this debate, this article examines two recent sources of data on U.S. workers who bring work home from their primary workplace: the 2003–08 American Time Use Survey (ATUS) and the 1997, 2001, and 2004 May Current Population Survey (CPS) Work Schedules and Work at Home Supplement (CPS Supplement). The ATUS provides detailed information on time spent on work, work-related activities, and nonwork activities during a single day, as well as information on the locations of these activities. The CPS Supplement provides information on the number of hours worked at home each week, information on whether or not workers had a formal arrangement to be paid for work at home, and reasons for working at home.

Recent research on work at home has focused almost entirely on paid work done by

those who have a formal arrangement to work at home. However, two papers published within the last 10 years have examined unpaid work at home. Using the May 2001 CPS Work Schedules and Work at Home Supplement, Younghwan Song examined the determinants of unpaid work at home for full-time wage and salary workers in the nonagricultural sector.¹ He found that unpaid work at home is positively related to education, the absence of overtime rates, being a team leader, efficiency wages, and greater earnings inequality within occupation groups. Song attributed workers' willingness to take on this additional unpaid work as an investment in their careers and future wage growth. In another study, Paul Callister and Sylvia Dixon used the 1999 New Zealand Time Use Survey and found that bringing work home was much more common than working exclusively from home.² The majority of work at home lasted for less than 2 hours per day, and a significant proportion was done in the evenings after work and on weekends.

Although hours worked at home under a formal arrangement are important economically, they almost certainly are included in official hours estimates; thus, their increased prevalence does not bias estimates of productivity growth. In contrast, when workers

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bring work home on an informal basis, it is more likely that the hours are worked off the clock and therefore are not included in these estimates. This study begins by explaining productivity measurement and discussing how unmeasured hours can affect estimates. Next, those who bring work home are defined and their characteristics and reasons for bringing work home evaluated. Then, the data are examined to determine the amount of work brought home and whether those who bring work home work longer hours or are simply shifting the location of some of their work. Finally, the study assesses whether BLS measures of hours and productivity capture the hours worked at home by those who bring work home from the workplace and, more importantly, whether unmeasured hours worked at home affect productivity trends.

Unmeasured hours and productivity growth

Labor productivity measures the difference between output growth and hours growth, and reflects many kinds of changes, including changes in the quantities of nonlabor inputs (that is, capital services, fuels, other intermediate materials, and purchased services) and changes in technology, economies of scale, management techniques, and the skills of the labor force. The Bureau of Labor Statistics calculates labor productivity for the nonfarm business sector by combining real output from the National Income and Product Accounts produced by the Bureau of Economic Analysis with BLS measures of hours worked for all persons. The primary source of data on hours is the average-weekly-hours-paid series for production workers in goods-producing industries and for nonsupervisory workers in service-providing industries.³ Data for these series are collected in the BLS Current Employment Statistics (CES) survey, a monthly payroll survey of establishments that collects data on employment and hours paid for the pay period that includes the 12th of the month.⁴ Average weekly hours are adjusted to remove the hours of employees who work for nonprofit institutions and to convert the series to an hours-worked basis, using an hours-worked-to-hours-paid ratio estimated from the BLS National Compensation Survey.⁵ The hours-worked adjustment ensures that changes in vacation, holiday, and sick pay, which are viewed as changes in labor costs, do not affect growth in hours, but it does not adjust for hours worked off the clock.

Total hours worked by production and nonsupervisory employees are calculated as

$$(1) \quad H_p^M = (AWH_p^M)(N_p) \quad (52),$$

where AWH_p^M represents average weekly hours worked by production and nonsupervisory employees and N_p is the employment of nonfarm business production and nonsupervisory employees.

Average weekly hours worked by nonproduction and supervisory employees are estimated by applying a ratio adjustment from the CPS data to the production and nonsupervisory hours data. The adjustment is the ratio of the average weekly hours worked by nonproduction and supervisory employees to the average weekly hours worked by production and nonsupervisory employees.⁶ This ratio (subsequently referred to as the *CPS ratio*), combined with the hours-worked series for production and nonsupervisory employees and CES employment data, is used to calculate the total hours worked by nonproduction and supervisory employees as

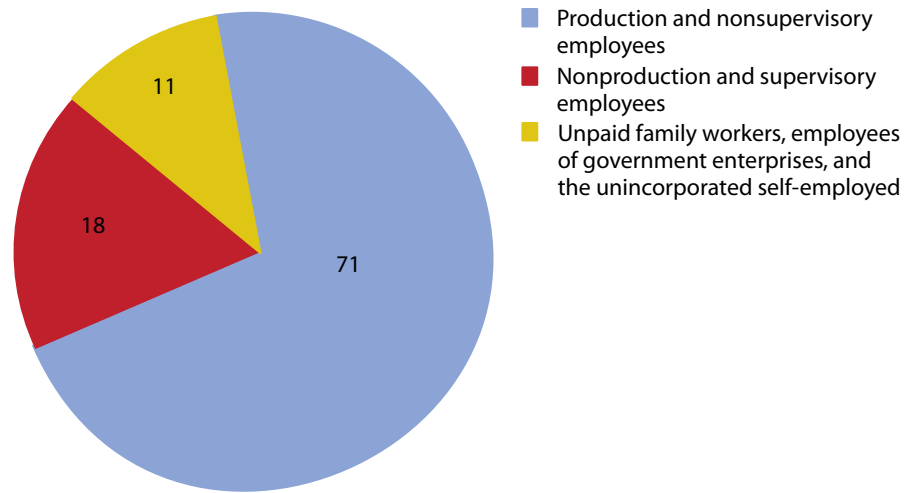
$$(2) \quad H_{NP}^M = (AWH_p^M) \left(\frac{AWH_{NP}^{CPS}}{AWH_p^{CPS}} \right) (N_{NP}) \quad (52),$$

where AWH_{NP}^{CPS} and AWH_p^{CPS} represent CPS measures of average weekly hours worked by nonproduction and supervisory employees and production and nonsupervisory employees, respectively, and N_{NP} denotes the employment of nonfarm business nonproduction and supervisory employees.

The Bureau constructs total hours worked by production and nonsupervisory employees and total hours worked by nonproduction and supervisory employees at the major industry group level in the North American Industry Classification System and the BLS-defined 14-sector level and then aggregates both measures to the level of all nonfarm business sector. Total hours worked by all persons in the nonfarm business sector are the sum of production and nonsupervisory employee hours, nonproduction and supervisory employee hours, and hours worked by unpaid family workers, employees of government enterprises, and the unincorporated self-employed.⁷ Chart 1 shows each group's share of nonfarm business sector hours worked in 2008. Production and nonsupervisory employees account for the majority of nonfarm business sector hours (71 percent), nonproduction and supervisory employee hours account for 18 percent, and the unincorporated self-employed, unpaid family workers, and employees of government enterprises make up the smallest share (11 percent).

Some critics have suggested that innovations in information technology have allowed many more workers the flexibility to work outside the traditional workplace and that these hours are not properly captured in official BLS productivity measures—in particular, the quarterly labor productivity estimates for the nonfarm business sector.⁸

Chart 1. Percent of nonfarm business sector hours worked, by type of worker, 2008



Although, undoubtedly, unmeasured hours are a possible source of bias, it is important to keep in mind that an underestimation of hours worked will affect measures of productivity growth only if unmeasured hours grow at a rate different from that of measured hours.

Unpaid hours worked can affect the hours-worked calculations in two ways: through the CES estimates of average weekly hours and through the CPS ratio adjustment. As noted earlier, the CES survey measures hours paid, not hours worked, which means that any unpaid work brought home by production and nonsupervisory employees will not be counted. As regards the CPS ratio adjustment, if work at home is not accurately reported and if the percent of unreported hours worked at home differs between production and nonsupervisory employees, on the one hand, and nonproduction and supervisory employees, on the other, then the ratio could be biased. However, an examination of the bias in the CPS ratio adjustment is beyond the scope of this study, so the focus here will be on the extent to which unpaid hours worked at home are missing from the production and nonsupervisory employee hours series.

Data sources

As noted earlier, this study uses data from the CPS and the ATUS. For consistency with the productivity measures, the analysis focuses on nonfarm business employees, defined as employees who are 15 years and older, work

outside of the farm sector, and work for private, for-profit entities. Although unpaid family workers and the self-employed are in the nonfarm business sector, these groups are excluded from the analysis because they may have the ability to shift freely between work and nonwork activities and may also lack a clear definition of a principal workplace; therefore, for such groups, the concept of bringing work home is not well defined and is beyond the scope of the study.

The American Time Use Survey. The ATUS, which began collecting data in 2003, is an ongoing survey of how people living in the United States spend their time. The ATUS sample consists of individuals living in households that recently have completed their final outgoing rotation interview for the CPS.⁹ Households are selected on the basis of demographic characteristics, and one person 15 years or older is selected at random to be interviewed. ATUS interviews occur 2 to 5 months following the respondent’s final CPS interview. Unlike the CPS, the ATUS does not allow proxy respondents. ATUS respondents are interviewed by telephone about how they spent their time over a 24-hour period. The 24 hours represent a “diary day” of activities that the respondent recalls engaging in and reports sequentially beginning at 4 a.m. on the day prior to the interview.

Interviewers categorize the diary entries into more than 450 different primary activities. For each activity, the ATUS collects information on its duration (actually, beginning time and ending time), the location where the activ-

ity took place, and the people who were in the room with the respondent or who accompanied the respondent during the activity.¹⁰ Thus, it is possible to construct measures of hours worked that include time at work; time spent on work activities by location, such as at one's usual workplace, at home, or in a restaurant; and interruptions of 15 minutes or longer that took place during the workday.¹¹ Single-day diaries are thought to be more accurate than retrospective survey questions because time diaries have a shorter recall period and are less subject to aggregation bias (the sum of time spent in all activities must equal 1,440 minutes, and respondents do not have to add together individual work episodes themselves).¹² Also, time diary data should capture all work done by all persons, regardless of their usual work schedule.¹³ Finally, the ATUS updates the demographic and employment information that was collected in the CPS and asks respondents to report any activities during which children under 13 years were in their care. This request makes it possible to determine when parents are working and simultaneously caring for a child.

The ATUS sample covers every day of the year, except for the days before major holidays. In 2003, there were 20,720 ATUS interviews. Beginning in December of that year, the sample size was reduced by 35 percent, yielding 13,973 completed diaries in 2004. From 2005 to 2008, approximately 13,000 diaries were completed each year, with the exception of 2007, when only 12,248 diaries were completed.

Because the study presented here is concerned primarily with unmeasured hours of work at home, the analysis was restricted to work done for a respondent's main job. It is expected that those who are working at home on a second job are in fact being paid for those hours, and the hours would be captured in measured hours. Hours of work brought home from the primary job may be "extra hours," not explicitly paid for and thus unmeasured. The restriction to the main job also allows a comparison of results from the ATUS with those from the CPS Supplement, because the latter collects information about work at home only for the main job. This approach may slightly underestimate work done at home, and thus unmeasured hours, to the extent that people combine work at their workplace with work at home on their second jobs. However, most second jobs are part time and, therefore, more likely to pay hourly and be captured in standard measures.

To analyze hours of work, the minutes spent on activities coded as "work at main job" were aggregated by location for each ATUS respondent, in order to construct measures of worktime both at the workplace and at the home. Reported

breaks of 15 or fewer minutes occurring at the workplace, as well as work-related travel (not commuting) occurring between episodes of work at a workplace, are included as worktime.¹⁴ From a productivity standpoint, short breaks are considered productive time.¹⁵

For this study, "bringing work home" is defined as bringing extra work home when home is not the primary workplace. Respondents whose diary day was a nonholiday weekday are classified as those who bring work home if they report any minutes of work for their main job both at the workplace and at home on the same day. Respondents whose diary day was on a weekend day or a holiday are classified as those who bring work home if they report any minutes of work at home on their diary day. Unfortunately, it is not possible to distinguish whether those who worked exclusively at home on a weekend diary day were home-based workers, telecommuters, or traditional "nine-to-five" office workers who bring extra work home to do over the weekend. However, when the hours worked at home by this group are described later in the article, it will become clear that the group consists primarily of employees who bring work home, rather than home-based workers. Because those who bring work home are identified only according to work activities they engaged in on their diary day, the analysis using ATUS data is further restricted to nonfarm business employees who worked on their diary day. It is important to keep in mind that, because the ATUS covers only a single day, it is impossible to identify people who bring work home if they do not do so on their diary day.

The CPS Work Schedules and Work at Home Supplement.

The Work Schedules and Work at Home Supplement was collected as part of the May CPS in 1997, 2001, and 2004. Although changes in industry and occupational coding and changes in the sequence and wording of the questions on work at home limit the direct comparability of some data collected in 1997, data from all 3 years are included in the analyses, with limitations noted as they occur. As previously mentioned, the CPS supplement collected information only on whether respondents did any work at home as part of their main job. Wage and salary respondents who reported working at home were asked whether they had a formal agreement with their employer to be paid for work at home or whether they were just taking (unpaid) work home.

The analysis focuses on those who reported that they were just taking work home, because their hours at home are the hours most likely to be unmeasured. Unfortunately, the questionnaire did not allow for the possibility that an

employee had a formal arrangement to be paid for work at home and also took unpaid work home.¹⁶ Respondents were asked their reasons for working at home, how frequently they worked at home, and the number of hours per week they worked at home. In 1997, respondents were asked for actual hours worked at home, whereas they were asked for usual hours in 2001 and 2004. The 2001 and 2004 respondents also were given a choice of “it varies” as a response for hours worked at home; therefore, it is not possible to determine a numerical measure of work hours for all respondents in these years. The analysis focuses only on workers who have positive weekly hours worked during the reference week.

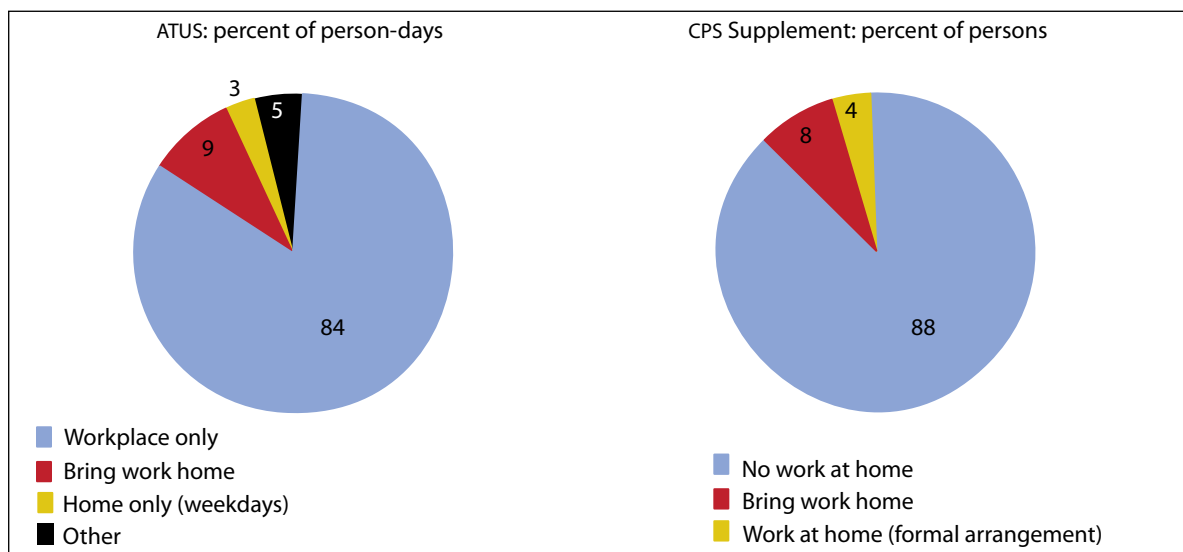
ATUS and CPS Supplement matched data. CPS Supplement respondents in 2004 who were in their 5th through 8th months in the May CPS were eligible for an ATUS interview from July 2004 through January 2005. It is possible to directly match 745 nonfarm business employees who (1) were in the same industry and occupation, (2) reported the same class of worker in both datasets, (3) did not change employers between their last month in the CPS and their ATUS interview, and (4) worked on their diary day. Of the 745 directly matched respondents, 93 reported in the CPS Supplement that they brought unpaid work home and 66 reported that they brought work home on their ATUS diary day. However, there are definitely limitations associated with the matched data. Some respondents to the Supplement questions answered that they did not do any work at home as part of their job, although their time diary clearly stated that they did some work at home. For example, of the 66 individuals who brought work home on their diary day, only 35 reported in the CPS Supplement that they had ever worked at home.¹⁷ This may be because the nature of their job changed between the time the CPS Supplement was conducted and the time the ATUS interviews took place, a period that could have been anywhere from 2 to 8 months. Alternatively, the CPS Supplement questions may have been misinterpreted by the respondents so that they answered affirmatively only if they brought work home on a regular basis, or answers may have been subject to proxy reporting bias; however, even self-respondents (as opposed to proxies) reported differently between surveys. The 2004 directly matched data indicate that 69 percent of those in the CPS Supplement who worked at home on their weekend or holiday diary day did not have a formal arrangement to be paid for such work. This finding provides additional evidence that most employees who worked at home on the weekend are not home-based or occasional telecommuters.

Who is bringing work home?

Many nonfarm business employees bring work home from the workplace. According to the 2004 ATUS diaries, 84 percent of nonfarm business employees who worked on their diary day worked exclusively in a workplace that day, 9 percent brought some of their work home, and 3 percent worked exclusively at home on weekdays.¹⁸ (See chart 2.) The 2004 CPS Supplement data show that approximately 12 percent of nonfarm business employees did some work at home. (See chart 2.) The CPS Supplement specifically asked those who responded that they did work at home whether they brought work home; 8 percent of employees reported bringing some work home in 2004, while 4 percent reported that they had a formal arrangement to be paid for work conducted at home. Because the ATUS captures only a person’s diary day, some employees who bring work home on some days, but not their diary day, may be categorized as working only at a workplace or working only at home. Therefore, the observed proportion of employees who bring work home is understated to some extent in the ATUS.¹⁹

Both datasets reveal that the characteristics of nonfarm business employees who bring work home from the workplace are different from the characteristics of those who work exclusively in the workplace.²⁰ Employees who bring work home from the workplace are more likely to be male, older, White, and married, to have a child and at least a bachelor’s degree, and to work in a management or professional occupation, compared with employees who work only in the workplace²¹ (see tables 1 and 2), and are less likely to be Black, Hispanic, part-time workers, or paid hourly.²² For example, according to the 2004 CPS Supplement, 63 percent of those who brought work home held at least a bachelor’s degree, whereas 19 percent of those who did no work at home held at least that same degree. Also, of those who brought work home, 15 percent reported being paid hourly, while 69 percent of nonfarm employees who did no work at home were paid hourly. Although 38 percent of those who brought work home worked in a management or professional occupation, not all work brought home is done by white-collar office workers. For instance, the 2004 CPS Supplement found that, among nonfarm business employees who brought work home, 3 percent worked in construction and maintenance occupations. The data indicate that women were less likely than men to have brought work home. Gender-related differences such as this may simply be capturing the fact that work may be less portable in traditionally female-dominated occupations and in-

Chart 2. Nonfarm business employees, by location of work, 2004



NOTE: ATUS respondents represent only those who worked on their diary day. The category labeled "Other" consists of those who worked at locations other than home or the workplace and those who combined other locations with the workplace. CPS Supplement respondents represent those who said yes to the question "As part of this job, do you do any of your work at home?"

dustries. This finding is consistent with the observation that, among those who bring work home, just 3 percent are in service occupations.

In addition to shedding light on who is bringing work home, the CPS Supplement asked respondents why they worked at home. The following tabulation lists the 2001 and 2004 percentages of nonfarm business employees who brought work home, by reason for working at home:²³

Reason	2001	2004
Finish or catch up on work.....	59	56
Nature of the job.....	24	29
Reason other than any of those listed..	7	6
Coordinate work schedule with personal or family needs.....	5	5
Business is conducted from home.....	4	4
Reduce commuting time or expense....	1	1
Participate in local transportation or pollution control program.....	0	0

As the tabulation shows, the main reason reported was to finish work not completed at the usual workplace. The second most frequently cited reason for bringing work home was that it was the nature of the job. Five percent of workers reported that they brought work home to coordinate their work schedule with personal or family needs. In

support of this reason, ATUS data show that 49 percent of parents who brought work home over the 2003–08 interval worked at home while simultaneously caring for their children under age 13.²⁴

Do those who bring work home work more hours?

Results from the ATUS. The following tabulation shows the percentages of nonfarm business employees who bring work home, by the day of the week, averaged over the 2003–08 period:²⁵

Day of week	Bring work home on—	
	All diary days	Weekdays
Sunday.....	18	...
Monday.....	13	17
Tuesday.....	14	21
Wednesday.....	16	25
Thursday.....	15	23
Friday.....	9	14
Saturday.....	15	...

According to the ATUS data, nonfarm business employees who brought work home on their diary day were more likely to work at home on a Sunday than on any other day of the week. Those who brought work home on a weekday were more likely to have brought it home during the

Table 1. Comparison of characteristics of nonfarm business employees who bring work home with characteristics of those who work exclusively in the workplace, 2003–08 (ATUS)

[In percent, except for age]

Characteristic	2003		2004		2005		2006		2007		2008	
	Bring work home	Work-place only	Bring work home	Work-place only	Bring work home	Work-place only	Bring work home	Work-place only	Bring work home	Work-place only	Bring work home	Work-place only
Sex												
Men.....	59	60	67	57	68	56	67	56	61	57	64	56
Women.....	41	40	33	43	32	44	33	44	39	43	36	44
Mean age, years.....	42.00	38.09	41.82	38.39	41.88	38.38	40.99	38.06	41.97	37.68	40.67	38.65
Standard deviation of mean age	(15.30)	(15.91)	(14.86)	(15.89)	(20.38)	(17.00)	(17.79)	(18.77)	(16.66)	(18.38)	(17.15)	(18.17)
Race or ethnicity												
White.....	81	69	82	69	82	67	80	66	75	65	79	67
Black.....	5	11	7	10	5	11	6	11	8	10	6	10
Other race.....	9	5	6	5	8	5	9	6	11	6	8	5
Hispanic.....	5	16	6	16	5	17	5	18	6	19	6	18
Marital status¹												
Single.....	16	35	24	32	26	34	22	35	24	37	26	33
Married.....	69	54	66	56	64	53	68	53	64	52	66	54
Divorced.....	13	11	10	12	12	13	10	12	12	11	8	13
Pay status												
Part time.....	11	18	12	17	10	17	6	18	8	17	7	18
Paid hourly.....	26	67	33	67	25	67	23	67	24	67	25	68
Education												
No high school degree.....	4	17	4	15	4	15	3	15	2	16	2	15
High school degree.....	19	34	21	35	12	36	10	35	14	35	12	35
Some college.....	24	28	27	28	27	28	29	29	22	29	23	27
Bachelor's degree.....	34	16	29	15	39	15	36	16	41	16	34	18
Advanced degree.....	19	5	19	6	18	6	22	5	22	4	29	5
Youngest child in the home												
No children.....	55	63	54	63	75	74	55	63	54	63	60	63
Infant.....	8	7	8	7	6	9	9	8	11	8	10	8
Preschooler.....	14	11	12	11	11	11	12	9	10	10	11	10
Elementary school student.....	12	9	10	10	11	9	11	10	12	9	8	9
Adolescent.....	11	11	14	10	10	10	13	10	13	10	11	10
Occupation												
Management and professional..	58	26	49	27	53	26	64	25	64	24	59	26
Service.....	6	16	5	17	5	15	4	17	5	16	6	17
Sales and office	27	26	29	25	28	28	23	28	23	30	26	26
Farming, fishing, and forestry.....	0	0	0	0	0	0	0	0	0	0	0	0
Construction and maintenance...	5	12	8	12	9	12	5	10	5	12	4	12
Production, transportation, and material moving.....	4	20	9	18	4	19	4	19	4	18	5	18
Industry												
Mining.....	0	0	0	0	1	1	0	1	1	1	0	1
Construction.....	5	8	5	8	7	9	6	8	5	8	4	9
Manufacturing.....	19	19	19	19	14	20	19	18	20	17	12	18
Wholesale and retail trade.....	16	20	16	20	17	20	9	21	15	22	14	18
Transportation and utilities.....	40	5	4	5	4	6	5	5	2	5	4	5
Information.....	7	3	7	3	6	3	5	3	8	3	6	2
Financial activities.....	10	8	10	8	14	8	18	9	13	10	17	8
Professional and business services.....	16	11	16	11	19	10	20	10	17	11	23	12
Educational and health services..	16	11	16	11	10	12	13	11	11	10	14	12
Leisure and hospitality.....	6	10	6	10	6	9	3	10	6	12	3	12
Other services.....	2	4	2	4	3	3	2	4	2	3	2	3
Number of observations.....	554	3,746	403	2,466	356	2,359	374	2,317	403	2,340	380	2,287

¹ Marital status is from outgoing rotation interview in CPS.

NOTE: Sampling weights are used to account for survey design.

Table 2. Comparison of characteristics of nonfarm business employees who bring work home with characteristics of those who work exclusively in the workplace, 2001 and 2004 (CPS Supplement)

[In percent, except for age]

Characteristic	2001		2004	
	Bring work home	Work-place only	Bring work home	Work-place only
Sex				
Men.....	62	55	62	55
Women.....	38	45	38	45
Mean age, years.....	40.98	37.44	42.45	37.98
Standard deviation of mean age	(12.02)	(15.08)	(14.61)	(17.17)
Race or ethnicity				
White.....	90	83	88	81
Black.....	6	12	5	12
Other race.....	5	5	7	7
Hispanic ¹	4	14	5	16
Marital status				
Single.....	18	34	19	35
Married.....	70	53	70	52
Divorced.....	12	13	11	13
Pay status				
Part time ²	6	18	6	19
Paid hourly ³	15	69	15	69
Education				
No high school degree.....	1	17	2	16
High school degree.....	15	36	12	35
Some college.....	23	29	23	30
Bachelor's degree.....	41	14	39	15
Advanced degree.....	20	4	24	4
Youngest child in the home				
No children.....	56	67	60	68
Infant.....	7	6	8	6
Preschooler.....	13	9	11	9
Elementary school student.....	11	9	9	8
Adolescent.....	13	9	12	9
Occupation				
Management and professional.	56	18	38	16
Service.....	11	6	3	19
Sales and office	13	5	25	29
Farming, fishing, and forestry....	5	1	0	0
Construction and maintenance	2	7	3	11
Production, transportation, and material moving	1	1	2	19
Industry				
Mining.....	1	1	0	1
Construction.....	1	1	5	8
Manufacturing.....	4	7	15	17
Wholesale and retail trade.....	11	13	16	20
Transportation and utilities.....	8	8	3	5
Information.....	3	5	5	3
Financial activities.....	3	2	16	8
Professional and business services.....	1	1	20	10

See notes at end of table.

Table 2. Continued—Comparison of characteristics of nonfarm business employees who bring work home with characteristics of those who work exclusively in the workplace, 2001 and 2004 (CPS Supplement)

[In percent, except for age]

Characteristic	2001		2004	
	Bring work home	Work-place only	Bring work home	Work-place only
Educational and health services.....	8	5	14	12
Leisure and hospitality.....	10	23	3	12
Other services.....	16	7	1	4
Number of observations.....	2,851	29,280	3,080	33,941

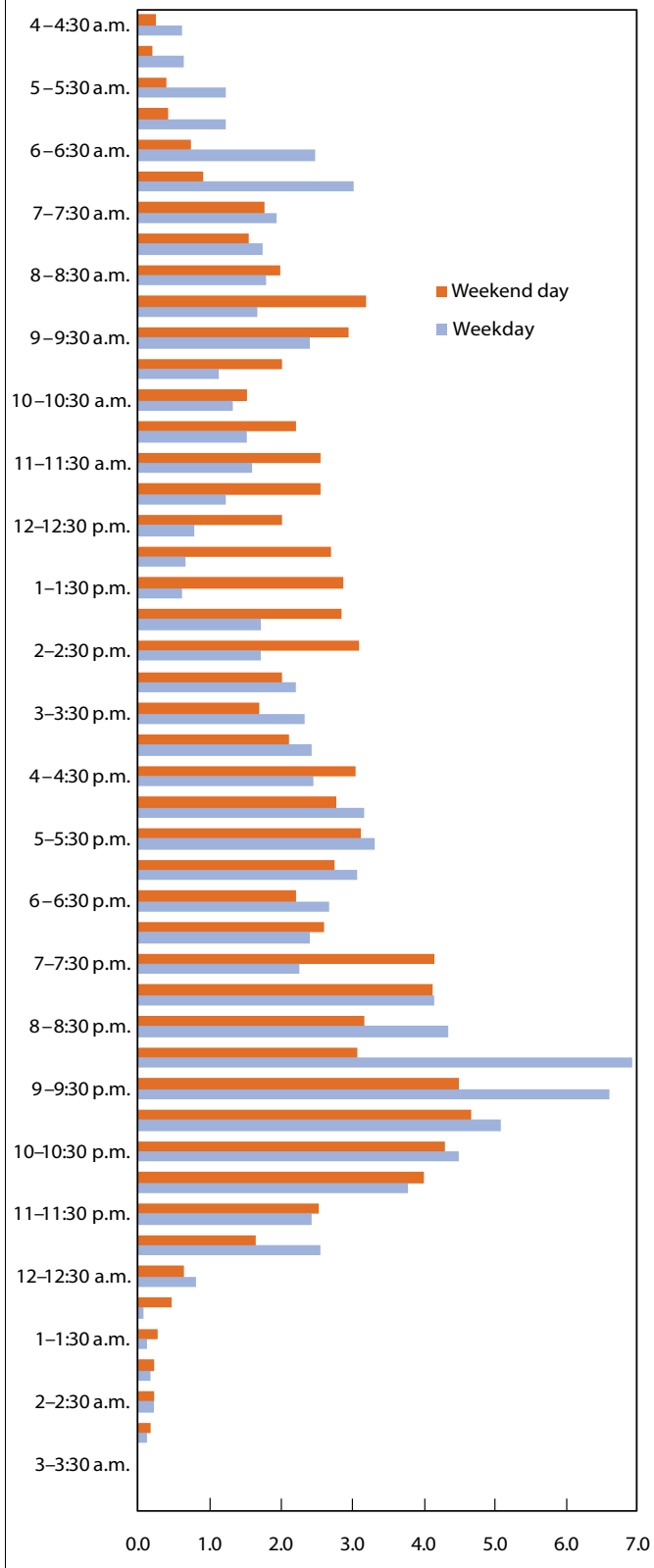
¹ Hispanic proportions for 2001 are based on 31,825 observations, with no missing values.
² Part-time proportions for 2001 are based on 29,892 observations on hours worked per week. There are no missing values.
³ Paid-hourly proportions are based on the outgoing rotation sample.
NOTE: Sampling weights are used to account for survey design. Estimates are based on those who reported working positive hours during the reference week of the survey.

middle of the week than on a Monday or a Friday. Chart 3 presents the distribution of minutes worked at home in 2008 by those who brought work home, by the time of day that the work was done. For weekday diaries, the majority (56 percent) of work at home was done after 5 p.m., and about 17 percent of work at home was done before 9 a.m. This work done outside traditional working hours suggests that workers are either bringing extra work home or shifting the timing of their work. For weekday diaries, there is also a distinct lull in work at home around lunchtime, as well as a small dip during the dinner hour. A different pattern of work at home is observed on weekend days, with work at home being more evenly distributed throughout the day on weekends than on weekdays.

Table 3 presents the percentage of nonfarm business employees who bring work home on their diary day by the number of minutes worked at home. The amount of work done at home is economically significant and, for the majority of employees who bring work home, definitely represents more substantive work than responding to an occasional e-mail or phone call. For example, in 2008, although 23 percent of those who brought work home reported working at home for less than 15 minutes on their diary day, 40 percent worked more than 1 hour at home and 22 percent worked at home for more than 2 hours.

The ATUS data for 2003–08 show that nonfarm business employees who brought work home on a weekday worked, on average, 9.1 hours per day, while those who

Chart 3. Percent of minutes worked at home by those who bring work home, by time of day (ATUS, 2008)



worked exclusively in the workplace worked an average of 8.2 hours per day. (See table 4.) However, those who brought work home on a weekday worked an average of only 7.6 hours per day at the workplace. In other words, those who brought work home on a weekday worked, on average, 12.6 percent more hours than those who worked exclusively in a workplace; but they also worked an average of 6 percent fewer daily hours at the workplace.²⁶ Thus, those who bring work home on a weekday are shifting some hours of work from their workplace to their home, as well as extending their workday; therefore, they work more hours, in total, on their diary day. Those who bring work home on a weekday tend to work approximately 15 percent of their daily hours at home on their diary day.

Nonfarm business employees who work any hours at home on a weekend day or a holiday worked, on average, 2.5 hours on their diary day, whereas those who work exclusively at the workplace worked 7.2 hours, on average, on their diary day. Although some of the respondents who bring work home on weekend days may actually be home-based workers, the 1.8 hours that they worked at home are not much different from the 1.4 hours worked at home by respondents who bring work home from the workplace on weekdays. In addition, those who bring work home on a weekend day or a holiday tend to work approximately 72 percent of their daily hours at home on their diary day. These findings suggest that the group of employees working at home on a weekend day or a holiday consists predominantly of employees who are catching up on office work not completed during the week.

In order to determine whether workers who bring work home on their diary day work more hours in general than do those who work exclusively in a workplace (and are not completely offsetting the hours they work at home on their diary day with fewer hours worked on a different day of the week), table 5 compares each ATUS group's average weekly hours worked, as reported in the CPS. The ATUS asks about usual hours worked, the CPS about actual hours worked. Comparisons, however, should be made on actual hours, because hours worked at home may be variable and not included in reports of usual hours worked. Also, because the final month the respondent was in the CPS was 2 to 5 months before the ATUS was conducted, the sample for the comparison of average weekly hours was further restricted to those who had the same employer, occupation, and usual duties when completing the ATUS diary as they did when last interviewed for the CPS.²⁷

According to both weekday and weekend/holiday diary data, those who bring work home from their workplace on their diary day report significantly higher av-

Table 3. Percent of nonfarm business employees who bring work home, by minutes worked at home, 2003–08 (ATUS)

Minutes per day	2003	2004	2005	2006	2007	2008
Less than 15.....	17	20	23	21	20	23
16–30.....	17	18	18	17	18	16
31–60.....	24	24	22	18	21	20
61–120.....	21	18	13	19	16	18
121–180.....	9	9	11	12	7	9
181–240.....	4	6	5	5	9	5
241 or more.....	10	6	7	9	8	8
Number of observations.....	554	403	356	374	403	380

NOTE: Percentages are weighted to account for the sampling design and may not sum to 100 because of rounding.

Table 4. Daily hours worked by nonfarm business employees, conditional on working on the diary day, 2003–08 (ATUS)

Year and type of daily hours	Weekday diaries		Weekend/holiday diaries	
	Workplace only	Bring work home	Workplace only	Bring work home
2003				
Daily hours.....	8.2	9.1	7.1	2.2
Daily workplace hours.....	8.2	7.3	7.1	.6
Daily hours at home.....	....	1.7	....	1.5
2004				
Daily hours.....	8.2	8.7	7.3	2.6
Daily workplace hours.....	8.2	7.3	7.3	.9
Daily hours at home.....	....	1.3	....	1.7
2005				
Daily hours.....	8.1	9.0	7.1	2.2
Daily workplace hours.....	8.1	7.5	7.1	.5
Daily hours at home.....	....	1.3	....	1.6
2006				
Daily hours.....	8.2	9.4	7.2	2.6
Daily workplace hours.....	8.2	8.0	7.2	.5
Daily hours at home.....	....	1.3	....	2.1
2007				
Daily hours.....	8.1	9.4	7.0	2.8
Daily workplace hours.....	8.1	7.9	7.0	.7
Daily hours at home.....	....	1.4	....	2.0
2008				
Daily hours.....	8.1	9.3	7.4	2.5
Daily workplace hours.....	8.1	7.9	7.4	.7
Daily hours at home.....	....	1.3	....	1.8
Average, 2003–08				
Daily hours.....	8.2	9.1	7.2	2.5
Daily workplace hours.....	8.2	7.6	7.2	.6
Daily hours at home.....	....	1.4	....	1.8

NOTE: The sum of daily workplace hours and daily hours at home may not equal daily hours because of rounding or work at other locations. Results of *F*-tests for differences in means are all significant at the 5-percent level.

erage weekly hours than those who work exclusively in a workplace. Because the latter employees may actually bring some work home on unobserved days and the group of employees who bring work home had higher average weekly hours than those who work only in the workplace, the average weekly hours of the two groups appear more similar than they actually were. From the weekday diaries, the average weekly hours for those who bring work home were 11 percent greater, on average, than the hours of those who work exclusively in the workplace on their diary day. From the weekend/holiday diaries, the average weekly hours of those who bring work home were 19 percent greater, on average, than the hours of those who work exclusively in the workplace on their diary day. Thus, the average number of weekly hours worked by those who bring work home, as reported in the weekend/holiday diaries, is close to that of respondents who bring work home on weekdays. The fact that the number of hours worked at home reported in the weekend diaries is similar to the number of hours worked at home reported in the weekday diaries, as are the average total weekly hours spent working, suggests that those who bring work home on weekend days are not working a typical workday on the weekend, but rather are bringing extra work home. Therefore, combining weekday and weekend/holiday diaries to calculate both the share of workers who bring work home on their diary day and who worked on that day and the average weekly hours of those who bring work home is appropriate. Over all days, those who bring work home on their diary day worked, on average, 12 percent more hours than those who work exclusively in the workplace on their diary day.

Results from the CPS Supplement. The following tabulation lists the percentages of nonfarm business employees who brought work home, by the frequency with which they did so, in 2001 and 2004:²⁸

Frequency	2001	2004
At least once a week.....	71	73
At least every 2 weeks.....	13	12
At least once a month.....	10	10
Less than once a month....	6	5

The tabulation shows that, according to the 2004 CPS Supplement, among the 8 percent of nonfarm business employees who bring work home, 73 percent reported working at home at least once a week, about 12 percent worked from home at least every 2 weeks, 10 percent at least once a month, and 5 percent less than once a month. Estimates are similar for the 2001 CPS Supplement, as shown.

Table 5. Average weekly hours worked by nonfarm business employees, 2003–08 (ATUS)

Year	Weekday diaries		Weekend/holiday diaries		All diaries	
	Workplace only	Bring work home	Workplace only	Bring work home	Workplace only	Bring work home
2003						
Average weekly hours.....	38.2	41.6	36.5	41.9	38.1	41.7
Number of observations.....	2,335	201	679	249	3,014	450
2004						
Average weekly hours.....	38.0	41.7	37.0	43.0	37.9	42.2
Number of observations.....	1,591	151	447	194	2,038	345
2005						
Average weekly hours.....	38.4	43.5	36.2	43.6	38.2	43.5
Number of observations.....	1,523	131	393	169	1,916	300
2006						
Average weekly hours.....	38.4	42.5	35.3	43.5	38.1	42.8
Number of observations.....	1,469	134	432	185	1,901	319
2007						
Average weekly hours.....	37.8	43.3	36.6	43.7	37.6	43.4
Number of observations.....	1,495	149	463	207	1,958	356
2008						
Average weekly hours.....	38.2	42.3	34.9	42.9	37.9	42.5
Number of observations.....	1,448	133	437	191	1,885	324
Average weekly hours, 2003–08.....	38.2	42.5	36.1	43.1	38.0	42.7

NOTE: Results of *F*-tests for differences in means are all significant at the 5-percent level. Hours are restricted to those who had the same employer and duties in the ATUS as they had in the CPS.

The CPS Supplement data also indicate that employees who bring work home had statistically significantly higher average weekly hours (21 percent higher in 2004) than those who never work from home as part of their job. (See table 6.) On the basis of the available data, separate estimates are reported for those who worked at home at least once a week in 2001 and 2004, because they should include hours worked at home in CPS average-weekly-hour reports, whereas the hours of workers who work at home infrequently may be missed in those reports if the work at home did not occur during the CPS reference week. The subgroup of employees who bring work home at least once a week had a slightly higher number of average weekly hours than did all employees who ever bring work home. When nonfarm business employees were asked in the 2004 CPS Supplement to report the hours they worked at home per week, roughly 31 percent of those who brought work home did not report how many hours they worked at home, but reported instead that their hours at home varied. Among those who worked at home at least once a week and whose hours did not vary, about 15 percent of their hours were worked at home each week. (See table 6). The conclusion from the two data sources is that those who bring work home do, in fact, work longer hours, on average, per week.

Are hours of work at home measured?

As mentioned previously, the Bureau constructs hours estimates for its productivity measures separately for production and nonsupervisory employees, on the one hand, and nonproduction and supervisory employees, on the other. Therefore, it is important to evaluate these groups of workers separately in this article.

Production and nonsupervisory employees. According to the 2003–08 ATUS data, 85.9 percent of production and nonsupervisory employees who worked on their diary day worked exclusively in the workplace, while 7 percent brought work home from the workplace. (See table 7.) Those who brought work home from their workplace reported, on average, 10 percent higher average weekly hours than those who worked exclusively in a workplace; the former also worked 16.5 percent of their daily hours at home on the day that they brought work home. No large consistent increase was seen in either the percentage of production and nonsupervisory employees who brought work home from their workplace or the number of hours that they worked at home over the 6-year interval examined.

Because the ATUS does not obtain information on whether work brought home is paid or unpaid, several as-

Table 6. Average weekly hours worked by nonfarm business employees, and share worked at home, 1997, 2001, and 2004 (CPS Supplement)

Year, hours, and share	No work at home	Bring work home	Bring work home at least once a week
1997			
Average weekly hours.....	38	47.4	(¹)
Share worked at home.....	....	17.7	(¹)
Number of observations.....	31,336	2,664	(¹)
2001			
Average weekly hours.....	37.8	45.4	46
Share worked at home ².....	....	12.0	13.8
Number of observations.....	29,280	2,851	2,001
2004			
Average weekly hours.....	37.6	44.9	45.5
Share worked at home ².....	....	12.8	14.6
Number of observations.....	33,941	3,080	2,205
Average weekly hours, 1997–2004.....	37.8	45.9	45.8
Average share worked at home, 2001–04.....	....	14.2	14.2

¹ The CPS Supplement for 1997 had no question on bringing work home at least once a week.

² Estimates are based on those whose hours worked at home do not vary.

NOTE: Results of *F*-tests for differences in means between average weekly hours of those working at the workplace only and average weekly hours of those who bring work home or who bring work home at least once a week are all significant at the 5-percent level. Estimates are based on employees who reported working positive hours during the reference week of the survey.

sumptions must be made in order to assess whether such work is measured. First, hours worked *at the workplace* are assumed to be captured in the CES survey, through employers' reports of employee hours paid; thus, these hours are measured. Second, it is assumed that hourly paid workers are paid for all the hours that they work whereas salaried workers who bring work home are paid only for the portion of their hours that are worked in the workplace. This assumption seems justified, given that more than 81 percent of production and nonsupervisory workers who report bringing work home without a formal arrangement to be paid were not paid hourly, according to the CPS Supplement. However, assuming that all work brought home is unpaid may overstate unmeasured hours in the ATUS, because some workers may be shifting work hours across locations, as suggested in table 4. Table 7 shows that, according to the ATUS, from 2003 through 2008 an average of 4.6 percent of production and nonsupervisory workers were paid a salary and brought work home. Among these employees, 16.4 percent of their weekday daily hours were worked at home on the day that

Table 7. Hours worked by production and nonsupervisory employees, 2003–08 (ATUS)

Year, shares, and hours	Workplace only	Bring work home	Bring work home (salaried employees)
2003			
Share of production and nonsupervisory employees.....	86.5	6.2	4.1
Number of observations.....	3,032	326	210
Share of daily hours worked at home ¹.....	...	20.1	19.1
Average weekly hours ²	37.2	38.6	39.6
Number of observations.....	2,413	264	179
2004			
Share of production and nonsupervisory employees.....	85.5	7.8	4.5
Number of observations.....	1,942	261	168
Share of daily hours worked at home ¹.....	...	15.9	16.7
Average weekly hours ²	36.7	39.9	41.4
Number of observations.....	1,565	220	152
2005			
Share of production and nonsupervisory employees.....	85.6	7.4	4.9
Number of observations.....	1,847	217	153
Share of daily hours worked at home ¹.....	...	16.9	15.4
Average weekly hours ²	37.2	42.1	43.4
Number of observations.....	1,497	182	131
2006			
Share of production and nonsupervisory employees.....	85.5	6.3	4.4
Number of observations.....	1,893	224	160
Share of daily hours worked at home ¹.....	...	15.0	13.7
Average weekly hours ²	37.4	40.0	42.0
Number of observations.....	1,544	188	136
2007			
Share of production and nonsupervisory employees.....	87.3	6.2	3.7
Number of observations.....	1,908	223	148
Share of daily hours worked at home ¹.....	...	15.6	18.3
Average weekly hours ²	36.9	41.4	43.8
Number of observations.....	1,573	193	136
2008			
Share of production and nonsupervisory employees.....	84.8	8.1	5.7
Number of observations.....	1,865	223	160
Share of daily hours worked at home ¹.....	...	15.7	15.1
Average weekly hours ²	36.8	41.9	44.0
Number of observations.....	1,503	189	139
Average, 2003–08			
Share of production and nonsupervisory employees.....	85.9	7.0	4.6
Share of daily hours worked at home ¹.....	...	16.5	16.4
Average weekly hours ²	37.0	40.7	42.4

¹ Weekday value used.

² Average weekly hours are restricted to those who had the same employer and duties in the ATUS as they had in the CPS.

NOTE: Results of *F*-tests for differences in means between average weekly hours of those working at the workplace only and those who bring work home (as either nonsalaried or salaried employees) are all significant at the 5-percent level for each year, except for 2003.

they brought work home and their average weekly hours were 14 percent greater than the average weekly hours of those who worked exclusively in a workplace.²⁹

Recall that the CPS Supplement specifically asked respondents whether they were paid to work at home or whether they took unpaid work home. The data indicate that approximately 92 percent of production and non-supervisory employees did no work at home (see table 8) while about 3 percent reported some paid work done at home and roughly 5 percent said that they were bringing work home. Four percent indicated that they brought work home at least once a week. Thus, according to the CPS Supplement, in any given week between 4 percent and 5 percent of production and non-supervisory employees bring unpaid work home. Those who bring work home have a statistically significant 20 percent higher average number of weekly hours worked than do those who do no work from home. About 15 percent of the average weekly hours worked by those who bring work home were worked at home.

Nonproduction and supervisory employees. Among nonproduction and supervisory employees who worked on their ATUS diary day, roughly 73 percent worked exclusively in

a workplace on that day over the 2003–08 interval while about 17 percent brought work home from the workplace that day.³⁰ (See table 9.) As with the results for production and nonsupervisory workers, those who brought work home from a workplace reported 10 percent higher average weekly hours than those who worked exclusively in a workplace. Also, those who brought work home worked more than 14 percent of their daily hours at home on the day that they brought work home. The ATUS data indicate that 14.5 percent of nonproduction and supervisory employees were salaried and brought work home. Average weekly hours of these workers were 12 percent greater than average weekly hours of those who worked exclusively in a workplace, and 14 percent of their daily hours were worked at home on the day they brought work home.

In the CPS Supplement, approximately 73 percent of nonproduction and supervisory employees reported that they did no work at home. (See table 10.) About 7 percent reported that they did some paid work at home, while roughly 20 percent reported that they bring work home. As in the ATUS, those who bring work home have significantly higher average weekly hours than those who do not do any work from home: 15 percent greater in 1997 and 2001 and 13 percent greater in 2004.

Table 8. Hours worked by production and nonsupervisory employees, 1997, 2001, and 2004 (CPS Supplement)

Year, shares, and hours	No work at home	Work at home		
		Paid	Bring work home	Bring work home at least once a week
1997				
Share of production and nonsupervisory employees.....	92.3	2.5	5.0	(¹)
Average weekly hours.....	37.3	40.2	45.6	(¹)
Share worked at home.....	...	38.2	18.0	(¹)
Number of observations.....	26,221	733	1,412	(¹)
2001				
Share of production and nonsupervisory employees.....	91.1	2.9	5.7	4.1
Average weekly hours.....	37.1	39.5	43.5	43.7
Share worked at home ².....	...	41.5	12.6	14.7
Number of observations.....	24,327	768	1,535	1,096
2004				
Share of production and nonsupervisory employees.....	91.6	2.8	5.3	3.9
Average weekly hours.....	36.8	38.7	43.2	43.7
Share worked at home ².....	...	44.6	13.9	16.0
Number of observations.....	28,710	914	1,711	1,249
Average, 1997–2004				
Share of production and nonsupervisory employees.....	91.7	2.7	5.3	4.0
Average weekly hours.....	37.1	39.5	44.1	43.7
Share worked at home.....	...	41.4	14.8	15.4

¹ The CPS supplement for 1997 had no question on bringing work home at least once a week.

² Estimates are based on those whose hours worked at home do not vary.

NOTE: Results of *F*-tests for differences in means are all significant at the 5-percent level. Estimates are based on employees who reported working positive hours during the reference week.

Table 9. Hours worked by nonproduction and supervisory employees, 2003–08 (ATUS)

Year, shares, and hours	Work-place only	Bring work home	Bring work home (salaried employees)
2003			
Share of nonproduction and supervisory employees.....	73.6	16.3	13.9
Number of observations.....	714	228	188
Share of daily hours worked at home ¹.....	...	13.6	14.2
Average weekly hours ²	41.8	45.9	47.3
Number of observations.....	601	186	158
2004			
Share of nonproduction and supervisory employees.....	76.7	12.8	11.0
Number of observations.....	524	142	126
Share of daily hours worked at home ¹.....	...	15.0	15.8
Average weekly hours ²	42.0	46.6	47.4
Number of observations.....	473	125	112
2005			
Share of nonproduction and supervisory employees.....	71.8	15.4	13.5
Number of observations.....	482	139	120
Share of daily hours worked at home ¹.....	...	13.7	11.5
Average weekly hours ²	42.2	45.9	46.8
Number of observations.....	419	118)	104
2006			
Share of nonproduction and supervisory employees.....	71.9	19.7	17.0
Number of observations.....	424	150	134
Share of daily hours worked at home ¹.....	...	13.5	14.5
Average weekly hours ²	41.0	46.2	47.1
Number of observations.....	357	131	118
2007			
Share of nonproduction and supervisory employees.....	69.0	19.9	18.6
Number of observations.....	432	180	165
Share of daily hours worked at home ¹.....	...	14.7	14.2
Average weekly hours ²	40.8	45.7	45.5
Number of observations.....	385	163	151
2008			
Share of nonproduction and supervisory employees.....	72.3	15.8	13.2
Number of observations.....	422	157	139
Share of daily hours worked at home ¹.....	...	12.7	14.4
Average weekly hours ²	41.9	43.4	44.5
Number of observations.....	382	135	121
Average, 2003–08			
Share of nonproduction and supervisory employees.....	72.6	16.6	14.5
Share of daily hours worked at home ¹.....	...	13.9	14.1
Average weekly hours ²	41.6	45.6	46.4

¹ Weekday value used.

² Average weekly hours are restricted to those who had the same employer and duties in the ATUS as they had in the CPS.

NOTE: Results of *F*-tests for differences in means between average weekly hours of those working at the workplace only and average weekly hours of those who bring work home (as either nonsalaried or salaried employees) are all significant at the 5-percent level for each year, except for 2008.

Unmeasured hours. As mentioned earlier, the Bureau constructs annual hours worked by starting with CES survey data on hours paid for production and nonsupervisory employees. If hours for these employees are understated, it is only to the extent that hours worked at home are not captured in reported hours paid. The preceding findings indicate that there are likely to be unmeasured hours for production and nonsupervisory employees who work outside the workplace.

These unmeasured hours—hours worked at home by those who bring work home—are estimated for all survey respondents. For the ATUS, daily hours worked at home by those who bring work home and who are not paid hourly are summed over all diary days in a given year. For the CPS Supplement, estimated weekly hours worked at home by those who bring unpaid work home are summed across all survey respondents.³¹ The following tabulation

Table 10. Hours worked by nonproduction and supervisory employees (CPS Supplement)

Year, shares, and hours	No work at home	Work at home		
		Paid	Bring work home	Bring work home at least once a week
1997				
Share of nonproduction/supervisory employees.....	74.4	6.6	18.9	(¹)
Average weekly hours.....	41.8	43.2	49.4	(¹)
Share of hours at home.....	...	36.0	17.0	(¹)
Number of observations.....	5,115	437	1,252	(¹)
2001				
Share of nonproduction/supervisory employees.....	72.7	7.1	19.8	13.8
Average weekly hours.....	41.6	40.8	47.5	48.6
Share of hours at home ².....	...	38.0	11.3	13.0
Number of observations.....	4,953	495	1,316	905
2004				
Share of nonproduction/supervisory employees.....	72.7	7.2	19.8	14.1
Average weekly hours.....	41.8	40.6	46.9	47.8
Share of hours at home.....	...	40.0	11.5	13.1
Number of observations.....	5,231	539	1,369	956
Average, 1997–2004				
Share of nonproduction/supervisory employees.....	73.3	7.0	19.5	14.0
Average weekly hours.....	41.7	41.5	47.9	48.2
Share of hours at home.....	...	38.0	13.3	13.1

¹ The CPS Supplement for 1997 had no question on bringing work home at least once a week.

² Estimates are based on employees who worked positive hours.

NOTE: Results of *F*-tests for differences in means are all significant at the 5-percent level, except for the difference in means between those who do no work at home and those paid for work done at home.

Measuring Productivity

shows unmeasured hours as a percent of measured hours worked by production and nonsupervisory nonfarm business employees:³²

<i>Survey and year</i>	<i>Percent</i>
ATUS:	
2003.....	0.98
2004.....	.81
2005.....	.93
2006.....	.79
2007.....	.79
2008.....	.98
2003–08.....	.88
CPS Supplement:	
1997.....	1.04
2001.....	.81
2004.....	.83
1997–2004.....	.89
CPS Supplement (those bringing home work at least once a week):	
2001.....	.68
2004.....	.70
2001–04.....	.69

As the tabulation indicates, according to ATUS data approximately 0.88 percent of the average weekly hours worked by nonfarm business production and nonsupervisory employees is unmeasured because work brought home over the 2003–08 interval was not reported.³³ According to the CPS Supplement, the percentage of unmeasured hours is 0.89 percent. Further, if the focus is on those who bring work home at least once a week, then approximately 0.69 percent of the average weekly hours worked by nonfarm business production and nonsupervisory employees goes unmeasured because work brought home was not reported.

Although the finding in this section suggests that nonproduction and supervisory employees who bring work home also work some unpaid hours at home, it does not imply that these unpaid hours are not measured, because BLS hours for nonproduction and supervisory employees are not constructed from a series of hours paid for nonproduction and supervisory employees, but rather incorporate self-reported CPS hours worked.³⁴

From equation (2), average weekly hours worked by nonproduction and supervisory employees are measured as

$$(3) \quad AWH_{NP}^M = \left(AWH_P^M \right) \left(\frac{AWH_{NP}^{CPS}}{AWH_P^{CPS}} \right),$$

where AWH_{NP}^M denotes the average weekly hours worked by nonproduction and supervisory employees, AWH_P^M

designates the average weekly hours worked by production and nonsupervisory employees, and AWH_{NP}^{CPS} and AWH_P^{CPS} represent CPS measures of average weekly hours worked by nonproduction and supervisory employees and production and nonsupervisory employees, respectively. Assuming that production and nonsupervisory employees and nonproduction and supervisory employees accurately report their average weekly hours worked to the CPS, then, by construction, the percentage of unmeasured hours for nonproduction and supervisory employees will be the same as that for production and nonsupervisory employees.

Using the preceding estimate of the percentage of unmeasured hours yields an hours series for all employees in the nonfarm business sector. In order to evaluate the BLS measure of hours worked by all persons, the hours worked by the unincorporated self-employed, unpaid family workers, and employees of government enterprises are added to the estimate of employee hours. The ATUS and the CPS Supplement both suggest that unmeasured hours of nonfarm business employees range between 0.6 percent and 0.9 percent of measured hours, meaning that between 0.6 percent and 0.8 percent of hours for all persons in the nonfarm business sector are unmeasured. However, from a productivity growth standpoint, it is important to examine whether unmeasured hours for all persons in the nonfarm business sector are increasing over time.

Growth of unmeasured hours. The analysis presented here finds that hours adjusted for work brought home from the workplace grew at about the same rate as the official hours series used to construct the BLS productivity measures for the nonfarm business sector over the 1997–2008 interval. (See table 11.) Year-to-year fluctuations are more volatile and will affect the official measures if the trends in hours differ by at least one-half of 1 percent, because the Bureau publishes productivity measures to the first decimal place. According to the ATUS results, adjusted hours grew annually by 0.01 percent to 0.1 percent faster than the official hours from 2004 to 2005 and from 2006 to 2007, but grew 0.1 percent to 0.2 percent slower from 2003 to 2004 and from 2005 to 2006. From 2007 to 2008, adjusted hours declined 0.16 percent slower than the measured series. According to the CPS Supplement results, adjusted hours grew 0.05 percent slower from 1997 to 2001 and fell at approximately the same rate as the measured series from 2001 to 2004.

The potential bias in hours levels resulting from unmeasured hours worked at home does not lead to any conclusive finding that the growth in hours is biased.³⁵ Instead, as table 11 shows, over most periods hours

growth is only slightly understated, although in some periods growth is slightly overstated. Over the longer period from 2003 to 2008, measured hours and adjusted hours grew at virtually identical rates, leading to no change in measured productivity growth. Therefore, recent productivity estimates are not overstated through any misreporting in hours because they are worked at home rather than in the office.³⁶

THIS ARTICLE ANALYZED DATA FROM TWO SOURCES—the ATUS and the May CPS Work Schedules and Work at Home Supplement—to determine whether hours worked by nonfarm business employees were understated and increased between 1997 and 2008 because of a growth in off-the-clock hours worked at home. The main advantage of using data from the CPS Supplement is that respondents report whether work done at home is paid—an indicator of whether hours at home are likely to be reported to the CES. The main advantages of using the ATUS data are that (1) the time of day when work is being performed at home is reported and (2) it is possible to get a more accurate measure of the number of hours worked at home across a diary day than over a week, the timeframe used in the CPS.

According to the 2003–08 ATUS data and the 1997–2004 CPS Supplement data, 8–9 percent of nonfarm business employees brought some of their work home from their primary workplace. A majority of CPS Supplement respondents indicated that they did work at home in order to finish or catch up on their work. The evidence also suggests that some parents brought work home at least in part to better balance work and family responsibilities.

Both datasets reveal that those who bring work home have higher average weekly hours than those who work exclusively in a workplace. According to the ATUS data, total daily hours worked at the workplace are lower for those who bring work home than for those who work exclusively in the workplace. Thus, it does appear that those who bring work home shift some work from their workplace to their home, yet work more hours in total.

Overall, there may exist a 0.7-percent to 0.9-percent downward bias in the official level of hours worked for nonfarm business sector employees due to the prevalence of unpaid work at home. However, when the official indexes of hours for all persons are augmented to include these

Table 11. Annual average growth of hours for all persons in the nonfarm business sector, various subperiods from 1997 to 2008

Survey and year	BLS series	Adjusted series	Difference
ATUS:			
2003–04.....	1.25	1.10	-0.15
2004–05.....	1.67	1.78	.11
2005–06.....	2.15	2.02	-.13
2006–07.....	.48	.49	.01
2007–08.....	-1.93	-1.76	.16
Average, 2003–08.....	.72	.72	.00
CPS:			
1997–2001.....	.82	.77	-.05
2001–04.....	-.65	-.64	.00
Average, 1997–2004.....	.19	.16	-.03
CPS Supplement (at least once a week), 2001–04....			
	-.65	-.64	.01

NOTE: Entries in Difference column may not equal difference of adjusted series and BLS series because of rounding.

unmeasured hours for employees, little change is seen in the growth of hours over the 6-year period from 2003 to 2008. There is no conclusive evidence that productivity trends are significantly overstated for the 1997–2008 period because of work brought home from the workplace.

The analysis revealed that nonproduction and supervisory employees are more likely to bring work home and, on average, work longer average weekly hours than production or nonsupervisory employees. Some previous research has found that those who work longer hours tend to overreport hours worked, compared with those who work “normal” hours.³⁷ If average weekly hours are not reported accurately to the CPS and the reporting bias differs between the nonproduction and supervisory employees and the production and nonsupervisory employees, then the percentage of unmeasured hours will differ between the two groups.³⁸

Because it is generally accepted that survey respondents are able to recall events of the previous day more accurately than they are able to recall those of the previous week, the ATUS data could be used to assess the reporting accuracy of responses of nonproduction and supervisory employees in the CPS. Such a task, however, is beyond the scope of this article, but there are plans to examine the issue in future research. □

Notes

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This article is an updated version of a publication by the Organization for Economic Cooperation and Development and includes 2007–08 ATUS data, as well as the 2008 major revision to BLS productivity data. (See Lucy Eldridge and Sabrina Wulff Pabilonia, “Are Those Who Bring Work Home Really Working Longer Hours? Implications for BLS Productivity Measures,” in Julien Dupont and Pierre Sollberger, eds., *Productivity Measurement and Analysis: Proceedings from OECD Workshops* (Neuchâtel, Switzerland, Swiss Federal Statistical Office, 2008), pp. 179–209.

¹ Younghwan Song, “Unpaid Work at Home,” *Industrial Relations: A Journal of Economy and Society*, October 2009, pp. 578–88.

² Paul Callister and Sylvia Dixon, “New Zealanders’ Working Time and Home Work Patterns: Evidence from the Time Use Survey,” New Zealand Department of Labour Occasional Paper No. 5, Aug. 1, 2001.

³ Production workers include working supervisors or group leaders who may be “in charge” of some employees, but whose supervisory functions are only incidental to their regular work. Nonsupervisory workers include every employee *except* those whose major responsibility is to supervise, plan, or direct the work of others.

⁴ Another source of data on hours is the BLS CPS. However, the CES survey is preferred for productivity measurement because it samples 400,000 nonfarm establishments, more than 6 times the 60,000 households sampled in the CPS. In addition, the CES survey is benchmarked annually to levels based on administrative records of employees covered by State unemployment insurance tax records. There is no direct benchmark for CPS employment data. Adjustments to the survey’s underlying population base are made annually with intercensal estimates and every 10 years with the use of the decennial census. Also, hours data from establishments are more consistent with the measures of output used to produce productivity measures; output data are based on data collected from establishments. In addition, establishment data provide reliable reporting and coding on industries and thus are well suited for producing industry-level measures. Industry measures based on household reports tend to produce estimates with considerable variance, even in a survey as large as the CPS. Hence, the Bureau’s official measures by industry come from establishment surveys whenever possible. The CES survey began collecting data on earnings and hours for all employees in September 2005. An experimental series that includes these new data is available on the Internet at www.bls.gov/ces/cesaep.htm. The Bureau is currently evaluating whether to start using this new series in its productivity statistics.

⁵ Prior to 2000, the annual Hours at Work Survey was used.

⁶ The Bureau introduced this new method of constructing estimates of hours for nonproduction and supervisory workers in August 2004. (See Lucy P. Eldridge, Marilyn E. Manser, and Phyllis Flohr Otto, “Alternative measures of supervisory employee hours and productivity growth,” *Monthly Labor Review*, April 2004, pp. 9–28.)

⁷ Average weekly hours for unpaid family workers, employees of government enterprises, and the unincorporated self-employed are obtained directly from the CPS. Employment counts for employees in agricultural services, forestry, and fishing come from the BLS Quarterly Census of Employment and Wages (formerly the ES-202 program), based on administrative records from the unemployment insurance system. The number of employees of government enterprises comes from the Bureau of Economic Analysis.

⁸ In this regard, Steven Roach argued that, as a result of the new portable technologies of the information age—laptops, cellular telephones, home fax machines, and pagers—many white-collar workers are working longer workdays than the official U.S. data show. (See Stephen Roach, *The Boom for Whom: Revisiting America’s Technology Paradox*, Morgan Stanley Dean Witter Special Economic

Study, Jan. 9, 1998.)

⁹ The CPS collects information on the demographic characteristics of all individuals in a household from a sample of about 60,000 households on a monthly basis. In addition, the CPS provides information on employment and hours worked by household members 15 years and older. Households are in the survey for 4 months, out for 8 months, and back in for another 4 months.

¹⁰ The ATUS does not report with whom a respondent spent time sleeping, grooming, on private activities, working, or taking a class; also excluded are activities the respondent refuses to classify by type and activities the respondent was unable to remember.

¹¹ A workplace is the place where a person usually works. For example, a waitress probably would work in a restaurant, a teacher would work in a school, and an accountant might work in an office building. ATUS interviewers are trained to ask a respondent about work breaks of 15 minutes or longer any time the respondent reports that he or she worked. Beginning in January 2004, an automated question was introduced into the survey instrument. If a respondent reports working for more than 4 hours at one time, the interviewer automatically is prompted to ask, “Did you take any breaks of 15 minutes or longer?” If the respondent reports taking a break, the interviewer records the beginning and ending times and what was done on the break; if the respondent reports that he or she did not take any breaks, a solid work episode is recorded.

¹² Suzanne M. Bianchi, John P. Robinson, and Melissa A. Milkie, *Changing Rhythms of American Family Life* (New York, Russell Sage, 2006).

¹³ Rachel Krantz-Kent, “Where People Worked, 2003 to 2007,” *Issues in Labor Statistics*, Summary 09–07 (U.S. Bureau of Labor Statistics, 2009).

¹⁴ Statistical testing excluding breaks and work-related travel yielded essentially the same results as the tests that included those activities.

¹⁵ See Edwin R. Dean and Michael J. Harper, “The BLS Productivity Measurement Program,” paper presented at the Conference on Research in Income and Wealth: New Directions in Productivity Research, Silver Spring, MD, March 20–21, 1998.

¹⁶ The 1997 CPS Supplement included a probing question later in the survey asking for the existence of additional unpaid hours; however, it is unclear how the information collected through this question may be appropriately analyzed.

¹⁷ These figures include those who were bringing a little work home on the weekend, as well as those who worked all day at home on their weekend diary day.

¹⁸ The distributions of work locations for other years are not statistically different from the 2004 results.

¹⁹ Throughout this article, all ATUS estimates are weighted with the ATUS respondent final weight. The sample of nonfarm business employees also is reweighted so that each day of the week is weighted the same in each of the analyses. All CPS Supplement estimates are weighted with the work schedules supplement weights.

²⁰ Lucy Eldridge and Sabrina Wulff Pabilonia (see Eldridge and Pabilonia, “Are Those Who Bring Work Home?”) used the ATUS sample and a multinomial logit model to estimate the effect of demographic and job characteristics on the probability of bringing work home, compared with working exclusively in the workplace. Then they used the CPS Supplement to perform a similar analysis.

²¹ From this point forward, results are presented for combined weekday and weekend diaries. Separate analyses conducted for weekday diaries and weekend diaries yielded similar results.

²² ATUS results may incorrectly categorize those who bring work home as working at the workplace only if they were not observed to bring work home on their diary day. As a result, the workplace-only cohort may be slightly “contaminated,” leading the two groups to appear more similar than they actually are. The finding that these groups have different characteristics remains.

²³ Note that the percentages shown are weighted to account for the sampling design. The reasons for working at home cited in the 1997 CPS Supplement are not comparable and, therefore, not reported here.

²⁴ The 49-percent figure is calculated from secondary childcare measures and does not imply that the child was in the same room while the parent was working. That is to say, the child may have been elsewhere in the home, but the parent was available if the child needed assistance.

²⁵ The percentages are weighted to account for the sampling design.

²⁶ Those who worked for 2 or more hours at home on a weekday worked, on average, 7.1 hours in the office on the same day, while their total hours were 9.9.

²⁷ A comparison of usual hours reported in the ATUS and in the CPS reveals that those who held similar jobs reported closer usual hours to the two surveys than did those who changed jobs.

²⁸ The percentages are weighted to account for the sampling design.

²⁹ Those who brought work home on a weekend or holiday diary day worked more than 70 percent of their hours at home.

³⁰ Numbers do not sum to 100 because workers could work in other locations or exclusively at home.

³¹ Weekly hours worked at home are estimated by multiplying average weekly hours by the share of hours worked at home. Shares of average weekly hours worked at home were calculated from data for those who reported actual hours worked at home; these shares were applied to the average weekly hours for all respondents who brought work home, yielding estimates of total hours worked at home for those who reported that their hours varied.

³² Measured hours are constructed as the sum of all hours worked, less unmeasured hours.

³³ However, the quality of these additional hours worked at home may not be the same as the quality of those worked in the workplace,

especially if the workers are engaged in secondary childcare while working at home.

³⁴ See equation (2).

³⁵ In a similar analysis, Eldridge found that a hypothetical hours series constructed by combining CPS average weekly hours with CES employment data produced slightly higher levels of hours, but hours showed a comparable trend from 2000 to 2003. (See Lucy P. Eldridge, “Hours Measures for Productivity Measurement and National Accounting,” paper presented to Paris Group on Measuring Hours of Work, Lisbon, September 29–October 1, 2004.)

³⁶ The results presented in this article are somewhat different than those arrived at in an earlier version, for two reasons. First, an improved method was used to adjust the weights in the ATUS data to account more accurately for differences in group selections. In addition, there was a major revision to the major sector productivity data on September 2, 2009, that significantly changed the employment and hours series for 2003–06.

³⁷ See, for example, John P. Robinson, Jonathan Gershuny, Kimberly Fisher, and Steven Martin, “Workweek Estimate: Diary Differences and Regression to the Mean,” presented at the International Association for Time Use Research Annual Conference, Washington, DC, October 17–19, 2007; Steffen Otterbach and Alfonso Sousa-Poza, “How accurate are German work time data? A comparison between time-diary reports and stylized estimates,” *Social Indicators Research*, June 2009, pp. 325–29; and Jens Bonke, “Paid work and unpaid work: Diary information versus questionnaire information,” *Social Indicators Research*, February 2005, pp. 349–68.

³⁸ Using the 2003–06 ATUS sample, Harley Frazis and Jay Stewart found that the CPS understates production and nonsupervisory workers’ hours worked on the main job by 1.2 hours per week; however, the CPS *overstates* production and nonsupervisory workers’ hours worked on *all* jobs by 0.2 hour per week, because of overreporting on second jobs, but this small difference is not statistically significant. (See Harley Frazis and Jay Stewart, “Why Do BLS Hours Series Tell Different Stories about Trends in Hours Worked?” in Katharine G. Abraham, James R. Spletzer, and Michael J. Harper, eds., *Labor in the New Economy*, National Bureau of Economic Research Book Studies in Income and Wealth, vol. 71 (Chicago, University of Chicago Press, 2010), pp. 343–72.)