8. ARE THOSE WHO BRING WORK HOME REALLY WORKING LONGER HOURS?
Implications for BLS Productivity Measures[108]

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Introduction

Advancements in information technology have increased workers' abilities to conduct their jobs in multiple locations. An ongoing debate surrounding U.S. Bureau of Labor Statistics (BLS) productivity data is that official productivity numbers may be overstated because of an increase in unmeasured hours worked outside the traditional workplace. To shed light on this debate, this paper examines two recent data sources for information on U.S. workers who bring work home from their primary workplace – the 2003 – 2006 American Time Use Survey (ATUS) and the 1997, 2001, and 2004 May Current Population Survey Work Schedules and Work at Home Supplements (CPS Supplement). The ATUS provides detailed information on time spent on work, work-related activities, and non-work activities on one diary day, as well as locations for these activities. The CPS Supplements provide information on the number of hours worked at home each week, whether or not workers had a formal arrangement to be paid for work at home, and reasons for working at home.

Previous research on work at home has almost entirely focused on home-based workers or part-time teleworkers. This study examines work that is brought home from the workplace. The study achieves three goals: determines the characteristics of those who bring work home from the workplace and sheds light on why they bring work home; determines whether those who bring work home work longer hours or whether they are simply shifting the location of work; and finally, assesses whether the BLS captures the hours worked at home by those who bring work home from the workplace in its hours and productivity measures and whether unmeasured hours worked at home affect productivity trends.

Prior Research

Previous research both on hours worked in other time-use surveys and on work-at-home arrangements are relevant to this paper; however, only Callister and Dixon (2001) specifically

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examined workers who work both at the workplace and at home on the same day. Using the 1999 New Zealand Time-Use Survey, they showed that 15.5 percent of non-agricultural weekday workers combined work at a traditional workplace with work at home on their diary day. This was much more common than working exclusively from home (8.3 percent). The majority of work at home lasted for less than two hours and a significant proportion was done in the evenings and on weekends.

Recent research on work-at-home arrangements in North America often includes paid work done by home-based workers or occasional telecommuters. Oettinger (2004) used the 1980, 1990, and 2000 U.S. Census to examine the growth in home-based employment. He showed that the wage penalty for working at home has decreased over time and that the increase in home-based work has been greatest for highly-educated workers. Using the May 1997 CPS Work at Home supplement, Schroeder and Warren (2004) analyzed workers who did any work at home, including home-based workers, occasional telecommuters, and those who combine work in a traditional workplace with work at home. They found that compared to traditional office workers, workers who did any work at home are likely to be older, better educated, married, white, and live in an urban area. They also found that managers and professionals are more likely to report some work at home than other occupational groups.

Using the 2001 CPS Supplement, Wight and Bianchi (2004) examined women who did some work at home. They found that being white, college-educated, married, and working in a higher paying occupation increased the probability of doing some (but not all) work at home versus doing no work at home. They found that for women with children there is an increased probability of working all of their hours at home versus none but no difference in the probability of working some of their hours at home versus none.

Using the Canadian Workplace and Employee Survey, Pabilonia (2005) analyzed the decision of employees to do paid work at home during part of their normal working hours (referred to as telecommuters) and the decision of firms to allow these employees to telecommute. In 2001, the 5.9 percent of telecommuters among Canadian workers were more likely to be tech-savvy, experienced white-collar workers than their non-telecommuting counterparts.

Evidence from older household time-use diaries indicated that respondents to labor force surveys similar to the CPS report higher hours worked compared to estimates from time-use diaries (Hamermesh (1990) used Michigan time use diary data for 1975 and 1981; and Robinson and Bostrom (1994) used three separate studies in 1965, 1975, and 1985).[109] Robinson and Bostrom (1994) showed that the difference between these surveys is greater for those who work long hours. Hamermesh (1990) and Robinson and Bostrom (1994) both showed that this difference increased over time. However, Jacobs (1998) found that independent, self-reported measures of working time based on time of departures to and returns from work support the estimates obtained from hours of work questions in labor force surveys. Until recently, no studies have compared hours worked from time diaries to hours reported to the post-redesign (1994) CPS questions, which were changed to enhance respondents' recall concerning their

[109] Note that the sample sizes in these studies are smaller than the ATUS sample.

hours of work in the prior week.[110] Using similar definitions of hours worked, Frazis and Stewart (2004) found that CPS reported hours of work are similar to hours constructed from the ATUS for the 12 CPS reference weeks in 2003.[111] However, Frazis and Stewart (2004) also found that ATUS respondents worked five percent fewer hours per week than reported in the CPS for weeks other than CPS reference weeks. Frazis and Stewart (2004) indicate that this is expected given that these weeks include holidays whereas the reference weeks were chosen to minimize holidays.[112] Robinson, Gershuny, Martin, and Fisher (2007) find a higher incidence of over- reporting of CPS hours worked by those who work longer hours.

Data Sources

Productivity trends for the U.S. are watched closely by businessmen, policymakers, and others interested in business cycles and U.S. competitiveness. The most widely watched BLS productivity statistics are the quarterly labor productivity measures for the nonfarm business sector.[113] Throughout this paper, we focus our study on nonfarm business employees, defined as household survey respondents who are fifteen-years-old and older, work outside of the farm sector, and are classified as employees of private for-profit entities. Although the self employed and unpaid family workers are in the nonfarm business sector, we exclude them because they may have the ability to shift freely between work and non-work activities and may lack a clear definition of the principal workplace; therefore, for this group, the concept of bringing work home is not well defined and beyond the scope of this study. For the ATUS, the analysis is further restricted to nonfarm business employees who worked on their diary day.

The American Time Use Survey

The ATUS, which began collecting data in 2003, is a survey of how people living in the United States spend their time. The ATUS sample consists of one household member aged fifteen or older from a subset of households completing their final month of interviews for the CPS.[114] In 2003, there were 20,720 ATUS interviews. Beginning in December 2003, the

[110] In the 1994 revised CPS, the question on usual hours is asked first, followed by questions about overtime and taking time off for reasons such as illness, slack work, vacation or holiday. Polivka and Rothgeb (1993, p. 16) report that "The mean of reported hours measured with the current [pre-1994] wording was 39.0 compared to 37.9 hours measured with the revised [1994- and later] wording." This is a combined survey effect of the employment and hours questions.

[111] The CPS reference week is the calendar week that contains the 12th day of the month.

[112] Data was compiled across all months due to the limited number of observations.

[113] The BLS also produces quarterly measures of labor productivity for the U.S. business and nonfinancial corporations sectors, and durable, nondurable, and total manufacturing sectors, as well as measures of multifactor productivity for major sectors and labor productivity for select detailed industries.

[114] The CPS is collected monthly for individuals in a sample of about 60,000 households. The CPS provides information on employment, hours worked, and demographics. Households are in the survey for four months, out for eight months, and back in for four months.

sample size was reduced by 35 percent, yielding 13,973 completed diaries in 2004. In 2005 and 2006, approximately 13,000 individual diaries were completed. The ATUS collects a 24-hour diary of activities that a respondent was engaged in starting at 4 A.M on the day prior to their interview. These diaries include information on work time, such as time at work, time spent on work activities at home, and interruptions of 15 minutes or longer that took place during the work day.[115] In addition to the types of activities and the time spent doing these activities, there is information on the demographic characteristics of the respondents, the locations where the activities took place, and the people who were with the respondent at the time of the activity.

In order to analyze hours of work, we aggregated minutes spent on activities coded as work at main job for each ATUS respondent by location from the ATUS activity files, and constructed measures of work time at the workplace and at home. We restrict our analysis to work done for a respondent's main job in order to focus on those who bring work home rather than those who may be doing some part-time work at home in the evenings. This restriction will also allow us to compare results with the CPS supplement, which only collected information about work at home for the main job. We may be underestimating work done at home to the extent that people combine work at their workplace with work at home on their second jobs. As the focus of this study is unmeasured hours of work, we expect that those who are working at home on a second job are in fact being paid for these hours and the hours would be captured in measured hours. Hours of work brought home from the primary job may be 'extra hours' and thus not explicitly paid for and potentially unmeasured.

For respondents whose diary day was a nonholiday weekday, we define those who bring work home as respondents who report any minutes of work for their main job at the workplace and at home on the same day. This weekday group of employees represents primarily those who work at home before or after a typical work day. For respondents whose diary day is on a weekend or holiday, we define those who bring work home as respondents who report any minutes of work at home on their diary day. Unfortunately, we can not identify whether those who worked exclusively at home on a weekend diary day were home-based workers, telecommuters, or traditional 9–5 office workers who bring extra work home to do over the weekend. However, when we describe the relative hours worked below, it will become clear that this group consists primarily of employees who bring work home rather than home-based workers.

The CPS Work Schedules and Work at Home Supplements

The Work Schedules and Work at Home Supplements were collected as part of the May CPS in 1997, 2001 and 2004. Although changes in industry and occupational coding and changes

[115] ATUS interviewers are trained to ask for work breaks of 15 minutes or longer any time a respondent reports that he or she worked. Beginning in January 2004, an automated probe 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 start and stop time and what was done on that break; if no break, the solid work episode is recorded.

in the sequence and wording of the questions on work at home limit the direct comparability of some data collected in 1997, we include data from all three years, noting the limitations as they occur. As previously mentioned, these supplements only collected information on whether respondents do any work at home as part of their main job. Wage and salary respondents who reported work 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 work home.

We focus our analysis on those who reported that they were just taking work home, since their hours at home are those most likely to be unmeasured. We refer to this group as those who bring work home. We note here that this question did not allow for the possibility that an employee had a formal arrangement to be paid for work at home and also took work home.[116] Respondents were asked their reasons for working at home, how frequently they worked at home, and the number of hours per week worked at home. In 1997, respondents were asked for actual hours worked at home while they were asked for usual hours in 2001 and 2004. The 2001 and 2004 respondents were also given a choice of "it varies" as a possible response; therefore, it is not possible to determine a numerical measure of work hours for all respondents.

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 in 2004. We are able to directly match 745 nonfarm business employees who were in the same industry and occupation in both data sets, did not change employers between their last month in the CPS and their ATUS interview, and worked on their diary day.[117]

From the directly matched respondents, there are 93 who reported that they brought work home in the CPS supplement, and 90 that 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 45 individuals who we observed bringing work home on their weekday diary day, only 21 reported that they ever work at home in the CPS supplement. This may be because the nature of their job changed between the CPS Supplement and the ATUS interviews, which could have been anywhere from two to five months apart. Alternatively, the CPS Supplement questions may have been misinterpreted by the respondents, or answers may be subject to proxy reporting bias. From the 2004 directly matched data, we find that 69 percent of those who worked at home on their weekend/holiday diary day did not have a formal arrangement to be paid for work at home in the CPS Supplement. This suggests that most employees who worked at home on the weekend are not home-based or occasional telecommuters.

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

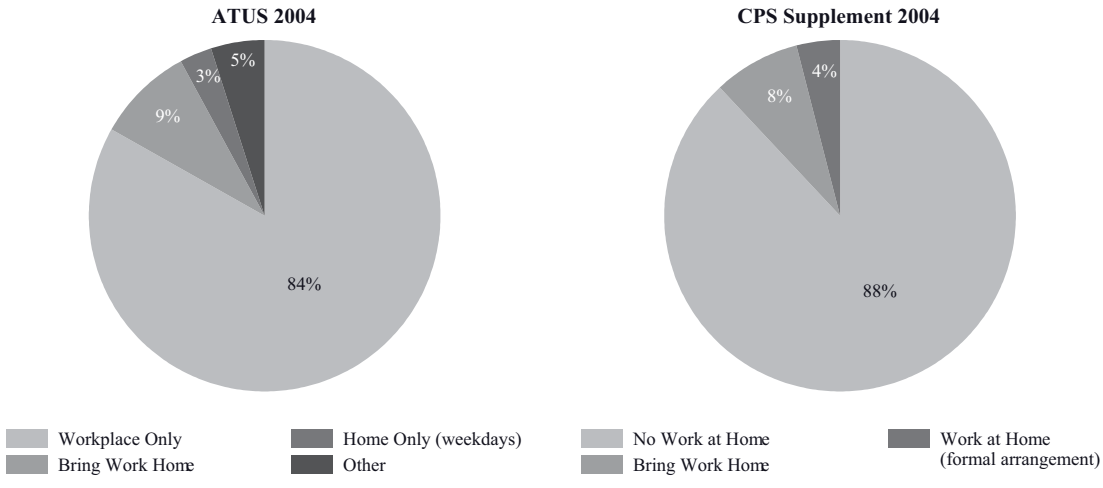
117 Of the 13,973 ATUS interviewed in 2004, 7,558 had a May CPS Supplement interview. Of these, 2,429 were employed in both the ATUS and CPS.

Who is Bringing Work Home?

Nonfarm business employees do, in fact, bring work home from the workplace. From the 2004 ATUS diaries, we find that although 84 percent of nonfarm business employees who worked on their diary day worked exclusively in a workplace, 9 percent brought some of their work home, while 3 percent worked exclusively at home on weekdays (Figure 1).[118] The 2004 CPS Supplement data show that approximately 12 percent of nonfarm business employees do some work at home (Graph 8–1). The CPS supplement specifically asked those who do work at home whether they bring 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. The shares of those who bring work home in the ATUS and in the CPS Supplement are surprisingly similar.[119] Throughout the paper, all ATUS estimates have been weighted using the ATUS respondent final weight.[120] All CPS Supplement estimates have been weighted using the work schedules supplement weight.

ATUS 2004 and CPS Supplement 2004
2004 data for figures

G 8–1



Note : ATUS respondents represent only those who work on their diary day. The other category consists of those who work at locations other than home or the workplace or those who combine other locations with the workplace.
CPS Supplement respondents represent those who answered the question "As part of this job, do you do any of your work at home?"

118 The "other" category in Figure 1 consists of those who work at locations other than home or the workplace, such as a restaurant or someone else's home, or those who combine other locations with the workplace. The ATUS does not ask for secondary activity, except for secondary childcare. Therefore, if a respondent reports commuting to work, there are recorded as commuting and not working.

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

120 In 2006, the ATUS created updated final weights (TU06FWGT) to allow for pooling data across years.

The main reason reported in the CPS supplement for bringing work home was to finish up on work not completed at the usual workplace (Table 8–1).[121] The second reason most frequently sited for working at home was that it was the nature of the job. Five percent of workers specifically reported that they work at home to coordinate their work schedule with personal or family needs. This is supported by ATUS data that shows 17 percent of parents who bring work home in the ATUS worked at home in the presence of at least one of their children over the 2003–2006 period.

T 8 – 1 Proportion of Nonfarm Business Employees Who Bring Work Home
by Reason for Work at Home (CPS Supplement)

	2001	2004
Finish or catch up on work	0.59	0.56
Business is conducted from home	0.04	0.04
Nature of the job	0.24	0.29
Coordinate work schedule w/ personal or family needs	0.05	0.05
Reduce commuting time or expense	0.01	0.01
Local transportation or pollution control program	0.00	0.00
Some other reason	0.06	0.06
Number of observations	2,895	3,143

Note: Proportions are weighted to account for sampling design.

Frequency of Bringing Work Home

From the ATUS data, we find that those who bring work home are roughly divided proportionally between weekday and weekend diaries (about 70 percent have a weekday diary day and 30 percent have weekend diary days). Among those who bring work home on a weekday, we find that in general fewer employees bring work home on Fridays than other weekdays. Table 8–2 presents the proportion of nonfarm business employees who bring work home by what time of day they conduct work at home. On weekdays, we find that the majority of those who bring work home do their work at home in the evenings. Over the 2003–2006 period, 59–66 percent did some work at home between 6 P.M. and 12 A.M. During the conventional working hours of 8 A.M. to 4 P.M., 26–33 percent did some work at home. A smaller percentage (20–23 percent) did some work at home between 6 A.M. and 8 A.M before heading to their primary workplace. This work reportedly done outside traditional working hours suggests that workers are either bringing extra work home or shifting the timing of their work. On weekends, a greater percentage of work at home is done during the daytime hours (49–58 percent) while less is done in the evenings (45–55 percent).

[121] The 1997 CPS Supplement reasons for work at home are not comparable and, therefore, not reported here.

T 8–2 Proportion of Nonfarm Business Employees Who Bring Work Home

by Time of Day Working at Home (ATUS)

	Weekdays				Weekends			
Time of Day	2003	2004	2005	2006	2003	2004	2005	2006
12AM–6AM	0.11	0.10	0.09	0.15	0.08	0.07	0.04	0.03
6AM–8AM	0.20	0.22	0.23	0.23	0.10	0.10	0.10	0.13
8AM–4PM	0.32	0.33	0.29	0.26	0.49	0.52	0.54	0.58
4PM–6PM	0.19	0.22	0.16	0.22	0.25	0.20	0.28	0.28
6PM–12AM	0.60	0.59	0.66	0.64	0.51	0.55	0.45	0.45
Number of observations	246	175	155	163	308	228	201	211

Note: Proportions are weighted to account for sampling design. Numbers are rounded and do not sum to 1 because a worker could be working in more than one time period.

Table 8–3 presents the proportion of nonfarm business employees who bring work home by the specific number of minutes worked at home. We find that the amount of work done at home is economically significant. Only 17–23 percent of those who bring work home reported working at home for less than 15 minutes on their diary day, while 36–45 percent worked more than one hour at home (of these 21–26 percent worked at home for more than two hours).

Among the 8 percent of nonfarm business employees who bring work home according to the CPS Supplement, we find that over 70 percent report working at home at least once a week, about 12–13 percent work from home at least every two weeks, 10 percent at least once a month and 5–6 percent less than once a month (Table 8–4). When asked to report hours worked at home, roughly 31 percent of nonfarm business employees who bring work home did not report how many hours they worked at home, but rather that their hours at home varied in 2004 (23 percent reported working 1–2 hours per week at home, 14 percent reported working 3–4 hours per week at home, 12 percent reported 5–6 hours per week at home, and the remaining respondents reported anywhere from 8–60 hours per week at home).

T 8–3 Proportion of Nonfarm Business Employees Who Bring Work Home

by Minutes Worked at Home (ATUS)

Minutes per day	2003	2004	2005	2006
≤15	0.17	0.20	0.23	0.21
16–30	0.17	0.18	0.18	0.17
31–60	0.24	0.24	0.22	0.18
61–120	0.21	0.18	0.13	0.19
121–180	0.09	0.09	0.11	0.12
181–240	0.04	0.06	0.05	0.05
241+	0.10	0.06	0.07	0.09
Number of observations	554	403	356	374

Note: Proportions are weighted to account for sampling design. Numbers are rounded.

T 8–4 Proportion of Nonfarm Business Employees Who Bring Work Home
by Frequency (CPS Supplement)

	2001	2004
At least once a week	0.71	0.73
At least every two weeks	0.13	0.12
At least once a month	0.10	0.10
Less than once a month	0.06	0.05
Number of observations	2,889	3,129

Note: Proportions are weighted to account for sampling design.

Characteristics of Those Who Bring Work Home

In Table 8–5, we examine the characteristics of nonfarm business employees in the ATUS, comparing those who bring work home from the workplace with those who work exclusively in the workplace.[122] In all years, employees who brought work home from the workplace were more likely to be older, white[123], married, have at least a bachelor's degree, and work in a management or professional occupation compared with employees who worked exclusively in the workplace. They were less likely to be black, Hispanic, work part time, or paid hourly. For example, among nonfarm business employees in 2006, 58 percent of those who brought work home held at least a bachelor's degree, while only 45 percent of those who worked exclusively in the workplace held at least a bachelor's degree. Of those who brought work home, only 23 percent reported being paid hourly, while 67 percent of nonfarm employees who worked exclusively in the workplace were paid hourly. Contrary to popular perceptions, not all work brought home is done by white-collar office workers. For example, among nonfarm business employees who brought work home in 2006, 5 percent worked in construction and maintenance occupations.

In Table 8–6, we use the 2001 and 2004 CPS supplement data to examine the characteristics of nonfarm business employees, comparing those who bring work home with those who do no work at home.[124] In both years, employees who brought work home were more likely to be older, white, married, have at least a bachelor's degree, have a child, and work in a management or professional occupation compared with those employees who do not bring work home. They were less likely to be female, black, Hispanic, or work part time.

[122] Results are presented for combined weekday and weekend diaries. The analysis was also conducted separately for weekday and weekends, and the results are similar.

[123] The "other race" category listed in Table 8–5 includes individuals of mixed-race categories, Asians, American Indians, Alaskan Natives, and Hawaiian/Pacific Islanders.

[124] Although we include 1997 information in our measurement discussion later, the surveys are not comparable to the time period investigated in the ATUS nor are the industry and occupation variables comparable. Therefore, we do not include 1997 estimates in the descriptive analysis.

T 8–5 Means and Proportions of Nonfarm Business Employees in the ATUS, comparing Bring Work Home with Workplace Only

	2003		2004		2005		2006	
	Bring work home	Work-place Only	Bring work home	Work-place Only	Bring work home	Work-place Only	Bring work home	Work-place Only
Female	0.41	0.40	0.33	0.43	0.32	0.44	0.33	0.44
Age	42.00	38.09	41.82	38.39	41.88	38.38	40.99	38.06
	(0.65)	(0.26)	(0.74)	(0.32)	(1.08)	(0.35)	(0.92)	(0.39)
White	0.86	0.84	0.87	0.84	0.87	0.84	0.84	0.83
Black	0.05	0.11	0.07	0.11	0.05	0.11	0.06	0.11
Other race	0.09	0.05	0.06	0.05	0.08	0.05	0.09	0.06
Hispanic	0.05	0.16	0.06	0.16	0.05	0.17	0.05	0.18
Single	0.16	0.35	0.24	0.32	0.26	0.34	0.22	0.35
Married	0.69	0.54	0.66	0.56	0.64	0.53	0.68	0.53
Divorced	0.13	0.11	0.10	0.12	0.12	0.13	0.10	0.12
Part time	0.11	0.18	0.12	0.17	0.10	0.17	0.06	0.18
Paid hourly	0.26	0.67	0.33	0.67	0.25	0.67	0.23	0.67
EDUCATION								
High school dropout	0.04	0.16	0.04	0.15	0.04	0.15	0.03	0.15
High school degree	0.19	0.34	0.21	0.35	0.12	0.36	0.10	0.35
Some college	0.24	0.28	0.27	0.28	0.27	0.28	0.29	0.29
Bachelor's degree	0.34	0.16	0.29	0.15	0.39	0.15	0.36	0.16
Advanced degree	0.19	0.05	0.19	0.06	0.18	0.06	0.22	0.05
YOUNGEST CHILD IN THE HOME								
No children	0.55	0.63	0.54	0.63	0.75	0.74	0.55	0.63
Infant	0.08	0.07	0.08	0.07	0.06	0.09	0.09	0.08
Preschooler	0.14	0.11	0.12	0.11	0.11	0.11	0.12	0.09
Elementary student	0.12	0.09	0.10	0.10	0.11	0.09	0.11	0.10
Adolescent	0.11	0.10	0.14	0.10	0.10	0.10	0.13	0.10
OCCUPATIONS								
Management and professional	0.58	0.26	0.49	0.27	0.53	0.26	0.64	0.25
Service	0.06	0.16	0.05	0.17	0.05	0.15	0.04	0.17
Sales and office	0.27	0.26	0.29	0.25	0.28	0.28	0.23	0.28
Farming, fishing, and forestry	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Construction and maintenance	0.05	0.12	0.08	0.12	0.09	0.12	0.05	0.10
Production, transportation, & material moving	0.04	0.20	0.09	0.18	0.04	0.19	0.04	0.19
INDUSTRY								
Mining	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01
Construction	0.05	0.08	0.05	0.08	0.07	0.09	0.06	0.08
Manufacturing	0.19	0.19	0.19	0.19	0.14	0.20	0.19	0.18
Wholesale and retail trade	0.16	0.20	0.16	0.20	0.17	0.20	0.09	0.21
Transportation and utilities	0.40	0.05	0.04	0.05	0.04	0.06	0.05	0.05

	2003		2004		2005		2006	
	Bring work home	Work-place Only	Bring work home	Work-place Only	Bring work home	Work-place Only	Bring work home	Work-place Only
Financial activities	0.10	0.08	0.10	0.08	0.14	0.08	0.18	0.09
Professional and business services	0.16	0.11	0.16	0.11	0.19	0.10	0.20	0.10
Educational and health services	0.16	0.11	0.16	0.11	0.10	0.12	0.13	0.11
Leisure and hospitality	0.06	0.10	0.06	0.10	0.06	0.09	0.03	0.10
Other services	0.02	0.04	0.02	0.04	0.03	0.03	0.02	0.04
Weekend	0.33	0.11	0.34	0.12	0.33	0.11	0.33	0.12
Number of Observations	554	3,746	403	2,466	356	2,359	374	2,317

Note: Sampling weights are used to account for survey design. Standard errors are in parentheses.

Regression Analysis

We estimated a multinomial logit model in order to determine the demographic and job characteristics of employees associated with bringing work home, compared with working exclusively in the workplace using the ATUS sample and compared with doing no work at home using the CPS Supplement. A third alternative in this model, but not discussed here, includes those who work in other locations on all diary days and exclusively at home on weekday diary days when using the ATUS and includes work in other locations and paid work at home when using the CPS Supplement. Independent variables in the model include educational degree attainment indicators, demographic characteristics (gender, age and age squared, indicators for race, Hispanic ethnicity, indicators for married or divorced, indicators for age of youngest child – infant, preschooler, elementary school student, or adolescent, and indicators for the interaction of these latter child variables with gender), job characteristics (part-time indicator, hourly indicator for ATUS sample[125], five occupation indicators, and ten industry indicators), and geographic characteristics (three region indicators), as well as a holiday diary indicator, day of the week indicator, and year indicators for the ATUS sample.

We estimated this model first using the pooled 2003–2006 ATUS data. We also examined salaried employees separately, because they are more likely to bring work home and more likely to have unmeasured hours worked.[126] Table 8–7 reports the marginal effects and standard errors from these estimations for all employees and then for salaried employees only. Next, we estimated the model using CPS supplement data for 2001 and 2004 sequentially. Table 8–8 presents the marginal effects and standard errors from these estimations.

Holding all else equal, overall results from both data sets indicate that highly-educated employees are much more likely to bring work home than less-educated employees, black

[125] We do not include an hourly indicator in the CPS Supplement, because pay status is only collected in the outgoing rotation.

[126] In the matched data, among nonfarm business employees that were observed to bring work home in the ATUS and reported that they took work home in the CPS Supplement, 86 percent were salaried employees.

T8–6 Means and Proportions of Nonfarm Business Employees in CPS Supplement, comparing Bring Work Home with No Work at Home

	2001		2004	
	Bring home work	No work at home	Bring home work	No work at home
Female	0.39	0.45	0.38	0.45
Age	40.96	37.48	42.48	38.04
	(0.22)	(0.09)	(0.26)	(0.09)
White	0.90	0.83	0.88	0.81
Black	0.06	0.12	0.05	0.12
Other race	0.05	0.05	0.07	0.07
Hispanic1	0.04	0.14	0.05	0.16
Single	0.18	0.33	0.19	0.35
Married	0.70	0.54	0.70	0.52
Divorced	0.12	0.13	0.11	0.13
Part-time2	0.06	0.18	0.07	0.19
EDUCATION				
High school dropout	0.01	0.17	0.02	0.16
High school degree	0.15	0.36	0.12	0.35
Some college	0.23	0.29	0.23	0.30
Bachelor's degree	0.41	0.15	0.39	0.15
Advanced degree	0.20	0.04	0.24	0.04
YOUNGEST CHILD IN THE HOME				
No children	0.55	0.68	0.6	0.68
Infant	0.08	0.06	0.08	0.06
Preschooler	0.13	0.09	0.11	0.09
Elementary student	0.11	0.08	0.09	0.08
Adolescent	0.13	0.09	0.12	0.09
OCCUPATIONS				
Management and professional	0.56	0.18	0.38	0.16
Service	0.11	0.06	0.03	0.19
Sales and office	0.13	0.05	0.25	0.29
Farming, fishing, and forestry	0.05	0.01	0.00	0.00
Construction and maintenance	0.02	0.07	0.03	0.11
Production, transportation, & material moving	0.01	0.01	0.02	0.19
INDUSTRY				
Mining	0.01	0.01	0.00	0.01
Construction	0.01	0.01	0.05	0.08
Manufacturing	0.04	0.07	0.15	0.17
Wholesale and retail trade	0.11	0.13	0.16	0.20
Transportation and utilities	0.07	0.08	0.03	0.05
Information	0.03	0.05	0.05	0.03
Financial activities	0.03	0.02	0.16	0.08

	2001		2004	
	Bring home work	No work at home	Bring home work	No work at home
Professional and business services	0.01	0.01	0.20	0.10
Educational and health services	0.08	0.05	0.15	0.12
Leisure and hospitality	0.10	0.23	0.03	0.12
Other services	0.16	0.07	0.01	0.04
Number of Observations	2,908	30,124	3,160	34,389

Note: Sampling weights are used to account for survey design. Standard errors are in parentheses.

1. Hispanic proportions for 2001 are based upon 32,716 non-missing observations.

2. Part-time proportions for 2001 are based upon 30,688 non-missing observations on hours worked per week.

employees are less likely to bring work home than white employees, and Hispanic employees are less likely to bring work home than non-Hispanic employees. We also find some evidence that divorced workers are more likely to bring work home than single workers. We find that females are less likely to bring work home than males, except in the 2001 CPS Supplement; although, the magnitude of these gender effects is small compared with the magnitude of the education effects. It is possible that these gender differences may actually capture occupation and industry differences in jobs held by gender that are not specified in our model. Several *more detailed* occupation groups, such as management and computer and mathematical science, have a high percentage of employees who bring work home, are male-dominated occupations, and constitute a large percentage of total employees in our sample. In the ATUS, those paid hourly are eight percent less likely to bring work home than salaried employees.

From the CPS supplement, we find that older employees are more likely to bring work home than younger employees. We also find some small differences in the probability of bringing work home between those who have children and those who do not. In the CPS Supplement in both 2001 and 2004, we find that men with a child aged 0–5 are more likely to bring work home than men without children; in 2001, fathers whose youngest child was elementary school-aged were also more likely to bring work home than males without children. In the ATUS only, mothers of preschooler and elementary school-aged children are more likely to bring work home than women without children. This suggests that some parents may bring work home to better balance work and family responsibilities when the children are young. In the CPS Supplement, we also find that mothers of infants are less likely to bring work home than fathers of infants. It is possible that mothers, as opposed to fathers, may choose not to bring work home because they traditionally spend more time on childcare and household production than their male spouses.

Do Those Who Bring Work Home Work Longer Hours?

We are interested in determining whether those who bring work home work longer hours, or whether they are simply shifting the location of work. Using the 2003–2006 ATUS data, we find different results for weekday diaries compared with weekend/holiday diaries. For respondents who bring work home on a weekday, we find that their daily hours worked are

T 8–7: Marginal Effects of Select Covariates on the Probability of Bringing Work Home from Multinomial Logit Model Using the ATUS

(Comparison group = Work Exclusively in a Workplace)

	All employees	Salaried Employees
Female	-0.035*** (0.010)	-0.061*** (0.014)
Age	0.001 (0.002)	0 (0.003)
Age squared/1000	0.002 (0.024)	0.006 (0.033)
Black	-0.030*** (0.011)	-0.043*** (0.012)
Other race	0.014 (0.014)	0.042* (0.022)
Hispanic	-0.047*** (0.009)	-0.050*** (0.013)
Married	0.008 (0.010)	0.01 (0.015)
Divorced	0.018 (0.014)	0.037 (0.022)
High school degree	0.011 (0.020)	0.092** (0.041)
Some college	0.065** (0.025)	0.145** (0.060)
Bachelor's degree	0.105*** (0.032)	0.204*** (0.060)
Advanced degree	0.131*** (0.038)	0.246*** (0.072)
Part time	-0.008 (0.011)	0.023 (0.020)
Paid hourly	-0.076*** (0.019)	–
Youngest child aged 0–2	0.005 (0.017)	0.001 (0.019)
Youngest child aged 0–2 * female	0.008 (0.026)	0.053 (0.042)
Youngest child aged 3–5	0.01 (0.013)	0.011 (0.017)
Youngest child age 3–5 * female	0.021 (0.021)	0.04 (0.031)
Youngest child aged 6–10	0.011 (0.014)	0.009 (0.017)
Youngest child aged 6–10 * female	0.023 (0.022)	0.065* (0.037)
Youngest child aged 11–17	-0.005 (0.012)	0 (0.016)
Youngest child aged 11–17 * female	0.052 (0.027)	0.07* (0.037)
F-statistic	14.35	46.92
Number of observations	13,655	5,736

Notes: A third alternative in the model, not shown here, includes work in other locations on all diary days and work exclusively at home on weekdays. All regressions include region, occupation, industry, weekend diary day, and year indicators as well as a constant. Marginal effects are evaluated at the mean. Sampling weights are used to account for survey design. Standard errors are in parentheses. Significance levels: * =p<.10;**=p<.05;***=p<.01.

greater than the hours worked by those who work exclusively in a workplace; daily hours are 11 percent greater in 2003, 5 percent greater in 2004, 13 percent greater in 2005, and 15 percent greater in 2006. However, we also find that daily hours worked **at the workplace** by those who bring work home on a weekday are less than the daily hours worked **at the workplace** for those who work exclusively at a workplace on their weekday diary day – 10 percent less in 2003, 12 percent less in 2004, 7 percent less in 2005, and 3 percent less in 2006 (Table 8–9). Thus, those who bring work home on a weekday are shifting some hours of work from their workplace to their home, but they work more hours in total on their diary day.

T 8 – 8: Marginal Effects of Select Covariates on the Probability of Bringing Work Home from Multinomial Logit Model Using the CPS Supplement

by year {Comparison Group = No Work at Home)

	2001	2004
Female	0.002 (0.003)	-0.012*** (0.003)
Age	0.006*** (0.001)	0.004*** (0.001)
Age squared/1000	-0.061*** (0.011)	-0.034*** (0.010)
Black	-0.026***(0.004)	-0.021***(0.003)
Other race	-0.027*** (0.004)	-0.014*** (0.004)
Hispanic	-0.026*** (0.004)	-0.016*** (0.004)
Married	0.011*** (0.004)	0.004 (0.003)
Divorced	0.009* (0.006)	0 (0.004)
High school degree	0.072*** (0.015)	0.016* (0.010)
Some college	0.130*** (0.019)	0.042*** (0.012)
Bachelor's degree	0.317*** (0.033)	0.099*** (0.019)
Advanced degree	0.485*** (0.042)	0.181*** (0.032)
Part time	-0.027*** (0.004)	-0.023*** (0.003)
Youngest child 0–2	0.015** (0.007)	0.021*** (0.007)
Youngest child 0–2* female	-0.021*** (0.007)	-0.016*** (0.006)
Youngest child aged 3–5	0.021*** (0.007)	0.016*** (0.006)
Youngest child age 3–5 * female	-0.01 (0.007)	-0.004 (0.007)
Youngest child aged 6–10	0.012* (0.007)	0.006 (0.005)
Youngest child aged 6–10 * female	-0.016** (0.007)	-0.01 (0.007)
Youngest child aged 11–17	0.008 (0.006)	0.002 (0.005)
Youngest child aged 11–17 * female	-0.005 (0.007)	0 (0.007)
F-statistic	37.13	712.84
Number of observations	31,542	39,549

Notes: A third alternative, not shown here, includes work in other locations and paid work at home. All regressions include region, occupation, industry, and year indicators as well as a constant. Marginal effects are evaluated at the mean. Sampling weights are used to account for survey design. Standard errors are in parentheses. Significance levels:
* =p<.10;**=p<.05;***=p<.01.

Because we only observe a single diary day, we defined those who do any work at home on a weekend/holiday diary day as those who bring work home. For those who work at home on a weekend or holiday, we find that their daily hours worked are significantly less than the hours worked by those who work exclusively in the workplace. The daily hours for those who bring work home on a weekend/holiday are 2–3 hours per day compared with a 7-hour work day by those who work exclusively at the workplace. Although some of the bring-work-home weekend respondents may be home-based workers, their hours at home are quite similar to the 1–2 hours worked at home by weekday respondents who bring work home from the workplace.

T 8–9: Daily Hours Worked for Nonfarm Business Employees (ATUS)

		Weekday Diaries		Weekend/holiday Diaries	
		Workplace Only	Bring Work Home	Workplace Only	Bring Work Home
	ATUS: daily hours	8.2	9.1	7.1	2.1
2003	ATUS: daily workplace hours	8.2	7.4	7.1	0.6
	ATUS: daily hours at home	–	1.6	–	1.5
	ATUS: daily hours	8.2	8.6	7.5	2.7
2004	ATUS: daily workplace hours	8.2	7.2	7.5	0.9
	ATUS: daily hours at home	–	1.4	–	1.8
	ATUS: daily hours	8.1	9.2	6.9	2.2
2005	ATUS: daily workplace hours	8.1	7.5	6.9	0.6
	ATUS: daily hours at home	–	1.4	–	1.5
	ATUS: daily hours	8.2	9.4	7.0	2.5
2006	ATUS: daily workplace hours	8.2	7.9	7.0	0.4
	ATUS: daily hours at home	–	1.4	–	2.0

Note: F-test results for differences in means are all significant at the 5 percent level.

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 off-setting hours at home on their diary day with fewer hours on another day during the week, we compare each group's CPS actual average weekly hours (Table 8–10).[127] Using either weekday or weekend/holiday diary data, we find that those who bring work home from their workplace reported significantly higher average weekly hours than those who work exclusively in a workplace. From the weekday diaries, average weekly hours for those who bring work home are 8–13 percent greater than those who work exclusively in the workplace. From the weekend/holiday diaries, the average weekly hours of those who bring work home are 15–23 percent greater than those who work exclusively in the workplace on their diary day. This provides additional evidence that those who work at home on weekends are bringing work home from the workplace. Recall that daily hours worked for these respondents were approximately 2 hours per weekend day, while their average weekly hours are over 42 hours per week. Assuming a five day work week, this suggests that the average daily hours for those who are working at home on a weekend should be about 8 hours per day. Thus, their daily and weekly hours closely resemble those of respondents who bring work home on weekdays. This suggests that combining weekday and weekend reports to calculate the share of workers who bring work home and their average hours worked is appropriate.

[127] To analyze hours worked, we further restrict the sample to those who have the same employer, occupation and usual duties as they reported to the CPS two to five months prior.

T 8–10: Average Weekly Hours Worked for Nonfarm Business Employees (ATUS)

		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	41.5	36.5	41.9	38.1	41.6
	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	42.1
	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	35.4	43.5	38.1	42.8
	Number of observations	1,469	134	432	185	1,901	319

Note: F-test results for differences in means are all significant at the 5 percent level.

Using the CPS supplement data, we also find that those who bring work home have statistically significantly higher average weekly hours (20–21 percent higher) than those who do no work from home (Table 8–11). We also report separate estimates for those who work at home at least once a week because their hours worked at home should always be included in CPS average weekly hours reports whereas only some of the hours from workers who do infrequent work at home will be captured in CPS average weekly hours. The subgroup of employees who bring work home at least once a week have slightly higher average weekly hours in 2001 and 2004 than all employees who bring work home. We do not report results for the 1997 CPS Supplement since respondents were not asked for frequency of work at home but only whether they worked at home last week, which would capture those working at home at least once a week and some of those who work less than once a week at home.

T 8–11: Average Weekly Hours Worked for Nonfarm Business Employees (CPS Supplement)

		No Work at Home	Bring Work Home	Bring Work Home at Least Once a week
1997	Average weekly hours	36.9	44.6	–
	Number of observations	32,305	2,733	–
2001	Average weekly hours	36.8	44.5	45.1
	Number of observations	30,124	2,908	2,040
2004	Average weekly hours	36.5	43.8	44.3
	Number of observations	34,892	3,160	2,269

Note: F-test results for differences in means are all significant at the 5 percent level.

The general results from the two data sources are the same; those who bring work home do in fact work longer hours. In addition, both data sources show very little change in average weekly hours over time. We will show these results also hold for nonproduction/supervisory employees and production/nonsupervisory employees separately.[128]

Use of Hours Data in U.S. Productivity Measurement

Labor productivity measures the difference between output and hours growth, and reflects many sources, including increases in the quantities of nonlabor inputs (i.e., capital services, fuels, other intermediate materials, and purchased services), changes in technology, economies of scale, changes in management techniques, and changes in the skills of the labor force. The BLS calculates labor productivity for the nonfarm business sector by combining real output from the National Income and Product Accounts (NIPA) produced by the Bureau of Economic Analysis (BEA) with quarterly measures of hours worked for all persons prepared by the BLS Office of Productivity and Technology (OPT). The primary source of data used to construct hours worked measures for productivity purposes is the monthly payroll survey of establishments conducted by the BLS Current Employment Statistics program (CES).[129] The CES collects data monthly on employment for all employees and average weekly hours paid for production workers in goods industries and for nonsupervisory workers in service industries. The data represent employment and average hours paid for the pay period including the 12th day of the month.[130] CES average weekly hours paid are adjusted to hours at work using an hours-worked to hours-paid ratio estimated from the National Compensation Survey (NCS). This adjustment ensures that changes in vacation, holiday, and sick pay, which are viewed as changes in labor costs, do not affect hours growth.[131] Production/nonsupervisory hours worked are calculated as:

$$AWH_P^M \quad * \quad N_P * 52 \tag{1}$$

[128] In goods-producing industries, workers are divided into production and nonproduction workers. Nonproduction workers include professional specialty and technical workers; executive, administrative, and managerial workers; sales workers, and administrative support workers, including clerical. In service-producing industries, workers are divided into supervisory and nonsupervisory workers. Supervisory workers include all executives and administrative and managerial workers

[129] The CES samples 400,000 nonfarm establishments, more than six times the 60,000 households sampled in the CPS. In addition, the CES 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 CPS underlying population base are made annually using intercensal estimates and every ten years using the decennial census. Also, establishment hours data 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. Measures for industries based on household reports tend to produce industry estimates with considerable variance, even in a survey as large as the CPS. Thus, the BLS's official measures by industry come from establishment surveys wherever possible.

[130] The CES program began collecting data on earnings and hours for all employees in September 2005. An experimental series including these new data is available at www.bls.gov/ces/cesaepp.htm.

[131] Prior to 2000, the annual Hours at Work Survey was used.

where AWH_P^M represents measured average weekly hours for production/nonsupervisory workers obtained from CES hours, that are adjusted by the hours-worked to hours-paid ratio and adjusted to remove the hours of employees of nonprofit institutions, and N_P is the employment of nonfarm business production/nonsupervisory employees.

Because official hours estimates are not available from the CES, the BLS estimates average weekly hours of nonproduction/supervisory employees.[132] Data from the BLS' household survey, the CPS, are used to construct a ratio of the average weekly hours worked by nonproduction/supervisory employees relative to the average weekly hours worked by production/nonsupervisory employees. Together with CES hours and employment data, this ratio (referred to subsequently as the CPS ratio) is used to calculate the total hours worked by nonproduction/supervisory employees. Nonproduction/supervisory hours worked are calculated as:

$$AWH_{NP}^{M} = AWH_{P}^{M} * \frac{AWH_{NP}^{CPS}}{AWH_{P}^{CPS}} * N_{NP} * 52 \quad (2)$$

where AWH_{NP}^{CPS} and AWH_{P}^{CPS} represent CPS measures of average weekly hours for nonproduction/supervisory and production/nonsupervisory employees respectively, and N_{NP} is the employment of nonfarm business nonproduction/supervisory employees. Average weekly hours for production/nonsupervisory employees and nonproduction/supervisory employees are constructed by OPT at the NAICS major industry group level and then aggregated. Total hours for all persons in the nonfarm business sector are the sum of production/nonsupervisory employee hours, nonproduction/supervisory employee hours, and hours worked by the unincorporated self-employed, unpaid family workers and employees of government enterprises. Average weekly hours for the unincorporated self-employed, unpaid family workers and employees of government enterprises are taken directly from the CPS; remaining data are obtained from various sources.[133]

Some critics of official productivity measures have suggested that IT innovations have allowed workers the flexibility to work outside the traditional workplace and that these hours are not properly captured in official BLS productivity measures.[134] This criticism is typically directed toward the quarterly labor productivity in the nonfarm business sector. It is important to note that an underestimation of hours worked affects measures of productivity growth only if unmeasured hours grow differently from measured hours and affect a significant portion of the working population. Eldridge (2004) found that a hypothetical hours series constructed by combining CPS average weekly hours and CES employment data produced slightly higher levels of hours, but hours showed a comparable trend from 2000–2003.

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132 In August 2004, BLS introduced this new method of constructing estimates of hours for nonproduction and supervisory workers. See Eldridge, Manser, and Otto (2004).

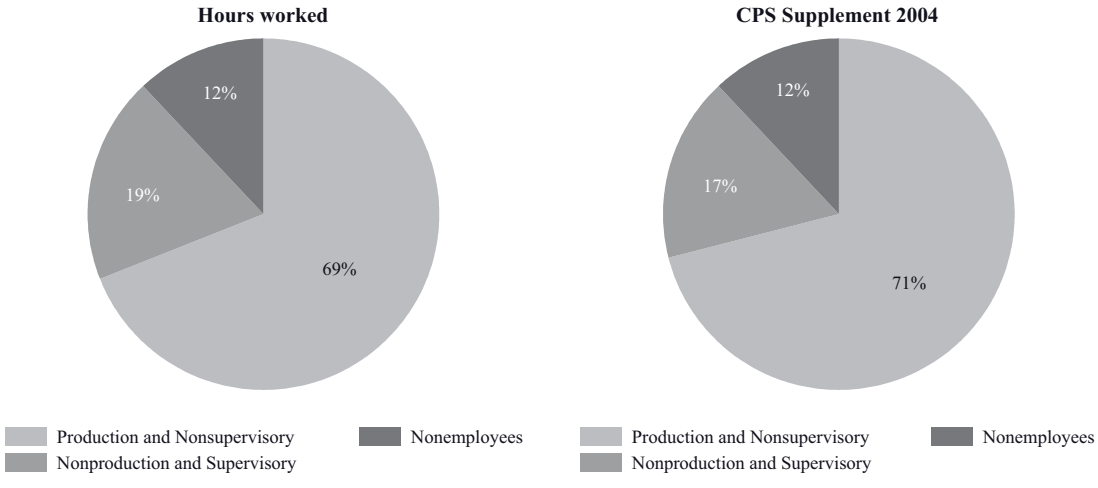
133 Employment counts for employees in agricultural services, forestry and fishing come from the BLS's 202 program, based on administrative records from the unemployment insurance system. The number of employees of government enterprises comes from the BEA.

134 Steven Roach (1998) argued that many white collar workers are working longer workdays than the official U.S. data show, as a result of the new portable technologies of the information age – laptops, cellular telephones, home fax machines, and beepers.

Are Hours of Work Brought Home Measured?

Hours worked are constructed separately for production/nonsupervisory employees, nonproduction/supervisory employees, and nonemployees.[135] Graph 8–2 shows each group's share of nonfarm business sector hours worked and employment. Production/nonsupervisory employees account for the majority of all nonfarm business sector hours (69 percent), while nonemployees account for the smallest share of hours (12 percent). As previously mentioned, an analysis of bringing work home among nonemployees is beyond the scope of this paper.

Percent of Nonfarm Business Sector Hours and Employment, by Type of Worker: 2004 **G 8–2**



Source: U.S. Labor Statistics

Production and Nonsupervisory Employees

Using the 2003–2006 ATUS data, we find that approximately 85–87 percent of production/ nonsupervisory employees who work on their diary day worked exclusively in the workplace, while 6 percent brought work home from the workplace in 2003, 8 percent brought work home in 2004, 7 percent brought work home in 2005, and 6 percent brought work home in 2006 (Table 8–12). We find that those who bring work home from their workplace report higher average weekly hours than those who work exclusively in a workplace; 4 percent higher in 2003, 9 percent higher in 2004, 13 percent higher in 2005, and 7 percent higher in 2006.

As mentioned before, the BLS constructs annual hours worked using hours paid data from the CES for production/nonsupervisory employees. If hours for production/ nonsupervisory employees are understated it is only to the extent that hours worked at home are not captured in reported hours paid.

[135] We use the term nonemployees in this study to represent the unincorporated self-employed, unpaid family workers and government enterprise workers.

T 8–12: Hours Worked for Production and Nonsupervisory Employees (ATUS)

		Workplace Only	Bring Work Home	Bring Work Home-Salaried
	Share of production/ nonsupervisory employees	86.5%	6.2%	4.1%
2003	Share of daily hours worked at home*	–	20.2%	19.1%
	Average weekly hours	37.2 (0.3)	38.6 (1.1)	39.8 (1.4)
	Number of observations	2,413	264	174
	Share of production/ nonsupervisory employees	85.5%	7.8%	3.9%
2004	Share of daily hours worked at home*	–	15.9%	16.5%
	Average weekly hours	36.7 (0.4)	39.9 (1.4)	42.7 (1.8)
	Number of observations	1,565	220	136
	Share of production/ nonsupervisory employees	85.7%	7.4%	4.4%
2005	Share of daily hours worked at home*	–	16.9%	15.3%
	Average weekly hours	37.2 (0.5)	42.2 (1.1)	42.9 (1.5)
	Number of observations	1,497	182	128
	Share of production/ nonsupervisory employees	85.4%	6.4%	3.7%
2006	Share of daily hours worked at home*	–	15.0%	13.8%
	Average weekly hours	37.5 (0.4)	40.0 (1.2)	42.4 (1.2)
	Number of observations	1,544	182	134

Note: Standard errors are in parentheses. F-test results for differences in means are all significant at the 5 percent level.

* weekday value used

** results for weekdays and weekends available upon request from the authors

The ATUS does not obtain information on whether work brought home is paid or unpaid. Therefore, to assess whether work that is brought home from the workplace is measured, we must make several assumptions. First, we assume that hours worked at the workplace are captured in reported hours paid and thus measured. Second, we assume that hourly workers are less likely to do unpaid work at home than salaried workers. The outgoing rotation cohort of the CPS Supplement indicates that over 81 percent of production/nonsupervisory workers who bring work home, without a formal arrangement to be paid, are not paid hourly. We find that approximately 4 percent of production/nonsupervisory workers were paid a salary and brought work home. Among these employees, we find that 14–19 percent of their weekday **daily** hours were worked at home. Among those who bring work home and are paid a salary, we find that average **weekly** hours were 7 percent greater than those who worked exclusively in a workplace in 2003, 16 percent greater in 2004, 15 percent greater in 2005, and 13 percent greater in 2006.

Recall that the CPS supplement specifically asked respondents whether they were paid to work at home or whether they just took work home. The CPS Supplement data indicate that approximately 91–92 percent of production/nonsupervisory employees report no work at home (Table 8–13), while 3 percent of production/nonsupervisory employees report some paid work at home and roughly 5–6 percent indicate they were just bringing work home. About 4 percent indicate that they bring work home at least once a week. Thus, in any given CPS week, somewhere between 4–6 percent bring work home. Comparing average weekly hours for those who bring work home with those who do no work at home, we find that those who bring work home have statistically significant higher average weekly hours (17–18 percent higher) than those who do no work from home. These findings suggest that there may exist unmeasured hours for production/nonsupervisory employees who work outside the workplace.

T 8–13: Hours Worked for Production and Nonsupervisory Employees
(CPS Supplement)

		NO WORK AT HOME	WORK AT HOME		
			Paid	Bring work home	Bring work home at least once a week
1997	Share of production/ nonsupervisory employees	92.4%	2.5%	5.0%	–
	Average weekly hours	36.1 (0.09)	38.1 (0.71)	42.6 (0.45)	– –
	Number of observations	27,060	754	1,453	–
2001	Share of production/ nonsupervisory employees	91.3%	2.9%	5.7%	4.0%
	Average weekly hours	36 (0.09)	37.8 (0.64)	42.5 (0.40)	42.9 (0.49)
	Number of observations	25,057	802	1,570	1,118
2004	Share of production/ nonsupervisory employees	91.7%	2.8%	5.3%	3.9%
	Average weekly hours	35.8 (0.10)	37.5 (0.67)	41.9 (0.44)	42 (0.55)
	Number of observations	29,540	941	1,766	1,296

Note: Standard errors are in parentheses F-test results for differences in means are all significant at the 5 percent level.

Nonproduction and Supervisory Employees

Among nonproduction/supervisory employees who worked on their diary day, roughly 72–77 percent worked exclusively in a workplace on their diary day, while 13–19 percent brought work home from the workplace on their diary day (Table 8–14).[136] As with the production/ nonsupervisory results, we find that those who bring work home from a workplace report

[136] Numbers do not sum to 100 since workers could work in other locations or exclusively at home. See footnote 9.

higher average weekly hours than those who work exclusively in a workplace – 9 percent higher in 2003, 11 percent higher in 2004, 9 percent higher in 2005, and 13 percent higher in 2006. The ATUS data indicate that 10–16 percent of salaried nonproduction/supervisory employees brought work home. We find that 12–16 percent of **daily** hours among salaried nonproduction/supervisory employees were worked at home. For these workers, we also find that average **weekly** hours were 13 percent greater than those who worked exclusively in a workplace in 2003, 12 percent greater in 2004, 12 percent greater in 2005, and 16 percent greater in 2006.

T 8–14: Hours Worked for Nonproduction and Supervisory Employees (ATUS)

		Workplace Only	Bring Work Home	Bring Work Home-Salaried
	Share of nonproduction/ supervisors	73.6%	16.4%	13.5%
2003	Share of daily hours worked at home*	–	13.5%	14.1%
	Average weekly hours	41.9 (0.5)	45.8 (1.0)	47.2 (1.1)
	Number of observations	601	186	162
	Share of nonproduction/ supervisors	76.8%	12.6%	10.4%
2004	Share of daily hours worked at home*	–	15.4%	16.2%
	Average weekly hours	42.0 (0.6)	46.8 (1.1)	47.1 (1.2)
	Number of observations	473	125	111
	Share of nonproduction/ supervisors	72.0%	15.3%	12.4%
2005	Share of daily hours worked at home*	–	13.6%	11.5%
	Average weekly hours	42.2 (0.6)	45.8 (1.2)	47.2 (1.2)
	Number of observations	419	118	102
	Share of nonproduction/ supervisors	72.2%	19.3%	16.2%
2006	Share of daily hours worked at home*	–	13.8%	14.9%
	Average weekly hours	40.9 (0.8)	46.1 (1.4)	47.3 (1.4)
	Number of observations	357	131	118

* weekday value used

** results for weekdays and weekends available upon request from the authors

Note: Standard errors are in parentheses F-test results for differences in means are all significant at the 5 percent level.

Using the CPS supplement, we find that approximately 73–74 percent of nonproduction/supervisory employees reported no work done at home (Table 8–15). About 7 percent of nonproduction/supervisory employees reported doing some paid work at home and 19–20 percent reported that they bring work home. Comparing average weekly hours for those who bring work home with those who do no work at home, we find that those who bring work home have significantly higher average weekly hours than those who do no work from home – 15 percent greater in 1997 and 2001 and 13 percent greater in 2004. Although these findings suggest that there are hours that may not be reported as hours paid for nonproduction/supervisory employees who bring work home, it does not lead to the implication that hours are not measured since BLS hours for nonproduction/supervisory employees are not constructed using a series of hours paid for nonproduction/supervisory employees, but rather incorporate self-reported CPS hours.[137]

T 8–15: Hours Worked for Nonproduction and Supervisory Employees
(CPS Supplement)

		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%	18.8%	–
	Average weekly hours	40.6 (0.18)	40.2 (0.91)	46.8 (0.40)	– –
	Number of observations	5,245	452	1,280	–
2001	Share of nonproduction/ supervisory employees	72.8%	7.1%	19.7%	13.7%
	Average weekly hours	40.6 (0.18)	39.9 (0.73)	46.6 (0.40)	47.5 (0.50)
	Number of observations	5,067	505	1,338	922
2004	Share of nonproduction/ supervisory employees	72.9%	7.2%	19.6%	13.9%
	Average weekly hours	40.8 (0.19)	39.7 (0.84)	46.1 (0.39)	47 (0.48)
	Number of observations	5,352	556	1,394	973

Note: Standard errors are in parentheses F-test results for differences in means are all significant at the 5 percent level.

Estimating the Percent of Unmeasured Hours

A. Assuming Accurate Response to the CPS

If we think of the measured average weekly hours series as capturing a weighted average of the average weekly hours of those who do not bring work home and the average weekly hours worked in a **workplace** of those who bring work home, then the measured series can be written as:

[137] See equation (2).

$$AWH_P^M = \left(w_P^{\sim bwh} AWH_P^{\sim bwh} + w_P^{bwh} AWH_P^{bwh} \gamma_P^{workplace} \right) \quad (3)$$

where $w_P^{\sim bwh}$ and $AWH_P^{\sim bwh}$ represent the share of workers who do not bring work home and their average weekly hours respectively, and w_P^{bwh} and AWH_P^{bwh} represent the share of workers who bring work home and their average weekly hours respectively. By construction, $w_P^{\sim bwh}$ and w_P^{bwh} sum to one. Also, $\gamma_P^{workplace}$ represents the percent of hours worked at a workplace by those who bring work home.

Unmeasured hours worked per week for production/nonsupervisory employees are the hours worked at home by those who bring work home, or:

$$w^{bwh} \; AWH^{bwh} \; * \; \gamma_P^{home} \quad (4)$$

where γ_P^{home} represents the percent of hours worked at home by those who bring work home, or 1- $\gamma_P^{workplace}$. Dividing equation (4) by equation (3) and rearranging terms gives the unmeasured hours worked at home as a percent of measured hours for production/nonsupervisory employees:

$$\theta_P = \frac{\gamma_P^{home}}{\frac{w_P^{\sim bwh} AWH_P^{\sim bwh}}{w_P^{bwh} AWH_P^{bwh}} + \gamma_P^{workplace}} \quad (5)$$

If we assume that average weekly hours are accurately reported to the CPS or that CPS reporting errors are similar among those who bring work home and those who do not, we can estimate the percent of unmeasured hours for production/nonsupervisory employees using equation (5). Table 8–16 presents the estimates of the percentage of unmeasured hours for production/ nonsupervisory employees in each year, as well as the estimates for the components of equation (5).

The measured average weekly hours for nonproduction/supervisory employees are calculated by OPT as:

$$AWH_P^M \; * \; \left[\frac{AWH_{NP}^{CPS}}{AWH_P^{CPS}} \right] \quad (6)$$

Assuming accurate reporting to the CPS by those who bring work home, the percent of unmeasured hours for nonproduction/supervisory employees will be the same as that of production/supervisory employees.[138] According to ATUS data, approximately 0.6–0.8 percent of average weekly hours of nonfarm business employees are unmeasured due to work brought home (Table 8–16). According to the CPS supplement, the percent of unmeasured hours is a bit larger (0.9–1.1 percent); although when we focus on those who bring work home at least once a week, the percent of unmeasured hours is 0.8 percent.[139]

[138] CPS average weekly hours should include all hours worked regardless of location for both production/ nonsupervisory employees and nonproduction/supervisory employees. Because this is a ratio, any survey effects will cancel out.

[139] However, the quality of these additional hours at home may not be of the same quality as those worked in the workplace, especially if workers are doing secondary childcare while working at home.

T 8–16: Percent of Unmeasured Hours for Employees in the Nonfarm Business Sector
(No Reporting Bias)

		Production/nonsupervisory Employees					Percent of unmeasured hours
		Those who do not bring work home		Those who do bring work home			
		Share of production/ nonsupervisory employees	AWH_P	Percent of hours at home	Share of production/ nonsupervisory employees	AWH_P	
ATUS	2003	95.9%	37.2	19.1%	4.1%	39.8	0.84%
	2004	96.1%	36.7	16.5%	3.9%	42.7	0.76%
	2005	95.7%	37.2	15.3%	4.4%	42.9	0.77%
	2006	96.3%	37.5	13.8%	3.7%	42.4	0.58%
CPS Supplement	1997	95.0%	36.1	18.5%	5.0%	42.6	1.09%
	2001	94.3%	36.0	13.3%	5.7%	42.5	0.89%
	2004	94.7%	35.8	14.6%	5.3%	41.9	0.91%
CPS Supplement (at least once a week)	2001	96.0%	36.0	15.7%	4.0%	42.9	0.75%
	2004	96.1%	35.8	17.1%	3.9%	42.0	0.78%

B. Assuming Reporting Bias by Those Who Bring Work Home

CPS respondents who bring work home may differ from those who do not bring work home in their ability to accurately report their hours worked at home. We have shown that those who bring work home work longer hours. Much of the previous research finds that those who work longer hours tend to over report hours worked compared to those who work `normal' hours, while the popular press tends to suggest that work brought home from the office is going unreported. To address this latter concern, we estimate an upper bound on the percent of unmeasured hours worked by assuming that those who bring work home are not reporting their hours worked at home to the CPS.

Because survey respondents should be better able to accurately recall events of the previous day than the previous week, we use ATUS data on the percent of hours worked at home by those who bring work home on their diary day to estimate a modified average weekly hours.[140] Recall that measured average weekly hours from equation (3) include only average weekly hours worked in a workplace. Given the assumption that hours worked at home are not reported to the CPS, reported average weekly hours will also include only average weekly hours worked in the workplace. Thus, we re-estimate the percent of unmeasured hours worked for production/ nonsupervisory employees by dividing equation (4) by total reported CPS hours and rearranging terms to get:

[140] Information from the CPS Supplement is not used because respondents were directly asked how many hours they usually work at home and how many hours they usually work in total in the same survey; therefore, these responses should be consistent and we would be unable to determine the correct percentage of hours worked at home if there is a recall bias.

$$\theta_P^r = \frac{\gamma_P^{home}}{\frac{\tilde{w}_P^{bwh} AWH_P^{\tilde{}\,bwh}}{w_P^{bwh} AWH_P^{bwh}} + 1} \tag{7}$$

Assuming that hours worked at home are not reported, the percent of unmeasured hours for nonproduction/supervisory employees is no longer equal to the percent of unmeasured hours for production/nonsupervisory employees. As we observed, nonproduction/supervisory employees are more likely to bring work home than production/supervisory employees. Therefore, if those who bring work home are not reporting the hours worked at home, then the nonproduction/supervisory to production/nonsupervisory hours ratio may be biased downward. Unmeasured hours for nonproduction/supervisory employees can be rewritten as:

$$AWH_P^M \left(1 + \theta_P^r\right) \left[\frac{AWH_{NP}^{CPS} + w_{NP}^{bwh} AWH_{NP}^{bwh} \left(\gamma_{NP}^{home}\right)}{AWH_P^{CPS} + w_P^{bwh} AWH_P^{bwh} \left(\gamma_P^{home}\right)}\right] \tag{8}$$

Dividing equation (8) by equation (6) and rearranging terms gives the percent of unmeasured hours for nonproduction/supervisory employees assuming all hours worked at home go unreported to the CPS as:

$$\theta_{NP} = \left\{ \left(1+\theta_P^r\right) \left[\frac{1 + \left(w_{NP}^{bwh} \gamma_{NP}^{home} AWH_{NP}^{bwh} / AWH_{NP}^{CPS}\right)}{1 + \left(w_P^{bwh} \gamma_P^{home} AWH_P^{bwh} / AWH_P^{CPS}\right)}\right] \right\} - 1 \tag{9}$$

Table 8–17 presents the estimates of the percent of unmeasured average weekly hours assuming hours worked at home by those who bring work home are not reported .[141] The percentage of unmeasured hours for production/nonsupervisory employees is virtually the same under either reporting assumption. However, the percent of unmeasured hours for nonproduction/supervisory employees are significantly higher (1.6–2.7 percent) than those of production/nonsupervisory employees. Total measured employee hours are the sum of the weighted share of hours of production/nonsupervisory employees and nonproduction/supervisory employees. From Graph 8–2, we know that production/nonsupervisory employees account for the majority of all hours worked, thus unmeasured hours by this group will be more heavily weighted. Assuming that CPS respondents who bring work home do not report their hours worked at home, we find that 0.9–1.1 percent of hours of all nonfarm business employees may be missed.

Our analysis using both the ATUS and the CPS supplement suggests unmeasured hours of nonfarm business employees may range from 0.6 to 1.1 percent of measured hours. We next examine whether unmeasured hours are increasing over time.

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141 For the 1997 CPS Supplement, we use actual hours worked last week and all hours worked at home last week to calculate the percent of hours worked at home. Due to questionnaire differences, we use usual hours worked at home and usual hours worked in total for those respondents who do not report that their hours vary for the 2001 and 2004 CPS Supplement.

T 8–17: Percent of Unmeasured Employee Hours in the Nonfarm Business Sector Assuming Reporting Bias Among Those Who Bring Work Home

by Employee Status (ATUS)

	Share who bring work home	Percent of hours at home	AWH of those who bring work home	AWH those who do not bring work home	Percent of unmeasured hours
Production/nonsupervisory Employees					
2003	4.1%	0.19	39.8	37.2	0.83%
2004	3.9%	0.16	42.7	36.7	0.75%
2005	4.4%	0.15	42.9	37.2	0.76%
2006	3.7%	0.14	42.4	37.5	0.58%
Nonproduction/supervisory Employees					
2003	13.5%	0.14	47.2	41.9	2.10%
2004	10.4%	0.16	47.1	42.0	1.88%
2005	12.4%	0.11	47.2	42.2	1.57%
2006	16.2%	0.15	47.3	40.9	2.73%

All Employees

	Production/Nonsupervisory Employees		Nonproduction/Supervisory Employees		Percent of Unmeasured Total Hours
	Share of total hours worked	Percent of unmeasured hours	Share of total hours worked	Percent of unmeasured hours	
2003	0.78	0.83%	0.22	2.10%	1.11%
2004	0.78	0.75%	0.22	1.88%	1.00%
2005	0.79	0.76%	0.21	1.57%	0.93%
2006	0.79	0.58%	0.21	2.73%	1.03%

Unmeasured Hours Growth

Using the percent of unmeasured hours estimated above, we construct an hours series for all employees in the nonfarm business sector and add to this the hours worked by the unincorporated self-employed, unpaid family workers and employees of government enterprises, as measured by BLS-OPT. Table 8–18 compares the growth in measured hours worked for all persons in the nonfarm business sector with the growth in each of our adjusted series (assuming first no reporting bias in the CPS and then a downward reporting bias among those who bring work home). Official productivity growth statistics are published to the first decimal place. We find a small upward bias in measured hours growth over the 2003–2006 period; the ATUS-adjusted series grows 0.03–0.08 percent per year slower than the official BLS measured hours series. Because hours and productivity trends are reported at the one decimal level, this difference would not affect the measured data. Year to year fluctuations are always more volatile. For the year to year changes, measured hours grow the same or faster than adjusted hours in most years, except from 2004 to 2005 when assuming no reporting bias and from 2005 to 2006 when assuming reporting bias. Assuming reporting bias, the year to year trends are the same trends at the one decimal level for 2003–2004 and 2004–2005. However, over the 2005–2006 period, the adjusted

hours series would produce a 0.2 percent reduction in hours growth if no reporting bias is assumed. Assuming reporting bias, the 2003–2004 and 2004–2005 trends would appear 0.1 percent slower than measured hours growth, while the 2005–2006 hours trend would be 0.1 percent faster if hours at home are assumed to be unreported. The CPS Supplement-adjusted series from 1997 to 2001, and over the longer period 1997–2004, grows slightly slower than the BLS measured series. Over the 2001–2004 period we find very little difference between the measured and adjusted series. Over all years the differences are too small to affect the official productivity growth statistics.

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. We find that over most time periods hours growth is not being understated as critics have suggested. Over the longer time periods hours would actually be growing slower than measured series if adjustments to incorporate hours worked at home are made; this would lead to an understatement of productivity growth. Therefore, we conclude that productivity estimates are not overstated due to any misreporting in hours.

T 8–18: Annual Average Growth in Hours of all Persons in the Nonfarm Business Sector

		OPT series	No reporting bias		Hours at home not reported	
			Adjusted	Difference	Adjusted Series	Difference
ATUS	2003–2004	1.34%	1.27%	-0.07%	1.24%	-0.10%
	2004–2005	1.66%	1.67%	0.01%	1.60%	-0.06%
	2005–2006	2.17%	2.00%	-0.17%	2.25%	0.08%
	2003–2006	1.72%	1.65%	-0.08%	1.70%	-0.03%
CPS SUPPLEMENT	1997–2001	0.81%	0.76%	-0.04%		
	2001–2004	-0.62%	-0.62%	0.01%		
	1997–2004	0.19%	0.17%	-0.02%		
CPS Supplement (at least once a week)	2001–2004	-0.62%	-0.61%	0.01%		

Conclusion

In this paper, we used both the ATUS and May CPS Work Schedules and Work at Home Supplements to determine whether hours worked by nonfarm business employees were understated and increased between 1997 and 2006 because of unreported hours worked at home. The main advantage of using the CPS Supplement is that we can determine whether work done at home is paid. The main advantages of the ATUS are that we can observe when during the day the work is being performed at home and get a more accurate measure of the number of hours worked at home.

According to the 2003–2006 ATUS data and the CPS Supplement, 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 work. We find evidence that suggests workers bring work home at least in part to better balance work and family responsibilities. We find that men and women of young children are more likely to bring work home than those without children. In addition, 17 percent of parents who brought work home reported a child in their care while working at home in 2003. Five percent of respondents to the CPS supplement directly indicated that they do work at home to better balance work and family responsibilities. Results from a multinomial logit model also indicate that highly-educated, salaried workers are much more likely to bring work home than their less-educated, hourly counterparts.

From both data sets we find that those who bring work home have higher average weekly hours than those who work exclusively in a workplace. From the ATUS data, we find that total daily hours 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 overall.

The data suggests that there may exist a 0.6–1.1 percent downward bias in hours worked for the nonfarm business sector employees. However, when the official indexes of hours for all persons are augmented to include these unmeasured hours for employees we find little change in the **growth** of hours over the period 2003–2006. Our findings indicate that hours trends would actually be growing slightly slower if our estimates of hours worked were adopted, thus productivity would grow slightly faster. We find no conclusive evidence that productivity trends are overstated for the 1997–2006 period due to work brought home from the workplace.

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