The Overworked American or the Overestimated Workweek?

Trend and Bias in Recent Estimates of Weekly Work Hours in the United States

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ABSTRACT

Individuals' estimates of their paid working hours in response to the Current Population Survey (CPS) are biased upward. The bias is demonstrated here using two independent alternative sources of work-hour estimates: time-diary studies and the BLS Current Employment Statistics (CES) survey, based on payroll records. Comparison of the CPS and CES suggests that the individual overestimation of hours increased substantially between 1965 and 1990, an increase that cannot be attributed to obvious differences between the CPS and CES in coverage or treatment of moonlighting. Examination of the distribution of reported hours in the CPS shows that the increase in bias is not a consequence of the "heaping" of individual hours responses on the 40-hour week. Cross-section analysis of 1985 time-diary data indicates that hours overestimation varies systematically by gender, education level, and presence of young children. The changing composition of the workforce by schooling can explain about half the increase in the overestimation of hours.

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1. Introduction

The number of hours that individuals spend at work—both paid and unpaid—is of immense economic and social significance. Work hours affect the quality of life by determining the amount of available free time; they also form the denominator in estimates of hourly earnings and labor productivity, both key measures of economic prosperity and performance.

Some economists have argued that American workers have been experiencing a "time squeeze" over the past 30 years or so, with average total work hours having actually increased. Were it true, this phenomenon would buck the long-run trend of declining working hours since the nineteenth century. But the time squeeze hypothesis, put forth most vigorously by Juliet Schor in her book, *The Overworked American* (1992), has been challenged by many labor economists and other scholars, who suggest that Schor's use of data was selective and misrepresented the actual trends. Estimates based on careful time-diary studies, for example, suggest that total weekly work hours fell by at least 6 hours for both men and women between 1965 and 1985 (Robinson and Godbey 1997).

In this paper I examine the alleged overestimation of weekly work hours at paid employment in data from the Current Population Survey (CPS), which is the monthly survey conducted by the U.S. Census Bureau to collect information on population, unemployment, earnings, and the like. The CPS asks individuals to report their hours on all jobs (paid employment) during the week preceding the survey. In recent years there has been a growing awareness that the weekly work hours reported to the CPS may be severely upward-biased, and that the bias may have been growing since the 1970s. This is most evident in comparisons of the CPS weekly hours with those estimated from time-diary studies. The CPS is widely used in studies of employment, hours, and earnings: if its measure of work hours is in fact unreliable, so too are estimates based on those numbers, such as average hourly earnings.

Although data from time-diary studies have been used to shed some light on the overestimation of weekly hours, there has been little systematic research aimed at confirming the existence of the bias using alternative data sources, determining the causes or at least correlates of the bias, and assessing its

implications for our understanding of labor-market trends. This paper aims to begin filling these gaps.

In the second section I examine evidence of the overestimation of weekly hours. I first review the evidence from the time diary studies. I then turn to an analysis of the discrepancy between weekly hours as reported by individual workers to the Census's Current Population Survey (CPS) and those reported by employers to the Bureau of Labor Statistics under its Current Employment Statistics (CES) program. This comparison reveals that the difference between the CPS and CES average hours grew dramatically between the late 1960s and the late 1990s. If the CES hours were less subject to bias, this evidence would suggest growing overestimation of hours in the CPS. However, there are various differences between the surveys other than reporting bias that could generate the gap in average hours. Using samples from the May CPS for benchmark years from 1970 to 1991, I calculate average hours that are comparable with the CES. These counterfactual CPS hours confirm the existence of increasing bias.

The third through sixth sections begin to explore potential explanations for growing bias. In the third section I consider whether "heaping" of survey responses on certain focal weekly hours—in particular 40—could explain the growing discrepancy. Even after removing workers who reported exactly 40 hours from the CPS samples, the distribution of hours shows very little movement between 1970 and 1991. I argue that this is evidence against the existence of a significant heaping effect. In the fourth section I present some cross-section evidence on patterns of bias in hours estimates using data from a time-use diary survey (*Americans' Use of Time*, 1985). The data reveal sharp differences in hours overestimation according to worker characteristics. Overestimation is significantly greater for women, for the more educated, and for women with young children in the family.

The fifth section shows that about half the upward trend in hours overestimation can be accounted for by the increasing educational attainment of the workforce, because the more educated tend to more greatly overestimate their hours. Although women tend to overestimate their hours by more than men, the increased representation of women in the workforce had an insubstantial effect on overall hours bias. The sixth section examines evidence from the 1965 and 1975 time diary studies. Generally the sample sizes are

too small to provide reliable estimates of hours overestimation for most sub-groups of the labor force. A concluding section summarizes the findings.

The focus of this paper is on weekly hours of work at paid employment. Therefore it ignores two additional dimensions of trends in total labor hours—namely, variation in annual hours due to changes in weeks worked, and variation in hours of unpaid work at home, such as child care and housework.[1] Estimates of trends in weeks worked, like estimates of weekly hours, come from the CPS. Whether workers have similar difficulty recalling their annual weeks worked is a question I have not explored here.

2. Evidence of weekly hours overestimation

Perhaps the most direct evidence pertaining to errors in survey estimates of work hours comes from time-use diary studies. Table 1 reproduces average weekly hours for employed persons by gender for 1965, 1975, and 1985, from three sources. The diary worksheet averages are derived from responses to the Americans' Use of Time Project time diaries. In these surveys, individuals are asked to fill out detailed diaries accounting for their principal activity at each point in time during an entire 24-hour period. The averages here represent hours at paid work, excluding commute time and lunch breaks but including coffee breaks and second jobs (Robinson and Godbey p. 94).[2] The workweek estimate questions are also from the time-use surveys, but represent the response to a single question about the individual's weekly hours of work, presumably during the week preceding the survey. Finally, the hours estimates from the CPS are the average of 12 monthly averages, which in turn represent average weekly hours of individuals who worked positive hours during the week prior to each month's survey date.

The table shows that estimates of weekly hours from the CPS and the survey workweek estimates

[1] Trends in annual hours are emphasized in recent work by Leete and Schor (1994), Bluestone and Rose (1997), and Pencavel (1997, 1998).

[2] Because the time diaries cover only one 24-hour period per respondent, averages of weekly hours are constructed from synthetic workweeks, adding the daily sample averages for each day of the week (see Section 4).

show little trend between 1965 and 1985, whereas for both men and women the diary hours drop by 6-7 hours per week. The time-use survey's workweek estimates are substantially greater than the CPS estimates, a finding that raises some concerns about the representativeness of the time-use survey responses; in my own analysis of the 1985 time-diary surveys, however, I obtain average estimated weekly hours that are generally much more consistent with the CPS averages (see Section 4).

Comparing the time-diary averages with the CPS estimates, the bias in hours estimation emerges between 1965 and 1985. Indeed, in 1965, men's average diary hours actually exceeded their average CPS estimated hours by about 3.6 hours per week. If the time-diary entries are more accurate, this suggests *underestimation* of work hours in 1965. By 1975, diary hours exceeded CPS hours by only 1.6, and by 1985 this gap had reversed itself, with CPS hours exceeding diary hours by 2.1, suggesting an overestimate. Among women, diary hours exceeded CPS hours by 1.6 hours in 1965 and by 1.8 hours in 1975, but the gap had reversed itself by 1985, when CPS hours exceeded diary hours 4.4 hours.

Robinson and his colleagues (Robinson and Bostrom 1994) also report that the overestimate of hours increases with the estimated number of hours. That is, workers who estimate very long work weeks appear to be more prone to overestimating their hours. Jacobs (1998), however, shows convincingly that this pattern is not necessarily a reflection of greater bias on the part of workers with long hours, but could instead easily be accounted for by regression to the mean, given random errors (with mean zero) in estimating hours.

The accuracy of the time diary data have been challenged by Schor (1992, 1994) who is particularly skeptical of the 1965 survey. The 1965 sample was restricted to urban households with at least one employed adult; Schor also notes that the different time-use surveys were taken at different phases of the business cycle, which may bias estimates of trend. For these reasons, it is useful to seek confirmation of the bias in the CPS weekly hours series using an alternative data source.

Jacobs (1998) reports the results of one such alternative estimate of work hours, based on individuals' reported times of departure for and return from work, adjusted for reported commute time, and

multiplied by number of days at work. The data come from the 1992 National Survey of the Changing Workforce. If workers are better at estimating the times of day at which they leave home and leave work than they are at directly estimating their total work hours, average hours calculated from departure and return times will be less subject to bias. Comparing these two types of estimates, Jacobs finds that they are fairly highly correlated (on the order of 0.6-0.8, depending on whether he corrects for apparent errors in reporting military times). The average workweek calculated from departure and return times is actually somewhat longer than the average of workers' estimates, a la CPS, implying if anything slight underestimation of hours.

The Jacobs results are suggestive, but leave open the possibility that the source of individual error in estimating hours may come from incorrectly estimating departure and return times. The Changing Workforce survey asks workers when they "typically" leave home for work and leave work for home—workers may regard days on which they leave home a little late or leave work a little early as atypical. Workers with irregular schedules may find it particularly difficult to provide an accurate response. It is also unclear how Jacobs handles workers whose jobs require different numbers of hours per day. Finally, because Jacobs examines only one year, it is impossible to identify any potential trend in the misreporting of hours.

A second source of information on hours is from surveys or payroll records of employers (establishments). A careful comparison of the hours and earnings responses provided by employees of a single large manufacturing firm and the company's own records is reported by Rodgers et al (1993). They find that although the errors in the worker survey responses violate many of the standard assumptions made about measurement errors, the errors typically have mean close to zero. Workers at this one firm, then, appear not to have overestimated their hours by very much.[3] The representativeness of this single firm

[3] Interestingly, Rodgers et al (1993) also report that measurement errors in hours were negatively correlated with the true values, implying that workers with long hours tended to underestimate their work time.

cannot, of course, be determined.

The standard source of employment, hours, and earnings data reported by employers is the BLS Current Employment Statistics (CES) survey, which is based on establishment payroll records. The published average weekly hours reported by the establishment (CES) and household (CPS) surveys are presented in Figures 1 and 2. Figure 1 shows the levels of average hours between 1948 and 1996, while Figure 2 shows the gap between the CPS and CES estimates, in hours per week. Two alternative CES series are presented. The "unadjusted" CES represents the average weekly hours *paid for* by employers, including paid holidays, vacations, and sick leave. The "adjusted" CES deducts estimates of paid time off in order to obtain weekly hours actually "at work."[4]

Setting aside for the moment the issue of comparability of these surveys, Figures 1 and 2 reveal a growing gap between the CPS and both CES estimates (this discrepancy has been noted by many others, including Robinson and Godbey 1997). Between 1948 and 1970, the difference between the CPS and unadjusted CES weekly hours fluctuated at about 1 to 2 hours per week. Sometime after 1965, the gap began to grow, leveling out at between 4 and 5 hours by 1990. The size of the gap is larger using the adjusted CES, but the upward trend is quite similar.

There are many reasons to expect differences between the hours estimates from these two sources, besides bias in individuals' estimates. A comparison of the coverage of CPS and CES hours estimates is summarized in Table 2, which is replicated from Devens (1978). In my view, the three most important sources of non-comparability between the payroll and household surveys are the following:

1. Differences in coverage by industry, occupation, and class of worker. The CPS survey covers

[4] For a number of years, the BLS has conducted an annual survey to estimate actual hours at work in order to obtain more accurate measures of labor productivity. In the standard CES survey, hours include paid leave for holidays, vacations, sick and personal or administrative leave. The hours at work surveys ask establishments to provide annual and quarterly data on hours at work and hours paid for the previous year. The survey defines hours at work as time spent actually working, as well as short rest periods, coffee breaks, standby and down time, travel time from job site to job site within the working day, and the like. These survey results are used to calculate industry-specific ratios of hours worked to hours paid, which are in turn used to adjust the estimates of weekly hours. See Jablonski et al (1990).

wage and salary workers (including domestics and other private household workers), self-employed persons, and unpaid workers in family-operated enterprises. The CES survey covers only production and nonsupervisory workers on the payrolls of private nonfarm establishments. Production workers include working supervisors and all nonsupervisory workers engaged in production and services closely associated with production operations (such as record keeping). Nonsupervisory employees include service-sector workers not above the working supervisory level. Thus the CPS survey is more inclusive than the CES in terms of industry (public employees are included), occupation (supervisors are included), and class of worker (self-employed and unpaid family members are included).

2. The average hours from the CPS are the average hours per worker on all jobs held, whereas the average hours from the CES are the average per job. Thus multiple job-holders ("moonlighters") have their total hours on all their jobs counted in the household survey, whereas their separate jobs are counted separately in the establishment survey. Other things equal, then, CPS average hours should exceed CES average hours if some workers moonlight. Indeed, this problem has been raised by Schor (1992) as a reason to discount the comparability of the CPS and CES hours, in particular because the incidence of moonlighting has been rising.

3. In the household survey (CPS), all persons with a job but not at work are excluded from the hours computations, whereas in the unadjusted CES estimate, production or nonsupervisory employees on paid vacation, paid holiday, or paid sick leave are included and assigned the number of hours for which they were paid during the reporting period.

To eliminate the first two sources of non-comparability, I use adjusted individual-level samples of the CPS to simulate mean weekly hours that are conceptually much closer to the CES averages in terms of coverage and the treatment of multiple jobholders. I refer to this as the "simulated CES" hours. I do not attempt to adjust the CPS data for the third source of non-comparability; instead, I rely on the BLS's own adjustment of hours paid for to hours worked. Because I am most interested in comparing the trends, rather than levels, of hours estimates, the choice of unadjusted versus adjusted CES series is not critical,

given their common trend during the period of interest.

The simulated CES hours estimates were constructed as follows. The samples were drawn from public-use samples of the May CPS for 1970, 1975, 1980, 1985, and 1991.[5] These years were chosen because they cover the period during which the gap between the CPS and CES estimates emerged. The May CPS is used because the May survey asked questions about multiple job holding, which are required to correct for the second problem noted above.

For each year, I restricted the CPS sample to individuals who reported positive work hours during the preceding week, were employed by nonagricultural private businesses, and who had production or nonsupervisory occupations.[6] By doing so, I have excluded the major groups of workers who are not covered by the CES hours estimates: public-sector workers, the self-employed, and supervisory workers.

To adjust for the presence of moonlighting, it is necessary to count the hours on second jobs separately. To do so, I first identified workers who reported second jobs.[7] Next, I determined which of the worker's jobs were valid, in the sense of being comparable with the CES sample in terms of coverage. Finally, I calculated average hours per valid job, rather than per worker. For the 1985 and 1991 samples, actual hours worked last week are reported only for all jobs together, not separately by job. "Usual weekly hours" are reported for the worker's second job. To maintain consistency, for these years I used the hours worked during the preceding week whenever possible. For workers with two valid jobs, I simply divided their total hours worked last week by two and counted the average twice toward the mean. For workers whose secondary job was valid but whose primary job was not, I used their reported "usual hours" on the second job. For workers whose primary job was valid but whose secondary was not, I used their total

[5] Samples of the May CPS are not available for years prior to 1969.

[6] Unlike the published CPS hours, my simulated CES sample includes workers who were 14 or 15 years old. Information on the work hours of children under 14 is not collected by the CPS.

[7] Workers with more than two jobs must be treated as holding just two jobs.

hours worked minus usual hours on the secondary job.[8]

Table 3 reports average hours comparing the CPS and CES sources, along with the simulated CES using the restricted May CPS sample. The first column in the table gives the BLS's published annual average of weekly hours from the CPS. The second column gives the average from my full sample of the May CPS. Clearly the May CPS hours tend to be very similar to the annual average. The third column reports the simulated CES, and the fourth and fifth columns report the unadjusted and adjusted average hours from the actual CES surveys. The final two columns report the difference between the simulated and actual CES figures, using the unadjusted and adjusted CES respectively.

If the growing gap between the CPS and CES average hours were due primarily to the differences in coverage and/or treatment of moonlighting between the two surveys, the simulated and actual CES would behave similarly. The simulated CES does more closely approximate the actual CES in its level. But in terms of the changes over time, the simulated CES more closely follows the CPS. This can be seen clearly in Figure 3, which plots the CPS and simulated and actual CES series. The final two columns of Table 3 show that the difference between the simulated CES and the actual CES increased by nearly four hours between 1970 and 1991, an increase that was even greater than the increase in the gap between the CPS and actual CES hours. In other words, the net effect of my corrections to the CPS to render it more comparable with the CES actually strengthen the finding of a widening gap between the average hours reported by individuals and those reported by establishments.

To summarize, the growing discrepancy between the CPS and CES average hours series cannot be attributed to the impact of increased moonlighting or changes in the composition of the workforce. How then can the growing gap between theses series be explained? One possibility is that employers have been

[8] In a small number of cases this last estimate yielded a negative estimate of hours, in which case I changed it to zero.

requiring more unpaid hours of work from their employees.[9] But the hypothesis that overestimation of work hours by individuals responding to the CPS has increased has the virtue of being consistent with the evidence from both the time-diary studies and the CES. This begs the question: Why did the tendency to overestimate work hours increase between 1970 and 1990? In the next section, I explore a potential answer to this question: the impact of the heaping of reported hours on certain focal hours—in particular, 40.

3. The 40-hour norm

A large proportion of workers (typically around 40 percent) report weekly hours of exactly 40 to the CPS. It may be that many of these workers actually do work exactly 40 hours, but it is also likely that many of them report 40 because it is a round number and also is conventionally thought of as the standard full-time number of work hours. In this sense one may speak of the tendency for hours responses to "heap" on 40.

Heaping of responses on 40 hours could result in a changing bias in average hours statistics if the underlying distribution of actual work hours were shifting across 40. For example, suppose that actual hours were distributed about their mean, μ, but that some fixed proportion p of all workers reported 40 hours regardless of their actual hours. Then the mean of reported hours would be $40p + \mu(1-p)$. The bias in mean reported hours would be $40p + \mu(1-p) - \mu = (40 - \mu)p$, which increases as μ decreases. A similar result would hold if the tendency to report 40 hours were an increasing function of the absolute difference between actual hours and 40.

Of course it is impossible to identify which of the individuals who report 40 hours actually worked 40 hours. But one strategy for assessing the importance of heaping is to examine the distribution of reported work hours excluding the individuals who reported exactly 40. If heaping on 40 were contributing

[9] This claim was made recently in a *New York Times* commentary by a labor lawyer, Thomas Geoghegan (January 24, 1999, p. WK 15).

to the growing bias in reported hours, then one would expect that the increase in reported working hours between 1970 and 1990 would be smaller among non-40-hour workers than it would be for the full sample.

Table 4 reports mean weekly work hours for all workers with positive hours and for those reporting non-40-hour weeks, using my benchmark years of the May CPS. The table also provides the percentage of all workers who reported exactly 40 hours. As can be seen, about 40 percent of both men and women report exactly 40 hours, and this proportion did not change much between 1970 and 1991. More to the point, although the mean of hours changes somewhat when 40-hour workers are excluded, the effect on the time trend in mean hours is small. In fact, the change in work hours over this period is virtually identical for men whether one examines the mean with or without 40-hour workers; for women, the trend of average hours is slightly more positive when 40-hour workers are excluded. In other words, removing the 40-hour women exacerbates, rather than moderates, the tendency of the CPS hours to increase.

Figures 4 and 5 show the cumulative distribution of weekly hours in these samples, excluding 40-hour workers.[10] For men, the distributions are virtually identical, and show no consistent shifts over time. For women, the increase in average hours after 1980 coincides with a small rightward shift in the cumulative. These results suggest that heaping is not a promising explanation of the increasing bias in the CPS empirically.

4. Covariates of hours overestimation: Evidence from the 1985 time diaries

Increasing bias in individual estimates of weekly work hours offers the most coherent explanation for reconciling the evidence from the CPS, CES, and time diary studies. But why do individuals overestimate their hours, and why did the bias increase between 1965 and 1990? To move toward an answer to these questions, in this section I present some evidence of covariates of hours overestimation

[10] In the diagram the value of the cumulative at 40 hours was calculated by linear interpolation between the values at 39 and 41 hours.

from the 1985 time-diary data analyzed by Robinson and his colleagues.[11] The bias in individual hours estimates in 1985 varied systematically by gender, schooling, and family composition.[12] These findings do not themselves constitute an explanation of hours overestimation, but they do point toward some variables that should be examined in trying to account for the trend in the overall bias.

Table 5 reports three estimates of average weekly hours for workers who reported positive work hours. The first column is from the May CPS. As I note above, the May CPS hours are very similar to the published annual averages for 1985. The second column reports the mean of workers' estimated weekly hours as reported to the time diary study. The exact wording of this survey question is not given in the data codebook or the published papers based on the data. Robinson and his colleagues treat the response as essentially comparable with the CPS hours question, and as I note below it usually yields an average rather close to the CPS response. The third column reports average diary work hours for a synthetic week. The synthetic week is used because respondents to the time diary study reported their time spent on various activities (including paid work) for one day only. Following Robinson et al, I construct the synthetic work week by taking the mean hours for each day of the week and adding the means together.

Use of the time diary data requires making some assumption about which activities are to count as work hours. For the estimates in Table 5, I have included time actually spent on paid work activities, as well as time on short breaks and at non-work activities while at the work site. Results using more and less inclusive definitions of work hours are provided in Table 6, which I discuss below.

A comparison of the first two columns of Table 5 reveals that individuals' estimates of their weekly hours for the CPS and the time-use study were quite similar in most categories. The third column gives estimated standard errors of the means from the time-use study: for most categories, the time-use

[11] Americans' Use of Time, 1985 (ICPSR 9875).

[12] The difference in the bias by gender has been noted by Robinson and Bostrom (1994).

estimate differs from the CPS mean by no more than 1-2 standard errors.[13] A notable exception is the reported hours for women with young children, for whom the CPS estimate (32.9 hours) is much smaller than the time-use estimate (38.8). Even using the smaller CPS estimate, however, we shall see that women with young children tended to overestimate their paid work hours by a substantial amount.

Average weekly hours as recorded in the time diary itself are reported in column (4), with the associated standard error in column (5). Finally, two estimates of the gap between the estimated hours and those recorded in the diary are presented in columns (6) and (7). Column (6) uses the CPS estimate and (7) uses the estimate from the time-use study. Thus column (7) is based on a single survey sample, whereas (6) is derived from means from two different samples.

The gaps in columns (6) and (7) are generally similar within categories, and they reveal striking patterns of bias in hours estimation. On the whole, women tended to overestimate their work hours by more than men did, although the gender difference is rather small if one uses the CPS hours estimates (3.9 hours versus 3.3 hours). For both males and females, hours overestimation varied dramatically by schooling, with the gradient tending in the direction of greater overestimation among the more educated. Indeed, using this measure of diary working hours, men with less than a high-school education actually underestimated their weekly hours by 3-5 hours, whereas male college grads overestimated their hours by about 5 hours. Men with a high-school diploma or some college fall inbetween. The gradient in the bias by schooling is similar for women: women with less than a high-school education tended to overestimate their hours by only 0-1 hour, whereas women with a college degree overestimated by at least 7.4 hours.

For both genders, bias in hours estimation was negligible among the young (19-24) as compared

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[13] The average hours for a synthetic workweek are calculated as $\bar{h} = \sum_i \frac{1}{n_i} \sum_{j=1}^{n_i} h_{ij}$ for day of the week i and individual observation j, where n_i is the number of observations for day i and h is daily work hours. Then assuming zero covariance in hours across individuals, the standard error of the average is $SE = \left[\sum_i s_i^2 \right]^{1/2}$ where s_i^2 is the sample variance of hours for day i.

with other age groups. Overestimation also tended to be greater for married workers. Finally, the presence of children under 5 was associated with much greater overestimation of work hours among women, whereas for men overestimation was actually smaller when young children were present. The results for children suggest the possibility that estimating weekly work hours may be particularly difficult for working mothers of young children, perhaps because hours spent at childcare and related activities are interspersed with paid work time. A caveat here is that the time-use sample sizes are rather small. Examining column (6), which uses the CPS estimated hours, the difference in the overestimate between the women with young children (7.3) and those without (4.0) is less than twice the standard error of the time-diary hours (2.5).

Of course, there is no way of knowing exactly what an individual would count as work hours when asked by the census to report last week's hours. Whether or not the response actually results in overestimation relative to the hours recorded in the time diary entries depends on which diary activities are counted as work time. Table 6 reports differences between estimated and diary hours for different definitions of work hours, by gender and schooling. The underlying estimate of hours is the same in each column (corresponding to column (2) of Table 5), but moving to the right additional activities are added toward the diary work hours. The second column in Table 6 uses the same definition of hours as Table 5, and thus is identical to column (7) of that table.

Table 6 shows that workers tend to overestimate their hours even when meals at work are counted as part of work time. Once we add commuting time, however, almost all categories of workers underestimate their work hours. Thus it would appear that workers do not tend to count their commute as part of working hours. What is clear from Table 6 is that the same notable pattern of bias in hours estimation by education is observed, whether the definition of working hours is narrow or broad.

5. Can cross-sectional variation in hours overestimation explain the time trend?

The striking relationship between the bias in hours estimates on the one hand and educational attainment and gender on the other suggests that the upward trend in the gap (overestimate) between the

1960s and 1980s might be partly explained by the changing composition of the labor force toward higher education levels and more women, even within-group bias were constant. The size of the composition effect can be estimated by assigning the 1985 gaps by gender and education and calculating mean predicted gaps for other years using the actual labor force proportions by gender and education as weights. That is, the predicted (counterfactual) gap between estimated and diary hours in year t is $G^t = \sum_i \sum_j p_{ij}^t b_{ij}$, where

b_{ij} is the gap between estimated and diary hours in 1985 for gender i and educational attainment j, and p_{ij}^t is the proportion of workers in cell i, j at time t.

The results are presented in Table 7, for different samples and assumptions about the within-cell bias. The first two columns uses a sample of the CPS that is comparable to the CES (establishment survey) in its coverage– namely, restricted to nonagricultural, nonsupervisory employees of private firms. These columns can be compared with Figures 2 and 3 above. Column (1) estimates b_{ij} using the 1985 gap between mean CPS hours and the time-diary hours (as in column (6) of Table 5). Column (2) estimates b_{ij} using the 1985 gap between the workweek estimates from the time study and the time-diary hours (see column (7) of Table 5). The third and fourth columns use a "full" sample of the CPS (including all nonagricultural workers 16 and up with positive reported hours).

In the top panel, all four series show a widening of the predicted hours gap of about 2 hours per week between 1965 and 1991. Comparing Table 7 with Table 3 and Figure 2, it appears that changes in the composition of the workforce can account for about half the increase in the overestimation of hours, as represented by the gap between CPS and CES average hours. The bulk of this effect is driven by changing educational attainment. The middle panel of Table 7 holds the overall proportion female fixed at the 1991 percentage but uses each year's composition by educational attainment within gender. The change in predicted bias is very similar to the full effect of gender and schooling combined (top panel). By contrast, holding the composition by schooling fixed and varying the gender composition (bottom panel) has only

small effects on the predicted bias in hours estimation.

The finding that changing composition of the workforce can explain a sizable part of the increased overestimation of weekly work hours leaves us with many unanswered questions. What accounts for the remainder of the growth in the gap? Has the bias in hours estimation remained constant within educational groups, or has the size of the bias increased for certain groups?

Finally, why do more educated workers overestimate their hours by so much more than the less educated? One might speculate that the more educated are more likely to have irregular work schedules and be paid salaries, and thus find it more difficult to estimate accurately their weekly work hours. Less educated workers, perhaps more often paid by the hour, punch a time clock each day and/or receive a pay stub that reflects actual hours paid for. Why the uncertainties faced by salaried workers should lead to systematic overestimation rather than an unbiased increase in error, however, is another unanswered question.

6. Notes on time diary hours, 1965-75

Part of the trend toward increased overestimation of hours can be accounted for by the changing composition of the workforce by schooling and gender. Is there also evidence of changing bias within gender-education cells? Given better data on hours estimates and diary hours over time, it would be possible to generate a standard shift-share decomposition of the change in the bias to quantify such an effect. Unfortunately, the 1965 and 1975 time diary data leave much to be desired. The sample sizes are small, questions have been raised about the representativeness of the samples and the survey years, and the publicly available samples do not include a variable for the individual's estimate of their weekly hours.[14] In spite of these deficiencies I have calculated average weekly hours using the 1965 and 1975 time diary data for comparison with the 1985 cross section. The results are summarized in Tables 8 and 9.

[14] Individual estimates of hours must have been collected in the original survey, as Robinson and his colleagues have calculated the bias between estimated and diary hours for these years.

Table 8 provides estimates of mean weekly hours from the time diaries of 1965, 1975, and 1985, along with comparison estimates from the CPS, by gender and educational attainment.[15] In this table the diary hours include time actually performing work activities plus breaks and other nonwork activities while at the workplace (the same as column (2) of Table 6). One feature to note immediately is the large standard errors on some of the estimated means from the diary data. Sample sizes in some of the gender-education cells are very small (as low as 31 for women with some college in 1975). Therefore the pattern by education must be treated with much caution.

Overall the gap (bias) is negative for both men and women in 1965 and 1975, and is actually more negative 1975. In other words, to the extent that the CPS and time diary samples are comparable, workers in 1965 and 1975 were *underestimating* their actual work hours in responding to the CPS, and by more in 1975 than 1965. The pattern by educational attainment is not consistent. In 1965, workers with intermediate schooling levels show slightly longer diary hours, whereas in 1975 men with intermediate schooling levels show shorter hours than those at the extremes. But the standard errors of the mean diary hours are often similar in magnitude to the absolute size of the measured gaps, particularly at the higher education levels. Therefore, it is difficult to draw any strong conclusions about the relationship between the bias in hours estimates and education before 1985.

Table 9 examines trends in weekly hours spent on some nonwork activities that might plausibly end up counted as work hours by some individuals responding to the CPS: meals at work and commute time. If time spent on these activities had increased substantially between the 1960s and 1980s, workers' estimates of work hours could have become inflated accordingly. The figures come from the same time diary samples as Table 8 and are thus subject to the same caveats regarding the samples. Comparing 1965 and 1985, there is a slight decrease in meal time at work, and virtually no change in commute time. The 1975

[15] For consistency with the rest of this paper, the May CPS was used for 1975 and 1985. No public use sample of the May CPS is available for 1965, so the Mare-Winship sample of the March 1965 CPS was used instead.

commute time is somewhat anomalous, being significantly greater for men than it was in either 1965 or 1985. Based on these data it is impossible to conclude that estimates of weekly work hours increased because workers were spending more time commuting or eating at work.

7. Summary

The weight of the evidence presented here confirms a growing tendency for workers to overestimate their weekly hours of work in their responses to the Current Population Survey. A careful comparison of the CPS and CES (establishment) estimates of hours shows that the growing gap between them cannot be attributed to the major differences in coverage or treatment of multiple job holding between these surveys. Additional and independent evidence of bias comes from the time-diary data, which also reveals significant cross-sectional variation in hours estimation by gender, education, and presence of young children.

The greater tendency of educated workers to overestimate their work hours might be attributable to the more flexible and irregular work schedules of professional workers, to the fact that they are less likely to be paid by the hour, or to a greater tendency to bring some work home, where it may be cognitively more difficult to separate out time spent at work activities from time spent at other activities. Because the workforce became more educated during the period considered here, the tendency to overestimate hours appears to have increased partly through a pure composition effect. My estimate of this effect suggests that it can account for about half the growth in the average overestimate of hours.

If my estimate of the composition effect is correct, it leaves about half the increase in overestimation of hours (about 1.5 to 2 hours per week) unexplained. Perhaps the tendency to overestimate work hours has increased uniformly across all educational classes in recent decades, or perhaps the bias has grown more rapidly for the more educated. The latter would have serious implications for our understanding of trends not only in work hours but also in hourly wages as derived from CPS weekly earnings data. Growing overestimation of hours by the more skilled would imply growing underestimation of their hourly wages, thus resulting in the underestimation of growth in hourly wage inequality.

Unfortunately, trends in hours overestimation by skill level can only be estimated using a sequence of time diary studies, and we have seen that the samples for 1965 and 1975 are simply too small to provide reliable results.

References

Bluestone, Barry, and Stephen Rose, "Overworked *and* Underemployed," *The American Prospect* 31 (March-April 1997), 58-69.

Devens, Richard M., "The Average Workweek: Two Surveys Compared," *Monthly Labor Review* (July 1978), 3-8.

Jablonski, Mary, Kent Kunze, and Phyllis Flohr Otto, "Hours at Work: A New Base for BLS Productivity Statistics," *Monthly Labor Review* 113:2 (February 1990), Table 5.

Jacobs, Jerry A., "Measuring Time at Work: Are Self-Reports Accurate?" *Monthly Labor Review* 121:12 (December 1998), 42-53.

Leete, Laura, and Juliet B. Schor, "Assessing the Time-Squeeze Hypothesis: Hours Worked in the United States, 1969-89," *Industrial Relations* 33:1 (January 1994), 25-43.

Pencavel, John, "Changes in Male Work Behavior and Wages," Dept. of Economics, Stanford University (February 1997).

Pencavel, John, "The Market Work Behavior and Wages of Women: 1975-94," *Journal of Human Resources* 33:4 (Fall 1998), 771-804.

Robinson, John P., and Ann Bostrom, "The Overestimated Workweek? What Time Diary Measures Suggest," *Monthly Labor Review* 117:8 (August 1994), 11-23.

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

Rodgers, Willard L., Charles Brown, and Greg J. Duncan, "Errors in Survey Reports of Earnings, Hours Worked, and Hourly Wages," *Journal of the American Statistical Association* 88 (December 1993), 1208-1218.

Schor, Juliet B., *The Overworked American* (New York: Basic Books, 1992).

Table 1: Average weekly hours of paid work from three sources

	1965	1975	1985
(1) Diary worksheet			
Women	36.8	35.8	30.8
Men	46.5	42.9	39.7
(2) Workweek estimate (time-use survey)			
Women	40.4	40.2	41.6
Men	47.1	46.8	46.4
(3) Workweek estimate (CPS)			
Women	35.2	34.0	35.2
Men	42.9	41.3	41.8

Sources: Robinson and Godbey (1997), p. 95; BLS.

Table 2: Coverage of workweek surveys

	Current Population Survey (CPS)	Current Employment Statistics program (CES)
Hours:		
Straight-time	Yes	Yes
Overtime	Yes	Yes
Standby and reporting time	Yes	Yes
Holiday, vacation, and sick time[1]	No	Yes
Industry group:		
Agriculture	Yes	No
Private nonagricultural industries	Yes	Yes
Government	Yes	No
Class of worker:		
Wage and salary	Yes	Yes
Self-employed	Yes	No
Unpaid family worker	Yes	No
Occupational function:		
Production or nonsupervisory	Yes	Yes
Other	Yes	No
Age:		
0-15	No	Yes
16 and over	Yes	Yes

1. Included in the payroll (CES) data if establishment paid employee for such hours.

Source: Adapted from Devens (1978), Table 1, p. 4.

Table 3: Average weekly hours of workers, CPS, CES, and simulated CES

Year	CPS		Simulated CES[1,2]	Actual CES		Simulated-actual CES	
	Published	Sample[1]		Unadjusted	Adjusted[3]	Unadjusted	Adjusted
1970	39.1	39.2	35.5	37.0	35.0	-1.5	0.5
1975	38.5	38.6	35.1	35.8	33.9	-0.7	1.2
1980	38.2	38.4	35.2	35.0	33.0	0.2	2.2
1985	39.0	39.1	36.1	34.9	32.8	1.2	3.3
1991	39.1	39.3	36.3	34.1	31.9	2.2	4.4

Notes:
1. Estimates use final adult sample weights for each year. Unweighted means are very similar.
2. Simulation from May CPS samples described in text.
3. Adjusted by ratio of hours worked to hours paid for.

Sources:
CPS published: BLS, Labor Force Statistics Derived from the Current Population Survey, 1948-87, Bull. 2307 (August 1988), p. 401.
Sample and simulation: Public use files of May CPS for each year.
CPS figures are for nonagricultural workers who reported hours during the survey week, age 16+.
Actual CES: U.S. BLS, *Employment, Hours, and Earnings, United States, 1909-94*, Bull. 2445 (Sept. 1994), p. 3.
For private nonfarm establishments.

Table 4: Effect on mean hours of excluding reported 40-hour weeks

	1970	1975	1980	1985	1991	Change 1970-1991	Change 1975-1991
Males							
Mean hours	42.4	41.6	41.5	42.2	42.4	0.0	0.8
Percent at 40 hours	42.8	44.5	44.2	41.9	41.1		
Mean hours excluding 40	44.2	42.9	42.7	43.8	44.0	-0.2	1.1
Females							
Mean hours	34.0	33.9	34.4	35.1	35.9	1.9	2.0
Percent at 40 hours	40.5	39.5	40.2	39.0	38.9		
Mean hours excluding 40	30.0	30.0	30.6	32.0	33.3	3.3	3.3

Notes: Individuals with nonagricultural employment, ages 16 and older, who reported positive work hours.
Source: Public use samples from May CPS for each year.

Table 5: Mean CPS, estimated, and diary weekly hours by individual characteristics, 1985

	CPS mean[1] (1)	Time-use estimate[2] (2)	Std. error of (2) (3)	Time diary[3] (4)	Std. error of (4) (5)	Diff. (1) - (4) (6)	Diff. (2) - (4) (7)	Diary data no. obs. (8)
All	39.9	39.2	0.3	35.9	0.5	3.9	3.3	3065
Females	35.5	35.8	0.4	31.6	0.6	3.9	4.2	1492
School < 12[4]	33.0	34.0	1.4	32.9	2.0	0.1	1.2	147
High school grad	35.5	36.0	0.6	31.7	1.0	3.8	4.3	613
Some college	34.8	35.8	0.9	32.5	1.5	2.3	3.4	262
College grad	38.2	36.1	0.8	28.7	1.3	9.4	7.4	319
Ages 19-24	33.4	31.4	1.1	33.7	1.7	-0.3	-2.3	177
Ages 25-44	36.5	37.6	0.5	30.8	0.9	5.7	6.8	729
Ages 45 +	35.1	34.4	0.8	31.3	1.2	3.8	3.1	412
Married[5]	34.7	35.5	0.5	29.8	0.8	4.9	5.6	808
Not married	36.6	36.3	0.6	33.7	0.9	3.0	2.6	684
Kids under 5[6]	32.9	38.8	1.7	25.6	2.5	7.3	13.2	95
No kids under 5	36.0	35.6	0.4	32.0	0.6	4.0	3.6	1397
Males	43.3	42.4	0.4	40.0	0.7	3.3	2.3	1573
School < 12[4]	40.2	38.4	1.4	43.3	2.1	-3.1	-4.9	173
High school grad	43.9	41.8	0.6	40.0	1.1	3.9	1.8	592
Some college	42.9	42.6	1.0	39.7	1.7	3.1	2.9	232
College grad	45.3	44.7	0.8	39.9	1.3	5.4	4.8	401
Ages 19-24	38.1	37.2	1.2	37.5	2.4	0.6	-0.2	167
Ages 25-44	44.9	44.5	0.5	41.8	0.9	3.1	2.7	790
Ages 45 +	43.3	40.8	0.8	39.1	1.2	4.2	1.7	429
Married[5]	44.8	43.9	0.5	40.6	0.8	4.2	3.4	999
Not married	40.4	39.6	0.7	39.2	1.2	1.2	0.4	574
Kids under 5[6]	45.3	46.7	1.2	45.4	2.1	-0.1	1.3	138
No kids under 5	42.9	41.9	0.4	39.6	0.7	3.3	2.4	1435

Notes:

1. Mean of reported hours on all jobs during the week preceding the May 1985 CPS, unweighted (use of adult sample weights has little effect). Estimated standard errors of CPS hours were less than 0.25 hours for all

categories.
2. Mean of the time-use study respondents' estimated weekly work hours.
3. Mean of diary hours (also from the time-use study) for a synthetic week, which is the sum of the sample means for each day of the week.
4. For the CPS sample, high school grad is exactly 12 years of school completed, college grad is 16 or more years of school completed.
5. Married refers to married with spouse present.
6. For the CPS sample, kids under 5 refers to the presence of any children ages 0-5 years old in the primary family. For the time-use data, kids under 5 refers to the presence of children under 5 years old in the household.
All samples restricted to individuals at least 18 years old who reported positive estimated work hours.
Data sources: *Current Population Survey, May 1985* (ICPSR 8663); *Americans' Use of Time, 1985* (ICPSR 9875).

Table 6: Bias in estimated hours for alternative diary-based measures of hours, By gender and education, 1985

	Work time only (1)	Add breaks and nonwork activities (2)	Add meals at work (3)	Add travel time (4)
All	4.01	3.26	1.97	-2.03
Females	4.89	4.22	3.02	-0.50
School < 12	1.68	1.15	0.05	-3.58
High school grad	5.00	4.34	3.15	-0.35
Some college	3.93	3.38	2.11	-1.57
College grad	8.01	7.36	6.07	2.96
Males	3.13	2.31	0.94	-3.53
School < 12	-3.88	-4.87	-6.41	-11.78
High school grad	2.57	1.79	0.60	-3.42
Some college	3.59	2.89	1.51	-3.58
College grad	5.60	4.81	3.49	-0.90

Notes: See Table 5. Moving from left to right, each column uses a more inclusive measure of work hours from the time diary; hence bias estimates decrease.

Data source: *Americans' Use of Time, 1985* (ICPSR 9875).

Table 7: Predicted hours bias using 1985 time diary gaps

	CES comparable[1]		Full CPS sample[2]	
	CPS estimates[3]	Time study estimates[4]	CPS estimates[3]	Time study estimates[4]
Change gender and schooling				
1965	0.99	0.25	1.67	0.88
1970	1.32	0.65	2.05	1.34
1975	1.93	1.32	2.61	1.96
1980	2.34	1.76	2.97	2.36
1985	2.79	2.23	3.33	2.73
1991	3.05	2.50	3.60	3.01
Schooling effect (gender composition constant)				
1965	1.17	0.64	1.85	1.26
1970	1.44	0.93	2.18	1.62
1975	2.00	1.50	2.69	2.14
1980	2.38	1.86	3.01	2.45
1985	2.81	2.28	3.35	2.77
1991	3.05	2.50	3.60	3.01
Gender effect (schooling composition constant)				
1965	2.93	2.30	3.49	2.81
1970	2.95	2.36	3.49	2.84
1975	2.97	2.40	3.51	2.89
1980	3.01	2.45	3.55	2.96
1985	3.03	2.48	3.57	2.98
1991	3.05	2.50	3.60	3.01

Notes:
Bias is measured as the predicted difference between reported and actual hours. The prediction assigns the hours bias calculated from 1985 diary data and CPS for each gender-education cell and year-specific gender and education weights (see text).
1. CES comparable uses sample restricted to production and non-supervisory employees of private nonagricultural businesses.
2. Full CPS sample is all individuals 16 years and older who reported positive hours worked.
3. CPS estimates report the difference between mean CPS reported weekly hours and mean diary hours for synthetic workweeks.
4. Time study estimates report the difference between time study respondents' mean estimated weekly hours and their mean diary hours for synthetic workweeks.
Data sources: For 1965, Mare-Winship sample of March CPS; for all other years, public use samples of May CPS. Time diary data from *Americans' Use of Time, 1985* (ICPSR 9875).

Table 8: Hours overestimation in CPS relative to 1965, 1975, and 1985 time diaries

	CPS mean	Time diary mean	SE of time diary mean	Difference: CPS - diary	Diary data N
1965					
All	41.2	41.8	0.7	-0.6	854
Females	36.0	35.3	1.2	0.6	339
School < 12	35.0	32.5	2.4	2.6	101
High school grad	36.5	36.2	1.6	0.3	143
Some college	34.3	38.5	2.7	-4.2	42
College grad	39.0	36.3	3.0	2.7	53
Males	44.0	46.1	0.9	-2.1	515
School < 12	42.6	45.8	1.5	-3.2	179
High school grad	45.2	47.2	1.5	-2.0	153
Some college	42.9	45.9	2.0	-3.0	84
College grad	46.9	44.2	2.3	2.7	99
1975					
All	39.5	45.6	1.1	-6.0	546
Females	34.3	38.8	1.9	-4.5	223
School < 12	32.9	34.1	5.3	-1.2	48
High school grad	34.8	30.0	2.5	4.8	108
Some college	33.0	38.3	5.1	-5.3	31
College grad	36.9	29.6	6.3	7.3	36
Males	43.0	49.9	1.3	-6.9	323
School < 12	41.0	47.2	2.9	-6.2	75
High school grad	44.3	38.8	2.1	5.5	111
Some college	42.0	38.3	4.1	3.7	51
College grad	44.9	50.4	2.0	-5.5	86
1985					
All	39.9	35.9	0.5	3.9	3065
Females	35.5	31.6	0.6	3.9	1492
School < 12	33.0	32.9	2.0	0.1	147
High school grad	35.5	31.7	1.0	3.8	613
Some college	34.8	32.5	1.5	2.3	262
College grad	38.2	28.7	1.3	9.4	319
Males	43.3	40.0	0.7	3.3	1573
School < 12	40.2	43.3	2.1	-3.1	173
High school grad	43.9	40.0	1.1	3.9	592
Some college	42.9	39.7	1.7	3.1	232
College grad	45.3	39.9	1.3	5.4	401

Notes: See Table 5.
Data sources: CPS: For 1965, Mare-Winship sample of March CPS; for all other years, public use samples of May CPS. Time diary: *Americans' Use of Time, 1965-1966, and Time Use in Economic and Social Accounts, 1975-1976: Merged Data* (ICPSR 7796); *Americans' Use of Time, 1985* (ICPSR 9875).

Table 9: Mean weekly hours spent on meals at work and commute time, time study data

	1965		1975		1985	
	Meals	Travel	Meals	Travel	Meals	Travel
All	1.78	4.25	1.87	5.89	1.29	4.00
Females	1.63	3.42	2.03	4.23	1.20	3.52
School < 12	1.69	3.31	1.43	3.86	1.10	3.63
High school grad	1.53	3.56	1.69	2.53	1.19	3.50
Some college	1.47	3.55	1.51	4.23	1.27	3.68
College grad	1.80	3.34	1.36	2.37	1.29	3.11
Males	1.89	4.83	1.68	7.24	1.37	4.47
School < 12	1.93	4.66	2.05	4.98	1.54	5.37
High school grad	1.96	4.66	1.47	3.91	1.19	4.02
Some college	1.84	4.67	1.61	3.59	1.38	5.09
College grad	1.76	5.27	1.69	7.95	1.32	4.39

Sources: *Americans' Use of Time, 1965-1966, and Time Use in Economic and Social Accounts, 1975-1976: Merged Data* (ICPSR 7796); *Americans' Use of Time, 1985* (ICPSR 9875).

Figure 1
Alternative estimates of weekly hours, nonagricultural workers, 1948-1996

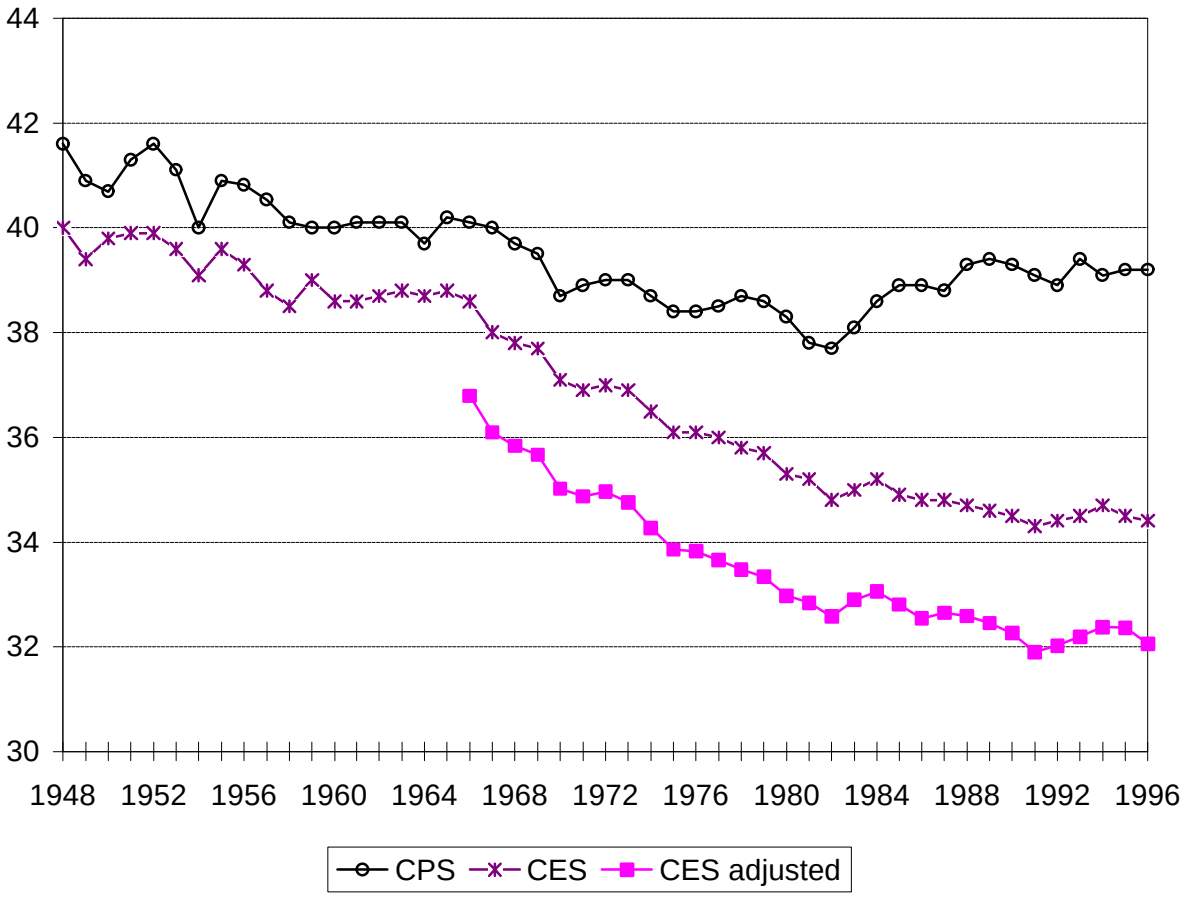

Figure 2
Difference, CPS-CES weekly hours

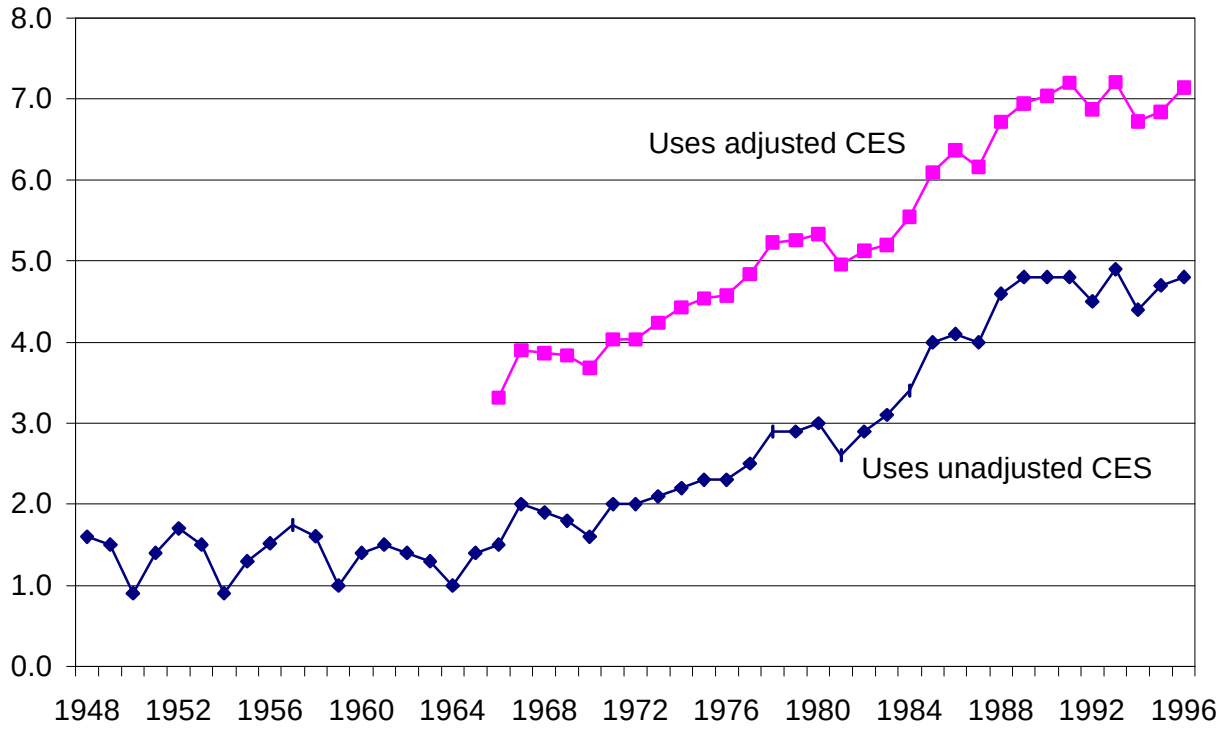

Figure 3
Three estimates of average weekly hours

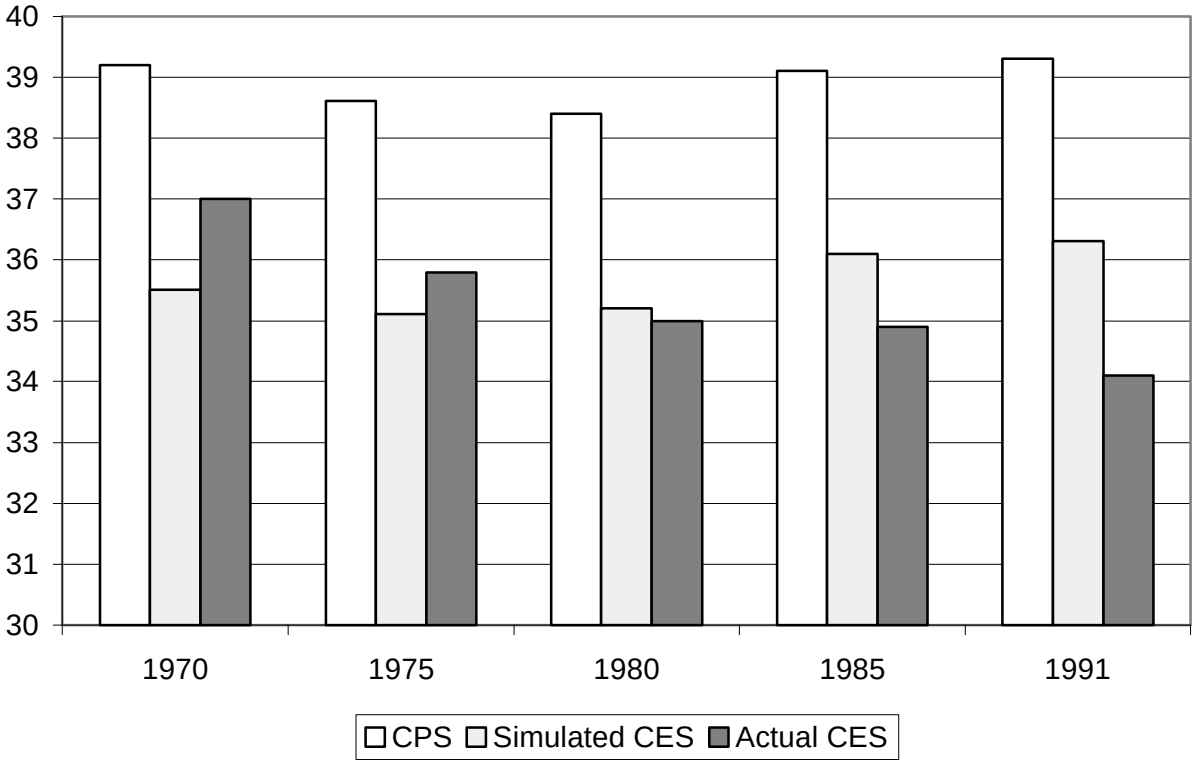

Figure 4
Cumulative distribution of weekly hours, excluding 40, males

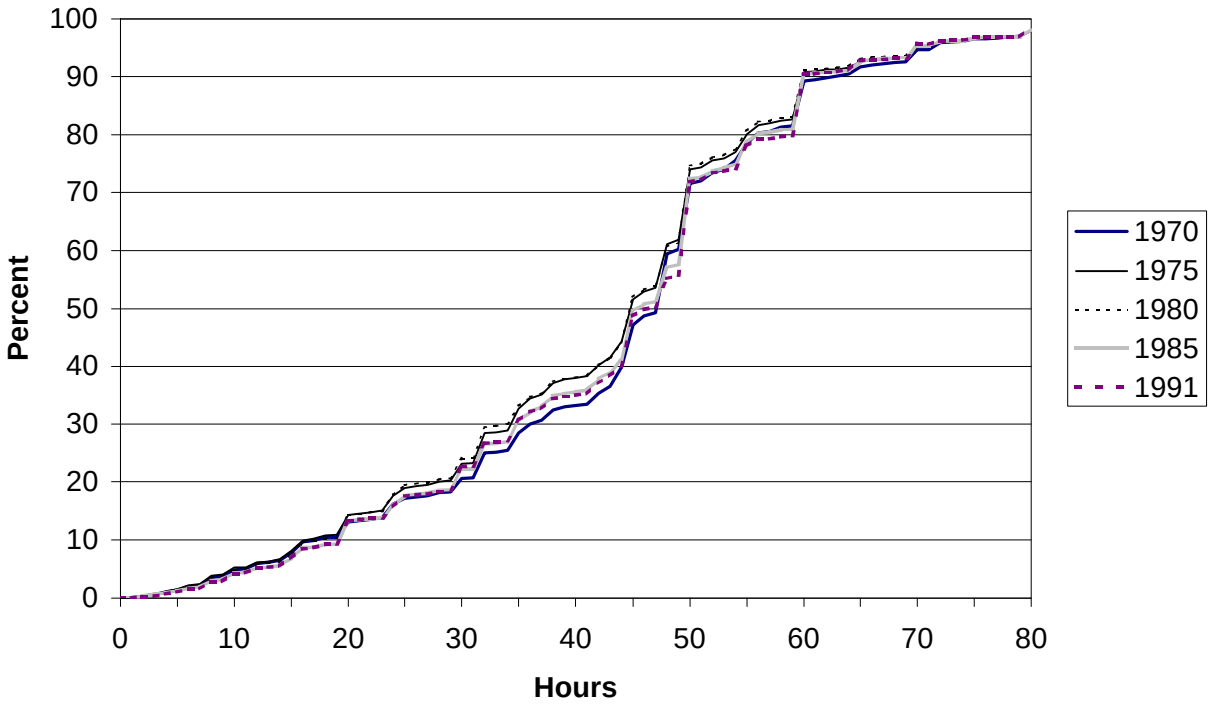

Figure 5
Cumulative distribution of weekly hours, excluding 40, females