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US hours at work☆

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HIGHLIGHTS

- We construct a novel measure of US hours worked using data on persons at work.
- Our measure is an alternative to estimates using data on all employed persons.
- Focus on persons at work eliminates the need for hard to obtain data on weeks worked.
- Our methodology allows us to disaggregate hours by subgroups of the population.

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ABSTRACT

We construct quarterly US average hours worked using Current Population Survey data on *employed persons at work* and their *actual hours worked*. Our methodology can be applied to different demographic groups, providing researchers with readily available long-run series of hours.

1. Introduction

We construct a quarterly measure of hours for the US economy since 1947, using the Current Population Survey (CPS) of the Bureau of Labor Statistics (BLS). This paper describes our methodology for constructing average hours worked – defined as total hours at work per working-age person – so as to allow other researchers to apply it in their analyses. To illustrate how our methodology can be applied to different subgroups of the working-age population, we construct hours worked by gender and age group.

Our measure of hours is novel since it uses data on *employed persons at work* and their *actual hours worked*. Alternate measures of hours in the literature use data on all employed persons and adjust hours per employed with aggregate estimates of weeks worked (e.g., Bick et al., forthcoming). By restricting the pool of employed to persons who were at work, our measure of hours eliminates the need for weeks worked. This is useful, since data on weeks worked are hard to come by, and only available annually.[1] As a result, our methodology provides the only direct measure of quarterly hours worked. Moreover, since it is based on actual rather than usual hours, our measure of US average hours worked enables accurately measuring labor productivity.[2]

The BLS has two independent surveys which allow for measuring hours: the household survey (CPS) and the payroll survey (Current Establishment Survey, CES). While differences exist between the surveys, recent academic papers provide support for using the

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[1] Weeks are not available in the CPS monthly samples, but only in the Annual Social and Economic Supplement of the CPS. The questionnaire asks: *How many weeks did this person work even for a few hours?* Respondents are prompted to includes paid vacation and sick leave as work, so weeks paid are measured.

[2] Wingender (2018) also stresses the importance of actual hours worked for productivity measurements. Baum-Snow and Neal (2009) discuss reporting errors for usual hours in the US Census and American Community Survey. They argue the CPS collects better data, via interviewers who help clarify questions.

CPS. For example, Perry (2005, p. 1) argues that "overwhelming preference for the payroll data" is not justified, and Hall (2008, p. 241) concludes that "the household survey is the only source of data that supports a clean set of measures of hours and employment."

That said, the BLS constructs a quarterly measure of total US hours worked based primarily on the CES and augmented with CPS and other data, as necessary.[3] These US hours series are provided to the Organisation for Economic Co-operation and Development (OECD) and the Conference Board, and have been used in previous academic research (e.g., Prescott, 2002; Rogerson, 2006). This computation of total hours is quite involved – e.g., it requires converting CES hours paid to hours worked, adding hours for groups of the population not covered by the CES – and does not allow disaggregating the hours by subgroups of the total population. In comparison, our methodology of constructing hours worked based on the CPS allows researchers to easily construct hours worked for different demographic groups.[4]

2. US total hours at work

We define US average hours worked as total hours at work per noninstitutional working-age population. In this section, we describe how we construct our series.

Hours worked and population data are based on the Current Population Survey (CPS). The CPS collects information on labor market activities during one week – *the reference week* – each month. The CPS questionnaire asks: *How many hours did this person actually work last week at all jobs?* Persons temporarily absent from their job or business are classified as employed, not at work last week.[5] Aggregating this information, the US Census and BLS report monthly data on: (i) employed persons at work, and (ii) their average actual weekly hours worked since July 1947. We label these data BLS-CPS and use them to construct total civilian hours worked. The Appendix contains detailed data sources.

We convert the monthly observations on persons at work and their actual hours into quarterly averages, as shown in Section 2.1. We seasonally adjust the resulting data using the US Census X12 algorithm. Total quarterly civilian hours worked at an annual rate equal employed persons at work times average actual weekly hours worked times 52.

Our measure of total hours worked includes both civilian and military hours. Since CPS hours data do not cover the military, we estimate their hours using total military personnel worldwide from the Department of Defence and a 40-hour workweek. Similarly, our measure of the working-age population includes both civilians and military personnel. This allows our total hours worked to be used for measuring labor productivity – gross domestic product per hour worked – as in Cociuba et al. (2012).[6]

Fig. 1 plots our quarterly measure of US average hours worked, labeled BLS-CPS. Americans of working-age (16–64) worked 1400 hours annualized (or 26.9 hours per week) in the third quarter of 1947, and 1462 annualized (or 28.1 hours per week) in the fourth quarter of 2017. This seemingly small change hides a sizable increase in average hours worked from the early 1980s to the 2000s, which largely leveled off during the Great Recession. Excluding the military, civilian hours were about 0.9% lower.

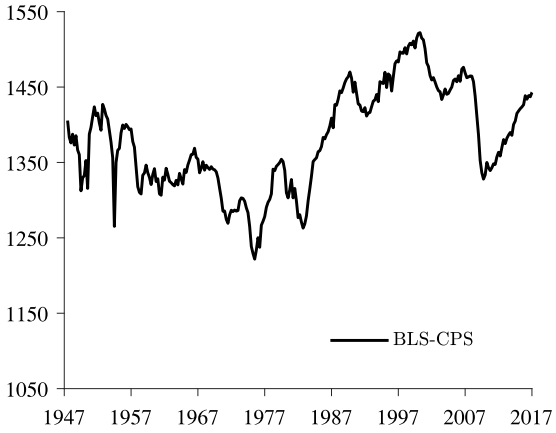

Fig. 1. US Average Hours Worked at Annual Rate, 1947-III to 2017-IV. Notes: Average hours worked are total hours worked per working-age population. Both hours and population cover civilians and military personnel. The Appendix provides detailed data sources.

2.1. Eliminating outliers from monthly hours worked data

The CPS reference week is typically the 7-day period, Sunday through Saturday, that includes the 12th of the month.[7] Occasionally, the CPS measure of actual hours worked drops at random, for example when a holiday falls in the reference week. When converting the CPS hours data into a quarterly average, we eliminate outliers as follows.

Let m_i with $i \in \{1, 2, 3\}$ denote monthly hours data in a quarter. Let $\overline{m} \equiv \frac{m_1+m_2+m_3}{3}$ and let $d \equiv \frac{\min\{m_1,m_2,m_3\}}{\overline{m}}$. We define as an outlier any monthly hours observation that is at least 3% lower than the average of the three months in the quarter. The quarterly average, call it q, eliminates outliers, as shown in Eq. (1).

$$q \equiv \begin{cases} \dfrac{3 \cdot \overline{m} - \min\{m_1, m_2, m_3\}}{2} & \text{if } d < 0.97 \\ \overline{m} & \text{if } d \geq 0.97 \end{cases} \tag{1}$$

Applying this procedure to actual hours worked from the US Census and BLS, we identify as outliers all of the September months when Labor Day fell during the reference week (1948–1951, 1953, 1954, 1959, 1964, 1970, 1981, 1987, 1992, 1998, 2009, 2015), and three instances when Good Friday fell during the reference week (April 1968, 1974, 1979). When calculating quarterly hours worked, these outliers are eliminated as shown in Eq. (1), to reduce the impact of holidays randomly falling in the reference week.

By design, the CPS survey seeks to minimize the overlap of the reference week with statutory holidays. A byproduct of this choice is that using the CPS reference week to extrapolate hours for the non-reference weeks (which may contain statutory holidays) introduces an upward bias in estimates of monthly, quarterly or annual hours worked. This upward bias is documented by Frazis and Stewart (2004), and discussed in Eldridge (2004). While our methodology does not address this bias, to the extent that the number of statutory holidays is stable from year to year, our estimates of hours worked are comparable over time and suitable for business cycle analysis and productivity measurement.

[3] This payroll-based series is available at: https://www.bls.gov/lpc/tables.htm. Detailed methodology about the construction of these hours is available at: https://www.bls.gov/lpc/lpcmethods.pdf.

[4] Frazis and Stewart (2010) document that weekly hours collected in the CPS and CES surveys have diverged since the mid-1980s. While the jury is still out as to why, our paper does not address this issue.

[5] Temporary absences from work in the CPS are due to vacation, illness, bad weather, childcare problems, maternity or paternity leave, labor-management dispute, job training, or other family or personal reasons.

[6] The gross domestic product measure provided by the Bureau of Economic Analysis includes on the cost side the salaries to military personnel worldwide, and not only the salaries of the military personnel within US borders. This justifies adding the hours of military personnel worldwide to total hours.

[7] The reference week in earlier surveys – in the late 1940s and early 1950s – did not always include the 12th of the month. Moreover, the November and December reference periods are sometimes moved one week earlier to avoid holiday periods (as noted in the CPS overview at: https://www.bls.gov/cps/).