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ABSTRACT

Effort at Work and Worker Well-Being in the US*

This paper analyses detailed 24-hour diary data from the United States to provide evidence on the relationship between workers' effort and well-being while at work. In doing so, we first measure workers' effort in terms of its timing, its nature, and its composition. Second, we link these three measures of worker effort with data on instantaneous well-being while at work. We find that the lower the number of on-the-job leisure episodes, and the more time workers spend working until on-the-job-leisure, the higher the levels of stress during their work tasks. A back-of-the-envelope calculation based on time use data over the last 4 decades indicates that an increase in the length of time uninterrupted by leisure, observed in the US, is related to increases in worker stress. In analyzing workers' effort and stress during market work activities we contribute to the underdeveloped literature on the determinants of worker happiness while at work, positing the structure of work as an affective factor.

JEL Classification: D60, J22, J24
Keywords: time-use, effort at work, stress

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1. Introduction

In this paper we analyze effort at work and well-being while at work. The analysis of worker wellbeing/happiness is important and is positively related to worker and firm productivity. Bryson, Forth and Stokes (2017) and Bockerman and Ilmakunnas (2012) show positive effects from retrospective job satisfaction on workplace performance. Recent findings from the lab show that a worker's instantaneous well-being while at work is also positively correlated with productivity (Oswald, Proto and Sgroi 2015). But despite prior analyses of worker happiness, the mechanisms underlying well-being while at work in real-business settings remain an open question in the literature. Here we identify one such mechanism, analysing the relationship between the structure of work tasks, aimed at measuring worker effort, on the one hand, and worker instantaneous well-being, on the other.

We analyze the structure of work in the US, in three dimensions: amount of on-the-job leisure, number of on-the-job leisure episodes, and the length of uninterrupted time working until leisure. We link these three measures to the well-being of workers, measured through instantaneous well-being data, during their work episodes. To that end, we use data from the 2010, 2012, and 2013 Well-Being Module (WBM) of the American Time Use Survey (ATUS) and compute the three measures of worker effort, together with the instantaneous well-being during paid work episodes. The nature of the data allows us to identify workers on their working days, and focus on their work episodes and the well-being experienced during those episodes. This makes this dataset especially useful for the analysis of wellbeing while at work. Furthermore, the fact that there is information at the episode level allows us to create the indicators of work effort and link them with worker wellbeing.

We find that the frequency of on-the-job leisure - that is, the number of on-the-job leisure episodes and the uninterrupted time spent working until leisure - appears to be a key determinant of instantaneous well-being during work activities in the US. In particular, decreases in on-the-job leisure episodes and increases in the uninterrupted time spent working are both associated with increases in the stress workers report during their paid work activities. Furthermore, we show that in the period 1980-2010 the uninterrupted time working has increased by 7% in the US. A back-of-the-envelope calculation based on these results indicates that due to the increase in uninterrupted time, the stress levels

of workers in the US have increased by 2% of a standard deviation. These results point towards a decrease in the well-being of US workers while doing their work, in comparison to three decades ago.

Our contribution to the literature is twofold. First, we contribute to the analysis of worker wellbeing, directly analyzing the wellbeing of workers while at work. Prior evidence has looked at work/job satisfaction, and the happiness of workers, although no previous analysis has directly analyzed wellbeing while at work. The only exception is Oswald, Proto and Sgroi (2015), who show (in an experimental setting) that increased happiness makes people more productive while at work. This evidence is based on a classic piece-rate setting, with randomly selected individuals, but no external validity has been provided and the findings are applicable only to the lab setting. How firm-level interventions that increase well-being while at work play out in real-business settings remains an open question in the literature. We focus on the structure of work tasks as a factor affecting workers' instantaneous utility. Our results are based on a national-scale survey, and thus are based on representative data that covers all industries and occupations, which makes our results of general interest. Furthermore, Layard et al. (2018) shows that the quality of work is in the second position as the most relevant factors accounting for the inequality of wellbeing in the population. Thus, the analysis of work characteristics is important, and here we show that the structure of work tasks affect workers' instantaneous utility (e.g., wellbeing).

Second, our results shed light on the evolution of workers' wellbeing in the US in recent decades. Decreases in instantaneous well-being during this period are consistent with prior studies documenting decreases in job satisfaction during the 1990s and early 2000s, as in Blanchflower and Oswald (1999), who showed that job satisfaction has declined over time in the United States, between the 1970s and the mid-1990s. These results are consistent with Kaplan and Schulhofer-Wohl (2018), who show that in the period 1950-2010, work has become more stressful – for men — because of changes in the distribution of occupations during the period. Here we examine occupations in depth, to uncover the structure of work as a channel affecting the well-being of workers.

The remainder of the manuscript is organized as follows. Section 2 presents a review of the Literature on effort at work and workers' wellbeing. Section 3 describes the data, and Section 4 presents the main results. Section 5 sets out our main conclusions.

2. Background

Effort at work is routinely measured as the number of hours worked, which are normally gathered from nationally representative labour surveys asking respondents about annual/monthly/weekly hours worked. However, this measure can be only an approximation of hours actually worked and may miss important information on what workers do while on the job. For instance, Hamermesh (1990) analyses the use of time on the job, considering scheduled and unscheduled breaks, finding positive correlations of this non-productive time with earnings. Furthermore, the labour supply literature has extended the traditional labour supply model of work-leisure choice to explicitly account for on-the-job leisure to get a better picture of actual hours of work. Dickinson (1999) augments the neoclassical labor supply model with consumption of on-the-job leisure to show that substitution between on- and off-the-job leisure can reconcile the negative compensated wage elasticity estimates often observed in empirical studies with the positive compensated wage elasticity predicted by classical labor supply theory.

More recently, studies have established non-work while at work as a measure of work effort. Burda, Genadeck and Hamermesh (2020) define work effort by using non-work time at the workplace, in the American Time Use Survey (ATUS), where non-work might be interpreted as 'loafing', 'shirking' or 'goofing off on the job'. Their measure is a measure of not working while at work and is what the respondent believes it to be. In the same way, Gimenez-Nadal and Sevilla (2022) define three measures of on-the-job leisure (i.e., non-work while at work) to measure the work effort of UK workers between the 1980s and the 2010s, linking its evolution to trends in automation and the routinization of jobs (e.g., routine biased technological change). The fact that these authors use time use data allows them to analyze what workers do while they are at work, which may represent a good proxy for work effort and compliment work effort measures based on weekly, monthly, or annual hours of work.

Regarding the literature on worker well-being, a long tradition in economics has analyzed the correlative factors. Analyses of life satisfaction or happiness of workers, or job satisfaction, are used to measure workers' well-being, although job satisfaction is preferred in the current context.[2] Economists mostly rely on Clark's (1996) utility theory

[2] Life satisfaction and happiness are studied to complement monetary indicators, such as income per capita, while job satisfaction is measured to complement hourly wage as a purely monetary and objective measure of work (Bleys, 2012; Clark, 2018).

to assess job satisfaction, which defines job satisfaction as the utility derived from the combination of wages and working hours, and a range of other job characteristics. Several factors have been found to be correlated with job satisfaction. Wage is observed to be positively correlated with job satisfaction (Easterlin, 1995: Clark et al., 2008), and the number of working hours a job requires has a non-linear relation to job satisfaction (Clark, 1996).

Other job characteristics found to be associated with job satisfaction include company provision of additional services or fringe benefits (Krumbiegel et al., 2018; Erro-Garcés and Ferreira, 2019), intrinsic rewards, such as promotion opportunities, job content, and autonomy (Herzberg, 1987; García-Mainar and Montuenga-Gómez, 2020; Wen et al., 2019), and contextual characteristics, such as the size of the firm and the working environment, including temperature and noise at the workplace (Bóo et al., 2010; Razafindrakoto and Roubaud, 2013; Erro Garcés and Ferreira, 2019). Furthermore, job satisfaction typically follows a U-shaped relationship with age, decreases with the number of children and the education level of workers, and is positively related to marital status, health conditions, and being female (Clark, 1996,1997; Clark et al., 1996; Sousa-Poza and Sousa-Poza, 2000; van Praag et al., 2003; Izvercian et al., 2016).

The analysis of the well-being of workers is important, as it is related to worker productivity, although the literature is scant in this aspect and economists still know relatively little about the causal linkages between these two variables. Edmands (2012) finds that levels of job satisfaction predict future stock market performance. Bockerman and Ilmakunnas (2012) show, in longitudinal European data, that an increase in the measure of job satisfaction by one within-plant standard deviation increases value-added per hours worked in manufacturing by 6.6%. Oswald, Proto and Sgroi (2015) showed that happiness makes people more productive in an experimental setting.

3. Data and variables

For the analysis of how workers feel during their market work activities, we use information on instantaneous well-being from the 2010, 2012, and 2013 ATUS Well-being Modules (WBM). The ATUS data provides us with socioeconomic variables about respondents, but also with information on individual time use, based on diaries, where respondents report their activities during the 24 hours of the day, from 4 am to 4 am of

the next day. Time use diaries have become the gold standard in the analysis of worker daily behavior (Aguiar and Hurst, 2007; Gimenez-Nadal and Sevilla, 2012; Guryan, Hurst and Kearney, 2008).[3]

The ATUS Well-being modules were fielded from January through December in each year. Diaries are divided into episodes where the respondent records a main activity and, in some surveys, additional information, such as whether the activity was done in the company of another individual, and where the activity took place.[4] The ATUS WBM provides a unique opportunity to analyze worker well-being during market work activities, as it uses the Day Reconstruction Method by which respondents are asked to fill out a diary summarizing episodes of activities for the selected day, and then are asked about their feelings while doing the activities (Kahneman et al. 2004).[5] In the ATUS WBM, one diary is completed by a given respondent on selected days of the week, and then respondents are asked to rank three randomly selected episodes lasting at least five minutes, describing the extent to which they were happy, stressed, sad, tired, or felt pain during the activity. Values are recorded on a 7-point scale, with "0" indicating that the respondent "did not experience the feeling at all", and "6" indicating that a "feeling was extremely strong".

We follow the literature and restrict the sample to non-retired/non-student individuals between the ages of 21 and 65, inclusive (Aguiar and Hurst, 2007; Gimenez-Nadal and Sevilla, 2012,2022), who devote at least one hour to market work activities during the diary day excluding commuting (i.e., workers on their working days), and report to work full-time.[6] We select episodes in the diary in which the respondent is at work, i.e.,

[3] The ATUS is considered the official time use survey of the US. It is sponsored by the Bureau of Labor Statistics, and conducted as part of the Current Population Survey (CPS) by the US Census Bureau. The ATUS data is part of the Integrated Public Use Microdata Series (IPUMS) of the Institute for Social Research and Data Innovation of the University of Minnesota (Hofferth et al., 2015).

4 For a methodological review of time use surveys see Gimenez-Nadal and Molina (2022).

[5] The type of well-being that is measured with these questions refers to experienced utility (Kahneman, Wakker and Sarin, 1997; Kahneman, 2000; Kahneman et al., 2004; Kahneman and Krueger, 2006), defined as the continuous hedonic flow of pleasure or pain, and represents a measure of subjective well-being that assesses the emotional, affective components of happiness. We refer to these measures as "instantaneous well-being".

[6]Around 1% of workers who report positive market work spend less than 60 minutes in work during the diary day.

episodes between the times in which the respondent first starts to work and the time in which the respondent records stopping work.

Regarding the indicators of effort at work, *total time at work* is defined as the time from the moment the respondent first begins work until the moment in which the respondent records the last work episode during the diary day. From this time period, we compute the variable *consumption of on-the-job leisure*, which measures the total time spent in a different activity from paid work during the time the respondent is at work (i.e., time spent not working while on the job).[7] We follow Hamermesh (1990) and divide the consumption of on-the-job leisure into leisure-related activities and other non-work activities. Leisure-related activities include social leisure, active leisure, such as going to the gym, passive leisure such as reading and watching TV, and meals at work. Other non-work activities include housework-related activities, personal care activities, and commuting (Table A1 in the Appendix provides a detailed description of all activities included in each of the categories of on-the-job leisure).

The frequency of on-the-job leisure has only been analyzed by Gimenez-Nadal and Sevilla (2022). We construct two other indicators of work effort: *number of on-the-job leisure episodes* and *working time until consuming on-the-job leisure*. A higher number of on-the-job leisure episodes indicates a higher frequency of on-the-job leisure, whereas a longer uninterrupted working time indicates a lower frequency of on-the-job leisure. This latter indicator is computed by dividing the total amount of time spent working by the number of work spells in the diary.

Table 1 shows an example of a working day from a randomly chosen worker in the ATUS. The diarist spent 8 hours and 40 minutes at work, starting work at 8:00 am, when the first episode of paid work was recorded in the diary, and finishing at 4:40 pm where the last episode of paid work was recorded in the diary. Out of the 8 hours and 40 minutes that the respondent spent at work, 7 hours and 30 minutes were spent working. There were 3 work spells of 3 hours, 2 hours and 10 minutes, and 2 hours and 20 minutes,

[7] As argued by Burda, Genadek and Hamermesh (2020), "an important question is what reported non-work actually represents. This is a measure of not working while at work and is what the respondent believes it to be, just as reported hours of work in the household surveys underlying the immense literature on labour supply represent what respondents believe their work time to be. Unlike recall about past weekly hours in those surveys, non-work time in the ATUS is specifically limited to and anchored by the time an individual spends at the workplace on the randomly selected diary day. These data are based on one-day recall, and errors should thus be fewer than those in the one-week recall of hours of work that are used in most labour force surveys."

respectively. The first work spell starts at 8:00 am and lasts until 11:00 am. From 11:00 am to 11:20 am the respondent records having a snack, followed by relax/do nothing from 11:20 am to 12:00 pm. The respondent goes back to work at 12:00 pm, finishing this second work spell at 2:10 to have a lunch break. The third work spell starts at 2:20 pm and lasts until 4:40 pm.

The consumption of on-the-job leisure is 1 hour and 10 minutes. Out of this time, the respondent spent 40 minutes in leisure activities (relax/do nothing), while the remaining 30 minutes were spent in meals at work. There are two on-the-job leisure episodes during the 1 hour and 10 minutes of on-the-job leisure. A first episode of on-the-job leisure between 11:00 and 12:00, with one passive leisure activity and a meal at work, and a second on-the-job leisure episode between 14:10 and 14:20 with a meal at work. Similarly, the respondent works for an average of two and a half hours until consuming on-the-job leisure, which is calculated by dividing the 7 hours and 30 minutes that the respondent is working over the 3 work spells recorded in the diary.

Table 2 and Figure 1 show the consumption and frequency of on-the-job leisure for our main sample of full-time workers. Workers spend about 9 hours and 55 minutes at work, from which they devote 8 hours and 38 hours working and 1 hour and 17 minutes (1.29 hours) in non-work activities (on-the-job leisure activities). From the total consumption of on-the-job leisure, 30 per cent are meal-related activities, 28 percent is taken up by other non-work activities (mostly housework activities), and 9 and 15 per cent is taken up by social and passive leisure activities, respectively.

Figure 1 shows the percentage of workers in our sample who are either working or at leisure, for every hour of the diary day (see Table A2 for all the values, measured as the percentage of workers out of the total number of workers).[8] For example, at 10 a.m. there are around 87 per cent of American full-time workers at work, 80 per cent working and 7 per cent at leisure. The proportion of workers who are working begins to increase from about 6 a.m., reaching a maximum of 75-80 per cent at around 11 a.m., with a decrease around 12 p.m. - perhaps a break for lunch - and an increase around 2 p.m., and gradually decreasing again from about 2 p.m. onwards. The consumption of on-the-job leisure begins to increase after 8 a.m., reaching about 10 per cent of workers at right before 12

[8] The time window considered for this graph is 15 minutes.

p.m. and peaking between 11:30 am and 1 p.m. After 1 p.m., the proportion of workers at leisure gradually decreases.

For the analysis of well-being at work, we restrict the analysis to work episodes containing well-being information. There are 1,069 work episodes with information on the five feelings or interest, which corresponds to 959 workers. For those workers, the average happiness level during work activities is 3.99, 2.42 for stress, 2.31 for tiredness, and less than 1 for both pain and sadness. Krueger (2007) documents similar levels of happiness, pain, sadness, stress, and tiredness during market work activities in the US.

When we focus on the indicators of work effort, for the sample of 959 workers, Table 3 shows that the average time at work is 8 hours and 38 minutes, while these workers spend 1 hour and 17 minutes in non-work activities while at work. Furthermore, workers in our sample have 1.56 on-the-job leisure episodes and spend 3 hours and 59 minutes ninterrupted time working until leisure. These figures are consistent with Gimenez-Nadal and Sevilla (2022).

We also define a set of socio-demographic characteristics to account for the observed heterogeneity of individuals. These variables include gender (ref.: male), age, dummy variables for 12 years of education, 13-15 years of education, 16 years of education, and 16+ years of education (ref.: less than 12 years of education), a dummy variable for living in couple/married (ref.: not in couple), the number of children under 18 in the household, and dummy variables for whether the youngest child in the household is less than 3 years or between 3 and 5 years old. Table A3 in the Appendix shows the description of this set of variables. Additionally, we control for the total number of activities reported by the individual in the diary day and the hours worked during the diary day.

Table 3 shows the summary statistics of the socio-demographic characteristics for the sample of 959 workers. Regarding education, 30% of workers have 12 years of education, 23% and 25% have 13-15 years and 16 years, and 15% of the sampled workers have more than 16 years of education. The average age of workers is 39.5 years, and 65% of workers are male, 84% of workers are married/in couple, the number of children under 18 in worker's households is 1.82, while 23% and 18% of workers have the youngest child aged between 0 and 2, and between 3 and 5, respectively. The number of different activities done by workers during their working days is 10.47.

4. Workers' effort and well-being at work

To see the relationship between the consumption and frequency of on-the-job leisure, on the one hand, and worker's instantaneous well-being, on the other, we estimate three different models where we separately control for each indicator of consumption and frequency of leisure.[9] We rely on Random Effects (RE) panel data estimators to account for the multilevel nature of our data in which episodes are nested within individuals (Allison, 2009). Ferrer-i-Carbonell and Frijters (2004) show the importance of controlling for personal unobserved heterogeneity of individuals when analyzing well-being/happiness, and thus we use RE models to control for inter-personal scaling differences in instantaneous well-being measures. This methodology is similar to results obtained with OLS models, when clustering the error term $\varepsilon_{j,i}$ at the individual level, to take into account the scaling effect of individuals when reporting their instant enjoyment (Kahneman and Krueger, 2006). We estimate the following Equation:

$$W_{ij} = \alpha_0 + \alpha_1 E_i + \alpha_2 X_i + \alpha_3 Z_i + \varepsilon_{ij} \quad (1)$$

where "*i*" is therespondent, and *j* refers to the work episode during the diary day. Our dependent variable, W_{ij} , refers to the standardized instantaneous well-being score for respondent *i* in episode *j*. We standardize these scores by subtracting the mean and dividing by the standard deviation (Sacks, Stevenson and Wolfers, 2012). E_i represents one of our three measures of work effort and is measured at the diary level. Our coefficient of interest is α_1, capturing the average number of standard deviation changes in instantaneous well-being associated with a one-unit change in the work effort indicator.

The remaining controls include person-specific socio-demographic characteristics: gender (ref.: male), age, secondary and university education (ref.: primary education), living in couple (ref.: not in couple), the number of children under 18 in the household, and hours worked during the diary day. Additionally, we control for the total number of activities reported by the individual in the diary day. It is important to note that in our regressions we control for the number of hours worked, so that the relationship between the work effort indicators and the feelings reported by workers during market work

[9] We do separate regressions for each on-the-job leisure indicator to avoid problems of multi-colinearity between them. The correlations between the consumption of on-the-job leisure and the number of leisure episodes is 0.48, and is -0.43 for consumption of on-the-job leisure and the uninterrupted working time until leisure, and the correlation between the number of leisure episodes and the uninterrupted working time until leisure is -0.70, respectively.

episodes is net of between-worker differences in market work hours. We also account for differences in scaling across individuals (individuals inherently more optimistic or pessimistic, for example) by including an individual effect in Equation (1), computed as the average in the feelings reported for individual "i" during non-market work activities.

Panels A to C of Table 4 show the results of estimating equation (1) for each of the three indicators (the results for the rest of controls are available upon request). We observe that the frequency of on-the-job leisure, that is, the number of leisure episodes, and the uninterrupted time spent working before leisure, seems to be a key determinant of instantaneous well-being during work activities. A decrease of one on-the-job leisure episode is associated with an increase of 7.7 percent of a standard deviation in stress during work episodes. Furthermore, a one-hour increase in time spent working before leisure is associated with an increase of 4.5 percent of a standard deviation in stress during work episodes. Thus, fewer on-the job leisure episodes and more uninterrupted time working are related to higher levels of stress of workers during their work episodes.

Back-of-the-envelope calculation

We compute the same indicators of on-the-job leisure for a set of time use surveys available in the US.[10] We use data from the 1985, 1992-94, 1998-99, 1999-2001 and 2003-2012 US time diary surveys, and apply the same sample selection criteria as above, computing average values of the three on-the-job leisure episodes – and also for working time – for the last four decades.[11] Table 5 shows the average values of the time working

[10] See Table A4 in the Appendix for a description of the time use surveys used in the analysis of trends.

[11] We apply a similar demographic weighting to maintain the demographic composition of the sample constant (Katz and Murphy, 1992), also used in Aguiar and Hurst (2007) and Giménez-Nadal and Sevilla (2012). We divide the sample into demographic cells defined by five age groups (21–29, 30–39, 40–49, 50–59, 60–65), three education categories (uncompleted secondary or less, completed secondary, above secondary education), two gender categories (male and female), and whether or not there is a child under 18 in the household. We do not create separate cells distinguishing child status for respondents aged sixty to sixty-five due to the small number who have children present in the home at that age. This division yields forty-eight demographic cells for each country. To calculate the constant weights used for our demographic adjustments, we pool together all our time-use data sets for each country and compute the percentage of the population in each demographic cell for each country. Following Katz and Murphy (1992), we use these fixed weights to calculate weighted means for each activity in each year. To that end, we calculate the percentage of men in each demographic cell (according to age range, education, and presence of children), with these percentages summing to one in each country. When pooling the surveys together to compute the percentage of the population in each of our cells, we use the weights provided by the surveys to ensure the data is representative of the total population. We adjust these weights so that each day of the week and each survey are equally represented in the overall sample.

and the three indicators of on-the-job leisure, for each decade, together with the 2010s-1980s difference (Column 5) and the p-value of a t-type test on equal sample averages. We first observe that the time spent working in the US increased by about 21 minutes in the US over this period, from 8 hours and 25 minutes per day to about 8 hours and 46 minutes per day. We find a larger increase in work hours between the 1980s and 1990s, when work hours peaked at 9.22 hours per day, followed by a smooth decrease in work hours in the 2000s and 2010s. These trends are in line with prior analyses using survey data based on questions about normal work hours in a given week. Rogerson and Shimer (2011) document trends in total work hours in the US between 1965 and 2008 (Figure 23), documenting an increase in work hours between the 1980s and 2000s, with a large increase in work hours between the 1980s and the 1990s, followed by a smooth decrease in work hours in the 2000s. Shimer (2009) finds an increase in work hours in the US between 1985 and 1995, followed by a decrease in the 2000-2005 period. Ohaian, Raffo and Rogerson (2008) also document increases in work hours between 1985 and 2004 in the US (Figure 1).

Against the background of increasing working time, the uninterrupted time spent working before leisure increased. Whereas in the 1980s, uninterrupted working time until leisure was around 3 hours and 51 minutes in the US, by the end of the period workers had increased this time by 7% (16 minutes). These results are consistent with results in the UK and may be interpreted as an increase in effort at work resulting from automation.

Following Krueger (2007), we apply a back-of-the-envelope calculation where we take the estimates in Table 4 and multiply them by the increase in uninterrupted working time until leisure in the US, shown in Table 5. We find an increase of 2 per cent of a standard deviation in stress for the US. The underlying assumption is that the effect of on-the-job leisure on worker's instantaneous well-being has remained constant over time, similar to the findings of Kaplan and Schulhofer-Wohl (2018) who showed that in the period 1950-2010 work has become more stressful as a consequence of the changes in the distribution of occupations during this period. Thus, the increase of the uninterrupted time working until leisure has led to an increase in stress for workers.

5. Conclusions

In this paper we analyse effort at work and well-being while at work. We analyze the structure of work tasks in the US, as a measure of worker effort, in three dimensions: amount of on-the-job leisure, number of on-the-job leisure episodes, and the uninterrupted time working until leisure. We find that the frequency of on-the-job leisure, that is, the number of on-the-job leisure episodes and the uninterrupted time spent working before leisure, appears to be an important determinant of instantaneous well-being during work activities. A back-of-the-envelope calculation indicates that, due to the increase in uninterrupted time working in recent decades, the stress levels of workers in the US have increased by 2 percent of a standard deviation.

How firm-level interventions that increase well-being while at work play out in real-world settings remains an open question in the literature, and here we focus on the relationship between the structure of work tasks and workers' instantaneous well-being. The structure of work tasks should be considered by employers in their firm-level interventions, in the sense that they should try to avoid employees working for too long a time before a break for some kind of leisure. This could be achieved through scheduled breaks, where workers would be asked to stop at regular times. This would enhance the well-being of workers, and thus the productivity of firms, consistent with the notion of Hamermesh (1990) that more closely monitoring workers would yield returns to firms. Hamermesh (1990) finds that break time is associated with earnings increases.

The current research presents several limitations. First, the data is a cross-section of individuals, and thus we cannot talk about a causal link between our indicators and the level of well-being at work. Second, the ATUS includes information on three episodes only, which prevents us from doing a more in-depth analysis. For instance, if we had information on all the episodes in the diaries of workers, we could directly compare the duration of market work activities for the same individuals, analysing whether more uninterrupted time working before a break is related to more stress, net of individual personal heterogeneity. In this last instance, the use of the 2014 United Kingdom Time Use Survey, which contains information on the enjoyment of individuals for all episodes in diaries, could be used to perform a more complete analysis of the structure of work.

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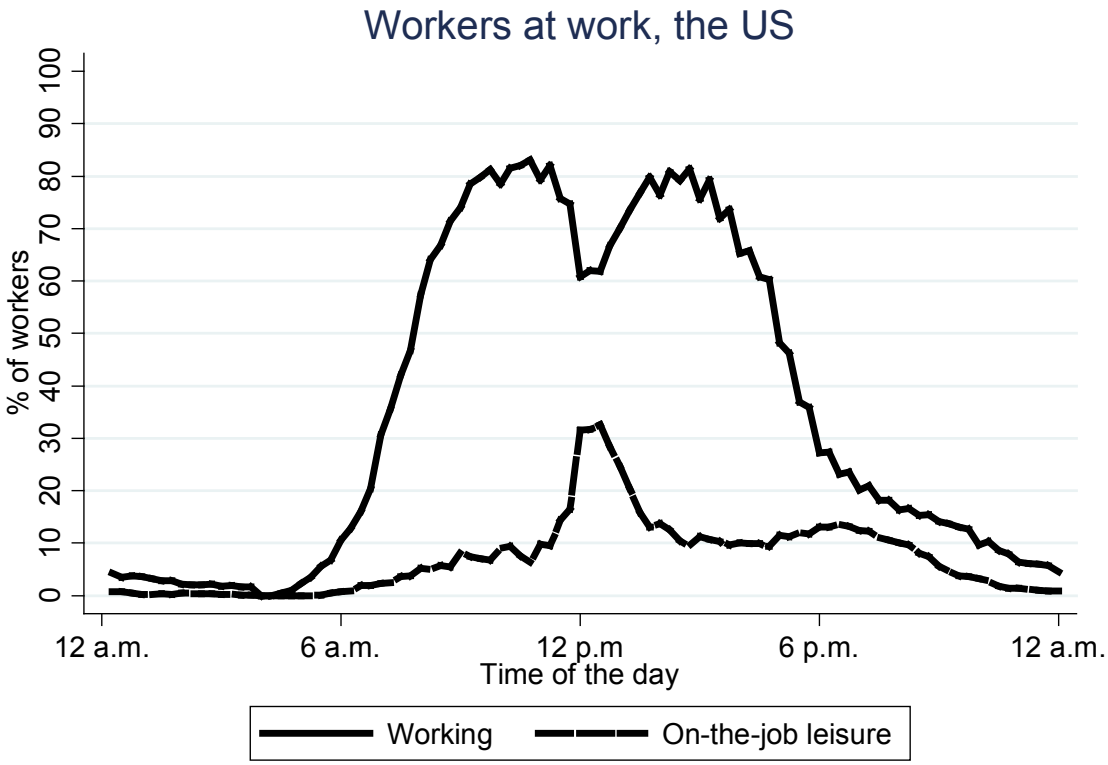
Figure 1. Frequency of on-the-job leisure



Notes: Data come from the 2010, 2012 and 2013 WBM ATUS. The sample are full-time workers aged 21-65. We select working days in which there are at least 60 minutes of market work activities, excluding commuting. See Table A1 in the Appendix for a description of the activities included in the variables of on-the-job leisure. See Table A2 in the Appendix for the percentage of workers in each activity at every point in time that generates this figure.

Table 1. Example of the consumption and frequency of on-the-job leisure

(1)	(2)	(3)	(4)
Start time	**Finish time**	**Activity type**	**Duration**
8:00 a.m.	11:00 a.m.	Paid work	3.00
11:00 a.m.	11:20 a.m.	Meals or snacks in other places	0.33
11:20 a.m.	12:00 p.m.	Relax/do nothing	0.66
12:00 p.m.	2:10 p.m.	Paid work	2.16
2:10 p.m.	2:20 p.m.	Work breaks	0.16
2:02 p.m.	4:40 p.m.	Paid work	2.33
Time at work (hours)			8.20
Time working (hours)			7.50
Consumption of on-the-job leisure (hours)			1.16
Number of on-the-job leisure episodes			2.00
Working time until consuming on-the-job leisure (hours)			2.50

Notes: Example comes from the ATUS 2012. *Time at work* measures the time from the moment a worker begins work until the time a worker stops working in a given diary day. *Time working* measures the time that the worker spends in market work activities while at work. *Consumption of on-the-job leisure* is the amount of time the respondent spends not working while at work. See Table A1 in the Appendix for a description of the activities included in the variables of on-the-job leisure. The *number of on-the-job leisure episodes* is constructed as the number of spells of non-work activities while at work. *Working time until consuming on-the-job leisure* is computed by dividing the total amount of time spent working by the number of work spells in a given diary day.

Table 2. Consumption of on-the-job leisure

	Hours per day	Standard Deviation	% of on-the-job consumption of leisure
Time at work	9.93	(2.91)	
Time working	8.64	(2.53)	
On-the-job consumption of leisure	1.29	(1.69)	
Leisure	0.34	(0.78)	26.59%
Social leisure	0.12	(0.35)	9.49%
Active leisure and exercise	0.03	(0.18)	2.15%
Passive leisure	0.19	(0.50)	14.95%
Meals at work and related	0.45	(0.49)	30.25%
Other non-work	0.36	(0.91)	27.85%
Housework	0.31	(0.82)	23.63%
Personal Care	0.05	(0.25)	3.82%
Commuting	0.15	(0.31)	11.60%
Number of workers	959		

Notes: Data come from the 2010, 2012 and 2013 WBM ATUS. The sample are full-time workers aged 21-65. We select working days in which there are at least 60 minutes of market work activities, excluding commuting. *Time at work* measures the time from the moment a worker begins work until the time a worker stops working in a given diary day. *Time working* measures the time that the worker spends in market work activities while at work. *Consumption of on-the-job leisure* is the amount of time the respondent spends not working while at work. See Table A1 in the Appendix A for a description of the activities included in the variables of on-the-job leisure.

Table 3. Sum stats of variables

	Mean	Std. Dev.
Wellbeing (1,069 episodes)		
Happy	3.99	(1.51)
Pain	0.84	(1.46)
Sad	0.63	(1.26)
Stress	2.42	(1.82)
Tired	2.31	(1.84)
Work effort (958 obs)		
Time at work	9.93	(2.92)
Time working	8.64	(2.54)
Consumpion of on-the-job leisure	1.29	(1.69)
Number of on-the-job leisure episodes	1.56	(1.09)
Working time until consuming on-the-job leisure	3.98	(2.21)
Socio-demographics (959 obs)		
Less than 12 years	0.07	(0.26)
12 years	0.30	(0.46)
13-15 years	0.25	(0.43)
16 years	0.23	(0.42)
16+ years	0.15	(0.36)
Male	0.65	(0.48)
Age	39.50	(9.04)
Married/In couple	0.84	(0.36)
Number children <18	1.82	(0.74)
Age youngest child 0-2	0.23	(0.42)
Age youngest child 3-5	0.18	(0.38)
Number of activities in diary	10.47	(2.98)
Year 2012 (ref.: 2010)	0.34	(0.47)
Year 2013 (ref.: 2010)	0.34	(0.47)

Notes: Standard deviations in parentheses. Data come from the 2010, 2012 and 2013 ATUS Well-being Modules of the US. The sample are full-time workers aged 21-65, and working 60 or more minutes, excluding commuting, in the day of the survey.

Table 4. On-the-job leisure and instantaneous well-being while at work

	Happiness	Pain	Sadness	Stress	Tiredness
	Panel A: Time in breaks				
Consumption of on-the-job leisure	0.016	0.003	-0.006	-0.018	0.029*
	-0.013	-0.011	-0.014	-0.014	-0.017
Personal heterogeneity measure	0.406***	0.566***	0.551***	0.329***	0.353***
	-0.03	-0.025	-0.042	-0.02	-0.018
Work time in diary day	-0.001	0.015	0.014	0.052***	0.046***
	-0.011	-0.009	-0.01	-0.012	-0.011
Constant	-1.919***	-0.227	-0.591	-1.585***	-0.852**
	-0.383	-0.411	-0.437	-0.367	-0.369
N° episodes	1,069	1,069	1,069	1,069	1,069
N° workers	958	958	958	958	958
	Panel B: Number of on-the-job leisure episodes				
Number of on-the-job leisure episodes	0.021	0.001	0.023	-0.077***	0.016
	-0.024	-0.022	-0.029	-0.027	-0.033
Personal heterogeneity measure	0.403***	0.566***	0.551***	0.330***	0.353***
	-0.03	-0.025	-0.042	-0.02	-0.018
Work time in diary day	-0.004	0.015	0.011	0.061***	0.043***
	-0.011	-0.009	-0.01	-0.012	-0.012
Constant	-1.907***	-0.227	-0.585	-1.601***	-0.850**
	-0.383	-0.411	-0.436	-0.369	-0.37
N° episodes	1,069	1,069	1,069	1,069	1,069
N° workers	958	958	958	958	958
	Panel C: Working time until consuming on-the-job leisure				
Working time until consuming on-the-job leisure	-0.012	0.002	0.013	0.046***	-0.011
	-0.015	-0.011	-0.016	-0.015	-0.016
Personal heterogeneity measure	0.403***	0.566***	0.552***	0.330***	0.353***
	-0.03	-0.025	-0.042	-0.02	-0.018
Work time in diary day	0.002	0.014	0.009	0.037***	0.049***
	-0.013	-0.011	-0.011	-0.013	-0.012
Constant	-1.882***	-0.232	-0.622	-1.699***	-0.828**
	-0.384	-0.407	-0.441	-0.367	-0.371
N° episodes	1,069	1,069	1,069	1,069	1,069
N° workers	958	958	958	958	958

Notes: Robust standard errors in parentheses. Data come from the 2010, 2012 and 2013 ATUS Well-being module. The sample are full-time workers aged 21-65. We select working days in which there are at least 60 minutes of market work activities, excluding commuting. *Consumption of on-the-job leisure* is the amount of time the respondent spends not working while at work. See Appendix Table A1 for a description of the activities included in the variables of on-the-job leisure. The *number of on-the-job leisure episodes* is the number of spells of non-work activities while at work. *Working time until consuming on-the-job leisure* is computed by dividing the total amount of time spent working by the number of work spells in a given diary day. We estimate the following OLS regression: $W_{ij} = \alpha_0 + \alpha_1 E_i + +\alpha_2 X_i + \alpha_3 Z_i + \varepsilon_{ij}$, where "i" refers to respondent i, and j refers to the work episode during the diary day. Our dependent variable, Wij refers to the instantaneous well-being score for respondent i in episode j (e.g., happiness, pain, sadness, stress and tiredness). The vector X_i includes person-specific socio-demographic characteristics: gender (ref.: male), age, dummy for secondary and university education (ref.: primary education), dummy for living in couple (ref.: not in couple), the number of children under 18 in the household, the presence of one child under 6 in the household, market work hours during the diary day, and the total number of activities reported by the individual in the diary day. Z_i includes year dummies (ref.: 2010) and occupational dummies *Significant at the 10% level; **significant at the 5% level; ***significant at the 1% level.

Table 5. Consumption and frequency of on-the-job leisure over time; the US

	(1)		(2)		(3)		(4)		(5)	(6)
	Decade 1980s		Decade 1990s		Decade 2000s		Decade 20010s		Diff 2010s-1980s	P-value diff
Time at work	9.71	(0.12)	9.95	(0.06)	9.93	(0.03)	10.00	(0.04)	0.29	(0.01)
Working Time	8.42	(0.09)	9.22	(0.05)	8.62	(0.02)	8.77	(0.04)	0.35	(<0.01)
Consumption of on-the-job leisure	1.29	(0.07)	0.73	(0.03)	1.31	(0.01)	1.24	(0.02)	-0.05	(0.48)
Frequency of on-the-job-leisure										
Number of on-the-job leisure episodes	1.28	(0.04)	0.78	(0.02)	1.43	(0.01)	1.34	(0.01)	0.06	(0.19)
Working time until consuming on-the-job leisure	3.85	(0.08)	5.76	(0.06)	3.90	(0.02)	4.12	(0.03)	0.27	(<0.01)
Number of diaries	840		3,155		23,823		8,535			
Number of workers	840		3,155		23,823		8,535			

Notes: Data come from the 1985, 1992-94, 1998-99, 1999-2001 and 2003-2012 US time diary surveys. The sample are full-time workers aged 21-65. We select working days in which there are at least 60 minutes of market work activities, excluding commuting. *Time at work* measures the time from the moment a worker begins work until the time a worker stops working in a given diary day. *Time working* measures the time that the worker spends in market work activities while at work. *Consumption of on-the-job leisure* is the amount of time the respondent spends not working while at work. See Table A3 in Appendix A for a description of the activities included in the consumption of on-the-job leisure. The *number of on-the-job leisure episodes* is the number of spells of non-work activities while at work. *Working time until consuming on-the-job leisure* is computed by dividing the total amount of time spent working by the number of work spells in a given diary day.

Appendix

Table A1. Definition of on-the-job leisure activities

Commuting	Travel to/from work
Meals at work	meals at work, meals or snacks in other places
Leisure-related activities	
Social leisure	voluntary, civic, organizational act; worship and religion; other public event, venue; restaurant, café, bar, pub; party, social event, gambling; receive or visit friends; voluntary/civic/religious travel
Active leisure	work breaks, leisure & other education or training; pet care (not walk dog); general out-of-home leisure; attend sporting event; cinema, theatre, opera, concert; general sport or exercise; walking; cycling; other outside recreation; gardening/pick mushrooms; walk dogs; general indoor leisure; art or music; knit, crafts or hobbies; no activity, imputed or recorded transport; other travel; no recorded activity
Passive leisure	conversation (in person, phone); games (social & solitary)/other in-home social; correspondence (not e-mail); relax, think, do nothing; read; listen to music or other audio content; listen to radio; watch TV, video, DVD; computer games; e-mail, surf internet, computing; travel to and from work
Other non-work activities	
Personal Care	imputed personal or household care; sleep and naps; imputed sleep; wash, dress, care for self; consume other services
Housework	regular schooling, education; homework; food preparation, cooking; set table, wash/put away dishes; cleaning; laundry, ironing, clothing repair; maintain home/vehicle, including collect fuel; other domestic work; purchase goods; consume personal care services; physical, medical child care; teach, help with homework; read to, talk or play with child; supervise, accompany, other child care; adult care; education travel; child/adult care travel; shop, person/hhld care travel

Notes: Data come from 2010, 2012 and 2013 ATUS WBM.

Table A2. Timing of work activities

Time band	Working	On-the-job leisure	At work	Time band	Working	On-the-job leisure	At work
Time band 1	4.21	0.72	4.93	Time band 49	62.01	31.62	93.63
Time band 2	3.49	0.72	4.21	Time band 50	61.81	32.55	94.35
Time band 3	3.80	0.41	4.21	Time band 51	66.74	28.34	95.07
Time band 4	3.59	0.21	3.80	Time band 52	70.12	24.64	94.76
Time band 5	3.18	0.21	3.39	Time band 53	73.51	20.43	93.94
Time band 6	2.88	0.31	3.18	Time band 54	76.80	15.81	92.61
Time band 7	2.77	0.21	2.98	Time band 55	79.77	13.04	92.81
Time band 8	2.16	0.41	2.57	Time band 56	76.39	13.76	90.14
Time band 9	2.05	0.41	2.46	Time band 57	80.80	12.53	93.33
Time band 10	2.05	0.31	2.36	Time band 58	79.16	10.37	89.53
Time band 11	2.16	0.31	2.46	Time band 59	81.42	9.55	90.97
Time band 12	1.75	0.21	1.95	Time band 60	75.67	11.19	86.86
Time band 13	1.85	0.21	2.05	Time band 61	79.26	10.68	89.94
Time band 14	1.64	0.10	1.75	Time band 62	71.97	10.27	82.24
Time band 15	1.64	0.10	1.75	Time band 63	73.61	9.65	83.27
Time band 16	0.00	0.00	0.00	Time band 64	65.30	10.06	75.36
Time band 17	0.00	0.00	0.00	Time band 65	65.81	9.86	75.67
Time band 18	0.41	0.00	0.41	Time band 66	60.78	9.86	70.64
Time band 19	1.03	0.00	1.03	Time band 67	60.27	9.34	69.61
Time band 20	2.26	0.00	2.26	Time band 68	48.26	11.50	59.75
Time band 21	3.49	0.00	3.49	Time band 69	46.20	11.19	57.39
Time band 22	5.54	0.10	5.65	Time band 70	36.96	12.01	48.97
Time band 23	6.78	0.41	7.19	Time band 71	35.93	11.70	47.64
Time band 24	10.58	0.72	11.29	Time band 72	27.21	13.04	40.25
Time band 25	12.83	0.92	13.76	Time band 73	27.31	13.04	40.35
Time band 26	16.12	1.85	17.97	Time band 74	23.20	13.66	36.86
Time band 27	20.43	1.95	22.38	Time band 75	23.61	13.14	36.76
Time band 28	30.60	2.26	32.85	Time band 76	20.12	12.42	32.55
Time band 29	35.63	2.46	38.09	Time band 77	20.95	12.22	33.16
Time band 30	42.09	3.59	45.69	Time band 78	18.17	10.99	29.16
Time band 31	46.82	3.70	50.51	Time band 79	18.17	10.58	28.75
Time band 32	57.39	5.13	62.53	Time band 80	16.32	10.06	26.39
Time band 33	64.07	5.03	69.10	Time band 81	16.63	9.65	26.28
Time band 34	66.84	5.75	72.59	Time band 82	15.30	8.11	23.41
Time band 35	71.36	5.44	76.80	Time band 83	15.40	7.39	22.79
Time band 36	74.03	8.21	82.24	Time band 84	14.07	5.54	19.61
Time band 37	78.54	7.39	85.93	Time band 85	13.76	4.72	18.48
Time band 38	79.77	6.98	86.76	Time band 86	13.04	3.80	16.84
Time band 39	81.31	6.78	88.09	Time band 87	12.63	3.59	16.22
Time band 40	78.44	8.93	87.37	Time band 88	9.65	3.29	12.94
Time band 41	81.52	9.45	90.97	Time band 89	10.27	2.77	13.04
Time band 42	82.03	7.60	89.63	Time band 90	8.62	1.75	10.37
Time band 43	83.06	6.26	89.32	Time band 91	7.91	1.34	9.24
Time band 44	79.26	9.75	89.01	Time band 92	6.37	1.44	7.80
Time band 45	82.03	9.55	91.58	Time band 93	6.16	1.23	7.39
Time band 46	75.77	14.37	90.14	Time band 94	5.96	1.03	6.98
Time band 47	74.64	16.43	91.07	Time band 95	5.75	0.92	6.67
Time band 48	60.78	31.52	92.30	Time band 96	4.52	0.82	5.34

Notes: Data come from 2010, 2012 and 2013 ATUS WBM.

Table A3. Definition of demographic variables

	Description
Education	Coded from peeduca: what is the highest level of school you have completed or the highest degree you have received?"
Less than 12 years	Dummy variable: value "1" for the categories 31 "less than 1st grade", 32 "1st, 2nd, 3rd, or 4th grade", 33 "5th or 6th grade", 34 "7th or 8th grade", 35 "9th grade", 36 "10th grade", 37 "11th grade". Value "0" otherwise
12 years	Dummy variable: value "1" for the categories 38 "12th grade - no diploma" and 39 "High school graduate - diploma or equivalent (GED)". Value "0" otherwise
13-15 years	Dummy variable: value "1" for the categories 40 "Some college but no degree", 41 "Associate degree - occupational/vocational" and 42 "Associate degree - academic program". Value "0" otherwise
16 years	Dummy variable: value "1" for the category 43 "Bachelor's degree (BA, AB, BS, etc.)". Value "0" otherwise
16+ years	Dummy variable: value "1" for the categories 44 "Master's degree (MA, MS, MEng, MEd, MSW, etc.)", 45 "Professional school degree (MD, DDS, DVM, etc.)" and 46 "Doctoral degree (PhD, EdD, etc.)". Value "0" otherwise
Age	Coded from prtage: Age", measured in years.
Male	Coded from "tesex", value "1" for males and "0" for females
Married	Coded from "tespempnot: employment status of spouse or unmarried partner", value "1" for individuals with "employed" or "not Employed", value "0" for those who this question is not applicable
Number of children in household	Coded from trchildnum: Number of household children < 18".
Age of youngest child	Minimum age of individual if age <18 and relation with person of reference in household (perrp) is 4 "Own child" or 9 "Foster child".
Youngest child 0-2	Dummy variable: value "1" if youngest child in household is aged 0-2, value "0" otherwise.
Youngest child 3-5	Dummy variable: value "1" if youngest child in household is aged 3-5, value "0" otherwise.

Notes: Information obtained from the 2010, 2012 and 2013 ATUS WBM.

Table A4. Survey description for the US surveys

Study aims, target populations, and sample restrictions

Survey years	*Organizing Aims and Considerations*	*Target Population*	*Sampling Restrictions*
1985	Aimed to determine how people used their time and to compare diaries collected by post-out/post-back, phone, and face-to-face interview	The national population beyond secondary school age not living in institutions	People aged 12 or older living in private households with phones (Alaska, Hawaii, and some smaller, rural states excluded)
1992-1994	Aimed to measure time use and exposure	The national population living in private residences	1 person of any age living in sampled private households with phones (Alaska and Hawaii excluded)
1998-1999	Aimed to examine social capital and quality of life in the USA	The national population living in private residences	Adults aged 18 or older, who were interviewed about their activities yesterday using computer-assisted telephone interviewing (CATI)
1999-2001	Measure social capital and quality of life for national sample, measure work-life balance for parents sample	The national adult population living in private residences; parents only in one survey	People aged 18+ for the national sample, parents of children aged <18 in the second
2003-2012	Aimed to follow a sub-sample of the CPS for a 9th wave to facilitate the study of national accounts. The ATUS is administered by the US Bureau of Labor Statistics and is considered the official time use survey of the country (http://www.bls.gov/tus/).	The national population not living in military bases or institutions	1 person aged 15 or older in the household

Relevant points in time from the sample designs

Survey years	*Fieldwork Period*	*Sampling of Days of the Week*	*When Activities Were Recorded*
1985	Whole year of 1985	Mail-out after phone calls.	Diaries to be completed on a specified day in the subsequent week
1992-1994	September 1992 – October 1994	Phone calls were attempted on all days of the week.	Diaries covered the previous 24-hour day
1998-1999	7 March 1998 - 9 December 1999	Phone calls were attempted on all days of the week.	Diaries covered the previous 24-hour day
1999-2001	May 1999- June 2000, a few remaining diaries through Spring 2001	Phone calls attempted on all days of the week	Diaries cover the previous 24 hour day
2003-2012	Whole years	Half of diaries were collected on weekday, half on weekend days.	Diaries covered the previous 24-hour day

Sample designs and response rates

Survey years	*Sample Frame*	*How Sample Drawn*	*Response Rate*
1985	Adults 18 years or over, living in houses with telephones in the contiguous United States.	Stratified and clustered, random-digit dialing, with only private residences pursued for an interview. Information on the household collected by telephone.	55.2 %
1992-1994	Potential phone numbers within lists of area codes	Random-digit dialing, only private residences pursued for interview. The person who would next have a birthday completed the diary.	63%
1998-1999	National sample study (of the contiguous 48 states plus Washington DC)	One Plus List-Assisted Random Digit Dial (RDD) frame to identify a sample of adults	56%
1999-2001	Potential phone numbers within lists area codes	Random-digit dialling, only private residences pursued for interview. The adult aged 18+ who next had a birthday completed the diary	64%
2003-2012	The CPS sample	A random sub-sample of the CPS, with the over-sampling of small states dropped but families with children over-sampled. Half of the diaries are collected on week days, the other half on weekend days	55-60%

Source: Authors' compilation. See http://www-2009.timeuse.org/information/studies/