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NOT WORKING AT WORK:
LOAFING, UNEMPLOYMENT AND LABOR PRODUCTIVITY

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ABSTRACT

We use the American Time Use Survey (ATUS) 2003-12 to estimate time spent by workers in non-work while on the job. Non-work time is substantial and varies positively with the local unemployment rate. While average time spent by workers in non-work conditional on any positive amount rises with the unemployment rate, the fraction of workers reporting positive values varies pro-cyclically, declining in recessions. These results are consistent with a model in which heterogeneous workers are paid efficiency wages to refrain from loafing on the job. That model correctly predicts relationships of the incidence and conditional amounts of non-work with wage rates and measures of unemployment benefits in state data linked to the ATUS, and it is consistent with estimated occupational differences.

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Introduction

The relationship between labor-market slack and worker effort is a hoary topic in macroeconomics and labor economics. The notion of labor hoarding—retaining workers during times of low product demand even though their labor input is reduced—goes back at least 50 years and has been adduced as an explanation for pro-cyclical changes in labor productivity—productivity falling as unemployment rises. (See Biddle, 2014, for a thought-historical discussion of this concept.) The notion that unemployment incentivizes workers to work harder to avoid layoff—the idea of efficiency wages—was described formally in the now-classic study by Shapiro and Stiglitz (1984), and goes back to writings of Kalecki (1943) and even to the reserve army of the unemployed described by Marx (1867) in Chapter 23 of *Das Kapital*.¹ It implies counter-cyclical changes—that labor productivity and effort rise as unemployment rises. Both of these strands in economic thought describe the relationship between unemployment in a labor market and worker effort (and presumably labor productivity). Yet their implications are contradictory.

A large empirical literature has inferred from lags in employment adjustment behind shocks to output that labor hoarding is important (Hamermesh, 1993, Chapter 7). A much smaller literature has used the theory of efficiency wages to examine how wages respond to workers' opportunities (e.g., Cappelli and Chauvin, 1991). No study to date has examined directly how effort at work responds to differences or

¹A recent sociological study, Paulsen (2015), presents cases illustrating the role and reasons for people loafing on the job. Lazear *et al* (2013) and Pencavel (2014) analyze changes in effort and productivity in single firms.

changes in unemployment.² The reason is simple: Until very recently no large-scale data set has been available detailing what workers do on the job and providing such information as unemployment varies.

This paper asks and answers the following questions: 1) On what do American workers spend time on the job when they are *not working*? 2) Most important, how does non-work vary with local labor market conditions, as measured by the unemployment rate? 3) Is there a model that can account consistently for any regularities that we observe? 4) What are the implications of these findings for aggregate labor productivity and macroeconomic behavior generally?

I. Data and Descriptive Statistics

Since 2003, the American Time Use Survey (ATUS) has generated time diaries of large monthly samples of individuals showing what they are doing and where they are located. (See Hamermesh *et al*, 2005, for a description of these data, and Aguiar *et al* (2013) for an examination of some cyclical aspects of time use.) It thus allows the first study of how workers spend time on the job, its relationship to their demographic and job characteristics, and its variation with differences and changes in unemployment. Throughout this analysis we use various sub-samples from the ATUS, which over the period 2003-2012 collected 136,960 monthly diaries of former Current Population Survey (CPS) respondents' activities on one particular day between two to five months after their final rotation in the CPS. Because we are concentrating on activities while the respondent was at work, the only diaries included are those for days when a respondent reported some time at the workplace. Since half the diary days in the ATUS are on weekends when relatively few respondents are working, this restriction cuts the sample greatly, leaving us with 41,111 usable diaries. Moreover, since our focus is on employee productivity, for most of this study we exclude the self-employed (most of the remaining excluded observations) and those diaries without information on usual weekly hours of work, which reduces the sample to 35,548 usable observations. Thus for a typical month in the sample period after 2003 we have around 250 observations on employees.³

²Hamermesh (1990) examines cross-sectional differences in the allocation of time on the job.

³The ATUS collected more diaries in its first year, generating about 450 usable diaries each month in 2003.

Obtaining responses about what the respondent was doing at each moment of the diary day, the ATUS then codes them into over 400 distinct activities. Respondents also note where they were while performing each activity, with one of the possible locations being “at the workplace.” We focus on primary activities performed at that location, defining total time at work as all time spent at the workplace. We then divide time at the workplace into time spent working and time spent not working.⁴ The latter is divided into time spent eating, at leisure and exercising, cleaning, and in other non-work activities.⁵ In the ATUS, eating at work can be a primary activity, a secondary activity to working or a part of the job. Non-work time at work which is spent eating corresponds to a response of eating as a primary activity at the workplace. Non-work time at work also includes activities that might be viewed as investment in future productivity but that are not currently productive, such as cleaning and perhaps exercising, as well as others such as gossiping, web-surfing and chatting that are less likely to be productive. Non-work time does not include any time spent away from the workplace during the workday.

Table 1 presents sample means and their standard errors of the proportions of time spent at the workplace in these four activities and in actual work, along with the time spent at work and other variables that are central to our analysis. All the statistics are calculated using the ATUS sampling weights, thus accounting for disproportionate sampling across days of the week, for standard CPS weighting and for differential non-response to the ATUS by former CPS participants. The first thing to note is that the typical day at work lasts about eight hours and twenty minutes, a statistic that yields a

⁴Time spent working includes time spent in “Work Related Activities” or ATUS codes 50000-50299. Work-related activities include socializing and eating as a part of the job.

⁵In the original data, non-work time on the job is divided into the following broad primary activities: Personal care; household production; care-giving; educational activities; shopping; services; eating, leisure, exercising and sport, and volunteering and religious activities. Several of these are observed so infrequently as to prevent them from being analyzed separately, so that we combine them into the fifth (other) category of non-work time on the job. Household production is not considered an act at work.

five-day workweek of 41.74 hours, which is consistent with the mean usual weekly hours of 41.38 hours reported retrospectively by employees in the sample.⁶

Sample respondents report spending nearly seven percent of time at the workplace not working, amounting to thirty-four minutes per day. Roughly half of this time is spent eating; the other half is spent in leisure, exercise, cleaning and other non-work activities. These latter three activities are so rare that henceforth we concentrate on the twofold division between eating and non-work non-eating time at work. While thirty-four minutes per day at the workplace not working seems low, most eating reported during the work day as a primary activity probably occurs away from the workplace and thus is not specifically assignable to the job in these data. To the extent that eating away from the workplace during work hours varies cyclically, it will be reflected in cyclical variations in the length of the day at the workplace.

As Figure 1 shows, there are a substantial number of zeros in the responses, 33.7 percent of the sample, and much of our subsequent analysis focuses on this fact. The conditional mean amount of positive non-work time is slightly over 50 minutes per day. Beyond that, the distribution is skewed to the right, with a tiny fraction of respondents even reporting not working the entire time on the job. 30.8 percent of the respondents reported eating at the workplace but no other non-work time, 14.6 percent reported other non-work but no eating on the job, and 20.9 percent reported both eating and other non-work time on the job.

Throughout this study, the central forcing variable is the local unemployment rate, measured as the jobless rate in the state where the worker resides.⁷ The average unemployment rate in the sample is 6.6 percent, but it varies over a wide range—from barely two to over fourteen percent. Partly because of the Great Recession, there is substantial variation in unemployment, which allows us to examine how non-work responds to changing local labor-market conditions.

⁶This near-equality differs from the result in the literature that recall weekly hours exceed diary hours (Juster and Stafford, 1991; Frazis and Stewart, 2004). The difference may arise because we restrict the workday to the time respondents spend at the workplace in any activity.

⁷Experiments with the one-month unemployment rate consistently yielded weaker fits, so we limit the reported results to those based on the three-month average. Replacing the most recent three-month average unemployment rate with a lagged three-month average yielded similarly weaker fits (but no qualitative change in the estimates), and similarly for nonlinear transformations of the unemployment rate.

II. Non-work and its Relationship with Unemployment over Time and Space

Before presenting evidence on the cyclical behavior of non-work time at work, it is important to remember that economic theory is ambiguous about the sign of the relationship between non-work and business cycle conditions. This is because workers and their employers have different interests in non-work. If initiated by the worker, non-work might be interpreted as “loafing,” “shirking” or “goofing off on the job.” A raft of theories predicts a negative relationship between local labor market conditions and shirking. The most prominent of these are Calvo (1981), Akerlof (1982), Shapiro and Stiglitz (1984) and Bowles (1985). In this vein, high unemployment signals a lower value of utility in the state of unemployment, either because the incidence or duration (or both) of joblessness is high. To avoid landing in the state, workers exert higher effort when employed, in order to curry favor with their employers, to increase their productivity, or to reduce the probability of detection when they do shirk. Because effort is unobservable and/or monitoring is costly, firms accept this outcome passively, with few or no layoffs of shirkers occurring in equilibrium.

Alternatively, firms may find non-work by workers in certain states of the world to be desirable. Firms face variable and imperfectly forecastable demand for their products, while producing with workers who represent substantial investments in human capital, search effort and other considerable resources. In an economic downturn which is perceived as temporary, it is easy to show that a layoff, even if temporary, is an inferior choice to maintaining employment, possibly even at standard hours.⁸ This behavior is often referred to as labor hoarding. In this case, firms assign workers to “unproductive” tasks such as cleaning, maintenance, painting, etc. or even tolerate more worker-initiated non-work.

A, Central Results

In Table 2 we present evidence on the cyclical behavior of non-work in the United States based on the ATUS. This cyclical behavior is measured by the response of non-work time at the workplace to

⁸Burda and Hunt (2011) showed that while firms in Germany retained workers during the Great Recession, hours worked declined by less than would be expected given the decline in output, so that hourly productivity fell in a recession for the first time since 1970. In the U.S., Gordon (1981) documented a decline in labor productivity in every postwar recession up to that point in time; Galí and van Rens (2014) find that the correlation between the business cycle and productivity since 1990 has become negative.

variations in local labor-market conditions. We assume that workers take those conditions as given, and we note that they vary across both time and space.⁹ In the data most of the variation in unemployment is across time: Temporal movements account for two-thirds of the variance. Only twelve percent of the variance in unemployment rates is idiosyncratic at the state and month level.

The initial least-squares results shown in Column (1) simply relate the proportion of non-work time at work to the state unemployment rate.¹⁰ There is a highly significant positive association of unemployment with non-work time on the job. Over the entire range of unemployment observed in the data, the estimate suggests that the proportion of non-work time will vary by 0.013 (on a mean of 0.069).

The estimates in Column (1) fail to account for the possible co-variation of time spent in non-work with the amount of work performed and with workers' demographic characteristics. The equation underlying the estimates in Column (2) includes quadratic terms in usual weekly hours and time at work on the diary day; indicators of race and ethnicity; a vector of indicators of educational attainment; a quadratic in potential experience ($\text{age} - \text{education} - 6$), indicators of gender and marital status and their interaction, and an indicator of metropolitan residence.¹¹

A longer usual workweek significantly increases the fraction of work time not working up to 43 usual weekly hours, with decreases thereafter. Conditional on usual hours, however, spending more time at work in a day decreases the proportion of time spent in non-work activities, but only up to 5.9 hours of work time per day. Beyond that, and thus for 85 percent of the sample, additional time on the job increases the share of time spent not working. Whether because of boredom, fatigue or something else,

⁹We cannot rule out that workers might self-select via migration, effectively choosing regions in which unemployment is lower and thus affecting the conditions under which they work. The same argument applies to employers and capital mobility. This possibility would bias the estimated impact of unemployment toward zero.

¹⁰All the results in this section remain qualitatively identical if we use minutes of the various types of non-work time rather than their proportions of the workday as the dependent variables. Similarly, using more flexible representations of usual weekly hours and time spent at work does not alter the results, nor does deleting the quadratic in time at work from the estimates in Columns (2) and (3) change the central conclusions.

¹¹In the Table we only report those estimates that are economically interesting. One should also note that, unsurprisingly, the estimates vary negligibly if we use a quadratic in age instead of potential experience. The estimates using the latter do, however, describe variations in time not working slightly better than do those including age.

the marginal effect of additional work time on non-work activities is increasing for most employees as the workday lengthens.¹²

The estimates on the indicators of gender and marital status, and their interaction, are small and individually and jointly insignificant here and in all subsequent estimates, so we do not report them in later tables. African-Americans, Hispanics and Asian-Americans, however, report spending higher fractions of their time at work not working than do workers with otherwise identical demographic characteristics and with workdays and workweeks of the same length. Not only are these effects highly significant statistically, they are also large, implying a proportion of non-work time 15 to 20 percent above the average. Additional schooling attainment monotonically decreases the reported proportion of work time spent not working. Here too the differences are substantial, with the proportion among employees with graduate degrees being about 30 percent below that of high-school dropouts.

While the estimated impact of unemployment does change with the addition of these covariates, their unsurprisingly very weak correlation with state unemployment rates guarantees that their inclusion does not qualitatively alter the estimated effect of unemployment on non-work time.¹³ The inference may understate the magnitude of this effect: As unemployment rises, even holding demographic characteristics constant, workers who retain their jobs may be those who report less non-work at work, creating a compositional effect that negatively biases the estimated impact of unemployment on non-work time.

In Column (3) we add vectors of fixed effects for occupation, industry, state and month to the estimating equation in Column (2). Each of the four vectors of indicators is jointly statistically significant: There are substantial differences across occupations, industries and states in the (conditional) proportion

¹²This finding is consistent with older evidence from the scientific management literature charting workers' productivity over the work day (Florence, 1958).

¹³The covariates included in Column (2) describe 0.92 percent of the variation in state unemployment rates over time.

of time at work spent not working. Even with these additions, however, over half of the estimated positive effect of unemployment on time not worked remains.¹⁴

These estimates have aggregated all non-work time at work; yet one might expect different responses to changing unemployment of the partly biological activity, eating at work, and the broader category, other non-work time on the job. We thus re-estimate the basic model, first using the proportion of time at work spent eating as the dependent variable, then using the proportion of time at work spent in other non-work time. In each case, we first include the vectors of work time and demographic measures that were added to the estimates shown in Column (2), then add the same four vectors of fixed effects included in the estimates shown in Column (3).

The results, presented in Columns (4) - (7) of Table 2, are striking. The overwhelming majority of the effect of changing unemployment on non-work time at work operates through its impact on other non-work time—i.e., on leisure on the job. Eating at the workplace is affected by variations in unemployment much less.¹⁵ Moreover, except for Hispanics and Asian-Americans, the effects of differences in workers' demographic characteristics on non-work time also operate mainly through other non-work time, not through eating at work.

As Table 1 and Figure 1 showed, there are many zeros in these data. That fact might suggest estimating these models using tobit, but that is problematic for two reasons: 1) There is no reason to assume that the impacts of unemployment (or of any of the other regressors included in Table 2) on the probability of non-work and its conditional mean work in the same direction. That difficulty suggests using a more free-form technique, either the all-in-one approach suggested by Cragg (1971), or separate treatment of the probability of non-work and its mean conditional on its occurrence; 2) The zeros may

¹⁴Almost the entire drop in the estimate arises from the inclusion of state fixed effects. Re-estimating the model excluding state effects, the estimated impact of unemployment is essentially unchanged from that in Column (2).

¹⁵One might be concerned that employees change the amount of non-work multi-tasking that they do as unemployment changes. The ATUS does not provide information on secondary activities in most months; but for 2006 and 2007, as part of the Eating and Health Module, it collected information on secondary eating, including at work. Of the employees in our sample in those years, 41 percent report some secondary eating and/or drinking at work. Among those who do, the average amount of time spent in these secondary activities is almost exactly two hours per day. Although this activity is important, re-estimates of the models in Table 2 show that variations in secondary eating are independent of differences in unemployment rates across states and over these two years.

result partly from the limitation of the diaries to a single day (Stewart, 2013), who argues that estimating a probit on the incidence of non-work and a regression on the amount of non-work among those non-zero observations circumvents this difficulty. Since that approach handles both problems, we follow it here.

Table 3 presents the probit derivatives of the variables' impacts on the probability of non-work on the job, and regression coefficients describing their effects on the amount of non-work for the two-thirds of the sample respondents who report positive non-work. The independent variables are the same as those included in the regressions in columns (2) and (3) of Table 2. The differences between these results and those in Columns (2) and (3) from the unconditional regressions are remarkable. While higher unemployment is positively associated with the proportion of time at work reported non-working, it significantly reduces the probability that a worker spends any time not working. This reduction is more than offset by the significant increase in the proportion of time not working as the unemployment rate rises by those who state that they spent some time not working.

Unlike in the unconditional regressions, the negative impact on the probability of not-working and the positive impact on the conditional mean are robust to the inclusion of all the vectors of fixed effects. Moreover, the effects are economically important: Over the range of unemployment in the sample, the probability of not working falls by 0.061 on a mean of 0.337, while the fraction of time not working rises by 0.020 on a conditional mean of 0.100. Our results also show that the demographic differences observed in Table 2 stem mostly from demographic differences in the probability of reporting non-work time as opposed to the amount of time spent by those reporting non-work. That is especially the case for differences in educational attainment; but even the racial/ethnic effects, while significant on both the probability and the conditional mean, are much stronger on the former.¹⁶

¹⁶Do these effects arise from a greater willingness of minorities and the less educated to report non-work time on the job? We cannot be sure, of course, but the evidence suggests the opposite. African-American workers report 0.6 fewer different activities per day than otherwise identical workers, on a mean of 19 activities; Hispanics report 0.7 fewer activities per day, while Asian-Americans report 0.9 fewer activities. Those with graduate degrees (college degrees) report 0.9 (0.8) more activities per day than high-school dropouts. In short, the likelihood of reporting an activity is opposite the impact of these demographics on the propensity to report on-the-job loafing. These fascinating racial/ethnic differences are not the focus of this study, and we leave exploration of their causes for future work.

The results displayed in Table 2 showed that the positive effect of higher unemployment on time spent not working was mainly on other non-work time rather than on time spent eating at work. Table 4 presents estimates of effects on the probabilities of eating at work and engaging in other non-work, and on their conditional means. In all cases, we present only the specifications expanded to include all the vectors of fixed effects. The negative impacts of unemployment on the probabilities of eating at work and engaging in other non-work are essentially identical. The difference in the responsiveness of eating and other non-work activities to higher unemployment that were shown in Table 2 result from the greater responsiveness of the latter among those workers who report some non-work time: The impact on the intensity of other non-work time is three times as large as that on time spent eating at work.

B. Robustness Checks—Alternative Samples and Specifications

Our central finding is that higher unemployment is associated with a greater fraction of time at work spent not working, with most of the effect coming from greater time at work in leisure, cleaning up, etc. Since higher unemployment, other things equal, is also associated with less time at work (in this sample each extra percentage point of unemployment reduces the workday by 2.4 minutes per day), this finding suggests that employers are allowing workers to spend a greater fraction of the workday not working. The net effect is underlain by an important and surprising pair of subsidiary effects, namely that higher unemployment reduces the likelihood of non-work, while increasing the conditional amount of non-work sufficiently to generate the net positive relationship between unemployment and non-work on the job. The question, however, is how sensitive these findings are to alternative specifications of the estimating equations and underlying samples. In this subsection we present a number of re-examinations focusing on this question.

While we have held constant for fairly large vectors of occupation (22) and industry (51) indicators, one might argue that these are insufficiently fine to account for differences in the structure of labor demand. The ATUS provides more detail on these measures, 513 occupation and 259 industry categories. At the expense of some cells being very sparsely populated or empty, we re-estimate the equations in columns (3) of Table 2 and columns (2) and (4) of Table 3 including these expanded vectors

of indicators. For this experiment and the others, Table 5 reports the parameter estimates of the effects of unemployment on the unconditional mean proportion of time spent not working at work, its incidence and its intensity. This expansion of the vector of controls generates a slight increase in the impact of higher unemployment on the conditional mean, but only tiny changes in its impact on the incidence and intensity of non-work.

With less cyclical in demand and less exposure to the risk of job loss, we might expect that public-sector employees' non-work will be less cyclically sensitive. To examine this possibility, in the second experiment we delete the roughly 1/6 of the respondents who are public employees. As the results listed in the second row of Table 6 demonstrate, the expected change is exactly what we observe. Private-sector employees' non-work is more sensitive to variations in unemployment, but solely because its intensity is more variable; its incidence actually varies slightly less with unemployment than does that of the entire work force.

The Great Recession was a unique experience in post-war American history; and regrettably much of the variation in unemployment during our sample period arose because of this shock. To what extent are our results driven by responses to this unusual event? In the third experiment we delete observations from December 2007 through June 2009, the peak to trough of the NBER dating of this cycle. Remarkably enough, these deletions hardly alter the estimated impacts of unemployment on the three outcomes. Indeed, the effect on the unconditional mean is slightly higher than that estimated over the entire 120 months, because the impact on the intensity of non-work is greater when observations from the Great Recession are excluded.

While we included gender in the basic specification, we did not allow for different responses to unemployment by gender. In the fourth experiment we estimate the three basic equations separately by gender, with the estimated impacts of unemployment shown in the fourth and fifth rows of Table 5. The average increase by men in time spent loafing as unemployment rises exceeds women's, because men's

probability of loafing is less (negatively) responsive than women's, while their conditional mean loafing is more positively responsive to higher unemployment.¹⁷

The cyclical responsiveness of loafing may differ by payment method, even holding constant for differences in demographics and occupational and industry attachment between hourly and salaried workers. The former are more likely to report some loafing than are salaried workers. As the results in the sixth and seventh rows of Table 5 show, however, differences in the cyclical responsiveness of non-work on the job by payment method are small. The net impact is slightly greater among hourly workers, mainly because their conditional mean amount of non-work is more responsive to variations in unemployment. As with the central results, for both groups the incidence responds significantly negatively to increases in unemployment, while the conditional mean responds significantly positively.

In the penultimate experiment we limit the sample to full-time workers, to examine the possibility that the incentives for loafing and the demand for part-time workers differ from those for workers more closely attached to the labor market. The results, shown in the eighth row of Table 5, do not differ greatly from the central results. While the net effect is smaller than in Table 2, both the incidence and intensity effects are statistically significant, of opposite sign, and differ very slightly from those shown in Table 3. Finally, deleting those workers who report loafing the entire day means truncating the sample on the dependent variable, thus biasing any results. Although thus not desirable, in the last row of Table 5 we nonetheless examine how the results change if we exclude this one percent of the sample. The net impact of unemployment among the remaining group is nearly zero; but the incidence of loafing responds to higher unemployment even more negatively than in the entire sample, while the intensity of loafing responds significantly positively, as before, but less strongly than in the entire sample.

Overall this array of alternative specifications with samples truncated temporally or by workers' characteristics suggests that the central conclusions from the results in Tables 2 and 3 are quite robust. There is a small net positive effect of higher unemployment in the amount of non-work in the workplace,

¹⁷The presence of young (age 13 or less) children significantly reduces men's unconditional mean loafing while not affecting women's. This result seems consistent with income effects on married men's efforts in households with young children where the male is the major earner.

a net effect that is composed of a significant negative impact on the incidence of non-work and a more important significant positive impact on the amount of non-work by the roughly two-thirds of workers who report any at all.

IV. A Suggestive Model of Non-Work (Loafing)

Our results imply contradictory and offsetting motives for non-work on the job over the business cycle or at different states of the labor market. Workers engage in non-work less frequently in bad times (when the rate of unemployment is higher), but given that they do so, they tend to do more of it. The following efficiency wage model with heterogeneous preferences can reconcile these apparently contradictory findings.

A. Preliminaries

We consider an environment in which workers' effort cannot be monitored perfectly, but their *aggregate* productivity is an observable outcome of the state of the business cycle or the local labor market as well as of the fraction of their time spent in non-work activities. Workers are heterogeneous and, in the spirit of Shapiro and Stiglitz (1984), face a binary decision to spend a fraction of working time in non-work or exert full effort. Individual workers are risk-neutral and receive utility from consumption goods purchased with their wages, as well as from leisure on the job (non-work). Each worker is endowed with one unit of time and, if employed, receives a wage w plus the monetary equivalent of time spent in leisure on the job (non-work or "loafing"), denoted as ℓ_i . Workers are indexed by $i \in [0,1]$ in increasing order of ℓ_i , so $i > j$ implies $\ell_i > \ell_j$ for all i and j . Without loss of generality, the index could represent the percentile of the worker in the distribution of preferred loafing times; in our example, the index is the "name" of the individual worker in question and equals the preferred loafing time (as a fraction of total available labor effort). If undetected, worker i is assumed to prefer enjoying this fixed amount of non-work ℓ_i and exerting work effort $e_i = 1 - \ell_i$ to exerting full effort $e_i = 1$. The valuation of non-work ℓ_i is drawn when the job begins and lasts for its duration and has time-invariant expected value $E\ell_i$.

In each period, worker i chooses between loafing with income equivalent $w + \ell_i$, and not loafing at all and receiving w . With exogenous probability θ , management monitors workers; if they are found

loafing, they are fired. Employment relationships also end exogenously with probability δ . Unemployed workers receive income equivalent in value to b and are indistinguishable from other workers on the basis of employment or non-work history. They find jobs at rate f , which, given the stock of employment, a separation rate, and an exogenous labor force, is determined endogenously by a steady-state condition to be described below.

B. To Loaf or Not to Loaf: That is the Question

For an arbitrary worker $i \in (0,1)$ earning wage w_i , it is straightforward to compute steady-state valuations of the three possible labor-force states/strategies: Employment without any non-work (V_i^N), employment with non-work (V_i^S), and unemployment (V^U):

$$V_i^N = \frac{w_i}{1+r} + \frac{\delta}{1+r} V^U + \frac{1-\delta}{1+r} V_i^N, \quad (1)$$

$$V_i^S = \frac{w_i + \ell_i}{1+r} + \frac{\theta + \delta}{1+r} V^U + \frac{1-\theta-\delta}{1+r} V_i^S, \quad (2)$$

$$V^U = \frac{b}{1+r} + \frac{f}{1+r} V^E + \frac{1-f}{1+r} V^U, \quad (3)$$

where

$$V^E = E \left[\max_{\ell_i \in \{0, \ell_i\}} \{V_i^S, V_i^N\} \right] \quad (4)$$

represents the expected value of employment from the perspective of an unemployed person who does not know her future value of ℓ_j , but knows that she will choose the strategy that maximizes expected utility going forward.

Given this set of behavioral assumptions, each worker i is characterized by a “no-loafing wage.”

If paid above this wage, the worker’s valuation of not loafing at all dominates that of loafing:

$$V_i^N \geq V_i^S. \quad (5)$$

As in Shapiro and Stiglitz (1984), this “no-loafing condition” (NLC), defines the cutoff or minimal threshold wage \bar{w}_i at which worker i is indifferent between loafing and not loafing, i.e., $V_i^N = V_i^S$. In

Appendix A, the “NLC wage” for worker i is shown to be:

$$\bar{w}_i = b + \frac{r + \delta + f}{\theta} E\ell_i + \frac{r + \delta}{\theta} (\ell_i - E\ell_i) \quad (6)$$

The NLC wage depends positively on income in unemployment b , the interest rate r , exogenous job turnover δ , the outflow rate from unemployment f , and the worker's expected valuation of loafing $E\ell_i$ as well as the deviation of her current value from the mean $\ell_i - E\ell_i$. It depends negatively on θ , the probability of detection.

C. Aggregate Loafing and the Steady-State Flow Equilibrium

The NLC wage represents a threshold wage above which a worker i will not loaf at all. Inverting (6) yields the identity of the “marginal loafer” for whom $\bar{w}_i = w$, i.e., who is indifferent between loafing her preferred amount and not loafing at all:

$$\bar{\ell} = \frac{\theta(w - b) - fE\ell_i}{r + \delta} \quad (7)$$

At any common wage w , all workers for whom $\bar{w}_i > w$ (or, equivalently, $\ell_i > \bar{\ell}$) will spend time ℓ_i in non-work on the job. Let $g(\ell_i)$ be the density of workers on the support of preferred loafing time $[0,1]$ and G be the associated c.d.f. The following measures are implied by (7), all contingent on w :

- 1) **Fraction of workers loafing**, $\gamma(w)$: $\gamma = \int_{\bar{\ell}}^1 g(\ell_i) d\ell_i = 1 - G(\bar{\ell})$;
- 2) **Aggregate loafing**, $\ell(w)$: $\ell(w) = \int_{\bar{\ell}}^1 \ell_i g(\ell_i) d\ell_i$
- 3) **Aggregate effort**, $e(w)$: $e(w) = 1 - \ell(w)$;
- 4) **Conditional mean loafing**, $\phi(w)$: $\phi = E[\ell_i | \ell_i > 0] = \frac{\int_{\bar{\ell}}^1 \ell_i g(\ell_i) d\ell_i}{1 - G(\bar{\ell})} = \frac{\int_{\bar{\ell}}^1 \ell_i g(\ell_i) d\ell_i}{\gamma}$.

In the steady state, the outflow rate f , expressed as a fraction of the unemployed, endogenously equates gross outflows and inflows into unemployment. Outflows are the product of f and $(\bar{L} - L)$, where \bar{L} is the exogenous labor force and L is employment. The mass of workers who flow into

unemployment equals that of workers who lose their jobs through exogenous separation ($\delta\bar{L}$) plus those who are monitored and were loafing ($\theta\gamma L = \theta(1-G(\bar{\ell}))L$). The flow rate out of unemployment f is:

$$f = \frac{(\delta + \theta\gamma)L}{\bar{L} - L} = (\delta + \theta\gamma)(u^{-1} - 1) .^{18} \quad (8)$$

By inspection, an increase in unemployment has two opposing effects on the outflow rate. In the first instance, it decreases f directly via the steady-state unemployment flow condition (8). Yet lower f will *increase* the expected duration of unemployment and the cost of loafing. This second-order effect reduces the fraction of loafers (γ) and lowers the inflow into unemployment due to those who are caught, and renders the overall effect on f of a rise in unemployment, strictly speaking, ambiguous. Without further restricting the model, we will assume that the first-order effect dominates:

Assumption: In general equilibrium, the outflow rate f is decreasing in the unemployment rate:

$\partial f / \partial u < 0$. In Appendix A, we show that a sufficient condition for this assumption is that the elasticity of the extensive margin of loafing with respect to the outflow rate is less than unity; i.e., $(f / \gamma) \partial \gamma / \partial f < 1$.

D. Predictions

With these results and imposing $\partial f / \partial u < 0$, we can establish the following propositions (proofs of which can be found in Appendix A), which will help interpret our findings and point to further empirical implications for loafing:

Proposition 1: *Loafing and unemployment.* Holding the wage constant, the fraction of workers who loaf depends negatively on the unemployment rate.

Proposition 1 is a partial-equilibrium relationship which holds all other factors constant, including the wage. A rise in unemployment lowers the outflow rate, and thereby raises the no-shirking wage and reduces the fraction of workers for whom shirking is the more attractive option.

¹⁸We assume that separations occur exogenously before monitoring.

Proposition 2: *Loafing, wages and unemployment income.* Holding the outflow rate f constant, the fraction of workers who loaf depends negatively on the wage and positively on income in

unemployment: $\frac{\partial \gamma}{\partial w} < 0$ and $\frac{\partial \gamma}{\partial b} > 0$.

Proposition 2 holds that, *ceteris paribus*, an increase in the wage will deter some workers who were previously enjoying non-work from doing so. Similarly, an increase in unemployment income will increase the mass of workers who enjoy positive non-work.

Proposition 3: *Conditional mean loafing and unemployment.* Holding the wage constant, the conditional mean of non-work on the job by those with positive non-work is increasing in the

unemployment rate: $\frac{\partial \phi}{\partial u} > 0$.

Proposition 4: *Conditional mean loafing, wages and unemployment income.* Holding the outflow rate constant, the conditional mean of non-work on the job by those with positive non-work is increasing

in the wage and decreasing in income in unemployment: $\frac{\partial \phi}{\partial w} > 0$ and $\frac{\partial \phi}{\partial b} < 0$.

Propositions 3 and 4 have important implications about conditional effects for those observed with positive non-work. Proposition 3 implies that under the conditions assumed, an increase in unemployment will raise the average amount of non-work by those observed with any positive non-work. Intuitively, those who still loaf will have stronger preferences for it and this shows in the mean of those who still choose non-work. In contrast, and possibly counterintuitively, an increase in the wage and/or a decrease in unemployment benefits also increases the average non-work observed for those with positive non-work.

E. An Extension

Our theoretical model, which ignores labor hoarding, can explain both the negative influence of unemployment on γ , the fraction of workers who report any loafing at all, and the positive influence on ϕ , the mean value of their loafing conditional on nonzero values. Yet our empirical findings show that the response to unemployment at the intensive margin (the volume of non-work of each loafer) dominates

that at the extensive margin (incidence), implying a positive overall dependence of unconditional mean loafing,

$\gamma\phi$, on the unemployment rate. In the model presented above this is impossible, since for each individual i the amount of preferred shirking, if positive, is fixed at ℓ_i .¹⁹

A variable intensive margin can be readily incorporated into our model while continuing to eschew any explicit reference to the firm's decision (although such effects could also be operative and we discuss them below). Assume that loafing also imposes a fixed cost $\varepsilon(u) > 0$ on the worker, independent of identity, with $\varepsilon(u) < E\ell_i$. This cost reduces the utility of loafing and reduces preferred loafing time. It could be associated with peer effects – the stigma of being observed goofing off, for example. Although the sign of the dependence on unemployment could be positive or negative, it is more likely that this cost declines in the unemployment rate, $\varepsilon'(u) < 0$, implying a smaller stigma in recessions when unemployment is high, even as the potential cost of a layoff increases.

In addition to heterogeneity in the effect of loafing on utility, the preferred level of loafing can thus vary independently of the loafers' identities; local labor-market slack is assumed to impart a *peer effect* to the preferred level of loafing, perhaps resulting from the shame of being seen by colleagues, friends and others goofing off on the job. This cost links the preferred amount of loafing negatively to the state of the business cycle. In busy times when the labor market is tight and others are working hard, being seen loafing by friends on the job is more likely to be embarrassing. In contrast, in slack times, this cost will be smaller since others are working less.²⁰

¹⁹The effect of unemployment on aggregate effort at wage w is $\frac{\partial e(w)}{\partial u} = \frac{\partial}{\partial u} (1 - \int_{\bar{\ell}}^1 \ell_i g(\ell_i) d\ell_i) = \bar{\ell} g(\bar{\ell}) \frac{\partial \bar{\ell}}{\partial f} \frac{\partial f}{\partial u}$,

which is strictly positive since $\partial \bar{\ell} / \partial f$ and $\partial f / \partial u$ are both negative.

²⁰The importance of peer effects at work was noted eighty years ago by Mathewson (1931) and recently demonstrated by Mas and Moretti (2009). It would be straightforward to model this in a more direct fashion, allowing ℓ_i to depend positively on ϕ - salient loafing by colleagues provides a fillip to one's own loafing. An equivalent outcome would arise if firms hoard labor over the business cycle (Fay and Medoff 1984) and accept slack in bad times, which is taken up uniformly by workers choosing to loaf, regardless of the amount.

The additional effect of unemployment works as follows: higher unemployment lowers f , which raises the loafing threshold at any wage and thereby reduces non-work, but at the same time it also reduces the social cost (“peer effect”), which raises the amount of non-work by the amount ε' , conditional on doing any at all. Aggregate effort at wage w is now $e(w) = 1 - \int_{\bar{\ell}}^1 (\ell_i - \varepsilon(u)) g(i) di$. In the Appendix A we prove:

Proposition 5: In the presence of a pro-cyclical fixed cost of non-work, the net overall effect of unemployment on overall non-work is ambiguous.

The following toy model highlights this ambiguity. Preferred loafing is uniformly distributed: $g(\ell_i) = 1, G(\ell_i) = \ell_i$. Positive loafing is associated with a fixed cost $\varepsilon_0 - \varepsilon_1 u$, with ε_0 and ε_1 both positive and small, so that $\varepsilon_0 - \varepsilon_1 u < E\ell_i = 1/2$. We also impose $1 > \frac{\theta(w-b) - 1/2f + (r+\delta+f)(\varepsilon_0 - \varepsilon_1 u)}{r+\delta} > 0$ to ensure meaningful outcomes. It follows that:

$$\bar{w}_i = b + \frac{r+\delta+f}{\theta} (1/2 - \varepsilon_0 + \varepsilon_1 u) + \frac{(r+\delta)}{\theta} (\ell_i - 1/2)$$

$$\bar{\ell} = \frac{\theta(w-b) - 1/2f + (r+\delta+f)(\varepsilon_0 - \varepsilon_1 u)}{r+\delta}$$

$$\gamma = 1 - \frac{\theta(w-b) - 1/2f + (r+\delta+f)(\varepsilon_0 - \varepsilon_1 u)}{r+\delta}$$

$$\phi = 1/2 \left[1 + \left(\frac{\theta(w-b) - 1/2f + (r+\delta+f)(\varepsilon_0 - \varepsilon_1 u)}{r+\delta} \right) \right]$$

Total non-work is given by:

$$\ell(w) = 1/2 \left[1 - (\varepsilon_0 - \varepsilon_1 u) \right] \left[1 - \left(\frac{\theta(w-b) - 1/2f + (r+\delta+f)(\varepsilon_0 - \varepsilon_1 u)}{r+\delta} \right)^2 \right],$$

and is represented as the trapezoid ABCD in Figure 2. Total available labor is 1 and total effort is $e(w) = 1 - \ell(w)$; while $\partial e / \partial w = -\partial \ell / \partial w > 0$ unambiguously, $\partial \ell / \partial u$ cannot be signed. Holding the wage constant, higher unemployment leads to a lower outflow rate f , which means fewer workers are loafing; but among those who are, the average amount of non-work is higher, since by assumption

$$\frac{\partial f}{\partial u} < 0 \text{ and } \frac{d\bar{\ell}}{du} = \frac{\left(\frac{df}{du}\right)(\varepsilon_0 - \varepsilon_1 u^{-1/2}) - \varepsilon_1(r + \delta + f)}{r + \delta} > 0.^{21}$$

Figure 2 illustrates the impact of an increase in unemployment which matches that found empirically in Section III, i.e., with the intensive margin dominating the extensive margin.

F. An Alternative Interpretation of the Empirical Results

Our model takes a supply-side view of non-work driven by workers' motives. Our data do not allow us to test this model against demand-driven explanations of non-work based on labor-hoarding motives, i.e., that firms contribute actively to countercyclical non-work. In this sub-section, we briefly sketch such a model and leave it to future research based on richer datasets with extensive employer information to distinguish between labor hoarding and shirking motives.

Suppose workers have different productivities based on their endowments of firm-specific human capital, and suppose that the state of demand for firms is perfectly (negatively) correlated with the unemployment rate. In downturns, when demand is low, firms lay off some workers, but due to the costs of investing in firm-specific capital they prefer to part with workers with lower levels of prior human capital first. (In terms of our model, this could be subsumed by allowing the control and layoff probability θ to depend explicitly on ℓ_i .) Workers understand this and know that if they are caught shirking they will be laid off. Because layoffs will be concentrated but not limited to workers with low firm-specific human capital, these workers have an incentive to reduce non-work and lower their layoff probability, while those with more firm-specific capital will tend take advantage of it. Overall, we would observe a reduction of non-work in recessions, but an increase of those for whom it is a low-risk activity, given firm-specific investments.

V. Further Implications

The model in Section IV provides several testable implications that we can examine using the ATUS data. The results in Section III also have implications for the ongoing debate over the cyclical

²¹Recall that $\varepsilon(u) = \varepsilon_0 - \varepsilon_1 u < E(\ell_i) = 1/2$ was imposed. It should be emphasized that even this expanded model is only partial equilibrium. In Appendix B, we endogenize the wage by embedding the model in a general equilibrium framework.

labor productivity (see, e.g., Hagedorn and Manovskii, 2011; Galí and van Rens, 2014). We deal with these two issues in turn in this Section.

A. *Unemployment Insurance and Goofing Off*

The validity of Propositions 2 and 4 in Section IV can be assessed by expanding the specifications presented in Tables 2 and 3 to include proxies for the wage rate and unemployment income. Rather than adding the wage rate itself, which would generate errors due to division bias, we add the usual weekly earnings that are reported in the ATUS. Since a quadratic in weekly hours is already included, weekly earnings in this context become a measure of the worker's hourly wage rate.

The relevant measure of unemployment insurance (UI) income for each worker depends on complicated formulas typically linking her most recent year's pattern of earnings and employment to state-specific regulations that are revised annually. The ATUS lacks worker-specific earnings histories; *faute de mieux* we therefore experiment with two measures of the UI income that might represent the average benefit available to an unemployed worker. The first, the annual state-specific maximum weekly benefit amount (*maxWBA*), is set legislatively. Given the relatively low benefit ceilings that characterize most states' programs, roughly half of UI recipients receive maximum benefits, so that this measure could be a good proxy for the incentives described in the model of Section IV. An alternative measure is the average weekly benefit amount (*averageWBA*) paid in each state each year.²² We experiment with this too, although it is not as clean a measure as *maxWBA*, since it depends partly on state-specific variation in unemployment.

We re-estimate the models in Column (3) of Table 2 and Columns (2) and (4) of Table 3, adding each worker's usual weekly earnings and sequentially the *maxWBA* and *averageWBA* in the state in the particular year. For both *maxWBA* and *averageWBA* we present estimates of the determinants of the unconditional mean of the percentage of non-work time, the incidence of non-work (the extensive margin) and its conditional mean (the intensive margin). We measure UI benefits and weekly earnings in

²²These data represent an extension of the sample used by Kroft and Notowidigdo (2011).

thousands of dollars for ease of presenting the parameter estimates, noting that their raw means are \$384, \$281 and \$858 respectively. While the results are very similar for both measures of UI benefits, the explanatory power is slightly higher when we include *maxWBA*.

Section IV generated no predictions about the determinants of the unconditional mean of non-work time; and we see in Columns (1) and (4) of Table 6 that the inclusion of neither *maxWBA* nor *averageWBA* has a significant impact on this outcome. Even with all the demographic controls, however, conditional on hours of work those with higher weekly earnings (implicitly a higher wage rate) spend a smaller fraction of their time at the workplace in non-work.²³ Proposition 2 suggested that the incidence of non-work will fall with increases in the wage rate and rise with increases in income when unemployed. The estimates in Columns (2) and (5) of Table 6 represent strong evidence in support of this hypothesis. Controlling for education and other characteristics, workers with higher wage rates are less likely to engage in any goofing off on the diary day in the ATUS. Workers in states and at times where the maximum (average) UI benefit is higher conditional on their earnings and hours are more likely to spend part of their day at work in non-work. This represents a strong confirmation of the model in Section IV and, more generally, of the role of incentives to shirk in determining workers' and firms' behavior.

Proposition 2 implied that the incidence of non-work is increasing in unemployment income and decreasing in the wage rate. Proposition 4, in contrast, implies that the intensity of non-work is decreasing in unemployment income and increasing in wages. The former implication is supported by the results in Columns (3) and (6) of Table 6: Other things equal, including the large vectors of demographic, industry and occupational characteristics, the conditional fraction of non-work is lower among workers with higher hourly wages. The only part of Propositions 1-4 that is not supported by the data is the relationship

²³The inclusion of weekly earnings and the UI variables does not qualitatively alter any of the inferences about the effects of the demographic and other variables on the amount and incidence of non-work time that were based on the estimates in Tables 2 and 3.

between unemployment income and conditional non-work time: As Table 6 shows, UI benefits exhibit no correlation with conditional non-work time, only with its incidence.²⁴

B. Heterogeneity of Loafing

The estimates in Section III suggest substantial heterogeneity in loafing along demographic, geographic, occupational and industrial dimensions. We explicitly excluded the self-employed from our empirical analysis, both because we wished to concentrate on how the employment relationship expresses differences and changes in loafing, and because we wished later to focus on causes of changing employee productivity. Yet the existence of self-employed individuals – who by definition are not subject to efficiency-wage considerations – suggests an additional test of the theory: They should behave qualitatively and quantitatively differently from employees. To test this, we estimate the same equations for the self-employed respondents who reported time at the workplace, of whom there are 3347 with complete information on work-days in the ATUS 2003-12.

The estimates of the same expanded models that appeared in Column (3) of Table (2) and Columns (2) and (4) Table 3 yield parameter estimates on the unemployment rate of 0.0027 (s.e.=0.0015), -0.0043 (s.e.=0.0061) and 0.00432 (s.e.=0.0022). Most interesting is the fact that the impact at the intensive margin is much larger than that shown in Column (4) of Table 3. This difference should be expected, although the model in Section IV is not relevant here, as when unemployment is high and demand is slack, self-employed individuals might spend less time working at work, instead waiting for work or for customers. Together with a slightly smaller impact at the extensive margin, this finding results in much more cyclicity of non-work time at work among the self-employed than among employees.

In the equations presented in Tables 2 and 3 the parameter estimates of the vector of occupational indicators were highly significant statistically. Figures 3a, 3b and 3c present these estimates for the net impact, the extensive margin and the intensive margin respectively, with management as the excluded

²⁴Unreported results show that adding earnings to the specification hardly reduces the estimated positive impacts of minority status on the unconditional mean of loafing, nor does it alter very much the impacts on its incidence and intensity. The results suggest that an explanation related to incentives, rather than discrimination may better account for minority-majority differences in the amount of non-work.

occupation. Remembering that the equations already hold constant a large vector of demographic characteristics, these parameter estimates suggest an interesting pattern of heterogeneity across occupations. First, except for protective services, workers in all other occupations loaf more on the job than do managers, other things equal. Second, and most striking, the occupational differences in the net amount of loafing arise almost entirely from differences at the extensive margin. The pattern at this margin is consistent with what seem easily predictable occupational differences in the ease of monitoring potential shirkers. It is plausible that the monitoring technology is the weakest, and the tolerance of slack to be the highest, in farming, fishing and forestry, in production and extraction and in construction.

C. Cyclical Movements in Labor Productivity Since 2003

The nature of cyclical changes in labor productivity has been a focus of macroeconomic controversy for over half a century (e.g., Okun, 1962). Labor-hoarding motives suggest that output per paid worker-hour will fall in recessions, while the reduction in shirking incentives coupled with diminishing marginal productivity suggests it will rise when workers are laid off. Our model implies the outcome will be ambiguous, depending on the relative sizes of the impacts at the extensive margin (counter-cyclical productivity per hour at work through greater incentives against shirking) and the intensive margin (pro-cyclical productivity per hour at work through increased loafing by retained workers).

In the model presented in Section IV, there are four distinct effects of an exogenous increase in labor productivity, characterized in Appendix B. First, the obvious direct effect is greater productivity per worker with the same number of workers. Second, competitive firms will expand production and hire more labor in response, which tends to reduce productivity at the margin. The third and fourth effects arise in a general equilibrium context. As employment rises unambiguously, wages rise unambiguously, enhancing effort and boosting productivity. Fourth, unemployment falls, increasing labor turnover and

reducing the cost of shirking, with the increase in loafing putting a damper on productivity. The net result of these effects is ambiguous.²⁵

Our estimates demonstrate that the impact at the intensive margin dominates that at the extensive margin, so that we would expect pro-cyclical labor productivity if we measure it as output per **hour on the job**. To examine how our finding might alter measures of productivity change over the cycle, we extend the measures of labor productivity generated by Burda *et al* (2013) to account for cyclical variation in non-work at work. Most crucially, in our adjustment we measure labor productivity as output per hour at work and working—i.e., per hour of actual effort, and thus the closest empirical analog to measuring average productivity in a neoclassical production function. We concentrate on labor productivity in 2006:IV, when the U.S. unemployment rate in our data reached its cyclical low, and 2010:I, when it reached its high.²⁶

The first row of Table 7 presents the BLS index of labor productivity in the business sector (using a base of 2003:I = 100) for these two quarters and its peak-trough percentage change. The second row lists a calculation based on a number of changes by Cociuba *et al* (2012) using detailed modifications of the BLS series that account carefully for hours actually at work among civilian workers. The third row shows calculations that adjust the measures in the second row to account for time at work as reported by ATUS respondents in their diaries, which we view as more reliable than one-week retrospective reports of time on the job, based on Burda *et al* (2013). All of these measures confirm that labor productivity rose during the Great Recession.

Amending these calculations to account for non-work time at work, the purpose of this exercise, will increase the estimated counter-cyclical of labor productivity, measured as output per hour of effort (since we showed that the net impact of higher unemployment is to raise non-work time at work), but the

²⁵In Appendix B we show that the partial derivative of average productivity with respect to a homothetic outward shift in the production function is ambiguous for the reasons cited in the text.

²⁶Aggregate unemployment reached its cyclical minimum of 4.4 percent in a number of months between October 2006 and May 2007. Its cyclical maximum was reached in October 2009. We use the minimum and maximum in the ATUS sample for convenience, although the use of these dates hardly alters the inferences qualitatively.

question is: By how much? Taking the change in unemployment over this cycle, and using the estimates in Column (1) of Table 2 as indicating the maximum possible cyclical change in non-work time at work, the fourth row of Table 7 shows the adjusted indexes of labor productivity.²⁷ As the final column shows, accounting for the counter-cyclical change in non-work time at work sharply increases the estimated counter-cyclical change in labor productivity. Indeed, it nearly doubles its variation during the Great Recession compared to the Cociuba *et al* (2012) measure, and increases it by 25 percent compared to the BLS measure. Even with much less counter-cyclical change in non-work (based on the estimates in Column (3) of Table 2), accounting for this phenomenon (in the sixth row of Table 7) still shows substantial effects on the estimated change in labor productivity over the cycle. The main conclusion is that the standard neoclassical prediction holds up even more strongly when worker effort is measured correctly.

D. The Changing Cyclical Behavior of Labor Productivity

We can decompose the rise in productivity with higher unemployment into the increase caused by the rise in non-work time at the intensive margin and the drop generated at the extensive margin. As the fifth and bottom rows of Table 7 show, movements at the intensive margin generate effects on productivity (per hour of actual effort) that double the counter-cyclical change in productivity as compared to the less comprehensive measures in Rows 1-3. The decomposition demonstrates that the cyclical change in productivity will depend crucially on the relative importance of movements along the extensive and intensive margins.

The increase in labor productivity in the wake of the Great Recession stands in contradiction to an earlier, conventional wisdom that labor productivity and total factor productivity in general are procyclical (e.g., Cooley and Prescott, 1995, Gordon, 2003, Ch. 8). Our estimates hint that this reversal in the correlation could be due to changing strengths of behavior at the intensive and extensive margins – in the pre-1990 period, the intensive margin may have dominated the extensive margin. Our model points to

²⁷These are calculated so that they equal the measure in Row 3 at the average unemployment rate during this period. Changing the basis does not change the estimated cyclical change in this adjusted index.

parameters such as worker turnover (δ or f) as well as the monitoring intensity (θ) or income while unemployed as causal in this regard and indicates several directions for future work.

VI. Concluding Remarks

We have focused on measuring changes in effort exerted by workers as the labor market loosens or tightens. This would appear to be a simple measurement issue, one that would have been reflected in official aggregate data for many years. It has not been. With the now thirteen-year-old large-scale study of time use, the American Time Use Survey, we can begin to examine this issue in a way that was heretofore impossible, since that survey provides information on time use on the job. In particular, these new data allow us to measure the cyclical variability of time not working while at the workplace.

There is some evidence that non-work time at work is counter-cyclical, consistent with the dominance of labor hoarding over the role of workers' incentives to reduce shirking at times when its cost rises due to reduced external opportunities. Within this net result, however, lie highly significant but opposite-signed impacts of higher unemployment. The role of shirking is reflected strongly in the pro-cyclical variation in the incidence of non-work time; but among those who shirk at all, the intensity of their non-work is strongly counter-cyclical. These empirical results can be rationalized by a model of interactions between employers and workers in which higher unemployment reduces the incentive for heterogeneous workers to shirk, so that those who choose to continue shirking as unemployment rises are those whose preferences for shirking are strongest.

The model also generates predictions about how additional external opportunities, in the form of prospective unemployment benefits, affect the incidence and intensity of non-work on the job. In general they suggest that higher unemployment benefits lead unsurprisingly to more non-work on the job, but they also lead those who do shirk to do less of it. These predictions are mostly supported when we match the time-use data to various parameterizations of states' unemployment insurance systems. Other models might be constructed that explain all of the phenomena we have documented and still others, and that would be a worthwhile additional development.

We use the estimates to develop a new measure of labor productivity, relating it to changing unemployment and showing that, at least during the period encompassing the Great Recession, labor productivity was even more counter-cyclical than suggested by previous estimates. No doubt there are many other applications of this new approach to measuring effort on the job that might be carried out. For example, we have shown striking demographic differences in the share of work time devoted to non-work. These might be used to re-estimate hourly wage differentials among different races/ethnicities; they might be employed to adjust measures of the returns to education; or they could be used to re-examine the returns to on-the-job training. We leave this large set of potential extensions and applications, along with the derivation of additional predictions from our model, to others.

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APPENDIX A

A1. Derivation of the NLC wage \bar{w}_i

For every value of ℓ_i , the NLC-wage \bar{w}_i implies indifference between the strategies of loafing and non-loafing. For any value of $\bar{\ell}_i$ we have the following four equations in four unknowns: the NLC wage \bar{w}_i , the expected value of employment when unemployed EV^E (not knowing ℓ_i), the value of unemployment V^U , and the value of employment V^E conditional on knowing ℓ_i and imposing $V_i^N = V_i^S = V_i^E$:

$$(r + \delta + \theta)V_i^E = \bar{w}_i + \ell_i - \varepsilon(u) + (\delta + \theta)V^U$$

$$(r + \delta)V_i^E = \bar{w}_i + \delta V^U$$

$$(r + f)V^U = b + fEV^E.$$

$$EV^E = V^U + \frac{E\ell_i - \varepsilon(u)}{\theta},$$

or in matrix form:

$$\begin{bmatrix} r + \delta + \theta & -1 & -(\delta + \theta) & 0 \\ r + \delta & -1 & -\delta & 0 \\ 0 & 0 & r + f & -f \\ 0 & 0 & -\theta & \theta \end{bmatrix} \begin{bmatrix} V_i^E \\ \bar{w}_i \\ V^U \\ EV^E \end{bmatrix} = \begin{bmatrix} \ell_i \\ 0 \\ b \\ E\ell_i \end{bmatrix} \quad (\text{A1})$$

Note that the system is block recursive. We can solve for V^U and EV_i^E easily and, given those, solve for \bar{w}_i and V_i^E . The lower block can be solved first:

$$\begin{bmatrix} V^U \\ EV^E \end{bmatrix} = \begin{bmatrix} \frac{b}{r} + \frac{f}{r\theta} E\ell_i \\ \frac{b}{r} + \frac{r+f}{r\theta} E\ell_i \end{bmatrix} \quad (\text{A2})$$

Using (xx) the upper block of (x) is

$$\begin{bmatrix} r + \delta + \theta & -1 \\ r + \delta & -1 \end{bmatrix} \begin{bmatrix} V_i^E \\ \bar{w}_i \end{bmatrix} = \begin{bmatrix} \ell_i + (\delta + \theta) \left(\frac{f}{r\theta} E\ell_i + \frac{b}{r} \right) \\ \delta \left(\frac{f}{r\theta} E\ell_i + \frac{b}{r} \right) \end{bmatrix}$$

The solution for the NLC wage is then

$$\bar{w}_i = b + \frac{r + \delta + f}{\theta} E\ell_i - \frac{(r + \delta)}{\theta} (\ell_i - E\ell_i)$$

and the NSC threshold at given wage w is

$$\bar{\ell}_i = \frac{\theta(w - b) - fE\ell_i}{(r + \delta)}.$$

A2. Conditions for $\partial f/\partial u < 0$ and $\partial \bar{\ell}/\partial u > 0$ to hold in steady state equilibrium.

Proof. For $\partial f/\partial u$: Differentiate equation (8), which defines f , with respect to u :

$$f = (\delta + \theta\gamma)(u^{-1} - 1) ,$$

to obtain

$$\frac{df}{du} = \theta \frac{d\gamma}{df} \frac{df}{du} (u^{-1} - 1) - (\delta + \theta\gamma)u^{-2}$$

or, solving

$$\frac{df}{du} = \frac{-(\delta + \theta\gamma)u^{-2}}{1 - \theta(u^{-1} - 1) \frac{d\gamma}{df}}$$

so for $df/du < 0$ it is necessary and sufficient that $\theta(u^{-1} - 1) \frac{d\gamma}{df} < 1$, which with $u = (\delta + \theta\gamma)/(\delta + \theta\gamma + f)$

becomes $\theta \left(\frac{\delta + \theta\gamma + f}{\delta + \theta\gamma} - 1 \right) \frac{d\gamma}{df} < 1$ or $\left(\frac{f}{\gamma} \right) \frac{d\gamma}{df} < \left(\frac{f}{\gamma} \right) \frac{\delta + \theta\gamma}{\theta f} = 1 + \frac{\delta}{\theta\gamma}$. Since $\frac{\delta}{\theta\gamma} > 0$, it sufficient

for $\frac{df}{du} < 0$ that $\frac{d\gamma}{df} \left(\frac{f}{\gamma} \right) < 1$.

Corollary: $\partial \bar{\ell}/\partial u > 0$: $\frac{\partial \bar{\ell}}{\partial u} = \frac{-E\ell_i}{r + \delta} \frac{\partial f}{\partial u}$, which is unambiguously positive because $\frac{df}{du} < 0$.

A3. Proofs of Propositions 1-4.

Proposition 1: *Loafing and unemployment.* Holding the wage constant, the fraction of workers who

loaf depends negatively on the unemployment rate: $\frac{d\gamma}{du} < 0$.

Proof: Differentiate $\gamma = 1 - G(\bar{\ell})$ with respect to u to obtain $\frac{d\gamma}{du} = -g(\bar{\ell}) \frac{d\bar{\ell}}{du} < 0$, because the density

$g > 0$ and the Corollary establishes that $\frac{d\bar{\ell}}{du}$ is positive. ■

Proposition 2: *Loafing, wages, and unemployment income.* Holding the rate of outflow constant, the fraction of workers who loaf depends negatively on the wage and positively on income in

unemployment: $\frac{\partial \gamma}{\partial w} < 0$ and $\frac{\partial \gamma}{\partial b} > 0$.

Proof. Differentiate $\gamma = 1 - G(\bar{\ell})$ with respect to w to, using $\bar{\ell} = \frac{\theta(w-b) - fE\ell_i}{r+\delta}$ yielding

$$\frac{d\gamma}{dw} = -\frac{\theta g(\bar{\ell})}{r+\delta} < 0; \text{ similarly, } \frac{d\gamma}{db} = \frac{\theta g(\bar{\ell})}{r+\delta} > 0. \blacksquare$$

Proposition 3: Conditional mean loafing and unemployment. Holding the wage constant, the conditional mean of non-work on the job for those with positive non-work is increasing in the unemployment rate: $\frac{\partial \phi}{\partial u} > 0$.

Proof. Differentiate $\phi \equiv E[\ell_i | \ell_i > 0] = \frac{\int_{\bar{\ell}}^1 \ell_i g(\ell_i) d\ell_i}{1 - G(\bar{\ell})} = \frac{\int_{\bar{\ell}}^1 \ell_i g(\ell_i) d\ell_i}{\gamma}$ with respect to u using Leibniz's

$$\text{Rule: } \frac{d\phi}{du} = -\frac{\bar{\ell} g(\bar{\ell})}{\gamma} \frac{d\bar{\ell}}{du} - \frac{\int_{\bar{\ell}}^1 \ell_i g(\ell_i) d\ell_i}{\gamma^2} \frac{d\gamma}{du}. \text{ Since } \frac{d\bar{\ell}}{du} > 0 \text{ (by the Corollary) and } \frac{d\gamma}{du} < 0 \text{ (by}$$

Proposition 1), the first term is negative and the second term is positive. Use Proposition 1,

$$\frac{d\gamma}{du} = -g(\bar{\ell}) \frac{d\bar{\ell}}{du} \text{ to rewrite this as:}$$

$$\frac{d\phi}{du} = -\frac{\bar{\ell} g(\bar{\ell})}{\gamma} \frac{d\bar{\ell}}{du} + \frac{\int_{\bar{\ell}}^1 \ell_i g(\ell_i) d\ell_i}{\gamma^2} g(\bar{\ell}) \frac{d\bar{\ell}}{du} = \left[-\bar{\ell} + \frac{\int_{\bar{\ell}}^1 \ell_i g(\ell_i) d\ell_i}{\gamma} \right] \frac{g(\bar{\ell})}{\gamma} \frac{d\bar{\ell}}{du}, \text{ which can be written as}$$

$$(\phi - \bar{\ell}) \frac{g(\bar{\ell})}{\gamma} \frac{d\bar{\ell}}{du} \text{ which is unambiguously positive, because the threshold value is by definition the lower}$$

bound of ℓ_i for all those who loaf, so this always holds.²⁸ \blacksquare

Proposition 4: Conditional mean loafing, wages and unemployment income. Holding the outflow rate constant, the conditional mean of non-work on the job for those with positive non-work is

increasing in the wage and decreasing in income in unemployment: $\frac{\partial \phi}{\partial w} > 0$ and $\frac{\partial \phi}{\partial b} < 0$.

Proof. As with the proof of Proposition 3, differentiate $\phi \equiv \frac{\int_{\bar{\ell}}^1 \ell_i g(\ell_i) d\ell_i}{\gamma}$ with respect to w and b :

²⁸Use integration by parts to get $\left(\int_{\bar{\ell}}^1 \ell_i g(\ell_i) d\ell_i - \gamma \bar{\ell} \right) \gamma^{-1} = \left(\ell_i G(\ell_i) \Big|_{\bar{\ell}}^1 - \int_{\bar{\ell}}^1 G(\ell_i) d\ell_i - (1 - G(\bar{\ell})) \bar{\ell} \right) \gamma^{-1}$
 $= \left(1 - \bar{\ell} - \int_{\bar{\ell}}^1 G(\ell_i) d\ell_i \right) \gamma^{-1} = \left(\int_{\bar{\ell}}^1 [1 - G(\ell_i)] d\ell_i \right) \gamma^{-1}$ which is unambiguously positive, since $1 - G(\ell_i) > 0$
for the entire interval $\ell_i \in [0, 1]$

$$\frac{d\phi}{dw} = \frac{\frac{d}{dw} \int_{\bar{\ell}}^1 \ell_i g(\ell_i) d\ell_i}{\gamma} - \frac{\int_{\bar{\ell}}^1 \ell_i g(\ell_i) d\ell_i}{\gamma^2} \frac{d\gamma}{dw} = (\phi - \bar{\ell}) \frac{\gamma^{-1} \theta g(\bar{\ell})}{r + \delta} > 0$$

$$\frac{d\phi}{db} = \frac{\frac{d}{db} \int_{\bar{\ell}}^1 \ell_i g(\ell_i) d\ell_i}{\gamma} - \frac{\int_{\bar{\ell}}^1 \ell_i g(\ell_i) d\ell_i}{\gamma^2} \frac{d\gamma}{db} = (\phi - \bar{\ell}) \frac{\gamma^{-1} \theta g(\bar{\ell})}{r + \delta} < 0$$

The signs of these derivatives follow from $\frac{d\gamma}{dw} < 0$ and $\frac{d\gamma}{db} > 0$, as shown in Proposition 2, and from the

fact that $\phi > \bar{\ell}$, established in the proof of Proposition 3. ■

A4. Fixed costs of non-work and Proposition 5.

Parallel to the original model, we assume that the conditions obtain that yield a negative correlation in general equilibrium between the unemployment rate u and the inflow rate f . Using arguments analogous to those above, it is straightforward to show that:²⁹

$$\bar{w}_i = \frac{(r + \delta)}{\theta} (\ell_i - E\ell_i) + \frac{r + \delta + f}{\theta} (E\ell_i - \varepsilon(u)) + b$$

$$\bar{\ell} = \frac{\theta(w - b) - fE\ell_i + (r + \delta + f)\varepsilon(u)}{r + \delta}$$

Using these results, we can prove

Proposition 5: In the presence of a pro-cyclical fixed cost of loafing, the net overall effect of unemployment on overall loafing is ambiguous.

Proof: Overall total loafing is given by $\ell(w) = \int_{\bar{\ell}}^1 [\ell_i - \varepsilon(u)] g(\ell_i) d\ell_i = \int_{\bar{\ell}}^1 \ell_i g(\ell_i) d\ell_i - \varepsilon(u) [1 - G(\bar{\ell})]$; by integrating the first term by parts, we can write $\ell(w) = 1 - \bar{\ell}G(\bar{\ell}) - \int_{\bar{\ell}}^1 G(\ell_i) d\ell_i - \varepsilon(u) [1 - G(\bar{\ell})]$.

Differentiate this with respect to u :

$$\frac{\partial \ell(w)}{\partial u} = -\bar{\ell} g(\bar{\ell}) \frac{\partial \bar{\ell}}{\partial u} - \varepsilon'(u) [1 - G(\bar{\ell})] + \varepsilon(u) g(\bar{\ell}) \frac{\partial \bar{\ell}}{\partial u} \quad (\text{A3})$$

Note first that $\frac{\partial \bar{\ell}}{\partial u} = \frac{-\frac{\partial f}{\partial u} (E\ell_i - \varepsilon(u)) + (r + \delta + f)\varepsilon'}{r + \delta}$, so $E\ell_i > \varepsilon(u)$ is no longer sufficient for $\frac{\partial \bar{\ell}}{\partial u} > 0$; a

value of ε' which is sufficiently close to zero will generate this inequality. Yet even then, the sum of three

²⁹A more detailed appendix describing this extension is available from the authors upon request.

terms in (A3) has an ambiguous sign; the first term is negative, the second is positive and the third is positive. ■

APPENDIX B. Closing the Model: Efficiency Wages versus Competitive Labor Markets

The model was set up in partial-equilibrium terms, focusing on the worker's decision to supply effort, taking the wage and unemployment as given. Closing the model requires specifying the wage determination process. One possibility is that firms set or post wages as in the efficiency wage or search literature.³⁰ In a class of model developed in Section IV, firms would choose a wage offer and a level of employment to maximize profits subject to dependence of effort on pay. Let the representative firm's production function be given by $Y = \Theta F(e(w)L)$, where F is a concave, continuous function of labor input $e(w)L$, with $e(w) = 1 - \int_{\bar{\ell}}^1 \ell_i g(\ell_i) d\ell_i$, $F' > 0$ and $F'' < 0$ and $\Theta > 0$ is an exogenous productivity shift term.

Note that $\frac{\partial e}{\partial w} = \frac{\theta g(\bar{\ell})}{r + \delta} > 0$.³¹ For simplicity, the price of output is set to one. First-order conditions for profit maximization are: $e\Theta F' = w$, and $\Theta e' F'(e(w)L) = 1$. Combining the two yields the familiar "Solow condition" (Solow, 1979), $w e' / e = 1$:

$$w = \frac{(r + \delta)e(w)}{\theta g(\bar{\ell})} = \frac{(r + \delta) \left(1 - \int_{\bar{\ell}}^1 \ell_i g(\ell_i) d\ell_i\right)}{\theta g(\bar{\ell})},$$

where $\bar{\ell} = \frac{\theta(w - b) - fE\ell_i}{r + \delta}$. From the firm's perspective, the wage set is independent of the marginal product of labor, equating it rather to the ratio of average effort and marginal effort in response to the wage. The model is closed by the optimality condition for employment L after substituting for e and $\bar{\ell}$

$$\Theta \left[1 - \int_{\bar{\ell}}^1 \ell_i g(\ell_i) d\ell_i\right] F \left(\left(1 - \int_{\bar{\ell}}^1 \ell_i g(\ell_i) d\ell_i\right) L \right) = w,$$

and the flow equilibrium condition for f (8), which yields, after substituting for $\bar{\ell}$, a system of three equations in w , L and f .

³⁰The notion that firms post or set wages has a diverse literature: Bewley (1999) presents evidence that firms set wages and are reluctant to reduce them; Burdett and Mortensen (1998) model wage-posting and turnover as sources of labor market frictions which gives rise to an equilibrium distribution of wages. Manning (2003) provides a summary of these arguments as deriving from both monopsony power and search frictions.

³¹To ensure uniqueness of the efficiency wage, we would need to require $e(w) = 0$ for some $w > 0$ and for $e(w)$ to be concave: $e'' < 0$. In the present model, the first condition is always met; the second is met if the density of preferred loafing times is declining at the optimum and $\bar{\ell}$ is decreasing in the wage in general equilibrium.

Alternatively, a competitive wage equates the marginal product of labor, given effort, with the monetary disutility of work at some level of employment. The representative firm's profit is as before, but firms choose employment only. For simplicity, we specify an iso-elastic production function $Y = \Theta L^{1-\eta}$ with $\eta > 0$. Profit maximization implies a single first-order condition $e\Theta F'(eL) = w$. At the same time, the competitive wage also equals the marginal disutility of work, $w = L^{1/\varepsilon}$. η and ε are thus the elasticities of labor supply and demand, respectively. The equilibrium level of employment L solves:

$$\left[1 - \int_{\bar{\ell}}^1 \ell_i g(\ell_i) d\ell_i \right] \frac{\eta - 1}{\eta} \Theta L^{-1/\eta} = L^{1/\varepsilon},$$

yielding one equation in L , after substituting for out $\gamma, f, \bar{\ell}$ and using $w = e(L^{1/\varepsilon})\Theta F'(L)$.

**Table 1. Descriptive Statistics, ATUS Employees' Workdays, 2003-12, N=35,548,
Means and their Standard Errors (and Ranges for Several Variables)**

	Unconditional Mean/ Incidence	Conditional Mean
Daily hours at work	8.35 (0.014) [0.02, 24]	
Proportion of time at work Not Working:	0.0688 (0.00062)	
Of which:	0.663	0.1003 (0.00084)
Eating	0.0372 (0.00028)	
Non-work not eating	0.518 (0.00057)	0.0682 (0.00041)
Of which:	0.0355	0.0869 (0.00145)
Leisure and exercise	0.0221 (0.00038)	
Cleaning	0.0046 (0.00031)	
Other	0.0050 (0.00028)	
Usual weekly work hours	41.38 (0.063) [1, 160]	
State unemployment rate (three-month average)	6.65 (0.012) [2.1,14.4]	

**Table 2. Basic Estimates of the Fraction of Time at Work Not Working, ATUS 2003-12, N=35,548
(Parameter Estimates and Their Standard Errors)***

Ind. Var.	Non-Work			Eating at Work		Other	
State unemployment rate (3-month average)	0.00104 (0.00037)	0.00084 (0.00036)	0.00056 (0.00041)	0.00024 (0.00022)	0.00001 (0.00022)	0.00060 (0.00030)	0.00056 (0.00035)
Usual weekly hours		0.0029 (0.0004)	0.0027 (0.0004)	0.0007 (0.0002)	x	0.0022 (0.0003)	x
(Usual weekly hours) ² /100		-0.0034 (0.0004)	-0.0031 (0.0004)	-0.0010 (0.0002)	x	-0.0024 (0.0003)	x
Hours at work		-0.0368 (0.0028)	-0.0377 (0.0028)	0.0046 (0.0013)	x	-0.0414 (0.0026)	x
(Hours at work) ² /100		0.0032 (0.0002)	0.0032 (0.0002)	-0.0002 (0.00009)	x	-0.0034 (0.0003)	x
African-American		0.0114 (0.0022)	0.0104 (0.0024)	0.0033 (0.0010)	x	0.0082 (0.0020)	x
Hispanic		0.0139 (0.0022)	0.0112 (0.0025)	0.0101 (0.0010)	x	0.0037 (0.0020)	x
Asian-American		0.0115 (0.0033)	0.0084 (0.0036)	0.0101 (0.0019)	x	0.0014 (0.0028)	x
Schooling=12		-0.0049 (0.0029)	-0.0041 (0.0029)	-0.0001 (0.0012)	x	-0.0049 (0.0027)	x
Schooling=13-15		-0.0094 (0.0033)	-0.0064 (0.0034)	-0.0016 (0.0015)	x	-0.0077 (0.0030)	x
Schooling = 16		-0.0180 (0.0031)	-0.0131 (0.0033)	-0.0036 (0.0012)	x	-0.0144 (0.0028)	x
Schooling >16		-0.0199 (0.0031)	-0.0167 (0.0035)	-0.0033 (0.0013)	x	-0.0166 (0.0029)	x

Table 2, cont.

Married	-0.0017 (0.0021)	-0.0025 (0.0021)	0.0018 (0.0011)	x	-0.0034 (0.0018)	x	
Male	0.0019 (0.0025)	-0.0018 (0.0026)	0.0004 (0.0013)	x	0.0016 (0.0022)	x	
Married x Male	0.0015 (0.0031)	0.0031 (0.0031)	0.0001 (0.0016)	x	0.0014 (0.0027)	x	
Occupation fixed effects (22)		x		x		x	
Industry fixed effects (51)		x		x		x	
State fixed effects (51)		x		x		x	
Month fixed effects		x		x		x	
Adjusted R ²	0.0004	0.074	0.084	0.029	0.044	0.112	0.115

*x denotes the variable or vector is also included. Each equation also includes a quadratic in potential experience, and an indicator of metropolitan status. Standard errors in parentheses here and in Tables 3-6.

Table 3. Probit Derivatives and Conditional Regression Estimates of the Fraction of Time at Work Not Working, ATUS 2003-12*

Ind. Var.	<u>Probit Derivatives</u>		<u>Conditional Regressions</u>	
State unemployment rate (3-month average)	-0.00347 (0.00150)	-0.00507 (0.00172)	0.00159 (0.00042)	0.00162 (0.00048)
African-American	0.0795 (0.0089)	x	0.0047 (0.0024)	x
Hispanic	0.0742 (0.0088)	x	0.0106 (0.0025)	x
Asian-American	0.0775 (0.0183)		0.0051 (0.0038)	
Schooling=12	-0.0279 (0.0124)	x	0.0009 (0.0032)	x
Schooling=13-15	-0.0645 (0.0131)	x	0.0003 (0.0035)	x
Schooling = 16	-0.1112 (0.0143)	x	-0.0048 (0.0034)	x
Schooling >16	-0.1174 (0.0144)	x	-0.0050 (0.0034)	x
Occupation fixed effects (22)		x		x
Industry fixed effects (51)		x		x
State fixed effects (51)		x		x
Month fixed effects		x		x
Pseudo- or Adjusted R ²	0.095	0.127	0.365	0.370
N =	35,548	35,548	23,578	23,578

*x denotes the variable or vector is also included. Each equation also includes quadratics in usual weekly hours, time at the workplace, and potential experience; indicators of gender, marital status and their interaction, and metropolitan residence.

Table 4. Probit Derivatives and Conditional Regression Estimates of the Fraction of Time Eating at Work and Other Non-Work, ATUS 2003-12*

Ind. Var.	<u>Eating at Work</u>		<u>Other Non-Work</u>	
	Probit Derivatives	Conditional Regressions	Probit Derivatives	Conditional Regressions
State unemployment rate (3-month average)	-0.00579 (0.00197)	0.00081 (0.00032)	-0.00529 (0.00180)	0.00231 (0.00072)
African-American	0.0483 (0.0120)	0.0014 (0.0014)	0.1015 (0.0111)	-0.0021 (0.0038)
Hispanic	0.0952 (0.0120)	0.0040 (0.0019)	0.0022 (0.0112)	0.0118 (0.0043)
Asian-American	0.0862 (0.0216)	0.0034 (0.0024)	0.0255 (0.0205)	0.0017 (0.0074)
Schooling=12	-0.0186 (0.0140)	0.0031 (0.0016)	-0.0057 (0.0124)	-0.0036 (0.0044)
Schooling=13-15	-0.0304 (0.0152)	0.0029 (0.0025)	-0.0353 (0.0130)	-0.0028 (0.0050)
Schooling = 16	-0.0397 (0.0165)	0.0026 (0.0021)	-0.0917 (0.0140)	-0.0087 (0.0056)
Schooling >16	-0.0383 (0.0176)	0.0011 (0.0023)	-0.1252 (0.0144)	-0.0058 (0.0062)
Occupation fixed effects (22)	x	x	x	x
Industry fixed effects (51)	x	x	x	x
State fixed effects (51)	x	x	x	x
Month fixed effects	x	x	x	x
Pseudo- or Adjusted R ²	0.153	0.143	0.058	0.498
N =	35,548	18,401	35,548	12,612

*x denotes the variable or vector is also included. Each equation also includes quadratics in usual weekly hours. Time at the workplace, and potential experience; indicators of gender, marital status and their interaction, and metropolitan residence.

Table 5. Robustness Checks on Basic Equations Describing Non-Work Time: Estimated Impacts of Unemployment*

	Dependent Variable:			
	Unconditional Mean	Incidence	Intensity	N = Total (Intensity)
Experiment:				
More occupation (513) and industry (259) indicators	0.00067 (0.00042)	-0.00506 (0.00202)	0.00160 (0.00048)	35,548 23,578
Private-sector only	0.00070 (0.00046)	-0.00466 (0.00191)	0.00177 (0.00054)	29,292 19,402
Exclude Dec. 2007 - June 2009	0.00062 (0.00046)	-0.00460 (0.00186)	0.00201 (0.00054)	30,204 20,019
Men and women separately:				
Men	0.00085 (0.00057)	-0.00437 0.00270)	0.00207 (0.00067)	17,777 11,808
Women	0.00026 (0.00058)	-0.00701 (0.00284)	0.00134 (0.00067)	17,771 11,770
Workers separately by payment method:				
Hourly	0.00066 (0.00053)	-0.00463 (0.00214)	0.00173 (0.00059)	20,541 14,644
Salaried	0.00050 (0.00064)	-0.00490 (0.00275)	0.00162 (0.00082)	14,991 8,932
Full-time (35+ weekly hours)	0.00032 (0.00040)	-0.00511 (0.00179)	0.00131 (0.00047)	29,864 20,408
No 100-percent non-workers	0.00016 (0.00028)	-0.0056 (0.00177)	0.00089 (0.00036)	35,059 23,089

*Each equation also includes all the controls included in Column (3) of Table 2, here and in Table 6.

Table 6. Estimates of the Effects of Earnings and Unemployment Benefits on the Incidence and Intensity of Non-work, ATUS 2003-12

	<u>Maximum Benefit</u>			<u>Average Weekly Benefit</u>		
	Unconditional Mean	Incidence	Intensity	Unconditional Mean	Incidence	Intensity
State unemployment rate (3-month average)	0.00049 (0.00045)	-0.00640 (0.00187)	0.00173 (0.00052)	0.00058 (0.00048)	-0.00635 (0.00197)	0.00178 (0.00056)
Weekly earnings (\$000)	-0.0035 (0.0011)	-0.0266 (0.0054)	-0.0020 (0.0014)	-0.0035 (0.0011)	-0.0261 (0.0054)	-0.0019 (0.0014)
UI benefits (\$000)	0.0180 (0.0231)	0.2823 (0.1034)	-0.0111 (0.0259)	0.0048 (0.0405)	0.3641 (0.1861)	-0.0260 (0.0465)
Pseudo- or Adjusted R ²	0.085	0.129	0.370	0.085	0.129	0.370
N =	35,548	35,548	23,578	35,548	35,548	23,578

Table 7. Changes in Productivity, 2006:IV – 2010:I (2003:I = 100)

Row	Productivity Measure	Peak Quarter 2006:IV	Trough Quarter 2010:I	Percentage Change Peak to Trough
1	Business Productivity	108.05	116.81	8.11
2	Cociuba <i>et al</i> Adjustment	106.27	111.79	5.20
3	Burda <i>et al</i> Adjustment of (2)	105.20	111.79	6.26
4a	(3) Adjusted for Maximum Non-work	103.57	114.44	10.49
	Of Which: Intensive Margin	103.27	117.66	13.93
4b	(3) Adjusted for Minimum Non-work	104.30	113.22	8.55
	Of Which: Intensive Margin	103.10	113.50	10.08
	Unemployment Rate	4.21	10.23	

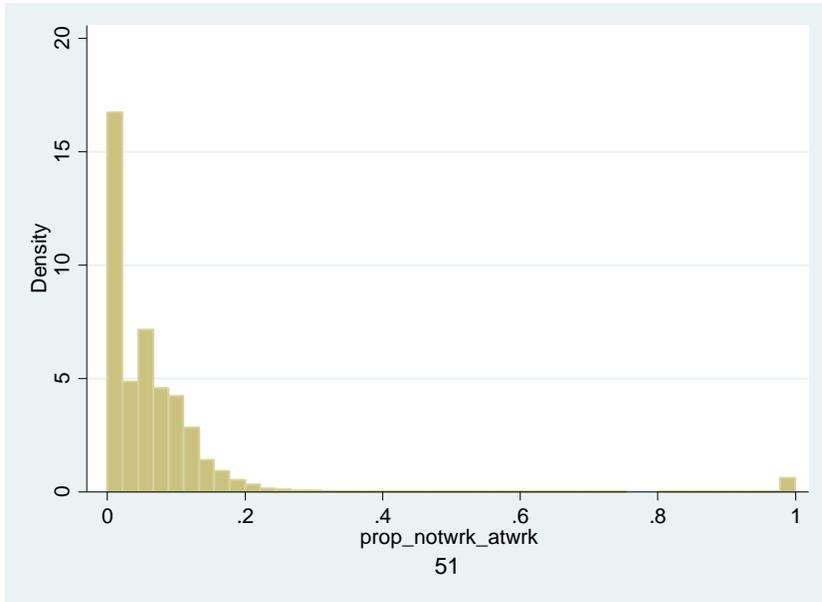


Figure 1. Distribution of the Fraction of Non-work Time, ATUS 2003-2012

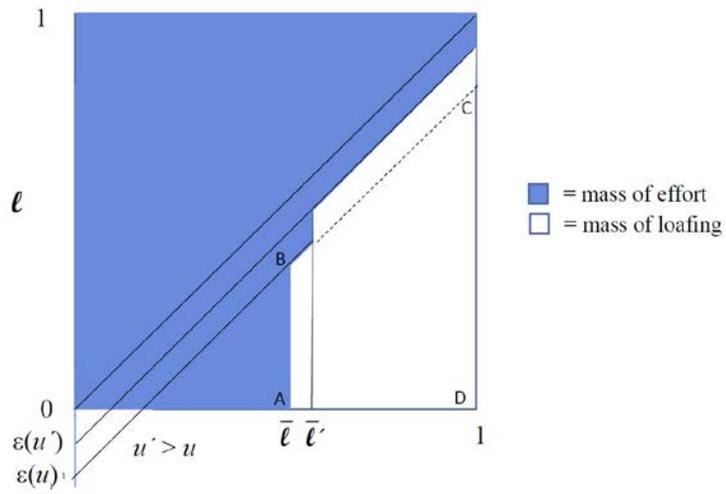


Figure 2. Effort and Loafing in a Toy Model with a Cyclically Sensitive Fixed Cost of Nonwork $\varepsilon(u) = \varepsilon_0 + \varepsilon_1 u$

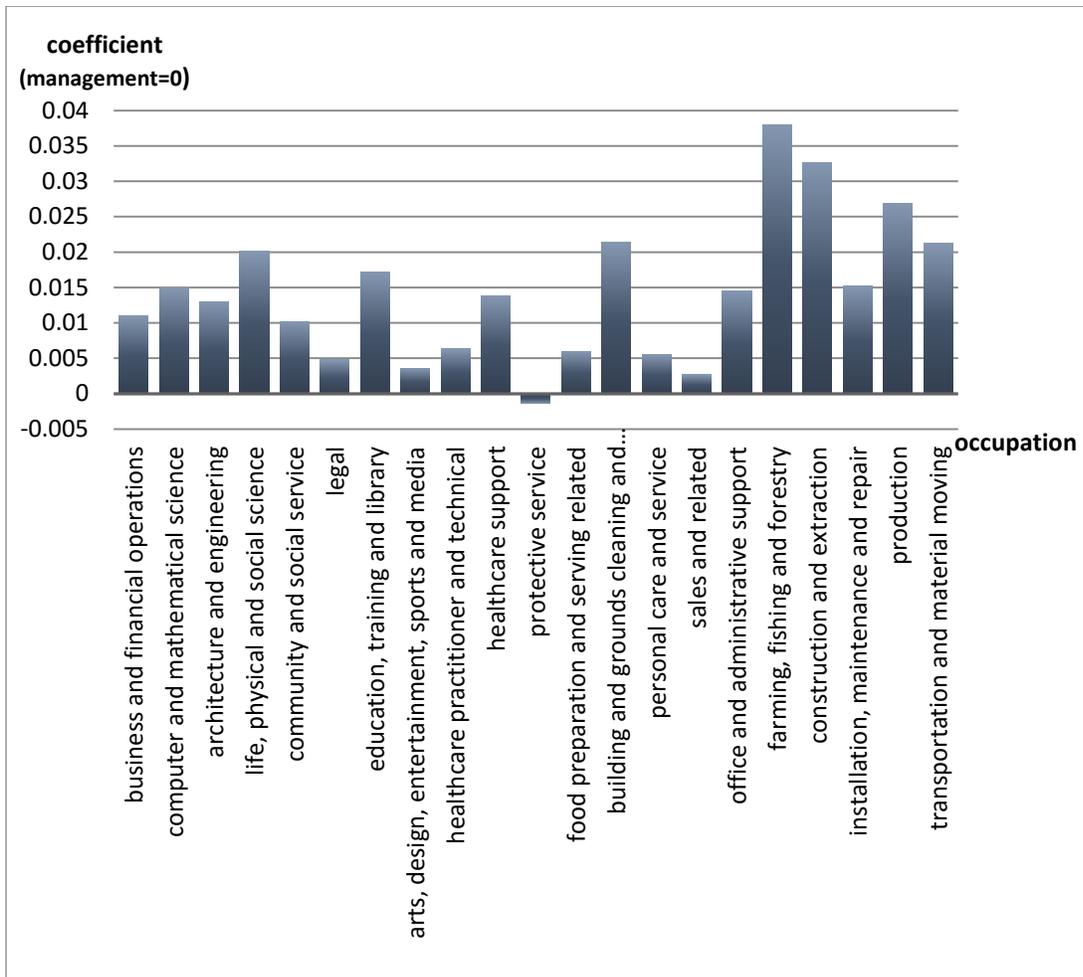


Figure 3a. Coefficients on Occupational Indicators, Column (3), Table 2 (Net Effect; Management Is the Excluded Category).

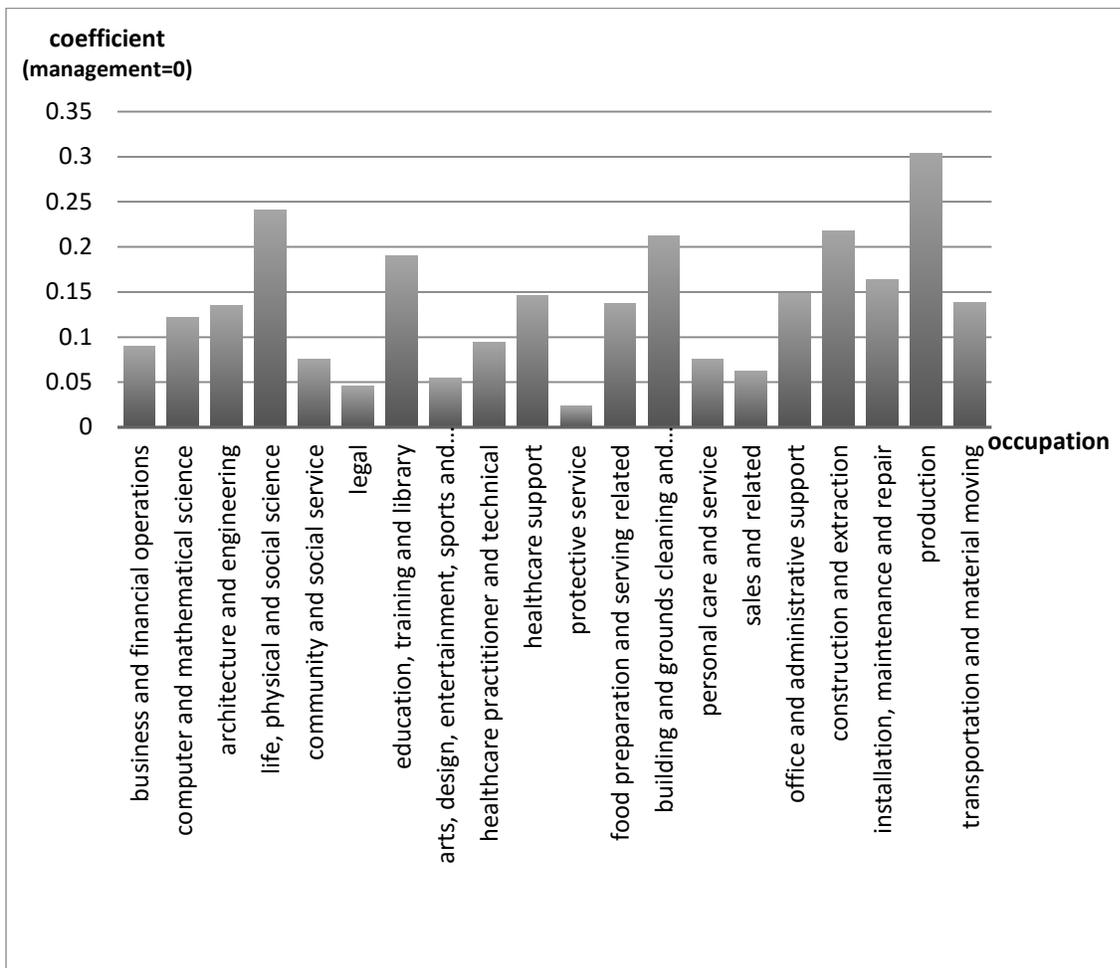


Figure 3b. Coefficients on Occupational Indicators, Column (2), Table 3 (Extensive Margin; Management Is the Excluded Category).

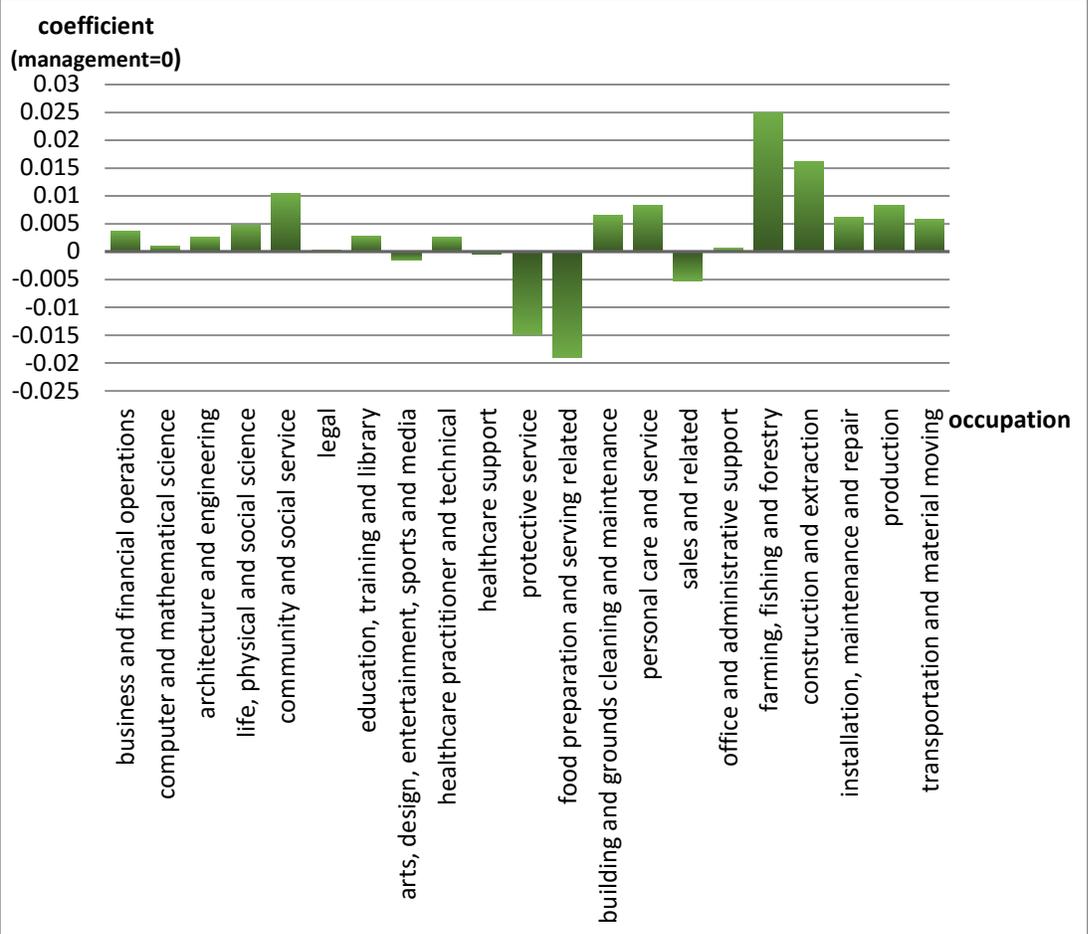


Figure 3c. Coefficients on Occupational Indicators, Column (4), Table 3 (Intensive Margin; Management Is the Excluded Category).