Who Moonlights and Why?

Evidence from the SIPP

Jean Kimmel
Economist
W. E. Upjohn Institute for Employment Research
300 S. Westnedge Avenue
Kalamazoo, MI 49002
(616) 385-0435

and

Karen Smith Conway
Associate Professor of Economics
Department of Economics
University of New Hampshire
Durham, NH 03824
(603) 862-3386

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Moonlighting workers represent a significant percentage of the labor force. The motives for moonlighting include the inability to work sufficient hours or earn enough money on the primary job, as well as a desire for a nonpecuniary aspect of the second job that is unavailable on the primary job. We refer to these motives as primary job constraints and heterogeneous jobs. We present extensive descriptive and econometric evidence using the SIPP, and conclude that both general motives are important.

Multiple-job holding is a significant characteristic of the labor market, with approximately 6 percent of all employed males reporting a second job in 1993 (Mishel and Bernstein, 1995 p.226). Who moonlights and why do they choose to take the second job? Moonlighters are more likely to be relatively young and higher educated than the typical non-moonlighter. And, approximately 40 percent of moonlighters report taking the second job due to economic hardship. However, moonlighting may also result from an increased need for flexibility to combine work and family or the worker's choice to pursue entrepreneurial activities while maintaining the financial stability offered by the primary job.

We can classify the different reasons for moonlighting into two types of motives, which helps us to answer both the "who" and "why" moonlighting questions. First, individuals may hold multiple jobs because an hours constraint on the primary job limits that job's earnings capacity (i.e., causing economic hardship). Second, moonlighting may arise because the labor supplied to the two jobs are not perfect substitutes. We refer to this reason as the heterogeneous jobs or job-packaging motive. For example, working on the primary job may provide the worker with the credentials to acquire a higher paying second job, such as a university psychologist testifying in a jury trial. Or, working on the second job may provide satisfaction not received from the primary job, such as a comedian who has a "regular" job by day and performs at night. In either example, the costs and benefits of both jobs are more complex than the monetary wages paid and the foregone value of leisure. When faced with such nonpecuniary benefits and costs, optimizing behavior may lead a worker to take two jobs.

Previous research on moonlighting, including Shishko and Rostker (1976), O'Connell (1979) Krishnan (1990), and Paxson and Sicherman (1996) , acknowledges that multiple motives may exist but focuses only on the constraint motive. To our knowledge, only three studies focus on the different reasons why people moonlight. Plewes and Stinson (1991) provide survey evidence from the 1989 Current Population Survey of the many distinct reasons for moonlighting reported by workers, while Lilja (1991) and Conway and Kimmel (1994) explicitly model the joint motives for moonlighting and control for the endogeneity of primary job hours in their estimation of moonlighting hours equations.[1]

This research examines the characteristics of moonlighters and the length of their moonlighting episodes with the goal of understanding who moonlights and why. We begin by studying the personal and job-related characteristics of moonlighters and how the length of the moonlighting episode varies with these characteristics. We also study the linkage between moonlighting and poverty status. Then, we examine the factors contributing to the probability of moonlighting using a probit model. Finally, we estimate a duration model with unobserved heterogeneity to identify formally the determinants of the length of the moonlighting episode when multiple motives may exist. The descriptive analyses reveal that most moonlighters in our sample work fulltime on their primary jobs and 15 to 20 hours a week on lower paying second jobs, and, in spite of those long hours, tend to be somewhat poorer than the average worker. Yet, a significant minority earns a higher wage on their second job, a result consistent with "job-packaging" rather than the constraint motive. The probit model reveals that both pecuniary and nonpecuniary factors are important to the moonlighting choice. And, our duration model results

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[1]Regets (1992), Lakhani (1994), and Mehay (1991) investigate a closely related issue, whether serving in the military reserves is moonlighting in the usual sense or is instead a case of compensated leisure.

suggest that the structural hazard increases over time and there is significant unobserved heterogeneity. Taken together, these results are consistent with the presence of multiple motives for moonlighting, with the constraint motive being the most common.

II. Moonlighting Trends and Data Description

Despite the importance of moonlighting to workers in today's economy, little comprehensive descriptive information exists in the economics literature. Three notable exceptions are Paxson and Sicherman (1996), Kimmel and Powell (1996), and Levenson (1995). However, Paxson and Sicherman rely on data from the Panel Study of Income Dynamics (PSID), which the authors themselves acknowledge is less than ideal because the specific survey questions make it unclear whether the jobs were held simultaneously or sequentially, and many of the survey responses to critical moonlighting questions are missing or unreported. Also, because the PSID is an annual survey, it may miss short moonlighting episodes. Kimmel and Powell (1996) focus on the comparison between Canada and the United States. And, Levenson (1995) focuses mainly on the links between moonlighting and parttime employment trends and therefore has little to say about the different motivations for moonlighting.

While only six percent of workers report holding two or more jobs at any given time in recent years, a much larger percentage moonlights at some time in their working lives. According to Paxson and Sicherman, over half of men who work continuously moonlight at some point in their working lives. Moonlighting rates peak for workers in their 30's and 40's, perhaps due to some combination of the financial burdens of raising children, purchasing a home, and saving for college. (Unpublished BLS data summarized in Kimmel, 1995) Or, the demands of family may lead workers to increase the flexibility of their work schedules through "job-packaging". Workers in this age group are also more likely to have the work experience and credentials to enjoy some of the nonwage benefits of moonlighting mentioned earlier.

The steadiness in male moonlighting rates in the past 25 years, combined with the increase in labor force participation for wives, and rising overall moonlighting rates suggest that workers are facing growing financial pressures.[2] Real wages for men with a high school education or less have fallen nearly 30 percent in the past two decades, while real home prices and rental rates have risen 20 percent and 13 percent, respectively, during the same period. Additionally, real wages for higher-educated workers have remained stagnant. (*The State of America's Children*, 1994)

Many of these broader moonlighting trends are reflected in the data set used in this paper's empirical analyses. These data are drawn from the 1984 Panel of the Survey of Income and Program Participation, a nationally-representative panel survey data set that contains detailed job information for up to two jobs in each four-month survey period or "wave". Included in the job details are specific job start and stop dates, which are used to identify the precise starting and stop

[2]Krishnan (1990) investigates the empirical relationship between moonlighting by the primary earner and the labor supply decisions of the spouse.

dates of each moonlighting episode.[3] We define the primary job as the one for which the individual receives the highest earnings.[4] Our subsample is restricted to prime-aged men who work continuously throughout the 3-year panel, yielding a sample of 203 moonlighting males.[5]

Two problems are encountered in undertaking a study of this kind. The first problem arises because individual and job characteristics may change over the course of the moonlighting episode. Because our data are observed in four-month intervals, a particular moonlighting episode may span several waves and the characteristics may change during the episode. For instance, the wage on the primary job may be different in the last wave of the episode than in the first. Our duration model described in the next section takes account of this problem by permitting time-varying covariates.

In our descriptive analysis, however, the solution is not so straightforward. We must choose a unit of measurement--one observation per moonlighting wave, per moonlighting episode, or per moonlighting individual. Using the wave-level observation describes the typical moonlighter more accurately at a given point in time, but it weights the analysis more heavily towards longterm moonlighters.[6] If we choose the episode or individual as our unit of measurement (the two will only differ for the people who have more than one episode), we must decide how to assign variable values for the entire episode. This measure more accurately describes the qualities of individuals who moonlight at some point during the panel, and weights all moonlighters equally, regardless of the length of their episodes. Thus, for some of the analyses

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[3]A potential source of error is that persons with brief periods of nonemployment during a wave may have their weeks employed overstated because of misreported or misleading job start and end dates in the SIPP's monthly records. Extensive data checks confirmed that the possibly overstated hours of work (and therefore understated imputed wages) for persons briefly without jobs is of no empirical importance to our results. We thank Theresa Devine for bringing this subtlety of the SIPP's monthly records to our attention.

[4] Redefining the PJ as the one with the highest hours worked affects only 4.1% percent of the observations.

[5]We restrict our sample to those who moonlight at least five days because shorter episodes are more likely to reflect job changes. However, the definition of job-start and job-end dates in the survey ensures that workers who moonlight repeatedly for short periods (such as on weekends) are included. We also exclude self-employed workers from our sample because their wages reflect the returns to both their labor and capital. Thus, the marginal wage received from working one more hour is nearly impossible to measure. And, we exclude individuals ages 18-25 who are in school, but retain other young people because they moonlight at such high rates and comprise a significant percentage of our sample. Because the self-employed and students tend to moonlight at relatively high rates, these exclusions, in conjunction with the requirement that individuals work all 9 waves of the SIPP, explain the relatively low moonlighting rates in our sample.

[6]For instance, the characteristics of a person who held two jobs for three years would enter into the calculation of the sample means nine times (a three year episode would span nine four-month intervals), whereas the characteristics of a person who held two jobs for three months would enter into the calculation only once.

it makes sense to use the wave as the unit of measurement, while for others the episode is the more logical choice. The unit of measurement is listed at the bottom of each table, and the variable values are from the first wave of the episode when the episode is the unit of measurement. Our total sample consists of 203 individuals, 261 episodes, and 586 observations/waves.

The second problem is that some individuals were moonlighting when the survey began and others were still moonlighting when the survey ended. These individuals are typically referred to as having left-censored and right-censored episodes, respectively. [The survey does not permit reported job start dates to precede the beginning the survey, making it impossible to identify the beginning of a left-censored episode.] These individuals only pose a problem when we examine the length of the moonlighting episode because this variable is measured with error and is biased downward. For instance, an individual who moonlights continuously for the entire panel is both left- and right-censored in our data and has a reported episode length of three years, the entire length of the panel. On the other hand, the individual's personal and job-related characteristics should be valid. Twenty-one percent of our observations involve a left-censored episode (affecting 54 individuals), while the same percent involve a right-censored episode. Only nine individuals are both left- and right-censored.

In section III we focus on the length of the episode by constructing and estimating a duration model. Whereas duration models are designed to deal with the problem of censoring, the presence of time-varying covariates requires that we omit left-censored episodes.[7] This selection yields a sample of 149 moonlighters, 207 episodes and 388 observations/waves. Therefore, in order for our descriptive analysis to be comparable to our duration model results, we report the results for the moonlighting sample both with and without left-censored episodes. When the focus of the descriptive analysis is on the length of the moonlighting episode, we report results both with and without left- **or** right-censored episodes because either type has a mismeasured episode length.

A. Who Moonlights?

Table 1 shows the means of key variables for the full sample of moonlighters, plus the subsample that omits left-censored episodes that is used in estimating the hazard functions. This table also provides means for a male comparison group (also from the 1984 SIPP panel) that does not stratify on moonlighting status. This comparison group permits us to study the differences between male moonlighters and the overall male labor force, thereby shedding additional light on the characteristics of moonlighters and the possible motivations for moonlighting.

Table 1, Part A reports the demographic characteristics of the moonlighters. Here we choose the individual as the unit of measurement because these variables do not vary much over the course of the moonlighting episode or across episodes. The typical moonlighter is 33 years old, which is about two years younger than the average worker. Also, moonlighters tend to more

[7]We discuss this issue further in Section III.

educated than the full sample. See that a greater percentage of the sample of moonlighters comes from the higher education categories, particularly the college-educated category.

The marital status of moonlighters is similar to the comparison group, with over 70 percent of them being married and 7 percent divorced, but they are a little more likely to be single. Moonlighters also tend to have more children (and more *young* children) than the comparison group. About 10 percent of both groups are nonwhite and very few (about 3 percent) report having a physical problem that makes it difficult to work. Finally, see that nonlabor income for the four-month period is quite similar across the two groups.

To what extent does our sample reflect the population of moonlighters in the United States? This is somewhat difficult to assess, but a comparison can be drawn between our data and the moonlighting data available from a special supplement to the 1985 Current Population Survey.[8] Compared to the CPS, our SIPP workers moonlight at a lower rate (6.1% versus 3.6%), likely resulting from the criteria used to construct our analysis sample. Specifically, our SIPP sample is comprised of workers with a strong attachment to the labor force who worked each of the nine waves in the SIPP panel. Also, we exclude workers who are self-employed or in school, two subgroups with relatively high moonlighting rates. However, 11.5% of the male workers in our SIPP sample moonlight at some point during the two and a half year panel. Two other noticeable differences between the SIPP and the CPS are the higher rate of moonlighting amongst nonwhites in our SIPP estimating sample, and the lower age. Ten percent more of our SIPP moonlighters are younger than 30 years of age. Other than these two differences, the other basic characteristics are fairly similar, with only minor differences. For example, the SIPP sample of moonlighters is comprised of slightly better educated workers than the CPS sample.

So why the choice of the SIPP over the CPS for the analyses in this paper? The CPS sample of moonlighters is much larger than the sample available in the SIPP, and so might reflect the US population more accurately. Additionally, the CPS has information available concerning the moonlighters self-reported reasons for moonlighting. Unfortunately, the advantages of the CPS stop with these two factors. The link between income levels and moonlighting cannot be addressed well with the CPS because of the extremely high rate of missing income data for moonlighters. Also, the CPS contains no information concerning the duration of moonlighting, a second focal point of this paper. And, because of the panel nature of the SIPP data set, true moonlighters can be distinguished from temporary job changers. Other advantages of the SIPP are the detailed information provided on up to two jobs (including job start and end dates) and the relatively short length of time (four months) covered by each interview of the survey. Both of these qualities make it possible to identify brief (as well as long) periods of moonlighting, movements into and out of jobs, and the characteristics associated with each job. Because moonlighting may be motivated by short term constraints, being able to observe short moonlighting durations is important.

Table 1, Parts B and C report the primary job and secondary job characteristics. Because these characteristics change during the moonlighting episode, we choose the wave as our unit of

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[8]These CPS numbers are drawn from unpublished analyses conducted by the authors.

measurement. Recall that the primary job is the one for which the individual receives the highest earnings. The wage measures are the reported earnings for the job divided by the reported hours. The average primary job wage is nearly 50 percent higher than the average secondary job wage, at $9.05 an hour versus $6.61 an hour. However, almost 25 percent of the sample received higher hourly wages on their second jobs. This suggests that while the "university professor who consults" model of moonlighting is important, it is not the most common. Average weekly hours worked on the primary job is 40.38, while average weekly hours on the second job are 17.47. The typical moonlighter therefore works fulltime on his primary job and moonlights on a lower paying, part-time job. Also, moonlighters in general earn a lower wage and work fewer hours on the primary job than the average worker.

The most common primary job occupations for moonlighters are service work (19 percent of all moonlighters), professional/technical occupations (19 percent), production and crafts (14 percent), and managerial occupations (14 percent). The most common moonlighting occupations are again service work occupations (27 percent), sales (18 percent), and professional or technical occupations (13 percent). And, approximately 37 percent of the moonlighting episodes are in jobs for which the primary job and secondary job occupations are the same. Compared to the average worker, moonlighters are much more likely to hold primary jobs in a service occupation and are less likely to be in production, craft or repair occupation, or be a machine operator or work in transportation. This suggests that if the service sector continues to grow, as predicted, then so too may the proportion of workers who moonlight.

All of these results point to limited earnings on the primary job as the motive for moonlighting. To further investigate this, Table 2 shows the relationship between working two jobs and poverty status. Again, because household income changes during the moonlighting episode, the wave is the unit of measurement. Based on government standards for poverty status (corresponding to the same time period as the data), column 1 shows the percentage of individuals with household income at four different poverty levels: below the poverty threshold, between one and two times the poverty line, between two and three times the poverty line, and greater than three times the poverty line. Column 2 repeats this percentage using a measure of household income that excludes earnings from the moonlighting job. Column 3 repeats the same percentages for the full comparison group of male workers. However, earnings from both jobs are an endogenous outcome of utility maximizing behavior, so that workers who are "job-packaging" may appear poor if only one job is considered. In other words, job-packagers may have been able to earn more on their primary job had they not chosen to take a secondary job. To address this endogeneity, we also report these poverty figures for the large subgroup of moonlighters who work fulltime (35 hours or more per week) on their primary jobs. Most moonlighters are in this subgroup, and their poverty rates for the different categories are quite similar to the rates for the full moonlighting group.

This table provides a rough picture of the percentages of workers who change their poverty level status by taking a second job. As the table reveals, earnings from the second job have a significant impact on poverty level status. Overall, poverty rates are very low in this sample in part because it is comprised of men who work continuously on at least one job for the entire panel. Still, the percent of the sample in poverty doubles if the income from the second job is taken away. And the percentage that is below two times the poverty threshold rises from approximately 17 percent to almost 25 percent. In total, thirty-five percent change poverty level status when earnings from the second job are excluded. Note also that, with the exception of those below the poverty threshold, moonlighters as a group are somewhat poorer than the comparison group, with or without the earnings from the second job. Thus, even though they are working a second job and working significantly longer total hours, moonlighters are still somewhat poorer than the average worker. This evidence points to the constraint motive as the most common reason for moonlighting.

An obvious weakness of any descriptive analysis is that it fails to isolate the independent effect of each variable. To remedy this, we estimate a moonlighting participation equation as a function of the characteristics listed in Table 1, Parts A and B. We omit PJ hours and poverty status because both are likely endogenous, and we must exclude all SJ characteristics as they are not observed for those who do not moonlight. We estimate a probit model, which transforms a discretely measured dependent variable into a continuous probability. Then, the resulting estimated coefficients can be transformed into derivatives to describe the effects of the independent variables on the probability of moonlighting.

The results from this exercise, estimated using the comparison group, are reported in Table 3. The results given in the table include the estimated coefficient, followed by its t-statistic in parentheses.[9] Age is inversely related to the probability of moonlighting; that is, a worker becomes less likely to moonlight as he ages. But this negative effect declines mildly as age increases, as is seen with the positive coefficient on age-squared. Having higher education levels (compared to the excluded category of less than 12 years of education) is associated with higher moonlighting rates. That is, ceteris paribus, more educated individuals are more likely to moonlight. This positive effect is strongest for those with 16 or more years of education. Having more children increases the probability of moonlighting, probably reflecting the greater budgetary needs of larger families. But, having a prechool-aged child reduces the incidence of moonlighting, implying that with young children, the value of time exceeds the need for additional income. Being divorced or never-married is not significantly related to the probability of moonlighting, and male workers who report being in fair or poor health are less likely to moonlight.

Having a primary job in a clerical or services occupation is associated with a higher probability of moonlighting. Often times, these moonlighters hold second jobs in the same occupations. Finally, even within the regression framework, budgetary factors are important to the moonlighting decision. Having higher amounts of nonlabor income is associated with a decreased probability of moonlighting. And, earning a higher wage on the primary job is also related to a lower probability of moonlighting. But, the PJ wage elasticity of moonlighting is only -0.05.

These probit regression results imply that male workers moonlight for a variety of reasons, which can be summarized as before as primary job constraints or heterogeneous jobs. This is

[9]The second column of Table 3 shows probit results from a subsample that excludes all moonlighting episodes that started prior to the start of the SIPP panel. This subsample is what is used in the duration models in the next section. These results are very similar to the findings using the full sample.

consistent with the descriptive evidence discussed earlier. The PJ wage is important, as is nonlabor income, both suggesting the constraints motive is important. And, after controlling those factors, other personal and job characteristics are still important. For example, the complex role of children in the moonlighting choice reveals that both budgetary as well as family-related time obligations play important roles in the moonlighting decision. This finding is consistent with the self-reported descriptive evidence available in the 1985 CPS moonlighting data.[10]

B. How Long do People Moonlight?

We believe the length of the moonlighting episode may differ in some systematic way depending upon the motive for moonlighting--individuals who moonlight due to constraints might tend to do so for shorter periods of time than those with alternative motives. We also expect the wage on the primary job to be higher than that on the second job if the constraint motive is the primary reason for moonlighting. Table 4 shows figures for the average moonlighting duration (in days), and primary and secondary job wages and weekly hours for a variety of different subgroups of the full moonlighting sample. The unit of measurement is the episode. The final column of the table shows the average moonlighting duration for a sample that excludes both left and right censored episodes, since the duration is mismeasured for these observations. However, by omitting these episodes we are likely excluding those with the longest durations. By analyzing the relationship between these characteristics and the duration of the episode, we can evaluate our hypothesis.

Divorced men have the longest moonlighting duration with and without the censored episodes (259 and 144 days), but the married group is close (244 and 127 days) and far more significant given its much larger size. Having children in the household is associated with a longer episode. Note that the group with the shortest duration, single males, also have the lowest wages on both jobs. This is probably because they are younger on average. In contrast, nonwhite workers, who also had low wages on both jobs, had moonlighting episodes that lasted longer than average.

The patterns in average duration by occupation are much more affected by excluding the censored episodes. When these episodes are included, clerical and sales workers moonlight the longest, while laborers and crafts workers exhibit the shortest moonlighting durations. However, almost half of the clerical and sales workers have censored episodes so that when those episodes are omitted, these two occupations have a shorter duration than average. None of the other occupations are affected nearly as dramatically, suggesting that the really longterm moonlighters disproportionately are sales and clerical workers. The secondary jobs with the longest moonlighting durations are again sales and clerical workers, although this conclusion is also affected by omitting the censored episodes. The long durations for sales workers are related to the prevalence of parttime jobs in this job sector.

The levels of and difference in wages over the two jobs varies a great deal by occupation as well. Workers with primary or second jobs in a professional or technical occupation tend to have higher wages and smaller PJ-SJ wage differences, as well as above average durations. This

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[10]This is drawn from unpublished analyses conducted by the authors.

suggests that workers in these occupations are more likely to moonlight for alternative reasons. Another interesting pattern emerges from workers in a managerial occupation on either their primary or second job. When the primary job is a managerial one the wages on both jobs tend to be higher, the hours worked lower, and the episode longer than when the second job is a managerial one. This may be evidence of the wide range of managerial jobs available, and reflects that workers with PJ managerial jobs are less likely to be moonlighting due to constraints than those with SJ managerial jobs. Finally, moonlighters with primary jobs as laborers and/or second jobs in service work tend to earn the lowest wages and work fewer total hours.

Turning to the effects of education, moonlighters at the two extremes appear the most similar in episode duration. Moonlighters with four or more years of college or those with less than a high school education have the longest moonlighting durations on average and the smallest difference in wages. [As expected, the wage *levels* are higher for more educated workers.] This suggests that moderately educated workers (high school education, maybe some college) are most likely to moonlight for short periods of time on jobs that pay much lower wages--a pattern consistent with the constraint motive. Highly educated or poorly educated workers are more likely job-packaging.

Focusing on poverty status, workers with household incomes between two and three times the poverty threshold have the longest moonlighting duration. However, this is also the group with the largest wage difference, so we would expect them to be moonlighting due to the constraint motive and therefore have a shorter duration. The lower income groups (in poverty or 1 to 2 times the poverty threshold) have shorter durations, yet have a much smaller difference in wages. Thus, when we examine the length of the episode it appears that low income workers are more likely to be moonlighting due to constraints, but if we look at the wage differences we arrive at the opposite conclusion. This apparent ambiguity may be due to the very low primary job wages received by the lowest income groups; minimum wage laws and other institutions may prevent the second job wages from being much lower.

As each of these tables have shown, there is significant variety within our sample of moonlighters. Tables 1 and 2 revealed that, on average, moonlighters receive lower wages, work longer hours and are poorer than the average worker. The average moonlighter works fulltime on his primary job and works 15 to 20 hours a week on his second job to receive an hourly wage that pays approximately 25 percent less than his primary job. The vast majority of moonlighters are not in poverty and would not be even if they did not moonlight; however, taking a second job does have a significant impact on their standard level of living. Yet, these sample averages mask important differences and patterns across variables that are only hinted at in Table 4. For example, the most and least educated workers tend to moonlight the longest and on jobs that pay similar wages. Similarly, workers in professional or technical occupations also tend to moonlight longer and receive similar wages on both jobs. These two findings suggest that these kinds workers are more likely to moonlight for an alternative motive, such as job-packaging.

III. Constructing and Estimating a Duration Model of Moonlighting

The large differences across groups of moonlighters revealed in Tables 1 through 4 emphasize the importance of seeking further insight with a formal econometric model. Estimating hazard functions will explain more accurately the factors underlying moonlighting durations. It also allows us to isolate the effect of each variable, such as education, while dealing with the problems of censored episodes and time-varying variables. And, by estimating a baseline hazard function, we can see whether individuals are more or less likely to continue moonlighting as their episode progresses.

What does economic theory suggest about the duration of moonlighting? How long a worker chooses to moonlight is likely to depend upon his motive for moonlighting. Labor supply constraints typically are believed to be temporary, and the worker will find other avenues for adjusting to any long-lasting constraints, such as finding a new job (e.g. Altonji and Paxson 1988, Paxson and Sicherman forthcoming). Thus, if the worker moonlights in response to a constraint on the primary job then the episode may be fairly short. On the other hand, workers who are moonlighting for other reasons, such as "job-packaging," may tend to moonlight for longer periods.[11]

Applying existing theories of moonlighting behavior to the duration of moonlighting suggests that the length of the moonlighting episode should depend upon the same factors that influence the decision to moonlight (as well as the number of hours to supply to the SJ) under both motives, plus any factors that help determine which motive is more important. It also suggests that different individuals will exhibit different probabilities of "leaving" the moonlighting state and that many of these differences will be unobserved. Thus, one way to explore why people moonlight is to identify the factors that are most significant in explaining the length of the moonlighting episode, as well as the duration dependence exhibited by the hazard function and the effect that unobserved heterogeneity has on the estimated structural model.

A. Theoretical Issues

Following Kiefer (1988) and Greene (1993), we define F(t) as the probability that the moonlighting episode will last no longer than t periods. The survival function, S(t), is the probability that the episode will last at least t periods and is therefore equal to 1- F(t). The hazard rate or function, $\lambda(t)$, is the probability that the episode will end at period t, given that it has lasted t periods already, and $\lambda(t) = f(t)/S(t)$, where f(t) is the probability density function associated with

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[11]The duration dependence of the hazard function, or how the probability of ending the episode changes over time, also may differ across motives. For instance, the probability that a constrained worker will quit moonlighting may increase as the duration of the moonlighting episode increases, whereas the probability for a heterogeneous jobs moonlighter could be either constant or decreasing over time. Unfortunately, the conventional ways of introducing unobserved heterogeneity and explanatory variables into the duration model do not permit either to affect the duration dependence of the hazard function. Allowing duration dependence to differ by motive is beyond the scope of the present paper, but is a topic worthy of future research efforts. We revisit this issue at the close of our empirical section.

F(t). Duration dependence refers to how the hazard rate changes with time, which is the sign of $\partial\lambda(t)/\partial t$. Negative duration dependence means that the probability that the episode will end decreases as t increases, or that $\partial\lambda(t)/\partial t < 0$. Conversely, positive duration dependence suggests that $\partial\lambda(t)/\partial t > 0$. Specification of the hazard function dictates the type of duration dependence permitted by the model.

Unobserved heterogeneity across observations will lead to a downward bias in the estimates of $\partial\lambda(t)/\partial t$ (Kiefer 1988, pp. 671-72). To illustrate, suppose that we have two discrete groups in our sample, (1) "constrained" moonlighters and (2) "job-packaging" moonlighters. Suppose also that Group (1) has a higher, but constant, hazard rate than Group (2)'s constant hazard rate. The estimated hazard function for these two groups combined will exhibit negative duration dependence by the simple fact that over time more members of Group (1) will quit moonlighting, leaving disproportionately more members of Group (2) in the sample, which are observations with a lower hazard rate. Thus, the hazard rate for the merged sample will decrease over time.

Multiple motives for moonlighting makes controlling for unobserved heterogeneity quite important. However, it is possible that the two main motives are not necessarily mutually exclusive and that the alternative reasons classified under "job-packaging" could have different effects on duration.[12] Thus, even if we could identify the *main* motive for moonlighting (which we cannot with our data), there could still be unobserved heterogeneity as other motives might also be playing a role in the decision. This heterogeneity may thus be better treated as a continuous random variable, rather than the discrete one suggested in the above example. However, we also present an alternative duration model in which the two motives are mutually exclusive.

We estimate our primary duration model of moonlighting behavior using the Weibull distribution for the hazard function, both with and without unobserved heterogeneity. The unobserved heterogeneity is modeled as a continuous random effect that follows a gamma distribution. The technical appendix discusses these distributions and their characteristics in more detail. Duration dependence is revealed through the parameter p and unobserved heterogeneity through the strictly non-negative parameter θ. The Weibull distribution allows for strictly positive, negative or zero duration dependence depending on whether p is greater than, less than or equal to 1.0, respectively. If $\theta = 0$ then there is no unobserved heterogeneity, whereas if it is greater than zero there is. With multiple motives for moonlighting, we expect the Weibull without heterogeneity to suggest negative or constant duration dependence ($p \leq 1$) because of the neglected heterogeneity and the Weibull with heterogeneity to reflect its relative importance ($\theta > 0$).

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[12]For instance, a worker who is suffering from hours constraints on his PJ may decide to take a second job that he also enjoys more and perhaps shows long run potential, such as a factory worker who moonlights as a handyman, an activity he enjoys more and one that he hopes might lead to a permanent business. Likewise, moonlighting on a job because one enjoys the work may lead to different behavior than the university professor who consults model where the two jobs complement one another.

We expect the probability of ending the moonlighting episode to not only depend on the length of the episode but on other variables as well. The explanatory variables are permitted to shift the hazard function upwards or downwards over all t, but generally are not allowed to affect the duration dependence or slope of the hazard function (Greene 1993, p.721). Variables likely to influence the duration of the moonlighting episode include the wages on both jobs and other characteristics of the two jobs, such as the worker's occupation. For example, the higher the wage on the second job, given the wage on the first job, the more likely one would be to continue moonlighting. Also, as revealed in Tables 1 through 4, several other job-related and personal characteristics are potentially important. Some occupations might lend themselves to greater opportunities for job-packaging, such as the college professor example given earlier, and therefore have a lower hazard rate. Demographic variables also appear to play a role, so variables such as age, education, and family structure are included. Local economic conditions might influence the probability of being constrained on the first job, as well as the severity and permanence of those constraints, so we include the local unemployment rate and seasonal dummy variables. Finally, if one believes that all workers who moonlight are constrained on their primary job (i.e., there is only one reason for moonlighting), then the number of hours on the PJ should not only be important, but exogenous as well. Therefore, we re-estimate all models including PJ hours as an explanatory variable. If the constraint motive is paramount, then this variable may greatly reduce the explanatory power of the other job-related variables.

As mentioned in Section II, many of these variables, such as wages, income and local economic conditions, vary over the length of the moonlighting episode, necessitating the inclusion of time-varying covariates. In essence, including time-varying covariates allows the hazard function to shift upward or downward at each discrete time interval (in our case, the survey wave) as the explanatory variables change. However, permitting time-varying covariates greatly complicates the problem of left-censored episodes. Recall that a left-censored episode is one that begins prior to the start of the survey panel and a right-censored episode is one that is still underway when the survey panel ends. In both cases, the observed duration is a lower bound on the true duration. If the explanatory variables do not vary over time, then left-censored and right-censored episodes are equivalent--both provide information on durations of at least *t*, and it is straightforward to deal with this censoring via maximum likelihood estimation (Greene 1993).

With time-varying covariates, however, left-censored episodes have unobserved explanatory variables. The first observation for a left-censored episode is not the first interval of the moonlighting episode, so the explanatory variables do not correspond to the episode's first interval. In fact, because we do not know when a left-censored episode began, we do not know which wave(s) of the moonlighting episode we are observing. If the explanatory variables vary over time then this problem becomes critical because we cannot match the correct variable values with the correct piece of the baseline hazard. Incorporating time-varying covariates dictates that we know the value of each regressor for each interval of the moonlighting episode, particularly the first period. This is not a problem for right-censored episodes because we observe the start of those episodes.

Therefore, in order to permit time-varying covariates, we must eliminate all left-censored episodes. We recognize that by eliminating these observations we may be excluding the people who moonlight the longest. To explore the severity of this problem we also estimate the model in two admittedly inferior ways that include the left-censored episodes: (1) allow time-varying covariates and treat the first wave as the episode's first interval, which we know is incorrect for left-censored observations, and (2) restrict the regressors to be constant over the episode and use the values from the first wave. Although both of these estimates will be biased, they may yield insight into the severity of the left-censoring problem.

In our primary estimating sample, there are 207 total episodes, with an average moonlighting duration of 175.49 days. Sixty-five percent of the moonlighting episodes last one wave or less, and 13 percent cross only two waves. Finally, 67.1 percent of the individuals have one moonlighting episode, 26.8 percent have two episodes, and 6.0 percent have three episodes. The natural log of the number of days of the moonlighting episode duration is the dependent variable in the survival function. Variables included as explanatory variables are age, age-squared, education categories, number of children in the household, number of children under age 6, dummy variables for whether the individual is married or divorced (never married is the excluded category), the state monthly unemployment rate, the wages on both jobs, nonlabor income, seasonal dummy variables and primary and secondary job occupation dummy variables. An extra set of regressions are estimated that include the log of primary job hours as a regressor.

B. Empirical Results

Table 5 reports the key parameter estimates for the two different hazard functions. For the sake of brevity and because the results are nearly identical, we do not present the estimates for these models when the log of primary job hours is included as a regressor. These results are available upon request from the authors.

These results reveal a pattern across the different hazard specifications consistent with multiple motives for moonlighting. Although the estimated Weibull model without unobserved heterogeneity suggests positive duration dependence ($\hat{p} > 1$), the hypothesis that p=1 cannot be rejected. Permitting unobserved heterogeneity, found to be statistically important (θ is statistically significant), more than doubles the estimate of p such that the results now suggest statistically significant positive duration dependence. As discussed earlier, this pattern follows directly from the downward bias in $\hat{p}$ when unobserved heterogeneity is ignored.

Because unobserved heterogeneity is statistically significant, we focus on the results from the Weibull model with heterogeneity. Two variables of interest, the wages on the two jobs, never have a significant effect on the length of the duration episode.[13] Perhaps the lack of statistical significance in the wage variables arises because the wage is a very noisy indicator of the desirability of either job--a result that is consistent with multiple moonlighting motives. In other words, there are benefits and costs to each job that are not reflected in the wage.

[13]Our hypotheses regarding the alternative motives for moonlighting suggest that the difference in the two wages might be what is important. Therefore, we re-estimate the model including various measures of this difference, such as the simple difference, the percentage difference and the ratio, and none are statistically significant. These results are available upon request.

Nonlabor income has a positive and statistically significant effect on the probability of ending the moonlighting episode at time t. This result has at least two possible interpretations: (1) individuals with high nonlabor incomes more likely moonlight because of constraints on the primary job, and (2) an individual who moonlights because he is constrained on the PJ may need to do so for a shorter period of time, the higher his nonlabor income. The only demographic variables that are ever statistically significant are the individual's age, being divorced, and the number of children, all of which affect the hazard rate negatively. It is rather surprising that education has no effect, given the results of the descriptive analyses. To explore this further, we also estimate a specification that includes age squared and education squared; however, none of the coefficients are statistically significant and no other results changed.

Similar to the descriptive analyses, we find the SJ occupation is important. Individuals working second jobs in farming or labor, sales, service, or in professional or technical fields moonlight for longer periods. In contrast, the occupation of the primary job appears to be unimportant. Finally, none of the variables reflecting local economic conditions are statistically significant.

The final variable of interest is the hours worked on the primary job. If all workers moonlight because they are constrained on the PJ, then hours worked on the PJ is exogenous and will be very important to the duration of the moonlighting episode. Including this variable has little effect on the other parameter estimates, except for causing some of the coefficients to become less statistically significant and a very slight increase in $\hat{p}$. Thus, including hours on the PJ does not substantially diminish the importance of the other variables. The coefficient is negative and statistically significant, suggesting that the more hours an individual works on his first job, the longer his moonlighting episode. This implies that individuals who work more hours on their PJ are more likely to job-package, and moonlight for longer periods. In addition, PJ hours may be an indication of the individual's tastes for work that are not captured by the other demographic variables. (Individuals with high PJ hours like to work more, and therefore moonlight for longer periods.) However, in order for PJ hours to be a valid regressor it must be exogenous, which is inconsistent with the "job-packaging" motive.

How sensitive are these results to the exclusion of left-censored episodes or to permitting time-varying covariates? As discussed in the previous section, permitting time-varying covariates requires eliminating left-censored episodes in order to avoid measurement error in the regressors. However, excluding left-censored episodes also may be omitting those observations with the longest durations. We explore this issue further by estimating the above specifications both with and without left-censored episodes, and both with and without time-varying covariates. (In the latter, we use the value of the variables in the first observed wave of the episode. Note that Table 5 reports the estimates from the specification without left-censored episodes and with time-varying covariates.) This exercise, while yielding biased estimates, may help reveal the separate influences of allowing time-varying covariates and eliminating left-censored episodes. Both experiments lead to very similar results, with the only notable change being a lower estimate of p. Also, by using more data (including left-censored episodes) or asking less of the model (treating the covariates as time-invariant), additional coefficients, such as the local unemployment rate, the summer seasonal dummy and the primary job wage, often become statistically significant and of the correct sign. Thus, our rather bland results in Table 5 may be due to the fact that we have eliminated some of the most interesting data and are asking a lot of the model simultaneously .

In sum, then, our estimates of the determinants of moonlighting duration are fairly robust with respect to the hazard function specified, the treatment of left-censored episodes and the presence of time-varying covariates. However, the estimated duration dependence, $\hat{p}$, is sensitive to these choices. Allowing for observed or unobserved heterogeneity or omitting left-censored episodes increases $\hat{p}$ and suggests positive duration dependence. Although the point estimates of p vary, once unobserved heterogeneity is permitted, they all are statistically significantly greater than 1.0. This suggests that individuals are more likely to quit moonlighting as their episode lengthens, which hints at the constraint motive as the primary reason for moonlighting.

C. Two Alternative Duration Models

A problem in interpreting our estimates of the determinants of moonlighting behavior is that each variable may have two separate and potentially opposing effects on the hazard function. Each variable may influence the individual's initial reason for moonlighting (constraint versus "job-packaging"), as well as the length of time the individual chooses to moonlight. The estimated effect of nonlabor income is a good example. An individual with high nonlabor income may be less likely to moonlight because he is constrained, and therefore have a lower hazard rate. Conversely, given that the individual has chosen to moonlight, he may need to do so for a shorter period of time. The wages on each job, the local unemployment rate and primary job hours may also have these dual effects on moonlighting behavior. We examine the importance of these two effects with those four variables by estimating an alternative model that includes the value of the variable in the first wave of the episode, plus a second variable that captures the change in the variable across waves over the course of the episode. Additionally, all specifications were re-estimated including both the level and change in primary job hours. Unfortunately, this alternative model is not successful in isolating the separate effects of these key variables (with the exception of PJ hours). The most likely explanation is that most of our moonlighting episodes last less than one wave, eliminating the importance of the change variables. A sample with a more even distribution of episode durations or a shorter time interval would likely yield much more interesting results.

We also estimate a second alternative duration model, one that is more in the spirit of our original view of moonlighting as arising from two distinct motives. This model also clarifies *three* possible influences that any variable may have on moonlighting behavior. Specifically, we specify a different hazard function for each type of moonlighter and a probability that each worker will be of each type. This kind of model is discussed in Kiefer (1988) and can be written as

$$f(t) = \pi\lambda_1 p_1 t^{p_1-1} e^{-\lambda_1 t^{p_1}} + (1-\pi)\lambda_2 p_2 t^{p_2-1} e^{-\lambda_2 t^{p_2}},$$

where the subscripts 1 and 2 denote the hazard functions for constrained and job-packaging moonlighters, respectively, π is the probability of moonlighting due to constraints (and hence having the first hazard function), λ_i is the baseline hazard for each type of worker, p_i is the duration dependence for each type of worker, and t is the length of the episode. Thus, π provides an estimate of the fraction of workers who are moonlighting due to constraints. Our theoretical argument suggests that $p_1 > 1$ (constrained moonlighters exhibit positive duration dependence) and that $p_2 \leq 1$ ("job-packagers" exhibit constant or negative duration dependence).

Ideally, the baseline hazards, the probability of moonlighting due to constraints and even the duration dependencies would be specified as functions of the explanatory variables. Unfortunately, however, due to our small sample estimating that many coefficients is infeasible, so we estimate a stripped-down version of the model that does not include any explanatory variables. While an unfortunate limitation, this simple model provides an estimate of the fraction of workers who are moonlighting due to constraints. It also focuses on the behavioral patterns suggested in our theoretical argument, that the duration dependencies will be different across types of moonlighters. This simple model also provides an excellent starting point for future research in which the effects of explanatory variables can be explored -- i.e., does X affect the probability of being constrained (π), the likelihood of continuing to moonlight given the worker's motive (λ_i) or how that likelihood changes over time (p_i)? Finally, we can find comfort in the fact that few of our explanatory variables are statistically significant in our other hazard models, and that our results from this simple model are quite reasonable and consistent with our theoretical argument.

The specific parameter estimates (and t-statistics) from this model are:

π	λ_1	p_1	λ_2	p_2
0.578	.00954	1.15	0.000658	0.9096
(1.53)	(4.19)	(4.28)	(0.15)	(0.40)

Thus, the probability of ending the moonlighting episode is higher and increases over time for constrained moonlighters as opposed to job-packagers, just as predicted. The probability of moonlighting because of constraints is .578, suggesting that about 60% of our sample is moonlighting for this reason. It is unfortunate that more of our coefficients are not statistically significant, but we believe this is further evidence that a more complicated model is infeasible given our data. Nonetheless, the results from this alternative duration model provide further evidence that while the constraint motive is the most common, other motives for moonlighting exist as well.

V. Concluding Remarks

This research investigates the factors associated with moonlighting using a superior data set and presents the first duration model of moonlighting behavior (to our knowledge) to appear in the literature. Using data from the SIPP, we first examine the characteristics of our moonlighting sample and compare them to our total sample of male workers. The typical moonlighter appears to be somewhat poorer than the average worker, despite working fulltime on his primary job and part-time on a lower paying second job. This finding is due in part to the relative younger age of moonlighters. Yet, there are many exceptions to this depiction, and the length of the moonlighting episode varies with many demographic and job-related variables. The probit model of moonlighting clarifies the importance of education to the moonlighting choice, while the effect of children on the father's moonlighting decision is more complicated.

To isolate the effects of these variables, control for problems in the data, and consider multiple motives for moonlighting, we estimate a duration model of moonlighting. Our results suggest that unobserved heterogeneity is important, and that once it is controlled, the probability of ending the moonlighting episode increases over time. Our interpretation of the factors affecting the length of the moonlighting episode is clouded by the dual effects that any given variable might have--it may affect the reason for moonlighting as well as have a direct effect on the duration of the episode. We propose two alternative models to address this problem, but our data do not appear to be rich enough to exploit them fully. However, these alternative models clarify the different influences that each variable may have on moonlighting behavior and may prove fruitful for other research endeavors. For example, AFDC recipients have been characterized frequently as belonging to two distinct groups, a group of short-term recipients who use AFDC during a period of transition (such as divorce) and a group of long-term recipients who receive AFDC as a long term source of income. In such a setting, a particular variable such as the local unemployment rate may have two (or three) effects by determining the type of AFDC recipient, as well as having a direct effect on the length of the episode.

In sum, all of our results point to the presence of multiple motives for moonlighting. However, the typically assumed motive of primary job constraints appears the most common, and taking a second job often is not enough to raise the family's income to the level of the average family.

References

Altonji, Joseph G. and Christina H. Paxson, "Labor Supply Preferences, Hours Constraints and Hours-Wage Tradeoffs," *Journal of Labor Economics*, 6, 1988, pp. 254-276.

Borjas, George J., "The Relationship Between Wages and Weekly Hours of Work: the Role of Division Bias," *Journal of Human Resources*, 15(3), 1980, pp. 409-423.

Conway, Karen Smith and Jean Kimmel, "Male Labor Supply Estimates and the Decision to Moonlight," first circulated as Institute Working Paper No. 92-09, revised June 1994.

Greene, William H. *Econometric Analysis*. New York: Macmillan Publishing Co., second edition, 1993.

Kiefer, Nicholas M., "Economic Duration Data and Hazard Functions," *Journal of Economic Literature*, 26(2), June 1988, pp. 646-679.

Kimmel, Jean. "Moonlighting in the United States," *Employment Research*, (Spring 1995), Volume 2, No. 1, pp. 4-6.

Kimmel, Jean and Lisa M. Powell, "A Comparative Analysis of Moonlighting and Related Policy Issues in Canada and the United States," prepared for presentation at the June 1996 Changes in Working Time in Canada and the United States conference, May 1996.

Krishnan, Pramila, "The Economics of Moonlighting: A Double Self-Selection Model," *Review of Economics and Statistics*, 72(2), May 1990, pp. 361-67.

Lakhani, Hyder, "Civilian Moonlighting and Reenlistment Probabilities of US Army Select Reserve/National Guard Personnel," U.S. Army Research Institute for the Behavioral and Social Sciences, June 1994.

Levenson, Alec R. "Where Have All the Part-Timers Gone? Recent Trends and New Evidence on Dual-Jobs," Milken Institute for Job and Capital Formation Working Paper 95-1, January 1995.

Lilja, Reija, "The Problematic and Unproblematic Second Job," Discussion Paper #107, Labour Institute for Economic Research, Helsinki, 1991.

Mehay, Stephen, "Reserve Participation Versus Moonlighting: Are They the Same?" *Defense Economics*, 2(4), 1991, pp. 325-37.

Mishel, Lawrence and Jared Bernstein. *The State of Working America*, 1994-1995. New York: M.E. Sharp, 1995.

O'Connell, John F., "Multiple Job Holding and Marginal Tax Rates," *National Tax Journal*, 32(1), March 1979, pp. 73-76.

Paxson, Christina H. and Nachum Sicherman, "The Dynamics of Job Mobility and Dual-job Holding," *Journal of Labor Economics,* 14(3), July 1996, pp. 357-393.

Plewes, Thomas J. and John F. Stinson Jr., "The Measurement and Significance of Multiple Jobholding in the United States," *Statistical Journal of the United Nations Economic Commission for Europe*, 8(1), 1991, pp. 57-68.

Regets, Mark, "Military Reserves as Compensated Leisure: A Peculiar Case of Labor Supply," mimeo, 1991.

Shishko, Robert and Bernard Rostker, "The Economics of Multiple Job Holding," *American Economic Review*, 66(3), June 1976, pp. 298-308.

The State of America's Children, 1994. Washington, D.C.: Children's Defense Fund.

Table 1
Variable Means

A. Demographic Characteristics

Variables	Moonlighting Individuals: Full[1]	Moonlighting Individuals: Exclude Left-Censored[2]	Comparison Group[3]
# observations	203	149	1832
Age (% of individuals in each range)			
< 30 years of age	0.41	0.44	0.30
30-45 years of age	0.47	0.44	0.51
>45 years of age	0.12	0.12	0.18
Years of Education	13.54	13.31	13.14
Education Categories:			
< 11 years	0.10	0.13	0.15
= 12 years	0.39	0.42	0.39
13-15 years	0.18	0.17	0.20
≥ 16 years	0.33	0.28	0.26
# of kids in household	1.09	0.98	0.91
# of kids < age 6	0.34	0.32	0.26
married	0.73	0.72	0.75
divorced	0.06	0.07	0.07
single	0.21	0.21	0.18
nonwhite	0.11	0.09	0.10
sick	0.03	0.03	0.04
nonlabor income	4042.67	4253.39	3909.18

[1]Includes first wave observation from first moonlighting episode.
[2]Estimating Sample: Includes same as above, but excludes episodes that begin prior to start of panel.
[3]Comparison sample of men from same panel survey, with moonlighters and non-moonlighters; includes first observation per individual.

Table 1
(Continued)

B. Primary Job Characteristics

Variables	Moonlighting Individuals: Full[1]	Moonlighting Individuals: Exclude Left-Censored[2]	Comparison Group[3]
# observations	586	388	16488
PJ Wage	9.05	8.29	10.12
PJ Weekly Hours	40.38	40.49	43.06
PJ Occupations:			
Clerical	0.11	0.08	0.07
Farming, Labor	0.04	0.05	0.07
Managerial	0.14	0.16	0.16
Precision production, crafts or repair	0.14	0.16	0.22
Machine operators; transportation	0.11	0.12	0.18
Professional/Technical	0.19	0.14	0.15
Sales	0.07	0.06	0.09
Service	0.19	0.23	0.07

[1]Unit of measurement is the wave.
[2]Estimating sample: as above but excludes left-censored observations.
[3]Comparison sample: includes each observation for all individuals.

Table 1
(Continued)

C. Secondary Job Characteristics for Moonlighters

Variables	Full Sample[1]	Exclude Left-Censored[2]
# observations	586	388
SJ Wage	6.61	6.42
SJ Weekly Hours	17.47	19.75
Seasons:		
Winter	0.17	0.23
Spring	0.15	0.20
Summer	0.44	0.24
Fall	0.24	0.32
SJ Occupations:		
Clerical	0.06	0.06
Farming, Labor	0.12	0.12
Managerial	0.09	0.09
Precision production, crafts or repair	0.07	0.09
Machine operators; transportation	0.06	0.07
Professional/Technical	0.13	0.15
Sales	0.18	0.15
Service	0.27	0.27

[1]Unit of measurement is the wave.
[2]Unit of measurement is the above, but excludes left-censored observations.

Table 2
Poverty Status and Moonlighting*

Poverty Level	Full HH Income		HH Income less SJ Income		Comparison Group[3]
	Full[1]	FT on PJ[2]	Full[1]	FT on PJ[2]	
Sample:					
< Threshold	1%	0.4%	2.0%	1.3%	2.0%
Between 1 and 2 Times Threshold	16.7	16.2	22.9	22.4	12.2
Between 2 and 3 Times Threshold	25.0	24.5	27.7	27.3	21.5
> 3 Times Threshold	57.3	58.9	47.4	49.0	63.8

* Numbers in table are percentages and reflect percent of relevant sample in each poverty status category.
[1]Includes all moonlighting observations (586 observations).
[2]Sample as above but includes only those individuals working 35 or more hours per week on primary job (531 observations).
[3]Comparison sample of men from same panel survey, with moonlighters and non-moonlighters; includes all observations in this sample (16,488 observations).

Table 3

Moonlighting Probit Equation

	Full Sample[1]	Subsample[2]
Age	-0.059*** (-2.95)	-0.088*** (-3.88)
Age-squared	0.0007*** (2.61)	0.001*** (3.45)
Years Educ=12	0.285*** (4.06)	0.021*** (2.66)
Years Educ 13 to 15	0.263*** (3.29)	0.225*** (2.60)
Years Educ ≥ 16	0.607*** (7.21)	0.409*** (4.36)
# children	0.166*** (8.19)	0.111*** (4.53)
# young children	-0.149*** (-2.72)	-0.179*** (-2.75)
Divorced	0.050 (0.65)	0.065 (0.77)
Single	-0.081 (-1.16)	-0.202*** (-2.52)
Nonwhite	0.146*** (2.44)	0.146** (2.15)
Sick	-0.246* (-1.93)	-0.154 (-1.15)
Nonlabor Income	-8E-6* (-1.70)	-6E-6 (-1.16)

Table 3
(Continued)

	Full Sample[1]	Subsample[2]
PJ Occupations:		
Clerical	0.337***	0.174*
	(4.36)	(1.85)
Farming/Labor	-0.143	-0.143
	(-1.47)	(-1.34)
Managerial	0.015	0.165*
	(0.20)	(1.94)
Machine operators; transportation	-0.113	-0.129
	(-1.59)	(-1.61)
Professional/Technical	0.123	0.070
	(1.63)	(0.78)
Sales	-0.006	-0.084
	(-0.07)	(-0.84)
Service	0.541***	0.556***
	(7.65)	(7.17)
PJ Wage	-0.030***	-0.040***
	(-5.85)	(-6.67)
Elasticity	-0.053	(0.07)
Constant	-0.836**	-0.577
	(-2.22)	(-1.36)

[1]Both probit models also include dummy variables for waves 2-9.
[2]This subsample excludes left-censored observations.
*, **, *** indicates significance at the 10 percent, 5 percent, and 1 percent levels.

Table 4
Moonlighting Duration and PJ and SJ Wages and Hours

Group [# obs]	Full Moon Sample[1]					Non-censored[2]	
	DURATION (s. dev.)	PJ Wage	SJ Wage	PJ Weekly Hours	SJ Weekly Hours	DURATION (s. dev.)	[# obs]
All [261]	227.8 (268)	8.20	6.02	40.5	21.3	119.2 (135)	[162]
Married [195]	244.4 (281)	8.74	6.46	41.8	21.4	127.2 (141)	[118]
Divorced [14]	259.0 (233)	9.90	6.10	38.1	17.4	143.6 (130)	[9]
Single [52]	156.9 (217)	5.69	4.34	36.1	22.1	86.0 (111)	[35]
Marry w/kids [146]	269.1 (294)	8.58	6.44	42.3	20.8	133.3 (153)	[85]
Marry, no kids [49]	170.9 (224)	9.22	6.52	40.3	23.4	111.6 (106)	[33]
Nonwhite [32]	270.9 (278)	5.91	4.87	39.7	19.9	137.6 (131)	[17]
PJ Occupations:							
Clerical [28]	315.2 (378)	8.20	5.84	37.6	18.9	107.0 (128)	[13]
Farming, Labor [18]	141.9 (151)	5.03	3.72	34.2	19.7	104.3 (104)	[14]
Managerial [34]	215.8 (209)	11.09	8.32	42.0	20.8	129.2 (147)	[21]
Precision production, crafts or repair [40]	148.2 (178)	8.29	5.31	41.3	22.5	85.8 (80)	[30]
Machine operators, transportation [32]	206.2 (206)	6.71	3.90	42.4	21.2	118.8 (108)	[18]

Table 4
(Continued)

Group [# obs]	Full Moon Sample[1] DURATION (s. dev.)	PJ Wage	SJ Wage	PJ Weekly Hours	SJ Weekly Hours	Non-censored[2] DURATION (s. dev.)	[# obs]
Professional/ Technical [45]	276.0 (332)	9.81	8.14	43.1	27.1	146.1 (186)	[26]
Sales [18]	282.2 (356)	7.87	6.27	40.3	22.1	82.2 (86)	[11]
Service [46]	232.7 (244)	6.80	5.23	38.9	17.0	149.5 (163)	[29]
SJ Occupations:							
Clerical [17]	288.5 (338)	8.27	5.87	43.5	18.9	92.0 (121)	[8]
Farming, labor [38]	172.4 (246)	6.85	4.94	39.2	23.0	131.0 (182)	[22]
Managerial [27]	207.3 (280)	9.13	6.85	44.4	28.3	111.4 (202)	[17]
Precision production, crafts or repair [21]	128.7 (150)	9.45	6.74	40.4	23.6	87.2 (88)	[18]
Machine operators; transportation [23]	145.6 (180)	7.86	4.92	39.8	31.7	99.4 (97)	[19]
Professional/ Technical [39]	252.2 (287)	10.92	10.07	42.1	21.9	127.8 (108)	[24]
Sales [35]	304.0 (306)	8.38	4.83	38.0	14.6	157.7 (160)	[21]
Service [61]	260.0 (268)	6.45	4.61	39.2	16.8	120.3 (103)	[33]

Table 4
(Continued)

Group [# obs]	Full Moon Sample[1] DURATION (s. dev.)	PJ Wage	SJ Wage	PJ Weekly Hours	SJ Weekly Hours	Non-censored[2] DURATION (s. dev.)	[# obs]
Education Categories							
<12 years [25]	205.2 (193)	6.28	5.20	40.5	21.4	163.3 (179)	[18]
=12 years [99]	212.4 (257)	7.04	4.43	40.4	21.6	105.8 (104)	[65]
13 to 15 years [50]	196.6 (226)	7.69	4.82	39.2	17.6	99.8 (105)	[30]
> 15 years [87]	269.6 (317)	10.35	8.74	41.2	23.3	132.8 (165)	[49]
Poverty Status:							
< 1 Times Poverty [4]	85.2 (82)	3.23	2.36	31.5	17.0	85.2 (82)	[4]
1-2 Times Poverty [51]	191.1 (233)	6.25	5.47	41.4	17.6	92.4 (85)	[34]
2-3 Times Poverty [72]	261.0 (295)	7.69	4.52	39.0	20.5	149.4 (191)	[39]
>3 Times Poverty [134]	228.1 (268)	9.36	7.14	41.1	23.4	117.7 (121)	[85]
Moon.No Changes Poverty [157]	246.1 (291)	8.77	6.30	40.5	21.7	124.0 (144)	[94]
Moon.Yes Changes Poverty [104]	200.0 (229)	7.32	5.59	40.4	20.8	112.6 (122)	[68]

Table 4
(Continued)

Group [# obs]	Full Moon Sample[1] DURATION (s. dev.)	PJ Wage	SJ Wage	PJ Weekly Hours	SJ Weekly Hours	Non-censored[2] DURATION (s. dev.)	[# obs]
Age Categories:							
< 30 years [103]	168.6 (212)	6.30	4.66	40.4	22.2	104.2 (114)	[75]
30 to 45 years [121]	270.7 (303)	9.41	6.78	40.2	20.1	136.0 (161)	[67]
> 45 years [37]	251.9 (265)	9.50	7.31	41.5	22.9	119.6 (107)	[20]
> 29 years [158]	266.3 (294)	9.43	6.90	40.5	20.8	132.2 (150)	[87]

Notes: Number of observations for final column showing figures for just the non-censored observations will differ from numbers shown in left column.

[1]First observation from each moonlighting episode.
[2]Sample as above, but excludes left and right censored episodes.

Table 5
Parameter Estimates for the Duration Model+
(standard errors in parentheses)

	Weibull	Weibull with Heterogeneity
Age	-0.017 (0.01)	-0.026* (0.01)
Years of Education	0.048 (0.05)	0.037 (0.04)
# children	-0.186* (0.10)	-0.089 (0.10)
# young children	0.338 (0.26)	-0.008 (0.24)
Married	-0.188 (0.37)	0.026 (0.36)
Divorced	-0.869** (0.44)	-0.183 (0.43)
Sick	-0.088 (0.60)	-0.272 (0.68)
Nonlabor Income (in 1000s)	0.029 (0.02)	0.037*** (0.02)
Unemployment Rate	0.002 (0.06)	0.019 (0.05)
PJ Wage	-0.015 (0.02)	-0.007 (0.02)
SJ Wage	-0.019 (0.02)	-0.002 (0.02)
Winter	0.003 (0.28)	0.220 (0.25)
Spring	0.055 (0.27)	0.061 (0.25)
Summer	0.072 (0.24)	0.124 (0.24)
Constant	-5.003*** (1.02)	-4.035*** (0.99)
Sigma	0.862*** (0.07)	0.364*** (0.06)
Theta	---	2.541*** (0.75)
P	1.160*** (0.10)	2.746*** (0.44)
Log-Likelihood	-1033.2	-1012.9

+Estimated with time-varying covariates and excludes left censored.
*, **, *** Indicates significance at the 10 percent, 5 percent, and 1 percent levels.

Technical Appendix[14]

The different distributions and corresponding characteristics of the hazard models estimated in Section III are discussed in more detail here. Our primary distribution is the Weibull, which can be written as

$$\lambda(t) = \lambda p(\lambda t)^{p-1}. \quad \textbf{(2)}$$

The Weibull distribution allows for strictly positive, negative or zero duration dependence depending on whether p is greater than, less than or equal to 1.0, respectively. The Log-logistic distribution, with hazard

$$\lambda(t) = \frac{\lambda p(\lambda t)^{p-1}}{\left[1 + (\lambda t)^{p}\right]}, \quad \textbf{(3)}$$

allows for first positive and then negative duration dependence as t increases, as long as $p > 1.0$. If $p \leq 1.0$, then the hazard rate always decreases with time.

We choose a common specification for the unobserved heterogeneity; it is modeled as a continuous random effect, v, with a probability density function,

$$f(v) = \frac{k^{k}}{\Gamma(k)} \; e^{-kv} v^{k-1}, \quad \textbf{(4)}$$

which is a gamma distribution with a mean of 1.0 and variance of 1/k. The survival function conditional upon v, or $S(t \mid v)$, is specified as a Weibull distribution,

$$S(t \mid v) = e^{-(v\lambda t)^{p}}. \quad \textbf{(5)}$$

The mixed hazard function can then be derived as

$$\lambda(t) = \lambda p\,(\lambda t)^{p-1}\left[S(t)\right]^{1/k}, \quad \textbf{(6)}$$

where

$$S(t) = \int_{o}^{\infty} f(v)\, S(t \mid v)\, \partial v = \left[1 + \frac{1}{k}(\lambda t)^{p}\right]^{-k}. \quad \textbf{(7)}$$

The parameter k, or the more commonly discussed parameter θ, where $\theta = 1/k$, indicates the degree of unobserved heterogeneity in the sample. If $\theta = 0$ then there is no heterogeneity and the hazard written in equation (5) collapses into the simple Weibull hazard written in equation (1). If $\theta > 0$ then unobserved heterogeneity exists and the mixed and structural hazards differ.[15] In particular, if $p \leq 1$, the mixed hazard exhibits negative duration dependence, whereas the structural hazard only exhibits negative duration dependence if $p < 1$. (It is constant if $p = 1$.) If $p > 1$, then the structural hazard exhibits positive duration dependence and the mixed hazard is ambiguous.

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[14] This summary of the hazard function model is drawn from Greene (1993).

[15] Recall that $\theta = 1/k$ is the variance of the random variable, v, and therefore must be strictly non-negative.