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Theory and Evidence

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Moonlighting Behavior
Theory and Evidence

Two labor supply issues that have received substantial attention are the responsiveness of labor supply to wage changes and the imposition of labor supply constraints. Adjusting hours worked on a second job may be the practical and perhaps only available response to either event yet, most labor supply studies only examine behavior on the primary job. Examining the motives for moonlighting provides evidence on both the wage-responsiveness of labor supply in general and the existence and consequences of labor supply constraints. If, for instance, workers moonlight only when constrained on their primary jobs, then moonlighting itself implies that labor supply constraints exist and so supports the previous literature that incorporates these constraints (e.g. Hamm 1982, 1986). Regardless of the motive for moonlighting, allowing for potential labor supply adjustments on more than one job may very will alter the much-accepted conclusion regarding the inelasticity f male labor supply (for surveys, see Killingsworth 1983 or Pencavel 1986). By ignoring moonlighting behavior, researchers may be eliminating the most significant avenue for short term labor supply adjustments.

Our research substantially improves the manner in which moonlighting is examined, and in so doing sheds new light on male labor supply elasticities. Specifically, we devise a theoretical model that permits different reasons for moonlighting and considers moonlighting in tandem with labor supply behavior on the primary job. Estimating both primary and secondary job hours equations using panel data from the SIPP (Survey of Income and Program Participation) for prime-aged men, we find evidence that the decision to moonlight is quite responsive to wage changes (on both jobs) and arises from at least two distinct motives. Furthermore, properly modeling primary job hours constraints and differences in moonlighting motives reveals that the desired labor supply of prime-aged males is much more wage-elastic than typically assumed.

Why do some people choose to moonlight? The predominant view is that it results from a constraint on hours worked on the primary job (Shishko and Rostker (1976), O'Connell (1979) and Krishnan (1990)). Due to workweek restrictions, economic conditions or other institutional factors, the worker is unable to work (or earn) as much as he or she desires on the primary job (PJ), and may thus consider taking a second job. The decision to moonlight hinges on a comparison between the reservation wage and the wage earned on a second job (SJ). The reservation wage and, there fore, the decision to moonlight will depend in part on the number of hours worked on the primary job. A major shortcoming of the aforementioned studies is the inclusion of (exogenous) primary job hours in moonlighting equations estimated for *all* workers (even non-moonlighters), many of whom may be unconstrained on their primary jobs. Indeed, estimating hours worked on the PJ as a choice variable is the purpose of a great many labor supply studies. To treat is as fixed and exogenous for all workers in inconsistent with basic economic theory and will likely lead to biased parameter estimates. Our econometric model corrects this misspecification and predicts which workers are constrained on their primary jobs.

Another explanation for moonlighting behavior is that labor supplied to different jobs may not be perfect substitutes or, put differently, the age paid and utility lost form the foregone leisure may not completely reflect the benefits and costs to working. For example, working on the primary job may provide the worker with the credentials to take on a higher paying second job, such as a university professor who engages in consulting. or, working on the second job may provide some pleasure (or less displeasure) but pay less than the primary job, such as a musician who has a "regular" job by day and performs at night.[1] In either example, the costs and benefits of both jobs are more complex than the monetary wages paid and the forgone value of leisure. When faced with such nonpecuniary benefits and costs, optimizing behavior may lead a worker to take two jobs. Whereas Shishko and Rostker (1976) and others acknowledge that such a motive may exist, only Lilja (1991) explores it theoretically and empirically.[2] Using Finnish data, the author finds evidence that this second motive better explains male moonlighting behavior that the first, more popular view. We build on Lilja's work by constructing a more consistent theoretical model and by explicitly modeling the behavior on the first job.

Our research examines moonlighting behavior recognizing that workers may moonlight because of constraints on their primary jobs or because the two jobs are heterogeneous. We make no *a priori* assumptions regarding the existence of PJ constraints. We choose the SIPP data for our empirical analysis because it has detailed information on the second job that is superior to that available in other surveys (namely the panel Study of Income Dynamics, National Longitudinal Survey, and Current Population Survey), and it has a short (four month) survey period that permits us to better observe worker movements into and out of jobs. Cross-sectional data likely understate the true degree of moonlighting.[3] In sum, our results help answer the questions of who moonlights and why, as well as provide new evidence of the wage-responsiveness of labor supply on both jobs and the prevalence of labor supply constraints.

II. A Theoretical Framework for Multiple Job-Holding

We assume that a person's labor supply decisions on the first and second job result from utility-maximizing behavior. However, to allow for the possibility that labor supplied to different jobs may not be equivalent, hours of work on the first job, h_1, hours o r work on the second job, h_2, and hours of leisure, L, enter the utility function separately. Total utility may be written as

$$(1) \quad Utility = U(C, h_1, h_2, L),$$

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[1] Still another possibility is that certain types of job situations present greater opportunities for tax evasion. Plewes and Stinson (1991) provide survey evidence (from the 1989 CPS) of the many distinct reasons for moonlighting reported by workers.

[2] Regets (1992) investigates a closely related issue, whether serving n the military reserves is moonlighting in the usual sense ro is instead a case of compensated leisure.

[3] Our data for men aged 18 to 55 indicate that while only 4 percent moonlight in any given time period, over 11 percent moonlight at least once during the two and a half years covered by our sample.

where C denotes consumption. If working on either job provides no (dis)utility beyond that caused by foregoing leisure then (1) simplifies to the standard leisure/consumption utility function. The utility function written in (1) is maximized subject to both a budget and a time constraint, or

$$(2)\ C = w_1h_1 + w_2h_2 + Y, \text{ and}$$

$$(3)\ T = h_1 + h_2 + L,$$

where w_i denotes the wage received for one hour worked on job i, Y is nonwage income and T is the total amount of time available. Substituting these constraints into the utility function for C and L yields the utility-maximizing problem,

$$(4)\ \underset{h_1h_2}{Max}\ U(w_1h_1 + w_2h_2 + Y,\ h_1,\ h_2,\ T - h_1 - h_2).$$

We can use the utility-maximizing problem written in (4) to describe both types of moonlighting behavior.

A. *Moonlighting Caused by Labor Supply Constraints*

If the worker is constrained on the primary job, then h_1 is no longer a choice variable and the only avenue for working more hours is to take a second job. This situation is considered by Shishko and Rostker (1976), O'Connell (1979) and Krishnan (1990) and is depicted fin Figures 1 and 2. Here the worker cannot work any more than $\underline{H}_1$ hours on the PJ, and the decision to take a SJ depends on whether the age paid on the SJ exceeds its marginal disutility, given that $\underline{H}_1$ hours have already been committed to the first job. Figure 1 depicts an individual who chooses to supply h_2 hours to a second job, whereas the worker shown in Figure 2 will not choose to moonlight.

Shishko and Rostker (1976) rigorously derive the testable implications for the resulting moonlighting equation and so we will not repeat them here. Substituting the constraint $h_1 = \underline{H}_1$ into the problem written in (4) yields

$$(5)\ Max\ U(w_1H_1 + w_2h_2 + Y,\ H_1,\ h_2,\ T - H_1 - h_2),$$

and results in the optimizing relationship,

$$(6)\ (U_2 - U_l)/U_c = w_2,$$

where U_2 denotes the partial derivative of utility with respect to h_2. Recognizing $(U_2 - U_l)$ as the marginal disutility from an hour of work on the second job (any (dis)utility from working minus the utility lost from the foregone leisure) reveals that equation (6) is the familiar condition between the reservation wage and the market wage.

Solving for hours supplied on the second job leads to the moonlighting equation,

(7) $h_2 = h_2^c(w_2, Y + (w_1 - w_2)\underline{H}_1, \underline{H}_1)$,

where $Y + (w_1 - w_2)\underline{H}_1$ can be seen from Figures 1 and 2 to be the "linearized" intercept of the new segment of the budget line, akin to the concept of virtual income in the income tax literature (e.g. Killingsworth 1983). The superscript *c* identifies this function as the moonlighting function of workers who are constrained on their primary jobs. Economic theory suggests that if leisure is a normal good then $Mh_2^c/MV < 0$, where V is the virtual income measure, $Mh_2^c/M\underline{H}_1 < 0$, and that Mh_2^c/Mw_2 has the usual ambiguous sign. In addition, when h_2^c is specified as a linear labor supply equation, then $Mh_2^c/M\underline{H}_1 = -1.0$.[4]

Shishko and Rostker (1976), O'Connell (1979) and Krishnan (1990) estimate Tobit (or probit) moonlighting functions similar to that written in (7) using data on all workers and including hours worked on the primary job as a regressor. Hours on the primary job is a valid regressor only if it is truly fixed and exogenous for all observations, which suggests that all workers are constrained on their primary jobs. This is quite a heroic assumption and one that Shishko and Rostker (1976) acknowledge (see footnote 14 on p. 304). There is no reason to believe that all non-moonlighters are constrained on their primary jobs, and even moonlighters may not necessarily be constrained. To assume that hours supplied to the primary jobs exogenous is to question the importance of much labor supply research. We develop a more theoretically consistent model by estimating the upper bound faced by workers ($\underline{H}_1$) and including it in the moonlighting equation.

B. *Moonlighting Caused by Heterogeneous Jobs*

If the first and second jobs have different nonpecuniary benefits or costs, we may observe moonlighting among workers who are not constrained on their primary jobs. Rather, utility-maximizing behavior leads them to supply their labor to two different jobs. The consumer's problem written in equation (4) once again yields the optimizing conditions,

(8) $(U_i - U_1)/U_c = w_1$, *for* $i = 1, 2$.

Equation (8) suggests that the individual will supply hours on job *i* until the marginal disutility of working another hour (divided by the marginal utility of income) is just equal to the (negative)

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[4] This can be seen by reviewing Figure 1 and noting that an alternative way of estimating the individual's labor supply would be to estimate *total* hours (or $\underline{H}_1 + h_2$) as a function of w_2 and virtual income. [Again, this is similar to estimating labor supply in the presence of progressive income taxation after "linearizing" the budget line.] Therefore, if we estimate only h_2 as a function of w_2, virtual income, and $\underline{H}_1$, then the coefficient on $\underline{H}_1$ should equal -1.0.

wage paid on the job. Clearly, rational behavior will lead to moonlighting only if there are nonpecuniary benefits or costs to working on job i, represented by U_i above. For instance, if the two jobs are identical and impose no additional costs or benefits beyond the utility lost to the forgone leisure, (8) simplifies to

$$(9)\ -U_L/U_c = -w_i, \text{ for } i = 1,2,$$

and the worker should devote all of his or her labor supply to the job paying the highest hourly wage.

If jobs are indeed heterogeneous, then we observe two labor supply equations of the form

$$(10)\ h_i = h_i^u(w_1,\ w_2, Y), \text{ for } i = 1,2,$$

where h_i^u denotes an unconstrained labor supply (and moonlighting, for $i = 2$) function. Comparative statistics for such a model (available upon request), given standard assumptions about the utility function, suggest that $\partial h_i/M w_j < 0$ for $i \ldots j$, and has the usual ambiguous sign when $i=j$. Assuming that leisure is a normal good suggests $\partial h_i/MY < 0$. The reader may recognize this problem as being similar to the one facing the individual who can devote labor supply to either household and/or market production activities; therefore, the same theoretical results apply. [See Gronau, 1973.]

Permitting two alternative motives suggest that there are two different moonlighting functions, one for those workers who moonlight in response to a labor supply constraint on the primary job (written in equation (7)) and another for those who moonlight because the two jobs have differences that go beyond the monetary wage paid (written in equation (10)). As mentioned earlier, Lilja (1991) is the first to explicitly explore both motives for moonlighting and to implement the resulting different functions, correcting for the simultaneity bias committed when one includes hours worked on the primary job as a determinant of h_2^c. However, the paper has several shortcomings. First, Lilja specifies an inappropriate utility function to study the issue. Most importantly, Lilja assumes the utility function is separable in hours worked on the first and second jobs and fails t recognizee that they must at least be linked through the time constraint.[5] Thus, the resulting unconstrained moonlighting equation is only a function of w_2 and Y, and excludes the primary job wage. Hours worked on the primary job also fails to appear in the constrained moonlighting equation except as part of nonwage (or virtual) income. Second, while using an instrument for $\underline{H}_1$ (the predicted value of hours worked on the primary job as a function of all exogenous variables in the system), Lilja fails t model it as a labor supply *constraint* that should be a function of labor demand variables only. finally, the specification and tests performed

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[5] Specifically, Lilja (1991) specifies a Cobb-Douglas utility function in C, h_1 and h_2 that is maximize subject to the budget constraint only. Therefore the value of leisure, the essential link between the two jobs, in no way enters into the analysis.

require ta al workers fit just one of the two profiles -- i.e. all must moonlight for the same reason.

C. Some Testable Implications

Our research addresses the above described shortcomings by building a consistent theoretical and empirical model that jointly explains labor supply behavior on both jobs and provides testable hypotheses. We accomplish this by explicitly modeling the behavior of the four possible types of workers, described by the following cell diagram.

	On Primary Job:	
	Unconstrained	Constrained
Moonlighters:	I: $h_1; h_2^u > 0$	*II:* $\underline{H}_1; h_2^c > 0$
Nonmoonlighters:	III: $h_1; h_2^u = 0$	*IV:* $\underline{H}_1; h_2^c = 0$

It is illuminating to consider the different predicted behaviors of these four groups and to consider some special cases. Consider first the two kinds of moonlighters (groups *I* and *II)*. We would expect group *I* to moonlight for longer periods of time, with no particular relationship between the wages paid on the two jobs. Conversely, group *II* moonlights in response to labor supply constraints on the first job and would there fore be expected to moonlight only temporarily. (In the long run, we would expect them to find a primary job that more closely matches their desired hours of work. See, for example, Altonji and Paxon 1988). Also, the wage on the second job will not be greater than that on the primary job if the two jobs are otherwise identical. In general, then, we would expect to see shorter, more sporadic episodes of moonlighting on lower paying jobs if the labor supply constraint motive is important, and observe more prolonged episodes of moonlighting with no particular relationship between the PJ and SJ wages if the heterogeneous jobs motive is present.

Two special cases are also worth noting. Shishko and Rostker (1976), O'Connell (1979) and Krishnan (1990) all assume that only two groups of workers, groups *II* and *IV*, exist. In other words, they assume that all workers are constrained on their primary jobs; thus, one is justified in including hours worked on the primary job as a regressor in the moonlighting equation. Our theoretical framework emphasizes the inappropriateness of this assumption and suggests a test of its validity. specifically, in a manner similar to Lilja (1991), we perform an exogeneity test by using two different measures of $\underline{H}_1$ (observed PJ hours and the predicted upper bound $\underline{H}_1$) for all regressors that are constructed using primary job hours information and examining the statistical significance of each measure. If we fail to reject exogeneity then this seemingly inappropriate assumption is supported by the data.

Another special case is if only groups *II* and *III* exist, or if all moonlighters are constrained on their primary jobs and all non-moonlighters are unconstrained. As pointed out by Shishko and

Rostker (1976) (footnote 14, p. 304), one labor supply equation could then be estimated for all workers, in which total hours worked ($h_1 + h_2$) is a function of the marginal wage (w_1 for non-moonlighters, w_2 for moonlighters) and the linearized intercept of the budget line (either Y or $Y + (w_1 - w_2)\underline{H}_1$, respectively). However, to permit the behavior exhibited by all four groups, we must also explicitly model labor supply behavior on the primary job.

III. Econometric Specification

A. Hours Worked on the Primary Job

We begin by estimating the hours worked on the primary job as part of a disequilibrium model, where ours worked will be the minimum of desired labor supply and the upper bound on hours worked, $\underline{H}_1$.[6] In particular, observed hours of work on the primary job, h_1, is generated by

$$
\begin{aligned}
(11)\quad & h_1^s = X^s\$^s + ,^s \text{ where } ,^s \text{ i.i.d. } N(O, `_s^2), \\
& h_1^d = X^d\$^d + ,^d, \text{ where } ,^d \text{ i.i.d. } N(O, `_d^2), \text{ and} \\
& h_1 = \min(h_1^s, h_1^d),\ Corr(,^s, ,^d) = D, \text{ and } h_1^d / \underline{H}_1.
\end{aligned}
$$

The model written in equation (11) is similar to the one pioneered by Fair and Jaffee (1972) ad discussed further by Quandt and Ramsey (1978) and Kiefer (1980), in which there is exogenous switching between the two regimes (denoted as s or d) based on either an observed or unobserved separation indicator.[7] Intuitively, the maximum likelihood estimation is accomplished (in the absence of sample separation information) by searching over the two equations and finding the one that has the higher probability of exceeding the observed value of h_1.

The variables in the desired labor supply equation are implied by equation (10) and include the wages on the primary and second jobs, nonwage income and a vector of taste variables such as education, age, number of children, marital status and health status. We do not observe the wage on the second job for non-moonlighters and we must therefore estimate it using data for moonlighters only, correcting for self-selection bias. The very first stage of our analysis, then, is to estimate a reduced form moonlighting participation equation in order to construct in inverse Mills ratio. Then, for each job, we estimate a standard Mincer-type wage equation, with controls added for local labor market conditions and age-education interactive variables (as suggested by Mroz 1987). Figure 3 outlines the various stages of our analysis and may serve as a useful

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[6] Note that our framework ignores the possibility that a worker may be over-employed, or that $\underline{H}_1$ may be a lower bound as well. Although an unfortunate limitation, we can take comfort in the fact that most survey evidence (such as that from the PSID) find overemployment to be far less prevalent than underemployment and that overemployment should not lead to moonlighting behavior. An interesting application of a disequilibrium model to the problem of overemployment, or a lower bound on hours worked, is Moffitt (1982).

[7] See Maddala (1983) and Quandt (1988) for surveys and further discussion of such models.

reference throughout this discussion.

The variables in the labor demand equation include the wage on the primary job, education, industry and occupation variables, labor market conditions (the state unemployment rate and region) and time and time squared to pick up any trends in economic conditions over time. However, note that h_d is not a labor demand equation in the usual sense; rather, it is the maximum hours an individual can work on his primary job and is therefore a function of his skills, job characteristics and economic conditions.

Some surveys, such as the PSID, ask the respondent if he or she was able to work as much (or little) as desired on the primary job. One could then use such information to construct a separation indicator that sorts the observations into one regime or another. However, several problems prevent us fro using this approach. Foremost, the SIPP data does not contain such survey information. We therefore have not separation indicator available and must treat it as unknown. However, were it available, the reliability of such data has been questioned and the survey questions are subject to misinterpretation (see, for example, Conway et al 1992). Also, such information provides a discrete, all-or-nothing measure of constraints on the primary job, whereas a more continuous measure, namely the probability of being constrained, may be more desirable.

Estimating the model written in (11), treating the separation indicator as unknown, yields several useful results. First, we can examine the signs of $\partial h_1^s/Mw_2$ and Mh_1^s/Mw_1. If moonlighting arises from heterogeneous jobs then $\partial h_1^s/Mw_2$ should be negative; otherwise, it should be zero. Also, if $\partial h_1^s/Mw_2$ is statistically important and the wages on the primary and secondary jobs are positively correlated (a sis likely), then omitting the second wage (as most studies do) may bias downward the estimate of Mh_1^s/Mw_1. By including w_2, we may find that primary labor supply is more wage-responsive than typically believed.

Estimating equation (11) also allows us to calculate both the probability that any one worker is constrained ($prob(h_1^s > h_1^d)$) and the level of that constraint, h_l^d or $\underline{H}_1$. One estimate of the probability is the marginal or unconditional probability that a worker is constrained, or $prob(h_1^s > h_1^d) = prob(,^d\text{-},^s < X^s\$^s\text{-}X^d\$^d)$. As Kiefer (1980) notes, however, a superior estimate would be one that also uses information about the observed outcome, or $prob(h_1^s > h_1^d | h_1)$, typically referred to as the conditional probability. Burkett (1981) empirically explores the difference between the estimated conditional and marginal probabilities in models where $\rho = 0$, and Lee (1984) proves that using the conditional probability minimized the total probability of misclassification. We therefore choose to use the conditional probability in our second stage.

Examining the distribution of the (conditional) probability of being constrained across moonlighters and non-moonlighters provides evidence as to the relative importance of each group of worker (groups *I-IV*, discussed above). More importantly, the estimated probabilities, as well as the estimated upper bound on primary hours, $\underline{H}_1$, are necessary to control for potential PJ constraints in the moonlighting hours equation.

B. *A General Moonlighting Function*

According to our theoretical model, workers have different moonlighting functions depending upon their motive for moonlighting. In particular, desired hours on the second job is distributed as

$$(12) \qquad f(h_2) = \begin{array}{ll} h_2^c(w_2,\ Y = (w_1\text{-}w_2)\underline{H}_1, \underline{H}_1) & \text{if } h^s > h^d, \text{ or } f(h_2 \mid h_1^s > h_1^d) \\ h_2^u(w_1,\ w_2,\ Y) & \text{if } h^s \# h^d, \text{ or } f(h_2 \mid \# h_1^d), \end{array}$$

which can be written and estimated as

$$(13) \quad h_2 = h_2^c(w_2,\ Y+(w_1\text{-}w_2)\underline{H}_1,\ \underline{H}_1)*Pr(h_1^s > h_1^d|h_1) + h_2^u(w_1,\ w_2,\ Y)*Pr(h_1^s \# h_1^d|h_1).$$

From our estimation of the hours worked on the primary job via equation (11), we obtain estimates of $\underline{H}_1\ (=X^d\$^d)$ and the probability of being constrained or unconstrained (given observed PH hours, h_1).

We estimate the moonlighting hours equation written in (13) in two ways. First we use the Tobit procedure for all workers, then we estimate an hours equation for moonlighters only, correcting for self-selection bias (using the probit estimates from the initial stage). Killingsworth (1983) and Mroz (1987) discuss in detail the statistical and economic consequences of each method. We estimate the model both ways to explore these differences. We again refer the reader to Figure 3 to clarify the purpose and order of the various stages of estimation.

Testable hypotheses fro our estimates of equation (13) include the statistical significance and sign of $Mh_2/Mw_i\ (i=1,2)$, and the relative importance of the constrained versus the unconstrained moonlighting functions. We also test whether observed hours on the primary job is exogenous by performing a Hausman exogeneiety test (Kmenta 1986, pp.717-18). These results shed light on the validity of past studies that assume all workers are constrained on their primary jobs. They will also reveal how much meaningful information about labor supply behavior is being lost when researchers ignore or omit moonlighters from empirical labor supply studies.

IV. Data and Descriptive Analysis

We use the 1984 Survey of Income and Program Participation (SIPP) panel for our empirical analyses. In the SIPP, each household is surveyed nine times, once every four months for 36 months. So, one time period lasts four months and is called a wave. Detailed nonlabor income and labor force data are collected, with job-specific information recorded for up to two jobs at each interview.

The primary advantage to using these data (as compared to the more frequently used labor supply data) lies in the availability of detailed information for up to two jobs per time period, and the frequency with which interviews are conducted. While both the PSID (Panel Study of Income Dynamics) and the NLS (National Longitudinal Survey) contain annual data, the SIPP interviews are conducted every four months, providing data measured with more frequency and requiring less long-term recall. The major drawbacks of the SIPP are the limited duration of each panel, and the unavailability of tax information for four-month time intervals.

To construct the estimating sample, the following theoretically-motivated exclusion criteria were imposed. First, any individual younger than age 18 or older than age 55 at any point in the panel was omitted. Second, any individual between the ages of 18 and 25 who was in school was excluded--the goal here was to omit those individuals who were most likely to be making concurrent labor force decisions and human capital investment decisions. We have also excluded the self-employed and those in the military.[8] Finally, in order to simplify the econometric analysis to follow, we have included only those men who held at least one job during each wave in the panel.

Each individual in the SIPP can report detailed employment information for up to two jobs at each interview. Thus, many individuals possess two complete job records at multiple waves. To deal with these episodes of multiple job-holding, we first identify the two jobs held within one wave as Primary job (PJ) or Secondary job (SJ) by ranking the jobs according to total earnings for wave and then by usual weekly hours worked. We distinguish actual moonlighters from those who held two jobs within a wave but not simultaneously by using job star and end dates.[9]

The hours of work information available in the SIPP includes the usual number of hours worked per week and the reported number of weeks worked per wave on each job. Because the number of weeks per wave varies from 17 to 18, we have normalized it using 17.33 as the maximum number of weeks per wave.[10] Hours of work per wave was created by multiplying the usual number of hours worked per week by this normalized variable.

The wage measure is the reported earnings for the job divided by the reported hours, deflated by the Consumer Price Index. Use of the imputed wage measure will tend to bias the wage coefficient downward (see Borjas, 1979). For that reason, we estimate PH and SJ wage

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[8] While excluding the self-employed omits some moonlighters, it allows us to avoid the fundamental problem of distinguishing returns to labor from returns to capital. This practice is consistent with previous research on moonlighting (e.g. Krishnan 1990, p.363)

[9] Note that reported weekly hours may be a problem for the small number of partial job overlappers in our sample because it is not possible to assess if the individual reports the usual hours for the duration of the overlap or for when there is no overlap. Treating these partial overlappers an Nonmoonlighters does not substantively alter our empirical results.

[10] For example, a person with 10 weeks employed in a 17-week wave would have a normalized weeks worked variable of 10*(17.33/17), or 10.19.

equations, in order to create predicted wage measures of use n the empirical analysis. Additionally, the SJ wage influences the choice of hours worked on the PJ, and so must be included in the PJ hours equation. Because the SJ wage measure is unavailable for individuals not holding secondary jobs, the predicted SJ wage can be used in its place.

Our sample is comprised of 1,832 males, 11% of whom moonlight at some point in the panel. See Figure 4 for a list of the variables and their definitions, and Table 1 for the variable means. Not reported in the tables is the average duration and number of moonlighting episodes experienced by the workers. Of the 211 people who moonlight at some point during the sample, 175 have only one episode, 31 have two, and the remaining five have three episodes. The average duration of each episode is one time period for the majority of moonlighters (121 out of 211). At the other extreme, only 14 individuals moonlight all nine time periods. Finally, the wage on the primary job is greater than that paid on the secondary job for 136 out of 211 people (or 400 out of 593 observations). All of these descriptive statistics point to the constraint motive for moonlighting because they reveal short-term episodes of moonlighting on jobs that frequently pay lower wages. The results of our empirical model yield much the same conclusion.

V. Empirical Results

Referring to Figure 3, our model requires three stages of estimation--the initial stage, the primary hours specification and the moonlighting specification. The results fro the initial stage of he estimation, namely the reduced form moonlighting participation equation and the primary and secondary wage equations, are not reported for the sake of brevity but are available upon request. We specify the labor supply equation (both primary hours and moonlighting equations) as a linear (constant slope) function, because it is a relatively popular specification and because it enables us to attach more meaning to the coefficient on $\underline{H}_1$ (see footnote 4). Empirical results from our estimation of the primary job hours equation are listed in Table 2 and the moonlighting equation estimates appear in Tables 3 and 4. We also estimate both the primary and secondary hours equations in the usual (and, we argue, inconsistent) way so that we can see how our more theoretically consistent specification alters the results.

A. Results from the Primary Job Hours Equation

Table 2 contains our single equation estimates of primary job hours, a specification that implicitly assumes labor supply constraints do not exist in a meaningful way. It also resents results from our switching regression estimates, which models primary hours as the minimum of desired labor supply, h_1^s, and the upper bound placed on hours, $\underline{H}_1$. Thus, the switching regression allows there to ve a difference between *observer* and *desired* labor supply, whereas the single equation specification implies that observed and desired labor supply are the same. Because most labor supply studies estimate the single-equation model, a comparison between these two methods is of interest.

The single equation specification suggests that the wage elasticity is positive and statistically significant, but small in magnitude (approximately +.07). In accordance with the theory that leisure is a normal good, the nonlabor income coefficient is negative and significant. In general, the results are consistent with other work (Killingsworth 1983, Pencavel 1986), although our wage elasticity is at the positive end of the spectrum. other single equation studies using SIPP data also find wage elasticities at the high end of the typical range (Kimmel and Kniesner, 1992). The single equation results, with a negative and statistically significant coefficient on the SJ wage, lend support to the heterogeneous jobs motive. The remaining variables are roughly consistent with what one typically expects; therefore, we have a reasonable benchmark with which to compare our results.

Turning to the switching regression labor supply estimates, we find that the wage elasticity increases a great deal in magnitude, from +.07 in the single equation model to +.81 in the switching regression labor supply model. Such an increase makes intuitive sense. If we ignore the fact that a substantial number of individuals are *unable* to adjust their labor supply on their primary jobs, then labor supply will appear less responsive to wage changes. Therefore, when we allow for labor supply constraints as an additional explanation for observed labor supply, we find that desired labor supply is much more responsive to the wage. This contrasts with other studies that use survey information about labor supply constraints, such as Kahn and Lang (1991) and to a lesser extent ham (1982), which tend to find a small *upward* bias in the wage coefficient if labor supply constraints are ignored. Conway et al (1992) provide evidence that this upward bias may be due to using "noisy" survey information to detect labor supply constraints.[11] Therefore, our results may differ because we do or other peculiarity of our data.

Variables other than the primary job wage become less important in this setting. In particular, nonlabor income, although still negative, is no longer statistically significant and the SJ wage is now positive and statistically insignificant. The support for the heterogeneous jobs motive provided by the single equation model does not carry over here. The age and education variable are also no longer important factors. A possible explanation is that these variables are more closely associated with the likelihood that a worker will face an hours constraint on his primary job than as a determinant of desired labor supply behavior. Ham (1982) comes to a similar conclusion, finding that the effects of education on desired labor supply are diminished when labor constraints are explicitly incorporated.

The estimated labor constraint equation is reported in the last column of Table 2. At first glance, it is somewhat startling to find a positive wage coefficient. However, the results are actually quite intuitive, given that this is not a true labor demand equation, but rather one that

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[11] Conway et al (1992) estimate a desired labor supply equation in three different ways: 1) ignoring labor supply constraints, 2) using survey information to identify workers who are constrained, and 3) treating such survey information as an imperfect indicator of labor supply constraints. The wage coefficient decreases between models 1 and 2, consistent with Kahn and Lang (1991) and others, but is larger in model 3 than in model 1 or 2, which is consistent with our results.

describes the upper bound on hours worked faced by a given worker on his primary job. In general, higher paid workers are likely to have jobs that require or at east permit longer hours. Likewise, a lower unemployment rate, an indicator of local economic conditions, leads to greater hours permitted on the primary job. Specific characteristics of the worker also prove important. Nonwhite workers face greater labor supply constraints (a lower $\underline{H}_1$) and more educated workers face fewer constraints.[12] Both of these results are consistent with Ham's (1982) findings. Finally, results for the region, occupation and industry controls are not reported due to space considerations but are available upon request.

The covariance estimates of the errors also tell an interesting story. The variance of the labor demand equation is much smaller than that of the labor supply equation, suggesting that desired labor supply is more likely determined by unobserved factors such as tastes and ability. The correlation between the labor supply and labor demand disturbances, ρ, is positive, but not statistically significant. A positive ρ suggests that labor supply constraints may indeed be a short-run phenomena as workers with high desired labor supply find jobs with high upper limits on hours worked.

With the estimated labor supply and labor demand parameters and (co)variances, we estimate the probability that a worker is constrained, conditional on his observed number of hours. We find that labor supply constraints are extremely important; approximately 86.5 percent of the sample has a conditional probability of being constrained of over .0. Over seven percent have a probability between .8 and .9, and at the other extreme, only two percent of the sample have a probability of less than .1. Surprisingly, moonlighters appear to face relatively *fewer* constraints than Nonmoonlighters.[13] Thus, although our results rather dramatically point to labor supply constraints on the primary job, they still leave open the question of why people choose to moonlight.

In sum, our primary job hours equation estimates suggest that allowing observed hours to deviate from desired hours significantly alters the estimated desired labor supply equation. In particular, labor supply si more responsive to wage changes than what is typically suggested by equilibrium models. Also, the predicted wage on the secondary job does not appear to affect desired labor supply on the primary job once labor supply constraints are incorporated. This result, in conjunction with finding very high estimated probabilities of being constrained for most workers, suggests that moonlighting results from labor supply constraints on the primary job and that moonlighting may be the only avenue for short term labor supply adjustments.

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[12] Specifically, the quadratic in education reaches its minimum at approximately 10 years of education. Each year of education beyond 10 years therefore increases the upper bound, $\underline{H}_1$, imposed on the primary job.

[13] For instance, only 75 percent have a probability over .9 and more than 5 percent have a probability less than .1.

B. *Results for the Moonlighting Equation*

We estimate the moonlighting equation two ways. Table 3 reports the results of a Tobit hours equation estimated for all workers, and Table 4 reports the results from second job hours regression estimated for moonlighters only, correcting for self-selection bias. The first column of both tables list the estimates from the specification that assumes that the only motive for moonlighting is as a response to primary job constraints (h_2^c written in equation (7)). The second column lists the estimates resulting from the heterogeneous jobs motive (or h_2^u written in equation (13)). For completeness, Table 3 also reports the elasticities of SJ hours with respect to the variables of interest using the Tobit derivatives (as opposed to coefficients). These elasticities measure the response of *observed* moonlighting hours to certain factors, whereas the Tobit coefficients measure the response of the latent variable that underlies the Tobit specification (Maddala 1983, p. 160).[14]

Because many studies of moonlighting behavior use the Tobit specification, we first focus on thee results. Also, the assumption that observed primary hours is an exogenous variable is perhaps most heroic for Nonmoonlighters, who are included only in the Tobit model. using the predicted bound of primary job hours rather than the observed value will therefore likely prove ore important to the Tobit model than the self-selected hours regression.

Looking at the first column of Table 3, we find strong support for the constraint motive. The coefficient on $\underline{H}_1$ is statistically significant, negative and close to -1.0, as the theoretical model developed earlier suggests. Likewise, the coefficient on virtual income is negative and statistically significant, consistent with leisure being a normal good. The wage coefficient is positive and statistically significant, suggesting that male labor supply on the second job is indeed quite responsive to wage changes.

The heterogeneous jobs motive also finds support in Table 3 (column 2). The SJ wage and on labor income coefficients are again statistically significant and of the expected sign. More importantly, the wage coefficient on the primary job is negative and statistically significant, which is consistent with the heterogeneous jobs motive where the labor supplied to the PJ and to the SJ are not necessarily perfect substitutes.

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[14] The elasticities in Table 3 should be viewed as "simple" in that they only measure the *direct* effect of the variable on SJ hours. Specifically, the SJ wage, PJ wage and $\underline{H}_1$ actually have two effects in the constrained model -- a direct effect that is captured by the variable's coefficient and an indirect effect captured via the virtual income term. In other words, a change in any of these variables actually requires a "relinearization" of the budget line, just as a change in the marginal tax rate causes a "relinearization" of the budget line in studies of progressive income taxation. Following the standard practice of that literature, we report only the *direct* effect of each variable. However, a quick review of ow virtual income is constructed reveals that adding the indirect effect will only exaggerate the size of the elasticities (i.e. it will increase the SJ wage elasticity, and decrease the PJ wage and hours bound elasticities).

The full model includes both motives and provides support for both. In general, all coefficients of interest are statistically significant and of the expected sign and, in particular, the coefficient on $\underline{H}_1$ is again very close to -1.0. These results are especially striking given the very high estimated probabilities of being constrained that are used in estimating this model. The unconstrained moonlighting equation appears to be approximately twice as responsive to wage changes as the constrained one, although the difference is not quite statistically significant. It makes sense that workers who are voluntarily allocating their labor supply between two heterogeneous jobs will be more responsive to wage changes than workers who re forced into considering a second job due to labor supply constraints on their first job. Our Tobit results combined with our first stage results suggest that although most workers appear tot be constrained on their primary jobs, such constraints are not the sole reason for taking a second job.

Another implicit test of labor supply constraints on the primary job is to perform an exogeneity test on all variables that are functions of primary hours ($\underline{H}_1$). Recall that there are two possible measures for $\underline{H}_1$, observed primary job hours and the upper bound predicted from the labor demand equation. By including both measures in all models that include $\underline{H}_1$ (and virtual income, which is a function of $\underline{H}_1$), we test whether observed primary job hours are exogenous or not. For both the constraint motive-only model (column 1) and the full model (column 3) we reject the null hypothesis that observed primary hours are exogenous at a 5 percent level of significance.[15] This suggests that including primary hours as a regressor in a moonlighting equation, as most researchers do, is not a sound practice and may lead to biased parameter estimates.

Turning to the self-select hours regressions reported in Table 4, we see an entirely different story. The results are dismal for all three models; although the SJ wage coefficient is consistently positive and quite large, none of the key variables are statistically significant. Furthermore, only the full model is statistically significant at the 5 percent level. Including both motives improves the performance f the model, but the overall results are still unimpressive. Likewise, it is not surprising that we also fail to reject the exogeneity of observed primary hours.[16] These results suggest that the decision to moonlight, as opposed to the continuous SJ hours choice, is the driving force behind our strong Tobit results. To confirm this suspicion, we estimate (but do not report) structural moonlighting probit equations, and obtain results that perfectly mimic those of the Tobit models.

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[15] Specifically, we perform a test similar to the Hausman exogeneity test (Kmenta 1986, pp.717-718) by including both measures of $\underline{H}_1$ in the model and testing whether the coefficients on the variables using the predicted measure are jointly statistically different from zero. Likelihood ratio tests for the constraint-only and full models yielded Chi-squared statistics of 9.058 and 8.4, respectively, easily surpassing the 5% critical value of 5.991.

[16] The F-statistics for the constraint-only and full models are .1085 and 1.7484, respectively. We should also note that including observed primary hours instead of the predicted upper bound does not substantively improve the results; none of the key variables are statistically significant at the 5 percent level with the exception of the PJ wage in the full model, which is unfortunately of the wrong sign.

We conclude that while the decision to moonlight is explained by both the constraint and heterogeneous jobs motives, the number of hours actually supplied to a second job remains largely unexplained. It is difficult to compare our results to the literature because our data and methods greatly differ and no general consensus presently exists. In general, however, including observed primary job hours appears to bias the coefficient on $\underline{H}_1$ upward towards zero (and above) and away from the theoretically-consistent value of -1.0.[17] Also, our SJ wage elasticities are greater than those of Shishko and Rostker (1976), O'Connell (1979) and Lilja (1991), and are comparable to those obtained by Krishnan (1990), who also uses the SIPP. From Table 3, we can see that failing to simultaneously permit both moonlighting motives may be partially responsible for the lower wage elasticities found by other studies.

What, then, do our first stage and second stage results tell us about primary labor supply and moonlighting behavior? Our switching regression model of primary job hours suggests that constraints on hours worked are widespread, and that failing to take account of these constraints may erroneously make *desired* male labor supply appear less wage-responsive. However prevalent labor supply constraints may be, or exogeneity tests reveal that treating observed primary job hours as exogenous is inappropriate and leads to biased parameter estimates in the moonlighting equation. Furthermore, although the labor supply constraint motive appears to dominate the moonlighting decision (by the sheer number of workers who are predicted to be constrained), we find strong support in our Tobit estimates for a theoretical model that permits workers to moonlight in response to either constraints on their primary jobs or nonpecuniary (or unobserved) differences between their two jobs. Allowing both motives increases the responsiveness of the decision to moonlight to secondary job wage changes. However, our disappointing self-selected hours estimates caution against applying these broad conclusions to the *continuous* moonlighting decision.

VI. Concluding Remarks

We build on the theoretical and empirical literature on male labor supply behavior by more carefully exploring an avenue for labor supply adjustment that is typically ignored, the ability to take a second job. We consider two motives for moonlighting, as a response to primary job constraints or differential nonwage benefits and costs. Modeling primary job and secondary job hours equations that are consistent with these two motives provides tests of these competing theories of moonlighting and helps determine whether labor supply constraints do exist on the primary jobs of most workers. Our empirical results, for the most part, are consistent with theory. All results point to the conclusion that a significant number of workers are constrained on their primary jobs -- this appears t be the primary motive for moonlighting. However, treating *all* workers as if they are constrained, as most studies do, appears to be going too far and is

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[17] For instance, when we include observed PJ hours in the Tobit models, we estimate coefficients on $\underline{H}_1$ of approximately -0.58 with standard errors ranging form 0.07 to 0.10.

soundly rejected by the model. Furthermore, the data support the hypothesis that people may also moonlight because jobs are heterogeneous. Perhaps most importantly, we find that once labor supply constraints on the primary job have been appropriately modeled and more than ne motive for moonlighting is permitted, desired male labor supply is quite responsive to wage changes. Therefore, failing to consider the option of moonlighting and the possibility of facing labor supply constraints appears to bias male wage elasticities towards zero.

Our research has important implications for labor supply research. It emphasizes the need to better incorporate demand-side factors into studies of *observed* labor supply on the primary job. It also suggests that he typical methods of treating moonlighters (either dropping them from the sample, ignoring their labor supply on the second job, or aggregating hours on all jobs) are inadequate. Moonlighters mirror the general working populations; many appear t be constrained on their primary jobs although others are not. Our model of labor supply constraints, heterogeneous jobs and the ability to take more than one job leads to different results than the typical approach. Clearly, however, there is still much to be done in this line of research. Our model is a static one in which intertemporal decision making has been ignored. In a life-cycle framework, if a worker faces temporary labor supply constraints on his primary job, he may choose to moonlight and/r plan to work more in the future when the constraints will be removed. also, even withing the context of our static model we are unable to explain *continuous* moonlighting behavior, possibly due to unavailable data on nonwage compensation and fixed costs of working. Further exploring this avenue for marginal adjustments to labor supply is clearly warranted. Nonetheless, the theoretical model and empirical results presented here have important ramifications for the manner in which most labor supply research treats moonlighters and the possibility that workers may face labor supply constraints.

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Table 1
Variable Means
(standard deviation in parentheses)

I. 0-1 Dummy Variables

	Full	Moonlighting	Non-Moonlighting
Sample Sizes	16,488	593	15,895
(# individuals)	(1,832)	---	---
YNGKIDS	0.26	0.33	0.26
	(0.44)	(0.47)	(0.44)
SICK	0.04	0.017	0.04
	(0.19)	(0.13)	(0.19)
NONWHITE	0.10	0.14	0.09
	(0.29)	(0.34)	(0.29)
MARRY	0.76	0.78	0.76
	(0.43)	(0.41)	(0.43)
MOONNOW	0.04	1.00	0.00
	(0.19)	(0.00)	(0.00)
MOONEVER	0.11	1.00	0.08
	(0.32)	(0.00)	(0.27)
NORTEAST	0.23	0.29	0.22
	(0.42)	(0.45)	(0.42)
SOUTH	0.31	0.32	0.31
	(0.46)	(0.47)	(0.46)
WEST	0.18	0.13	0.18
	(0.38)	(0.34)	(0.38)

II. Continuous Variables

AGE	36.89	35.16	36.96
	(9.22)	(8.56)	(9.24)
PJHRWAVE	730.96	678.26	732.92
	(157.50)	(163.32)	(156.94)
PJWAGE	10.12	9.62	10.14
	(3.24)	(3.04)	(3.24)
SJHRWAVE	8.71	242.13	---
	(59.18)	(202.32)	
SJWAGE	5.60	6.07	5.58
	(2.35)	(2.46)	(2.35)
NONLABY	4189.6	3736.2	4205.5
	(4850)	(4356)	(4866)
VIRTUAL Y[a]	7606.3	6419.2	7650.6
	(5585)	(4835)	(5606)
NUMKIDS	0.90	1.31	0.88
	(1.11)	(1.24)	(1.10)
YRSEDUC	13.17	13.83	13.15
	(2.80)	(2.72)	(2.80)
UNEMPL	7.66	7.51	7.67
	(1.81)	(1.74)	(1.82)

[a] Constructed as a function of $\underline{H}_1$, the predicted upper bound on primary job hours.

Table 2
Results for Primary Job Hours Equation

SINGLE EQUATION		SWITCHING REGRESSION			
h^S Variables	h^S Coefficients	h^SVariables	h^S Coefficients	h^dVariables[a]	h^d Coefficients[a]
PJWAGE	5.12** (7.440)	PJWAGE	58.37** (6.29)	PJWAGE	1.34 (1.07)
SJWAGE	-3.58** (-3.63)	SJWAGE	8.11 (0.89)	UNEMPL	-1.907** (-2.70)
NONLABY	-0.0011** (-4.43)	NONLABY	-0.0029 (-1.25)	---	---
YRSEDUC	-20.62** (-5.34)	YRSEDUC	-7.58 (-0.19)	YRSEDUC	-7.47** (-3.00)
	0.902** (5.60)	YRSEDUC2	-0.81 (-0.50)	YRSEDUC2	0.380** (3.91)
AGE	8.80** (6.54)	AGE	9.85 (0.88)	WAVE	1.049 (0.52)
AGE2	-0.11** (-6.48)	AGE2	-0.079 (-0.55)	WAVE2	-0.135 (-0.70)
MARRY	27.59** (7.97)	MARRY	141.89** (4.16)	NONWHITE	-29.13** (-5.65)
YNGKIDS	7.34** (2.03)	YNGKIDS	11.16 (0.34)	---	---
NUMKIDS	-4.42** (-2.99)	NUMKIDS	-1.34 (-0.09)	---	---
SICK	-13.44** (-2.99)	SICK	-125.2** (-2.38)	---	---
CONSTANT	627.39** (20.64)	CONSTANT	764.91** (2.60)	CONSTANT	800.43** (36.89)
SIGMA	154.41	SIGMA	491.16	SIGMA	130.36
RHO	----	RHO	0.184 (1.17)	RHO	0.184 (1.17)
Goodness of Fit Measure	$F^{11}_{16476}=61.6^{**}$				

[a] Additional h^d controls: 3 regional dummies; 7 occupation dummies; 8 industry dummies.
** Significant at the 5% level.

Table 3

Secondary Job Hours Equations -- Tobit Coefficients for All Workers
(elasticities in brackets; t-statistics in parentheses)

		PJ Hours Constrained[a]		PJ Hours Not Constrained[b]		Full Model[c]
A. Variables in constrained equation						
SJWAGE	[0.39]	19.109** (2.07)		---	[0.5]	24.94** (2.68)
VIRTUALY	[0.30]	-0.010** (3.95)		---	[-0.2]	-0.007** (-2.62)
$\underline{H}_1$	[-3.94]	-1.441** (3.74)		---	[-2.5]	-0.921** (-4.57)
B. Variables in unconstrained equation						
SJWAGE		---	[0.42]	21.40** (2.44)	[1.04]	51.16** (2.46)
NONLABY		---	[-0.06]	-0.004 (-1.62)	[-0.30]	-0.023** (-2.40)
PJWAGE		---	[-1.88]	-52.44** (-8.25)	[-1.53]	-41.83** (-2.16)
C. Variables in all models						
YNGKIDS		-103.10** (-3.30)		-99.05** (-3.20)		-89.206** (-2.90)
NONKIDS		97.56** (8.09)		100.13** (8.33)		98.56** (8.25)
AGE		-51.36** (4.44)		-16.34 (-1.31)		-39.05** (-3.29)
AGE2		0.619** (4.11)		0.260 (1.64)		0.490** (3.19)
YRSEDUC		93.56** (2.39)		119.53** (3.11)		120.07** (3.17)
YRSEDUC2		-2.48 (-1.56)		-2.59* (-1.67)		-3.71** (-2.44)
SICK		-127.67* (-1.74)		-134.44* (-1.85)		-155.00** (-2.13)
MARRY		-10.03 (-0.31)		-1.24 (-0.04)		18.27 (0.56)
CONSTANT		131.74 (0.31)		-1594.22** (-5.24)		-753.04** (-2.48)
Log-likelihood value		-6298.87		-6276.87		-6269.79

[a] Corresponds to equation (7) in text.
[b] Corresponds to equation (10) in text.
[c] Corresponds to equation (13) in text.

* Significant at 10%.
** Significant at 5%.

Table 4
Secondary Job Hours Equations -- Coefficients from Self-Select Model for Moonlighters Only

(t-statistics in parentheses)

	PJ Hours Constrained[a]	PJ Hours Not Constrained[b]	Full Model[c]
A. Variables in constrained equation			
SJWAGE	2.99 (0.41)	---	5.334 (0.72)
VIRTUAL Y	0.0002 (0.08)	---	0.002 (0.92)
$\underline{H}_1$	-0.0009 (-0.003)	---	-0.102 (-0.68)
B. Variables in unconstrained equation			
SJWAGE	---	2.87 (0.440)	10.95 (0.71)
NONLABY	---	0.0001 (0.06)	-0.008 (-1.18)
PJWAGE	---	0.96 (0.17)	11.69 (0.78)
C. Variables in all models			
YNGKIDS	-3.102 (-0.13)	-2.801 (-0.12)	2.801 (0.12)
NUMKIDS	2.259 (0.21)	2.03 (0.19)	6.13 (0.58)
AGE	-20.684** (-2.11)	-21.353** (-1.99)	-20.801** (-2.12)
AGE2	0.30** (2.36)	0.307** (2.27)	0.307** (2.42)
YRSEDUC	-50.244 (-1.42)	-51.175 (-1.47)	-43.009 (-1.26)
YRSEDUC2	1.819 (1.28)	1.832 (1.36)	1.446 (1.08)
SICK	-3.406 (-0.05)	-3.002 (-0.04)	4.797 (0.07)
MARRY	-41.99 (-1.51)	-42.75 (-1.52)	-28.47 (-1.02)
MILLS	-2.238 (-0.06)	-4.992 (-0.13)	-4.063 (-0.12)
CONSTANT	926.90** (2.44)	948.93** (3.11)	910.65** (3.26)
F-Statistic	1.74*	1.74*	2.80**

[a] Corresponds to equation (7) in text.
[b] Corresponds to equation (10) in text.
[c] Corresponds to equation (13) in text.

* Significant at 10%.
** Significant at 5%.

Figure 1. A Constrained Moonlighter

Figure 2. A Constrained Nonmoonlighter

NOTE: Figures are currently available in hard copy only.

Figure 3. Outline and Purpose of the Different Stages of Estimation

I. Initial Stage: Purpose is to estimate a second wage, w_2, for all observations to be used in both the primary hours equation and the moonlighting equation, and an inverse Mills ratio to be used in part III,B below.

A.) Estimate a reduced form moonlighting participation equation using Probit:
$H@ = 1$ if moonlight, zero otherwise and $H2=f(X_{all})$,

where X_{all} includes all of the exogenous variables in the model.

B.) Estimate a moonlighting wage equation for moonlighters only, correcting for self-selection bias:

$w_2 = g(X_{all}$, estimated inverse Mills ratio)

C.) Use the estimated parameters from B.) to estimate a second wage for all observations.

II. Primary Hours Equations: Purpose is to estimate the labor supply function and the equation that determines the upper bourn, $\underline{H}_1$, that constrained workers face. With these estimates, estimate the upper bound, $\underline{H}_1$, for each worker and the probability that he or she is constrained on the primary job.

A.) Estimate the following disequilibrium model:

$$h_1^s = X^s\$^s + ,^s \text{ where } ,^s \text{ i.i.d. } N(0, F_s^2),$$

$$h_1^d = X^d\$^s + ,^d \text{ where } ,^d \text{ i.i.d. } N(0, F_d^2),$$

$$h_1 = min(h_1^s, h_1^d), Corr(,^s, ,^d) = D \text{ and } h_1^d / \underline{H}_1.$$

B.) From the estimates of β, constructs estimates of $\underline{H}_1$ and the probability that the person is constrained on the primary job, given observed PJ hours, or prob($h^s > h^d \mid h_1$).

III. Moonlighting Equation: Estimate the hours supplied to the second job for A.) all workers, and B.) for moonlighters only.

A.) Estimate the following equation via Tobit for all workers:

$$h_2 = h_2^c(w_2, Y+(w_1-w_2)\underline{H}_1,\underline{H}_1)*Pr(h^s > h^d \mid h_1) + h_2^u(w_1, w_2, Y)Pr(h^s \# h^d \mid h_1).$$

B.) Estimate a self-selection corrected hours equation for moonlighters only:

$$h_2 = h_2^c(w_2, Y+(w_1-w_2)\underline{H}_1,\underline{H}_1)*Pr(h^s > h^d \mid h_1) + h_2^u(w_1,w_2,Y)*Pr(h^s \# h^d \mid h_1) \\ + (\text{inverse Mills ratio})*F.$$

Figure 4

Variable Definitions

I. 0-1 Dummy Variables

YNGKIDS:	have any children under the age of 6 living at home this wave
NORTEAST:	reside in the Northeast of the United States
SOUTH:	reside in the South of the United States
WEST:	reside in the West of the United States
SICK:	ever report having a work-limiting physical condition
MARRY:	married with spouse present in household
MOONNOW:	moonlighter in current time period
MOONEVER:	moonlight at least one time period during panel

II. Continuous Variables

PJHRWAVE:	reported hours worked this wave one primary job
SJHRWAVE:	reported hours worked this wave on secondary job
PJWAGE:	predicted wage on primary job (in constant 1984 dollars)
SJWAGE:	predicted wage on secondary job (in constant 1984 dollars)
NONLABY:	nonlabor income (household income minus own earned income minus own work-tied transfers)
VIRTUAL Y:	"linearized" nonlabor income $= (\text{PJWAGE} - \text{SJWAGE}) * \underline{H}_1 + \text{NONLABY}$
MILLS:	Inverse Mills Ratio, retrieved from the moonlighting probit equation results
NUMKIDS:	number of children under the age of 15 living at home this wave
UNEMPL:	state unemployment rate this wave
WAVE:	WAVE (time period)
WAVE2:	WAVE * WAVE
AGE:	age
AGE2:	age-squared
YRSEDUC:	number of years of competed education
YRSEDUC2:	years of education squared