Labor Supply Preferences, Hours Constraints, and Hours-Wage Trade-offs

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In a labor market with tied hours-wage packages and wage dispersion for a particular type of job, constrained workers may be willing to sacrifice wage gains for better hours when changing jobs. Likewise, workers may accept jobs offering undesirable hours only if the associated wage gains are large. We investigate this issue empirically by examining whether overemployment and underemployment on the initial and new job affects the relation between hours changes and wage changes for quitters. Our results generally support the view that an individual requires compensation to work in a job that, given the individual's particular preferences, offers unattractive hours.

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I. Introduction

The broad concern of this article is how trade-offs between work hours and wages are determined in the labor market. In the standard labor supply model, a worker who finds a job paying a higher wage may choose to adjust his labor supply. Since hours can be freely varied within jobs, the relation between hours changes and wage changes is determined by labor supply preferences.

However, there are a number of studies arguing that firms have strong preferences about hours and that they place restrictions on the hours an employee may choose.[1] Abowd and Ashenfelter (1981, 1984), Topel (1984), and Murphy and Topel (1987) interpret hours of unemployment as constraints on the number of hours worked and investigate compensating differentials for unemployment risk within a hedonic framework. In these models, workers choose among different combinations of expected unemployment, unemployment risk, and earnings in accordance with a market locus.[2] Rosen (1976), Lundberg (1984), Moffit (1984), and Biddle and Zarkin (1986) have investigated hours determination in hedonic models in which workers trade off hours and wages in accordance with a market locus. The wage change associated with any given hours change is a market-determined compensating differential. The preferences of a given individual influence the optimal hours-wage combination he selects but do not affect the wage associated with the particular hours level.

These hedonic models abstract from search costs and from the fact that for a given type of worker there is substantial dispersion in the wage offers associated with a particular type of job. If wage and hours offers are tied but, as in the job search literature, wages have a distribution around a market locus, workers will not necessarily be on either their labor supply functions or a market locus. The best job available to the worker at a moment in time may be one that pays very well but requires an hours level that is far from the worker's labor supply schedule or one that pays poorly but offers desirable hours. Furthermore, when wage dispersion and search costs are added to a hedonic market model, the wages received by

[1] See Lewis (1969), Rosen (1969), Barzel (1973), and Deardorff and Stafford (1976). There is also some empirical evidence to support the view that firms place significant constraints on hours worked. Gustmann and Steinmeier (1983, 1984) have shown that persons nearing retirement age must change jobs to reduce hours. In Altonji and Paxson (1986), we show that hours for a given individual are much more variable across time periods when the individual changes jobs than across time periods in which the job does not change. One interpretation of this result is that fixed hours requirements have a large influence on work hours. Dickens and Lundberg (1986) analyze a labor supply model in which workers choose among a finite number of job offers with the same wage but with different hours levels.

[2] See also Ehrenberg and Schumann (1984), Ashenfelter (1980), Ham (1979, 1985), and Rosen and Quandt (1978).

workers in jobs offering a given hours level will vary with the preferences of the workers. For example, one would expect workers who wish to work part-time but who have selected jobs requiring full-time hours to receive, on average, a higher wage than equally productive workers who prefer and have a full-time job. With search costs and wage dispersion for a given hours level, individuals may still have to make trade-offs between wages and hours even if there is no systematic market relation between wages and hours.

The above discussion suggests that hours constraints should influence the pattern of wage-hours trade-offs that occur when workers quit. Intuitively, one would expect that constrained workers may sacrifice wage gains for better hours when changing jobs. In other words, the partial effect of a positive change in hours on the wage gain required to induce a quit will be larger for those who are overemployed in their initial jobs and smaller for those who are underemployed in their initial jobs. Also, since overemployment on the new job influences the attractiveness of the job, the partial effect of a positive change in hours by job changers who are overemployed on their new jobs should be to increase the size of the wage gain associated with the quit. Positive hours changes will tend to be associated with smaller wage gains for job changers who are underemployed in their new jobs.

In what follows, we provide a study of how hours constraints affect hours-wage trade-offs when workers change jobs. The empirical analysis investigates how wage changes are affected by interactions among the change in hours and indicators of overemployment and underemployment on the old job and on the new job. We also use our results to provide an estimate of the compensated labor supply elasticity.

Section II discusses the implications of tied hours-wage offers with wage dispersion for the trade-off between hours changes and wage changes associated with quits. We also compare our analysis to conventional labor supply studies and studies such as Brown (1980) that have investigated whether there is a compensating differential for hours levels and a number of other job attributes. Section III discusses our sample of male heads of household from the Panel Study of Income Dynamics (PSID). Section IV presents the empirical analysis. We provide a brief summary in Section V.

II. Wage Dispersion, Hours Constraints, and Hours-Wage Trade-offs

We organize the discussion around the following simple model of job choice in the presence of tied wage-hours offers and wage dispersion. Each job is assumed to consist of a fixed hours-wage package. Furthermore, the combination of hours and wages for a certain type of job may vary across firms owing to differences in production technology, recruiting and turnover costs, and other factors discussed in the references in note 1 above.

Because the hours level within each job is fixed, workers must change jobs to change hours. We assume that there is imperfect information regarding the location of job opportunities, as can be seen in the job-search literature. As a result, workers are not always able to find jobs offering hours levels on their labor supply curves, even though there may be vacancies for such jobs in the economy. Instead, workers are assumed to obtain, at no cost, one offer each period. For a given hours level the wages offered to a particular worker may vary across firms because of matching, noncompetitive features of the labor market or other factors. Katz (1986) and Parsons (1986) present surveys of the wage literature.

The preferences of each worker are characterized by the function $U(H, W; \boldsymbol{x})$.[3] The variables H and W are the hours level and the real hourly wage rate. The individual-specific vector $\boldsymbol{x}$ is a set of characteristics (e.g., wealth, tastes for consumption and leisure, etc.) that affect the hours-wage trade-off. We assume that $U_{11} < 0$, $U_{22} < 0$, and $U_2 > 0$. The function U_1 is zero at the desired hours level; U_1 is negative if the worker is overemployed and positive if the worker is underemployed.

A worker will accept a job offer only if it provides a utility level exceeding that of the initial job by a mobility cost M, where M is measured in utility units. That is, given initial hours and wages of H_0 and W_0, a job offer H_1, W_1 will be accepted only if

$$\text{Gain}(H_1, W_1, H_0, W_0; \boldsymbol{x}) = U(H_1, W_1; \boldsymbol{x}) - U(H_0, W_0; \boldsymbol{x}) \geq M. \quad (1)$$

The set of acceptable offers $A(H_0, W_0; \boldsymbol{x})$ that satisfy (1) is depicted as the shaded region in figure 1. The curve U^0 represents the indifference curve for an individual initially in a job with an hours-wage package of $[H'_0, W'_0]$. The indifference curve U^M defines the acceptance set and is the locus of hours-wage combinations that provide the reservation utility level of $U(H'_0, W'_0; \boldsymbol{x}) + M$ required to induce a quit. The curve defines a reservation wage function W_M as a function of hours on the new job (H_1).

[3] We assume that decisions are based on a 1-period utility function rather than on a multiperiod utility function. The use of a multiperiod model would make the analysis considerably more complex. One complication is that the distribution $g(H, W)$ may enter the valuation of a job offering H, W because it affects the odds that a person will find a superior job. Furthermore, expectations as to whether preferences are transitory or permanent will affect the valuation of a current job offer. Kiefer (1984) analyzes a multiperiod search model of the labor market with fixed hours offers. However, Kiefer's model does not distinguish between offers from the current firm and from other firms. His framework is well suited for the analysis of transitions among employment, unemployment, and nonparticipation, the focus of his paper. With some major modifications it might be possible to use Kiefer's model to study what is our main concern, transitions from one employer to another.

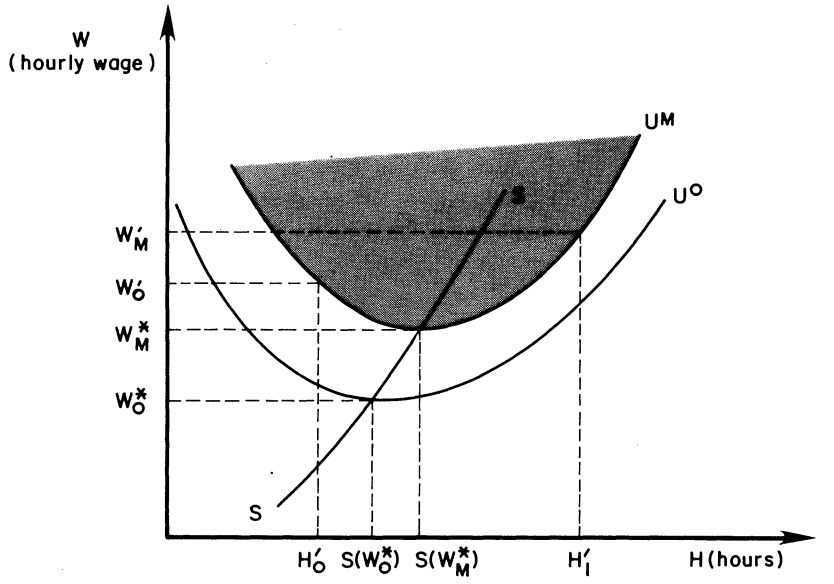

FIG. 1

If the initial hours level and wage are H_0 and W_0, W_M is defined implicitly by

$$\text{Gain}(H_1, W_M, H_0, W_0; x) = U(H_1, W_M; x) - U(H_0, W_0; x) = M. \quad (2)$$

The line SS is the labor supply curve and shows the desired hours level $S(W; x)$ at each wage. In what follows, we define W_0^* to be the wage that provides a utility level of U^0 when hours are equal to desired hours, and $S(W_0^*)$ equals desired hours at W_0^*. Likewise, W_M^* is the wage that provides a utility level of U^M when hours are equal to desired hours, and $S(W_M^*)$ equals desired hours at the wage W_M^*.

We use figure 1 to make several points about trade-offs between hours constraints and wage gains associated with quits. First, suppose that hours for both jobs lie on the labor supply curve SS. The vertical distance $(W_M^* - W_0^*)$ is the wage gain required to induce a quit when the initial wage is W_0^* and hours are on the labor supply curve in both jobs. If the marginal utility of the wage is relatively constant over the range required to induce a quit, then $(W_M^* - W_0^*)$ is approximately equal to M/U_2. Since the indifference curves are flat in the neighborhood of $S(W_0^*)$ and $S(W_M^*)$, small deviations in hours have little influence on the wage gain associated with a quit.

From the shape of the indifference curve U^0, it is obvious that substantial over- or underemployment lowers the gap between W_M^* and the initial

wage relative to $(W_M^* - W_0^*)$. For example, suppose that the initial job has an hours-wage package of $[H_0', W_0']$ and that the job offer requires $S(W_M^*)$ hours. In this case, the required wage gain is only $(W_M^* - W_0')$, which is obviously less than $(W_M^* - W_0^*)$.

Similar results hold if there are hours constraints in the new job. Since U^M is convex, the difference between the minimum acceptable wage offer W_M and W_M^* is an increasing function of the distance between the required hours level H_1 and $S(W_M^*)$. For example, the minimum acceptable wage offer associated with a job with H_1' hours is W_M'. Due to the convexity of the indifference curve, as H_1' rises with respect to $S(W_M^*)$, the wage gain required to induce a quit also increases.

In summary, this discussion suggests that the minimum wage gain required to induce a quit is not sensitive to small amounts of over- or underemployment but falls (rises) at an increasing rate with the absolute difference between actual and desired hours on the old (new) job. One may derive a specific equation with these properties by taking a Taylor expansion of Gain$(H_1, W_1, H_0, W_0; \boldsymbol{x})$ around the point $[S(W_M^*), W_M^*, S(W_0^*), W_0^*]$ up to second-order terms in $[H_1 - S(W_M^*)]$ and $[H_0 - S(W_0^*)]$ and first-order terms in $(W_M - W_M^*)$ and $(W_0 - W_0^*)$. Using the fact that $[W_M - W_0]$ is approximately equal to $[\ln(W_M) - \ln(W_0)][W_0]$, the minimum wage gain required to induce a quit may be expressed as

$$\begin{aligned}\ln[W_M(H_1, H_0, W_0; \boldsymbol{x})] - \ln[W_0] = M/[U_2 W_0] \\ - \phi[H_0 - S(W_0^*)]^2 + \phi[H_1 - S(W_M^*)].^2\end{aligned} \tag{3}$$

We work with log wages in anticipation of the empirical specification. In (3) the parameter $\phi = -.5U_{11}/U_2 W_0 > 0$, and we have imposed the assumption that the second derivative U_{11} is constant over the relevant ranges. Since the actual hours change $(H_1 - H_0)$ is observed, it is helpful to rewrite (3) as

$$\begin{aligned}\ln[W_M(H_1, H_0, W_0; \boldsymbol{x})] - \ln[W_0] = M/[U_2 W_0] + \phi[H_1 - H_0] \\ \times [H_0 - S(W_0^*)] + \phi[H_1 - H_0][H_1 - S(W_M^*)] - \phi[S(W_M^*) - S(W_0^*)] \\ \times [H_0 - S(W_0^*)] - \phi[S(W_M^*) - S(W_0^*)][H_1 - S(W_M^*)].\end{aligned} \tag{4}$$

This equation says that after adjusting for the change in desired hours, the effect of $(H_1 - H_0)$ on $[\ln(W_M) - \ln(W_0)]$ is a negative function of the amount of initial underemployment. This result is intuitively obvious since one would expect that individuals who are underemployed would be willing to sacrifice wage gains for additional hours and would require extra large wage gains to accept additional underemployment. The equation also says that the effect of $(H_1 - H_0)$ on $[\ln(W_M) - \ln(W_0)]$ is a positive (negative)

function of the amount of overemployment (underemployment) in the new job.

The empirical specification actually used in the analysis differs from (4) in several ways. First, (4) shows the relationship between the hours change and the *minimal* wage change required to induce a quit. However, only W_1 (the actual wage obtained) is observed. We substitute W_1 for W_M in (4).[4] Second, we replace $S(W_M^*) - S(W_0^*)$, which is unobserved, with a constant. Third, $H_0 - S(W_0^*)$ and $H_1 - S(W_M^*)$, the differences between actual and desired hours in each period, are also unobserved. However, the data set does contain information on whether the individual is under- or overemployed. Specifically, we define the underemployment indicator UNDER_j and the overemployment indicator OVER_j for time period j as

$$\text{UNDER}_j = 1 \quad \text{if } (H_j - S_j) < 0 \text{ and } \text{UNDER}_j = 0 \text{ otherwise}, \quad j = 0, 1;$$

$$\text{OVER}_j = 1 \quad \text{if } (H_j - S_j) > 0 \text{ and } \text{OVER}_j = 0 \text{ otherwise}, \quad j = 0, 1.$$

Variable S_j is desired hours *at the current wage,* hence S_j differs from $S(W_j^*)$. However, because the indifference curves are convex, it is necessarily the case that, if the individual wishes to work more (less) at the current wage, he would also wish to work more (less) at the wage W^*. Therefore, OVER_j and UNDER_j can be used as indicators of whether $[H_0 - S(W_0^*)]$ and $[H_1 - S(W_M^*)]$ are positive or negative. We replace the terms $[H_0 - S(W_0^*)]$ and $[H_1 - S(W_M^*)]$ with the variables UNDER_j and OVER_j in equation (4).

Equation (4) restricts the effects of increases in hours to be the same as the effects of reductions in hours. We do not always impose these restrictions in the actual estimation. We create the variable $|\Delta H \cdot \text{UP}|$, which equals the change in hours given that the hours change is positive and zero if the change in hours is negative. We also construct the variable $|\Delta H \cdot \text{DOWN}|$, which equals the absolute value of the change in hours if the change in hours is negative and zero if the change in hours is positive. These variables are used in place of $(H_1 - H_0)$ in equation (4).

[4] The substitution of W_1 for W_M is valid only if the change in W_1 (conditional on H_1 and $W_1 > W_M$) with respect to a change in hours is a positive function of the change in W_M with respect to hours. This will always be true if the offers of H and W are independent. However, if the hours-wage offers are correlated (as would be expected within a hedonic markets framework), it is possible that the $\partial E[W_1 | H_1, W_1 > W_M]/\partial H_1$ and $\partial W_M/\partial H_1$ are opposite in sign. Suppose, e.g., that $\partial W_M/\partial H_1$ is negative but that H_1 and W_1 are positively correlated. A larger hours offer will shift the mean of wage offers to a higher level. The expected value of W_1 conditional on $W_1 > W_M$ could rise, despite the fact that the lower bound for W_1 has fallen. Since we have no information on the density function $g(H, W)$, this problem is ignored.

We make additional modifications to (4) to reflect the implications of other theories for the relation between wage changes and hours changes. Both the conventional labor supply model and the hedonic market model imply that there will be a systematic relation between hours and wage changes. In order to control for the possibility that the relation between hours changes and wage changes is due either to movement along a labor supply schedule or a market locus, we add $(H_1 - H_0)$ as a separate variable.[5]

In addition, the variables CON_0 and CON_1 are added to the equation, where CON_0 and CON_1 are dummy variables for whether workers were free to *increase* hours on the initial job and on the new job. These variables are included since firms that restrict hours choice may have to pay a compensating differential to all workers regardless of whether the constraint is binding for a particular worker. This issue has been examined by Duncan (1976). Unfortunately, it is not possible to construct a variable that reflects whether hours can be reduced. Individuals who indicated that they wanted to work more but could not were never asked whether they could work less.

Finally, we add a vector of variables Z to the model, where Z consists of controls for education, experience, experience squared and cubed, race, changes in marital status, changes in health status, and a set of year dummies.

The final equations estimated have the form

$$\begin{aligned}\ln(W_1) - \ln(W_0) = {} & \beta_0 + \beta_1 Z + \beta_2 \mathrm{CON}_0 + \beta_3 \mathrm{CON}_1 \\ & + \beta_4 |\Delta H \cdot \mathrm{UP}| + \beta_5 |\Delta H \cdot \mathrm{DOWN}| + \beta_6 \mathrm{UNDER}_0 \\ & + \beta_7 \mathrm{OVER}_0 + \beta_8 \mathrm{UNDER}_1 + \beta_9 \mathrm{OVER}_1 \\ & + \alpha_{01} |\Delta H \cdot \mathrm{UP}| \mathrm{UNDER}_0 + \alpha_{02} |\Delta H \cdot \mathrm{UP}| \mathrm{OVER}_0 \\ & + \alpha_{03} |\Delta H \cdot \mathrm{DOWN}| \mathrm{UNDER}_0 \\ & + \alpha_{04} |\Delta H \cdot \mathrm{DOWN}| \mathrm{OVER}_0 \\ & + \alpha_{11} |\Delta H \cdot \mathrm{UP}| \mathrm{UNDER}_1 + \alpha_{12} |\Delta H \cdot \mathrm{UP}| \mathrm{OVER}_1 \\ & + \alpha_{13} |\Delta H \cdot \mathrm{DOWN}| \mathrm{UNDER}_1 \\ & + \alpha_{14} |\Delta H \cdot \mathrm{DOWN}| \mathrm{OVER}_1 .\end{aligned} \tag{5}$$

The expected signs for the parameters α_{01}–α_{14} are: $\alpha_{01} < 0$, $\alpha_{02} > 0$, $\alpha_{03} > 0$, $\alpha_{04} < 0$, $\alpha_{11} < 0$, $\alpha_{12} > 0$, $\alpha_{13} > 0$, $\alpha_{14} < 0$. Basically, a change in hours

[5] It is important to keep in mind that if labor supply preferences vary across periods, then (under the null hypothesis of a standard labor supply model) the hours change will be correlated with the error term of the wage change equation. Measurement error in hours is likely to be severe and to result in further biases.

that tightens the constraint on the initial job should be associated with a larger wage gain, and a change in hours that tightens the constraint on the new job should be associated with a larger wage gain. Thus individuals who reduce their hours when they initially wanted to work more should have a larger wage gain ($\alpha_{03} > 0$). Likewise, individuals who increase their hours when moving into a job where they want to work less should have larger wage gains ($\alpha_{12} > 0$). In some specifications of the model, we impose the symmetry restrictions $\alpha_{01} = -\alpha_{02} = -\alpha_{03} = \alpha_{04}$, $\alpha_{11} = -\alpha_{12} = -\alpha_{13} = \alpha_{14}$.

Equation (5) pertains to quitters only. We actually estimate equation (5) over the full sample of individuals who did and did not quit, with layoffs excluded. However, we allow coefficients on all variables *except* for those in Z to vary for quitters and stayers. Basically, we use the observations on stayers to help identify the effects of the control variables such as education and marital status. Use of the combined sample also enables us to compare the effects of hours constraints on patterns of hours and on wage changes for quitters and stayers.

III. Data

A sample of male heads of households was drawn from the 14-year (1968–81) Panel Study of Income Dynamics (PSID) individuals tape. Additional observations on these individuals for 1982 and 1983 were obtained from the 1968–82 and 1968–83 PSID tapes if the individual remained in the sample after 1981. Observations for a particular year were excluded if the individual was not between the ages of 18 and 60, inclusive, and was not retired or in school. Additional exclusions are discussed below.

The wage measure is the reported hourly wage at the survey date (typically March) divided by the implicit price deflator for consumption expenditures. This wage measure is available only from 1971 on for nonsalaried workers and from 1976 on for salaried workers. The dependent variables for the regression analysis is the change in the log of the wage rate, $\Delta\ln(\text{wage})$ measured over a 2-year time interval; that is, $\Delta\ln(\text{wage}) = \ln(\text{wage}_t) - \ln(\text{wage}_{t-2})$. The hours measure used is reported hours/week worked on the main job in the calendar year preceding the survey. The change in hours variables $|\Delta H \cdot \text{UP}|$ (change in hours given that the change is positive) and $|\Delta H \cdot \text{DOWN}|$ (absolute value of the change in hours given that the change is negative) are also computed over 2-year time intervals. The variable QUIT is a dummy variable signifying whether a quit occurred in $t - 1$.

Observations were excluded if total annual hours exceeded 5,000, the absolute change in hours per week exceeded 45, the real wage in either t or $t - 2$ was less than \$.50 per hour, or if $\text{wage}_t/\text{wage}_{t-2}$ was greater than 2.5 or less than .4. Prior to 1978, hourly wages of over \$9.98 were recorded

as $9.98. We excluded observations for which the wage in either t or $t - 2$ was affected by this upper bound.

Because we focus on hours-wage trade-offs for quitters, observations were excluded if a layoff occurred in time $t - 1$. Observations were also excluded if a separation occurred in time periods t or $t - 2$. By eliminating these observations, we reduce the possibility that the hours measures reflect hours worked in more than one job. We also insure that the wage measure (which is the wage at the survey date, usually March) corresponds to the hours measure (which refers to hours in the calendar year prior to the survey).[6] The resulting sample contains 13,118 observations. However, there are only 488 observations on quits.

The variables $OVER_j$, $UNDER_j$, and CON_j, described in the previous section, were constructed from a series of survey questions concerning the respondent's satisfaction with work hours.[7] Variable $UNDER_j = 1$ if the individual indicated that he would like to work more (and could not) and equals 0 otherwise; $OVER_j = 1$ if the respondent indicated that he would like to work less (and could not) "even if [the respondent] earned less money." Variable $CON_j = 1$ if the individual indicated that he could not work more at his job, regardless of whether or not he wanted to work more. In the full sample, 61% reported an upper constraint on hours ($CON_j = 1$), 27% reported underemployment ($UNDER_j = 1$) and only 5.5% report overemployment ($OVER_j = 1$).[8]

[6] Note that if a separation occurred in the survey time period $t - 1$, the possibility still exists that H_t is a mixture of hours on more than one job. Likewise, if a separation occurred in $t - 3$, H_{t-2} could be a mixture. We ignore these problems since the use of observations for which the hours measure unambiguously refers to hours on one job results in an excessive loss of observations, particularly for individuals who quit.

[7] The wording of the survey questions used to construct $UNDER_j$, $OVER_j$, and CON_j are as follows. Variable $CON_j = 1$ if the respondent answered "no" to "Was there more work available on (your job/any of your jobs) so that you could have worked more if you had wanted to?" Variable $UNDER_j$ was set to 1 if $CON_j = 1$ and the respondent answered "yes" to "Would you have liked to work more if you could have found more work?" Variable $OVER_j$ was set to 1 if the respondent answered "no" to "Could you have worked less if you had wanted to?" and "yes" to "Would you have preferred to work less even if you earned less money?" Individuals for whom $UNDER_j$ was set to 1 were never asked if they could work less, and so an indicator of whether hours were downward flexible could not be constructed.

[8] The wording of the question pertaining to overemployment may explain why there are so few reports of overemployment. Some respondents may have interpreted "even if you earned less money" as "even if your wage was lower," rather than "even if your income was lower." Perhaps some individuals *would* like to reduce hours at the current wage but would *not* like to reduce hours at a lower wage. This may be a source of measurement error in the overemployment indicator. The fact that some workers are offered a premium wage for overtime may introduce error into the measure of underemployment. The group of workers reporting under-

Descriptive statistics for the variables used in the analysis are reported in Appendix table A1.

IV. Results

To provide a feel for the overemployment and underemployment variables $OVER_j$ and $UNDER_j$, in table 1 we report descriptive probit models relating the overemployment and underemployment indicators $OVER_j$ and $UNDER_j$ to the demographic variables used in the wage change analysis as well as to work hours H_j. Not surprisingly, the results show that $UNDER_j$ is negatively related to H_j and that $OVER_j$ is positively related to H_j. Another result worth noting is that, holding other variables constant, blacks are 7% more likely than whites to report underemployment and 2.3% less likely to report overemployment.[9]

Table 2 provides descriptive statistics on the relation among $OVER_j$ and $UNDER_j$, the hours change, and the wage change for persons who quit. The sample consists of the 488 observations on quits taken from the full sample used in the regression analysis discussed below.

The patterns of hours changes for quits with over- and underemployment in the initial job are consistent with the notion that job changes are motivated by the desire to change hours. Underemployed quitters have larger hours changes than quitters initially satisfied with their hours; initially satisfied quitters have larger hours changes than those initially overemployed. Another finding is that the percentage of workers who are initially over- or underemployed falls from 35.9% on the initial job to 31.3% on the new job, suggesting that, on average, mobility leads to more satisfactory work hours.[10]

Table 2 also shows that individuals with initial hours constraints have, on average, a higher wage change than individuals who are initially satisfied with their hours: the average wage change is .087 when $OVER_0 = 1$, .101

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employment ($UNDER_j = 1$) might include some individuals in jobs that occasionally offer overtime but that offered no overtime around the time of the survey. These individuals might want to work more at the overtime wage but might not want to work more at the straight-time wage rate used in our study. It is not clear how this would affect our analysis. The occasional availability of overtime at a wage premium would be a positive job attribute for many workers. A correlation between $UNDER_j$ and the availability of overtime would probably affect the coefficients on $UNDER_0$, $UNDER_1$, and the interactions between $UNDER_j$ and hours changes in the wage equations. We have no evidence on the empirical importance of this issue.

[9] Additional information on $UNDER_j$ may be found in Ham (1982), who reports a probit equation relating $UNDER_j$ to a variety of demographic and labor market characteristics.

[10] We obtain results similar to these using a much larger sample that was not restricted to persons for whom data on the wage change were available.

Table 1
Probit Equations—Determinants of Hours Constraints

Independent Variable	UNDER (1 if underemployed) Parameter Estimate (1a)	UNDER Partial Effect on Probability at Sample Mean (1b)	OVER (1 if overemployed) Parameter Estimate (2a)	OVER Partial Effect on Probability at Sample Mean (2b)	Sample Means (3)
Intercept	1.975	.624	−2.328	−.2454	
	(16.17)		(14.65)		
Older (1 if age ≥ 55)	−.0181	−.0057	−.0526	−.0055	.104
	(.29)		(.60)		
Race (1 if black)	.2221	.0702	−.2205	−.0232	.332
	(8.30)		(4.95)		
Married (1 if married)	.0867	.0274	−.0961	−.0101	.886
	(2.24)		(1.67)		
Disabled (1 if health limitation)	−.0023	−.0007	.0367	.0039	.078
	(.05)		(.55)		
Education	−.0863	−.0273	−.00099	−.00010	11.65
	(18.67)		(.15)		(3.08)
Experience	−.00042	−.00013	−.0159	−.0017	19.29
	(.07)		(1.89)		(10.67)
Experience^2	−.00043	−.00014	.00054	.00006	486.10
	(3.02)		(2.58)		(506.17)
Hours/week	−.0366	−.0116	.0212	.0022	43.189
	(17.66)		(9.52)		(7.15)
χ^2	1,143.0		152.17		
df	8		8		
$P > F$	.1E-6		.1E-6		

NOTE.—N = 13,118. 26.7% of the sample reports UNDER = 1, while 5.5% of the sample reports OVER = 1. In cols. 1a and 2a, t-statistics are in parentheses; in col. 3, standard deviations are in parentheses.

when $UNDER_0 = 1$, and .077 when both $OVER_0$ and $UNDER_0 = 0$. Taken at face value, this result is inconsistent with the implication of figure 1 that constraints on the initial job lower the gap between the initial wage and the reservation wage. The mean wage changes classified by constraints in the new job do not always conform to expectations. However, these results were obtained with no controls for the effects of other variables on the wage change.[11]

[11] We also computed mean wage changes using annual earnings divided by annual hours as the wage measure; the use of this wage measure makes it possible to use a much larger sample. For this wage measure and the larger sample, the mean wage change is −.0236 when $OVER_0 = 1$, .0310 when $UNDER_0 = 1$, and .0377 when both $OVER_0$ and $UNDER_0 = 0$. These numbers are consistent with fig. 1. The results for constraints on the new job are qualitatively the same for the large and small samples.

Table 2
Descriptive Statistics and Wage and Hours Changes for Quitters by Constraint Classification

	$OVER_1 = 1$ (Overemployed, Final Job)	$OVER_1 = 0$ $UNDER_1 = 0$ (Satisfied, Final Job)	$UNDER_1 = 1$ (Underemployed, Final Job)	Column Total ($UNDER_1 = 0$ or 1, $OVER_1 = 0$ or 1)
$OVER_0 = 1$ (overemployed, initial job):				
OBS	5	26	3	34
MEAN (ΔW)	.1274	.1014	−.1086	.0867
VAR (ΔW)	.0136	.1355	.0923	.1138
MEAN (ΔH)	.8000	−1.154	−14.00	−2.00
VAR (ΔH)	1.700	145.17	511.00	156.0
COV (ΔW, ΔH)	.0197	.2618	6.862	.8567
$OVER_0 = 0$; $UNDER_0 = 0$ (satisfied, initial job):				
OBS	17	229	67	313
Mean (ΔW)	.0185	.0794	.0822	.0767
VAR (ΔW)	.0964	.0968	.0701	.0907
MEAN (ΔH)	6.353	1.140	−.9552	.9744
VAR (ΔH)	361.99	105.09	72.619	113.12
COV (ΔW, ΔH)	1.530	−.1682	−.2692	−.1205
$UNDER_0 = 1$ (underemployed, initial job):				
OBS	5	80	56	141
MEAN (ΔW)	.0246	.0976	.1135	.1013
VAR (ΔW)	.1573	.1286	.0621	.1017
MEAN (ΔH)	15.800	4.463	.7143	3.376
VAR (ΔH)	280.2	134.89	56.644	115.39
COV (ΔW, ΔH)	3.495	−.4067	−.4354	−.350
Row total ($OVER_0 = 0$ or 1, $UNDER_0 = 0$ or 1):				
OBS	27	335	126	488
MEAN (ΔW)	.0397	.0854	.0916	.0845
VAR (ΔW)	.0874	.1067	.0670	.0952
MEAN (ΔH)	7.074	1.755	−.5238	1.461
VAR (ΔH)	288.68	117.185	76.587	118.26
COV (ΔW, ΔH)	1.3609	−.1847	−.1448	−.1085

NOTES.—ΔW = change in ln(wage); ΔH = change in hours/week; OBS = no. of observations; VAR = variance; COV = covariance.

We also report the covariance of the wage change and hours change for the different constraint classifications. The discussion in the previous section predicts that this covariance will be larger when there is overemployment in the new and the old job and smaller (more negative) when there is underemployment in the new job and the old job. For the most part, this is what we find. We now turn to the regression analysis.

The OLS estimates of variants of (5) are reported in tables 3 and 4.[12] As discussed above, the coefficients for all variables except for the controls in vector Z are allowed to vary for quitters and stayers. Table 3 shows the parameter estimates for hours and constraint variables for quitters; table 4 shows the corresponding estimates for stayers.

In both tables, we report conventional OLS t-statistics as well as variants of the "White" t-statistics (see White 1984, p. 143). The White t-statistics account for heteroscedasticity and serial correlation across observations on the same individual but may be subject to larger sampling variation. The White t-statistics are generally smaller. Unless stated otherwise, we report OLS t-statistics in the text.

Column 1a presents a baseline equation that contains CON_0, CON_1, $OVER_0$, $UNDER_0$, and the absolute value of positive and negative changes in hours. In column 2a we add interactions among the hours changes and the variables $UNDER_0$ and $OVER_0$. In column 3a we add $OVER_1$, $UNDER_1$, and interactions of the hours changes and $OVER_1$ and $UNDER_1$.

The results may be summarized as follows.

1. *Compensating wage differentials for restrictions on hours increases.*— We find no evidence of compensating differentials for jobs that do not permit workers to increase hours. The coefficients for CON_0 and CON_1 for quitters have the wrong signs and are not statistically different from zero at the 10% level. These variables have the wrong sign and *are* significant at the 10% level for workers who do not change jobs. Duncan and Holmlund (1983), using Swedish data, obtained mixed results for a measure of inflexible hours.

[12] We use ordinary least squares to estimate the model despite the fact that the change in hours will be correlated with the error term of eq. (5) as a result of measurement error in hours or if hours are in fact chosen by workers. This would bias the coefficients of the change in hours variables and would affect the interactions of hours changes with the constraint indicators. If one takes the labor supply model as the null hypothesis, then determinants of wage offers across jobs might be used as instrumental variables for the hours change and constraint variables. However, the PSID does not contain sufficient information on determinants of wage offers to attempt such a procedure, especially given the fact that the analysis is conducted in first differences and that the instruments would have to be sufficient to identify the effects of several hours-change and constraint variables. Solon (1986) and Murphy and Topel (1987) discuss econometric issues relevant to the use of first difference wage models to examine compensating differentials.

Table 3
Ordinary Least Squares (OLS) Estimates of Variants of Equation 5, for Quitters
A. Change in Wage Equations, Parameters for Quitters

Variable	Expected sign	Parameter (1a)	OLS *t*-Statistic (1b)	White *t*-Statistic (1c)	Parameter (2a)	OLS *t*-Statistic (2b)	White *t*-Statistic (2c)	Parameter (3a)	OLS *t*-Statistic (3b)	White *t*-Statistic (3c)
1. QUIT	(+)	.0228	1.32	.27	.0243	1.30	.79	.0214	1.10	.65
Quit multiplied by:										
2. CON_0	(−)	.0229	1.17	.58	.0196	1.00	.59	.0223	1.12	.66
3. CON_1	(+)	−.0088	.53	.25	−.0135	.81	.44	−.0173	.89	.49
4. $UNDER_0$	(?)	.0103	.48	.22	.0138	.55	.35	.0061	.24	.14
5. $OVER_0$	(?)	.0138	.43	.21	.0222	.55	.34	.0350	.84	.51
6. $UNDER_1$	(?)							.0350	1.29	.83
7. $OVER_1$	(?)							−.0755	1.65	1.03
8. $\|\Delta H \cdot UP\|$	(?)	−.0003	.32	.02	.00008	.05	.04	−.0002	.11	.07
9. $\|\Delta H \cdot DOWN\|$	(?)	.0020	1.40	.25	.0023	1.37	.77	.0036	1.90	1.08
10. $\|\Delta H \cdot UP\| \times UNDER_0$	(−)				−.0019	.87	.47	−.0016	.70	.38
11. $\|\Delta H \cdot UP\| \times OVER_0$	(+)				.0073	1.67	2.23	.0073	1.62	2.06
12. $\|\Delta H \cdot DOWN\| \times UNDER_0$	(+)				.0061	1.41	1.22	.0057	1.29	1.19
13. $\|\Delta H \cdot DOWN\| \times OVER_0$	(−)				−.0061	1.47	.72	−.0063	1.41	.79
14. $\|\Delta H \cdot UP\| \times UNDER_1$	(−)							−.0036	1.12	.90
15. $\|\Delta H \cdot UP\| \times OVER_1$	(+)							.0056	1.89	1.17
16. $\|\Delta H \cdot DOWN\| \times UNDER_1$	(+)							−.0041	1.10	.74
17. $\|\Delta H \cdot DOWN\| \times OVER_1$	(−)							−.0055	1.20	1.42
R^2		.064			.065			.0674		
Degrees of freedom		13,082			13,074			13,062		

B. Marginal Significance Levels (*P*-Values) of χ^2 Tests:

	OLS χ^2	White χ^2	OLS χ^2	White χ^2
Rows 10–13 are jointly insignificant	.022	.025	.033	.075
Rows 14–17 are jointly insignificant			.070	.178

NOTES.—OLS, dependent variable = Δln(wage). Other variables included: intercept, controls for education, experience, race, changes in marital and health status, year dummies. Also included were interactions of all variables in rows 2–17 with a dummy signifying that no quit occurred (reported in table 4).

Table 4
Ordinary Least Squares (OLS) Estimates of Variants of Equation 5, Change in Wage Equations Parameters, for Stayers

Variable	Expected Sign	Parameter (1a)	OLS *t*-Statistic (1b)	White *t*-Statistic (1c)	Parameter (2a)	OLS *t*-Statistic (2b)	White *t*-Statistic (2c)	Parameter (3a)	OLS *t*-Statistic (3b)	White *t*-Statistic (3c)
No quit multiplied by:										
1. CON_0	(−)	.0078	1.98	1.04	.0078	1.97	1.93	.0062	1.56	1.52
2. CON_1	(+)	−.0064	1.80	1.09	−.0064	1.79	1.75	.0004	.11	.11
3. $UNDER_0$	(?)	−.0012	.29	.23	−.0011	.24	.26	.0043	.88	.93
4. $OVER_0$	(?)	−.0017	.23	.15	−.0022	.25	.28	−.0043	.49	.51
5. $UNDER_1$	(?)							−.0191	3.87	4.13
6. $OVER_1$	(?)							.0075	.84	.77
7. $\lvert\Delta H \cdot UP\rvert$	(?)	−.0021	5.29	3.17	−.0024	5.04	3.25	−.0026	4.99	3.16
8. $\lvert\Delta H \cdot DOWN\rvert$	(?)	.0009	2.42	1.66	.0012	2.68	1.83	.0015	3.02	2.08
9. $\lvert\Delta H \cdot UP\rvert \times UNDER_0$	(−)				.0010	1.17	.86	.0003	.39	.29
10. $\lvert\Delta H \cdot UP\rvert \times OVER_0$	(+)				.0012	.59	.46	.0016	.75	.86
11. $\lvert\Delta H \cdot DOWN\rvert \times UNDER_0$	(+)				−.0012	1.27	.95	−.0011	1.08	.85
12. $\lvert\Delta H \cdot DOWN\rvert \times OVER_0$	(−)				−.0005	.38	.29	−.00006	.04	.03
13. $\lvert\Delta H \cdot UP\rvert \times UNDER_1$	(−)							.0023	2.22	.03
14. $\lvert\Delta H \cdot UP\rvert \times OVER_1$	(+)							−.0114	1.07	.04
15. $\lvert\Delta H \cdot DOWN\rvert \times UNDER_1$	(+)							−.0004	.50	.03
16. $\lvert\Delta H \cdot DOWN\rvert \times OVER_1$	(−)							−.0040	1.92	.05
R^2		.06			.06			.07		
Degrees of freedom		13,082			13,074			13,062		

NOTE.—OLS, dependent variable = Δln(wage).

2. *Compensating differentials for hours levels.*—Column 1a of table 3 shows that there is a weak negative relation between wages and hours when no constraints are taken into account: the coefficient of $|\Delta H \cdot \mathrm{UP}|$ is −.0003, and the coefficient of $|\Delta H \cdot \mathrm{DOWN}|$ is .0020. Neither is statistically significant at the 10% level. If one interprets this as indicative of the shape of the hours-wage locus in a hedonic market model, then there seems to be only a weak negative trade-off between the wage and hours per week. Scaling up these coefficients by a factor as large as five to allow for downward bias from measurement in the hours change would not alter this conclusion very much. If one takes 40 hours per week as a base, then the point estimates suggest that the hourly wage for a 30-hour per week job exceeds the wage for a 50-hour per week job by about 2.3%. There is also a small and negative (but statistically significant) relation between the wage change and the hours change for those who do not change jobs. Brown (1980) obtained a similar finding. It should be kept in mind, of course, that these coefficients do not identify an hours-wage locus if the conventional labor supply model underlies hours-wage trade-offs.

3. *Effects of overemployment and underemployment on hours-wage trade-offs.*—Columns 2a and 3a of table 3 show the effects of hours change-constraint interactions for quitters. We expect to find hours changes that loosen (tighten) initial constraints to be associated with smaller (larger) wage gains. Likewise, hours changes that loosen (tighten) constraints on the final job should be associated with smaller (larger) wage gains. Despite the small number of observations on quits and the likelihood of problems with the data on hours constraints, the results are qualitatively consistent with the theory that workers trade off wage gains against the desirability of work hours when changing jobs. However, many of the coefficients are imprecisely estimated, and one hours-constraint interaction term (that of $|\Delta H \cdot \mathrm{DOWN}| \times \mathrm{UNDER}_1$) has the wrong sign.

Since we are stretching the data very thin by including four separate interactions terms, we have also estimated the equation in column 2a with the coefficients of $|\Delta H \cdot \mathrm{UP}| \times \mathrm{OVER}_0$, $|\Delta H \cdot \mathrm{UP}| \times \mathrm{UNDER}_0$, $|\Delta H \cdot \mathrm{DOWN}| \times \mathrm{OVER}_0$, and $|\Delta H \cdot \mathrm{DOWN}| \times \mathrm{UNDER}_0$ constrained to be equal in absolute value. In terms of equation (5), we define the parameter α_0 and restrict $\alpha_0 = \alpha_{01} = -\alpha_{02} = -\alpha_{03} = \alpha_{04}$. The estimate of the restricted parameter α_0 is reported in column 2a of table 5.

Our estimate of the restricted coefficient α_0 is .0042 and is statistically significant at the 2.5% level using either the OLS or White t-statistics. The equality restrictions easily pass a χ^2 test (not reported in the table). Given a mean hours level of approximately 43, the parameter estimate implies that constraints on the initial job change the wage elasticity with respect to hours by .18.

We also estimated the model in column 3a after imposing the restriction that all hours/constraint interactions on the initial job have coefficients

Table 5
Restricted Coefficients for Hours Change/Constraint Interactions
A. Parameters for Quitters

Restricted Parameter	Estimate (2a)	OLS *t*-Statistic (2b)	White *t*-Statistic (2c)	Estimate (3a)	OLS *t*-Statistic (3b)	White *t*-Statistic (3c)
Row 1 α_0	.0042	3.09	2.06	.0042	3.09	2.02
Row 2 α_1				.0024	1.77	1.64

B. Marginal Significance Levels (*P*-Values) of χ^2 Tests

Tests ($P > \chi^2$)	OLS χ^2	White χ^2
$\alpha_0 = 0$ and $\alpha_1 = 0$	.0017	.0408
$\alpha_0 = \alpha_1$	.367	.478

equal in absolute value, and all hours/constraint interactions on the final job have coefficients equal in absolute value. In terms of equation (5), we define the restricted parameters α_0 and α_1 and set $\alpha_0 = \alpha_{01} = -\alpha_{02} = -\alpha_{03} = \alpha_{04}$ and $\alpha_1 = \alpha_{11} = -\alpha_{12} = -\alpha_{13} = \alpha_{14}$. These results are presented in column 3a of table 5. The parameter estimate α_0 for the interaction of hours changes and constraints on the initial job (row 1) is $.0042_{(3.09)}$; the estimate of α_1 for constraints on the final job is $.0024_{(1.77)}$. Both sets of restrictions easily pass χ^2 tests. When we impose equality (in absolute value) among all eight constraint interactions, the resulting restricted coefficient α equals $.0033_{(3.45)}$, and the restriction passes a χ^2 test with a marginal significance level of .367. This parameter estimate indicates that a one standard deviation change in hours that relaxes overemployment or underemployment on the initial job or new job is associated with a 3.58% reduction in the wage gain required to induce a quit.

Table 4 reports the coefficients of the hours and constraint variables for stayers. In the theoretical discussion we assumed that hours and wages were fixed within a given job. In reality, the preferences of workers and employers vary over time. It is possible that firms may adjust the wage in response to both changes in required hours and changes in the required hours level *relative* to the preferred hours levels of particular workers. If this is the case, one would expect to find that hours constraints affect the patterns of hours and wage trade-offs *within* jobs. For example, workers who initially want to work less, but cannot, might be given larger raises if they were required to work more in the second period. An alternative hypothesis is that workers are sometimes offered new jobs with the same employer involving a different hours-wage package. If workers are not required to accept such offers and if all hours changes within firms are associated with job changes, then one might expect our findings for stayers to be qualitatively similar to our findings for quitters.

The evidence does not support either hypothesis. The coefficients on the hours-constraint interactions for continuing jobs are estimated fairly precisely but are small in magnitude. Five of the eight coefficients have the wrong sign.

Estimates of the Compensated Labor Supply Elasticity

In this section we relate our estimates of α to the compensated elasticity β of labor supply with respect to the wage. It is easy to show that β is equal to $(.5/\phi H^2)$, where ϕ is the parameter in equations (3) and (4). This inverse relation between the compensated labor supply elasticity β and the effects of hours constraints on reservation wages has been noted in a number of previous studies (e.g., Abowd and Ashenfelter 1981).

We use the restricted parameter estimate of α, discussed above, to obtain an estimate of the parameter ϕ which appears in the elasticity. Specifically, since the parameter α (of eq. [5]) was obtained by replacing actual levels of hours constraints (in eq. [4]) with indicators of hours constraints, one may interpret α as roughly equal to ϕ times the mean absolute value of actual minus desired hours for individuals who are constrained.[13] Given an estimate of the average absolute difference between actual and desired hours (denoted as $|H - S|$), together with the estimate of α obtained in the regression analysis, it is possible to get a rough estimate of parameter ϕ. Elasticity β can be estimated as

$$\beta = [.5|H - S|/\alpha H^2].$$

[13] This may be seen more clearly by rewriting eq. (4) as

$$\ln(W_M) - \ln(W_0) = K_1 + \phi(H_1 - H_0)[|H_0 - S_0|(\text{OVER}_0 - \text{UNDER}_0) + |H_1 - S_1|(\text{OVER}_1 - \text{UNDER}_1)],$$

where K_1 represents all other terms in the equation. Assuming that the average absolute difference between actual and desired hours is roughly the same in each period, one can replace the two variables $|H_j - S_j|$, $(j = 0, 1)$ with their sample mean (denoted as $|H - S|$) to obtain the equation

$$\ln(W_M) - \ln(W_0) = K_1 + \phi|H - S|(H_1 - H_0) \times [\text{OVER}_0 - \text{UNDER}_0 + \text{OVER}_1 - \text{UNDER}_1].$$

Likewise, if one restricts the parameters α_{01}–α_{14} to equal α, eq. (5) becomes

$$\ln(W_1) - \ln(W_0) = K_2 + \alpha(H_1 - H_0) \times [\text{OVER}_0 - \text{UNDER}_0 + \text{OVER}_1 - \text{UNDER}_1].$$

It is clear from these last two eqq. that α may be interpreted as approximately $|H - S|\phi$.

To obtain an estimate of $|H - S|$, we have computed a weighted average of the absolute values of the mean hours changes reported in table 2 for persons for whom $OVER_0 = 1$ and $UNDER_1 = OVER_1 = 0$, persons for whom $UNDER_0 = 1$ and $UNDER_1 = OVER_1 = 0$, persons for whom $OVER_1 = 1$ and $UNDER_0 = OVER_0 = 0$, and persons for whom $OVER_1 = 1$ and $UNDER_0 = OVER_0 = 0$. The estimate of $|H - S|$ is 2.94. Since the mean of hours is 43.19 and the estimate of α is .0033, the implied estimate of β is .24.

This estimate is very rough and is calculated for illustrative purposes. However, it is worth noting that the estimate is not far above most estimates for male household heads obtained in conventional labor supply analyses. Many economists have speculated that estimates based on the conventional labor supply methodology are seriously biased because they ignore constraints; our calculations suggest that this is not necessarily the case. Our results are also fairly similar to those of other studies that attempt to account for underemployment or unemployment (see Ham 1982, 1986). Our estimate of .24 is in the same range as the estimate of .09 obtained by Abowd and Ashenfelter (1981) and the estimates of .26 and .40 obtained by Murphy and Topel (1987) in their analysis of compensating differentials.

Furthermore, our estimate of the elasticity is probably overstated. Changes in desired hours due to preference changes and measurement error in the hours-change measure are likely to bias downward the coefficients on various hours-change variables in the regression, including the coefficients on the interactions with the constraints. This would bias the estimated elasticity upward.[14]

V. Conclusion

This paper examines how hours constraints affect the patterns of hours-wage trade-offs that result from job changes. The starting point of the paper is the assumption that hours cannot be freely varied within jobs and that costs of mobility and imperfect information about job openings will prevent workers from costlessly moving to jobs that offer hours-wage

[14] We do have some limited evidence on the importance of measurement error. For a sample of workers who are paid by the hour, we are able to construct an alternative measure of hours per week by dividing labor earnings by the product of weeks worked on the main job and the reported hourly wage. The questions used to construct these variables are independent of the question about hours per week on the main job, and so we use the covariance of the alternative hours measure with the reported hours per week as an estimate of the variance of the change in hours per week. For stayers and quitters who were paid by the hour, the variances in the change in reported hours per week are 35.2 and 98.25, while the covariances of the two hours-change measures are 14.4 and 61.1. This evidence suggests that measurement error might account for 37.8% of the variance in (H_1 and H_0) for quits. If one were to adjust all coefficients involving this variable by (98.25/61.1), one would obtain a corrected estimate of α of .0053 and a corrected estimate of β of .1494.

combinations on the labor supply schedule or a market hours-wage locus. Consequently, individual workers will trade off changes in the attractiveness of work hours against wage gains when changing jobs. Specifically, we examine the hypothesis that the partial effect of a positive change in hours by job changers who are initially overemployed (underemployed) is to increase (reduce) the size of the wage gain required to induce a quit. Also, the partial effect of a positive change in hours by job changers who are overemployed (underemployed) in their new job is to increase (reduce) the size of the wage gain.

Our empirical study is hampered by small sample sizes and lack of information on the magnitude of hours constraints and other econometric problems. It is encouraging that the results (in contrast to a number of previous empirical studies of compensating differentials) are qualitatively consistent with the theory, suggesting that additional research is warranted on hours-wage trade-offs associated with job mobility.[15]

Appendix

Table A1
Means and Standard Deviations of Selected Variables Used in Regression Analysis

	Full Sample (N = 13,118)		Quitters (N = 488)		Nonquitters (N = 12,630)	
Variable	Mean	SD	Mean	SD	Mean	SD
QUIT	.0372	.1892				
Δln(wage)	.0324	.1845	.0845	.3085	.0304	.1776
$\lvert\Delta H \cdot \text{UP}\rvert$	1.6996	4.4013	4.1106	7.8703	1.6064	4.1831
$\lvert\Delta H \cdot \text{DOWN}\rvert$	1.7718	4.2973	2.6495	5.8732	1.7379	4.2212
$\lvert\Delta H \cdot \text{UP}\rvert \times \text{UNDER}_0$	.5112	2.5947	1.3647	5.4526	.4782	2.4118
$\lvert\Delta H \cdot \text{DOWN}\rvert \times \text{UNDER}_0$	.3454	2.0172	.3893	2.1732	.3437	2.0110
$\lvert\Delta H \cdot \text{UP}\rvert \times \text{OVER}_0$	.0750	.9387	.1864	2.1206	.0707	.8610
$\lvert\Delta H \cdot \text{DOWN}\rvert \times \text{OVER}_0$	.1412	1.3839	.3258	2.4923	.1341	1.3222
$\lvert\Delta H \cdot \text{UP}\rvert \times \text{UNDER}_1$	.3162	1.9122	.6270	3.0633	.3042	1.8526
$\lvert\Delta H \cdot \text{DOWN}\rvert \times \text{UNDER}_1$	.5331	2.5202	.7622	3.0607	.5243	2.4967
$\lvert\Delta H \cdot \text{UP}\rvert \times \text{OVER}_1$	.1577	1.5890	.4959	3.7290	.1446	1.4428
$\lvert\Delta H \cdot \text{DOWN}\rvert \times \text{OVER}_1$	.0821	.9499	.1045	2.0059	.0812	.8843
CON_0	.6112	.4874	.6004	.4903	.6116	.4873
CON_1	.6094	.4878	.5778	.4944	.6106	.4876
UNDER_0	.2667	.4422	.2889	.4537	.2658	.4418
OVER_0	.0548	.2276	.0696	.2548	.0542	.2264
UNDER_1	.2672	.4425	.2581	.4380	.2676	.4427
OVER_1	.0553	.2286	.0553	.2288	.0553	.2286

[15] A serious omission in our study is the failure to consider hours on other jobs. It would also be useful to distinguish among jobs that permit workers to vary hours, jobs that require fixed hours, and jobs in which the required hours vary over time, perhaps using industry or occupation proxies as in Abowd and Ashenfelter

References

Abowd, J., and Ashenfelter, O. "Anticipated Unemployment, Temporary Layoffs, and Compensating Wage Differentials." In *Studies in Labor Markets,* edited by S. Rosen. Chicago: University of Chicago Press, 1981.

———. "Compensating Wage and Earnings Differentials for Employer Determined Hours of Work." Unpublished manuscript. Chicago: University of Chicago, August 1983.

Altonji, J. G., and Paxson, C. "Job Characteristics and Hours of Work." In *Research in Labor Economics,* vol. 8, edited by R. Ehrenberg. Greenwich, Conn.: JAI, 1986.

Ashenfelter, O. "Unemployment as Disequilibrium in a Model of Aggregate Labor Supply." *Econometrica* 48 (April 1980): 547–64.

Barzel, Yoram. "The Determination of Daily Hours and Wages." *Quarterly Journal of Economics* 87 (1973): 220–38.

Biddle, J., and Zarkin, G. "Choice among Wage-Hours Packages: An Empirical Investigation of Labor Supply." Unpublished manuscript. Durham, N.C.: Duke University, June 1986.

Brown, C. "Equalizing Differences in the Labor Market." *Quarterly Journal of Economics* 94 (February 1980): 113–34.

Deardorff, A., and Stafford, F. "Compensation and Cooperating Factors." *Econometrica* 44 (1976): 671–84.

Dickens, W., and Lundberg, S. "An Empirical Model of Labor Supply with Restricted Hours Choice." NBER Working Paper No. 1935, Cambridge, Mass.: NBER, 1985.

Duncan, G. J. "Earnings Functions and Nonpecuniary Benefits." *Journal of Human Resources* 12 (Fall 1976): 462–83.

Duncan, G. J., and Holmlund, B. "Was Adam Smith Right After All? Another Test of the Theory of Compensating Wage Differentials." *Journal of Labor Economics* 1, no. 4 (October 1983): 366–69.

Ehrenberg, R., and Schumann, P. "Compensating Wage Differentials for Mandatory Overtime." *Economic Inquiry* 22 (October 1984): 460–78.

Gustman, A., and Steinmeier, T. L. "Minimum Hours Constraints and Retirement Behavior." In "Contemporary Policy Issues," *Economic Enquiry* 1, no. 3, suppl. (April 1983): 77–91.

———. "Partial Retirement and the Analysis of Retirement Behavior." *Industrial and Labor Relations Review* 37, no. 3 (April 1984): 403–15.

Ham, J. "Rationing and the Supply of Labor: An Econometric Approach." Industrial Relations Section Working Paper no. 103A. Princeton, N.J.: Princeton University, May 1979.

(1981) and Murphy and Topel (1987). It would be useful to extend the analysis to other panel data sets (such as the Negative Income Tax data and the Quality of Employment Survey) that contain information on hours constraints. However, a definitive analysis of the role of hours constraints in job mobility and hours-wage trade-offs will require a new data collection effort. Ultimately, it would be desirable to provide a joint analysis of labor supply, employer determination of hours, the mobility decision, and the trade-off between hours and wage changes.

———. "Estimation of a Labor Supply Model with Censoring due to Unemployment and Underemployment." *Review of Economic Studies* 49, no. 3 (July 1982): 335–54.

———. "Testing whether Unemployment Represents Intertemporal Labour Supply Behaviour," *Review of Economic Studies* 53 (July 1986): 559–78.

Katz, L. "Efficiency Wage Theories: A Partial Evaluation." In *NBER Macroeconomics Annual,* edited by S. Fischer. Cambridge, Mass.: MIT Press, 1986, pp. 235–75.

Kiefer, N. "Employment Contracts, Job Search Theory and an Empirical Model of Labor Turnover." Unpublished manuscript. Ithaca, N.Y.: Cornell University, Department of Economics, August 1984.

Lewis, H. "Interés del empleador en las horas de trabajo del empleado." *Cuadernos de economia* 18 (1969): 38–54.

Lundberg, S. "Tied Wage-Hours Offers and the Endogeneity of Wages." NBER Working Paper no. 1431. Cambridge, Mass.: NBER, August 1984.

Moffitt, R. "The Estimation of a Joint Wage-Hours Labor Supply Model." *Journal of Labor Economics* 2, no. 4 (October 1984): 550–66.

Murphy, K. M., and Topel, R. H. "Unemployment, Risk and Earnings: Testing for Equalizing Differences in the Labor Market." In *Unemployment and the Structure of the Labor Market,* edited by K. Lang and S. Leonard. New York: Basil Blackwell, 1987, pp. 103–40.

Parsons, D. O. "The Employment Relationship: Job Attachment, Work Effort, and the Nature of Contracts." In *Handbook of Labor Economics,* edited by O. Ashenfelter and R. Layard. North Holland, N.Y.: Elsevier, 1986.

Rosen, H. S. "Taxes in a Labor Supply Model with Joint Wage-Hours Determination." *Econometrica* 64, no. 3 (May 1976): 485–507.

Rosen, H., and Quandt, R. "A Disequilibrium Model of the Labor Market." *Review of Economics and Statistics* (August 1978), pp. 371–79.

Rosen, Sherwin. "On the Interindustry Wage and Hours Structure." *Journal of Political Economy* 77 (1969): 249–73.

Solon, G. "Bias in Longitudinal Estimation of Wage Gaps." NBER Technical Working Paper no. 58. Cambridge, Mass.: NBER, June 1986.

Topel, Robert H. "Equilibrium Earnings, Turnover, and Unemployment." *Journal of Labor Economics* 2, no. 4 (October 1984): 500–522.

White, H. *Asymtotic Theory for Econometricians.* Orlando, Fla.: Academic Press, 1984.