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LABOR SUPPLY PREFERENCES,
HOURS CONSTRAINTS,
AND HOURS-WAGE TRADEOFFS

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ABSTRACT

In a labor market in which firms offer tied hours-wage packages and there is substantial dispersion in the wage offers associated with a particular type of job, the best job available to a worker at a point in time may pay well but require an hours level which is far from the worker's labor supply schedule, or pay poorly but offer desirable hours. Intuitively, one would expect hours constraints to influence the pattern of wage-hours tradeoffs which occur when workers quit to new jobs. Constrained workers may be willing to sacrifice wage gains for better hours. 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 (underemployment) on the initial job increases (reduces) the partial effect on the wage gain of a positive change in hours for those who quit. We also examine whether overemployment (underemployment) on the new job increases (reduces) the partial effect on the wage gain of a positive change in hours for those who quit. Despite the limitations imposed by small sample sizes and lack of information on the magnitude of hours constraints, our results support the view that an individual requires compensation to work in jobs which, given the individual's particular preferences, offer unattractive hours.

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I. INTRODUCTION

The broad concern of this paper is how tradeoffs 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 relationship between hours changes and wage changes is determined by labor supply preferences.

However, there are a number of studies which argue that firms have strong preferences about hours and place restrictions on the hours which an employee may choose.[1] Abowd and Ashenfelter (1981, 1984), Topel (1983) and Topel and Murphy (1986) 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 which he selects, but do not affect the wage associated with the particular hours level.

These hedonic models abstract from search costs and 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 wages have a distribution around the market locus, workers will not necessarily be on either their labor supply functions or on a market locus. The best job available to the worker at a point 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 desireable hours. Furthermore, when wage dispersion and search costs are added to a hedonic market model, the wages received by 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 tradeoffs between wages and hours even if there is no systematic market relationship between wages and hours.

The above discussion suggests that hours constraints should influence the pattern of wage-hours tradeoffs which 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 by job changers who are overemployed (underemployed) on their initial jobs should increase (reduce) the size of the wage gain required to induce a quit. Also, since overemployment or underemployment 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 (underemployed) on their new job should be to increase (reduce) the size of the wage gain associated with the quit.

In what follows, we provide a study of how hours constraints affect hours-wage tradeoffs 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 the new job. We also use our results to provide an estimate of the compensated labor supply elasticity.

Section 2 discusses the implications of tied hours-wage offers with wage dispersion for the tradeoff 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) which have investigated whether there is a compensating differential for hours levels and a number of other job attributes. Section 3 discusses our sample of male heads of household from the Panel Study of Income Dynamics. Section 4 presents the empirical analysis. We provide a brief summary in Section 5.

II. WAGE DISPERSION, HOURS CONSTRAINTS, AND HOURS-WAGE TRADEOFFS

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, due to differences in production technology, recruiting and turnover costs, and other factors discussed in the references in footnote 1.

Because the hours level within each job is fixed, workers must change jobs to change hours. It is assumed, however, that there is imperfect information regarding the location of job opportunities. 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, and for a number of reasons discussed in the "efficiency wage" literature. (See Parsons (1984) and Katz (1986) for surveys of this literature.)

The preferences of each worker are characterized by the function

$U(H,W;x)$.[3] The variables H and W are the hours level and the real hourly wage rate. The individual-specific vector x is a set of characteristics (e.g. wealth, tastes for consumption and leisure, etc.) which affect the hours-wage tradeoff. We assume that $U_{11} < 0$, $U_{22} < 0$ and $U_2 > 0$. U_1 is 0 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 which exceeds 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:

(1) $GAIN(H_1, W_1, H_0, W_0; x) = U(H_1,W_1;x) - U(H_0,W_0;x) \geq M.$

The set of acceptable offers $A(H_0,W_0;x)$ which satisfy (1) is depicted as the shaded region in Figure 1. The solid 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 dashed indifference curve U^M defines the acceptance set and is the locus of hours-wage combinations which provide the reservation utility level of $U(H_0',W_0';x) + M$ 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). If the initial hours level and wage are H_0 and W_0, W_M is defined implicitly by:

(2) $Gain(H_1, W_M, H_0, W_0; x) = U(H_1,W_M;x) - U(H_0,W_0;x) = M.$

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 which provides a utility level of U^0 when hours are equal to desired hours. $S(W^*_0)$ equals desired hours at W^*_0. Likewise, W^*_M is the wage which 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 tradeoffs 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 which is 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 $Gain(H_1, W_1, H_0, W_0; x)$ 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 $(W_0 - W^*_0)$:

$$(3) \quad W_M(H_1, H_0, W_0; x) - W_0 = M/U_2 - \phi[H_0 - S(W^*_0)]^2 + \phi[H_1 - S(W^*_M)]^2$$

In (3) the parameter $\phi = -.5U_{11}/U_2 > 0$ 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:

$$\begin{aligned}(4) \quad W_M(H_1, H_0, W_0; x) - W_0 &= M/U_2 \\ &+ \phi[H_1 - H_0][H_0 - S(W^*_0)] + \phi[H_1 - H_0][H_1 - S(W^*_M)] \\ &- \phi[S(W^*_M) - S(W^*_0)][H_0 - S(W^*_0)] - \phi[S(W^*_M) - S(W^*_0)][H1 - S(W^*_M)].\end{aligned}$$

This equation says that after adjusting for the change in desired hours, the effect of $(H_1 - H_0)$ on $(W_M - W_0)$ 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 the effect of $(H_1 - H_0)$ on $(W_M - W_0)$ 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] Also, we use the change in the log of the hourly wage rate as the dependent variable.

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 over employed. Specifically, we define the underemployment indicator $UNDER_j$ and the overemployment indicator $OVER_j$ for time period j as:

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

S_j is desired hours at the current wage, and so 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 $|\Delta H.UP|$, which equals the change in hours given that the hours change is positive, and 0 if the change in hours is negative. We also construct the variable $|\Delta H.DOWN|$, which equals the absolute value of the change in hours if the change in hours is negative, and 0 if the change in hours is positive. These variables are used in place of $(H_1 - H_0)$ in equation (4).

We make additional modifications to (4) to reflect the implications of other theories for the relationship between wage changes and hours changes. Both the conventional labor supply model and the hedonic market model imply that there will be a systematic relationship between hours and wage changes. In order to control for the possibility that the relationship between hours changes and wage changes is due to either 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 <u>increase</u> hours on the initial job and on the new job. These variables are included since firms which restrict hours choice may have to pay a compensating differential to all workers, regardless of a 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 for whether hours can be reduced. Individuals who indicated that they wanted to work more but couldn't 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:

$$(5)\ \log(W_1)-\log(W_0) = \beta_0 + \beta_1 Z + \beta_2 CON_0 + \beta_3 CON_1 + \beta_4|\Delta H.UP| + \beta_5|\Delta H.DOWN|$$
$$+ \beta_6 UNDER_0 + \beta_7 OVER_0 + \beta_8 UNDER_1 + \beta_9 OVER_1$$
$$+ \alpha_{01}|\Delta H.UP|UNDER_0 + \alpha_{02}|\Delta H.UP|OVER_0 + \alpha_{03}|\Delta H.DOWN|UNDER_0$$
$$+ \alpha_{04}|\Delta H.DOWN|OVER_0 + \alpha_{11}|\Delta H.UP|UNDER_1 + \alpha_{12}|\Delta H.UP|OVER_1$$
$$+ \alpha_{13}|\Delta H.DOWN|UNDER_1 + \alpha_{14}|\Delta H.DOWN|OVER_1.$$

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 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 <u>except</u> 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 wage changes for quitters and stayers.

III. DATA

A sample of male heads of households was drawn from the 14 year (1968-1981) Panel Study of Income Dynamics (PSID) Individuals Tape. Additional observations on these individuals for 1982 and 1983 were obtained from the 1968-1982 and 1968-1983 PSID tapes if the individual remained in the sample after 1981.[6] Observations for a particular year were excluded if the individual was 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 non-salaried 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, $\Delta\ln(wage)$ measured over a two year time interval (i.e. $\Delta\ln(wage) = \ln(wage_t) - \ln(wage_{t-2})$). The hours measure used is reported hours/week worked on the main job in the calendar year proceeding the survey. The change in hours variables $|\Delta H.UP|$ (change in hours given that the change is positive) and $|\Delta H.DOWN|$ (absolute value of the change in hours given that the change is negative) are also computed over two 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 $wage_t/wage_{t-2}$ 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 tradeoffs 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).[7] The resulting sample contains 12,711 observations. However, there are only 480 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.[8] $UNDER_j$ equals 1 if the individual indicated that he would like to work more (and could not), and equals 0 otherwise. $OVER_j$ equals 1 if the respondent indicated that he would like to work less (and could not) "even if [the respondent] earned less money". CON_j equals 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, 60% reported an upper constraint on hours (CON_j=1), 27% reported underemployment ($UNDER_j$=1) and only 6% report overemployment ($OVER_j$=1).[9]

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

IV. RESULTS

To provide readers with 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 5.8% more likely than whites to report underemployment and 2.4% less likely to report overemployment.[10]

Table 2 provides descriptive statistics on the relationship among $OVER_j$ and $UNDER_j$, the hours change, and the wage change for persons who quit. The sample consists of the 480 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 36% on the initial job to 31.5% on the new job, suggesting that on average mobility leads to more satisfactory work hours.[11]

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, .098 when $UNDER_0$=1, and .080 when both $OVER_0$ and $UNDER_0$ equal 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 either. However, these results were obtained with no controls for the effects of other variables on the wage change.[12]

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 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 (6) are reported in Tables 3 and 4.[13] As discussed above, the coefficients for all variables except for the controls in the 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), pg. 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 which 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 columns 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) <u>Compensating Wage Differentials for Restrictions on Hours Increases</u>

We find no evidence of compensating differentials for jobs which 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 0 at the 10% level. These variables have the wrong sign and <u>are</u> 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.

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 $|\Delta H.UP|$ is -.00004 and the coefficient of $|\Delta H.DOWN|$ is .00188. 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 tradeoff between the wage and hours per week. Scaling up these coefficients by a factor as large as 5 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 1.9%. There is also a small and negative (but statistically significant) relationship 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 tradeoffs.

3) Effects of Overemployment and Underemployment on Hours-Wage Tradeoffs

Columns 2a and 3a of Table 3 show the effects of hours change-constraint interactions for quitters. We expect to find that hours changes which loosen (tighten) initial constraints to be associated with smaller (larger) wage gains. Likewise, hours changes which 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 $|\Delta H.DOWN| \times UNDER_1$) 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 $|\Delta H.UP| \times OVER_0$, $|\Delta H.UP| \times UNDER_0$, $|\Delta H.DOWN| \times OVER_0$ and $|\Delta H.DOWN| \times UNDER_0$ 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 the following text table:

Restricted Coefficients for Hours Change/Constraint Interactions
Parameters for Quitters

	Restricted Parameter	Estimate (2a)	OLS t-stat (2b)	White t-stat (2c)	Estimate (3a)	OLS t-stat (3b)	White t-stat (3c)
ROW 1:	α_0	.0039	2.89	1.97	.0038	2.71	1.90
ROW 2:	α_1				.0021	1.50	1.05

Marginal Significance Levels (P-values) of χ^2 Tests

Tests: (Prob > χ^2)	OLS χ^2	White χ^2
$\alpha_0 = 0$ and $\alpha_1 = 0$:	.005	.073
$\alpha_0 = \alpha_1$	.374	.498

Our estimate of the restricted coefficient α_0 is .0039, and is statistically significant at the 2.5% level using either the OLS and 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 .17.

We also estimated the model in column 3a after imposing the restriction that all hours/constraint interactions on the initial job have coefficients 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 the text table above. The parameter estimate α_0 for the interaction of hours changes and constraints on the initial job (ROW 1) is $.0038_{(2.84)}$; the estimate of α_1 for constraints on the final job is $.0021_{(1.51)}$. 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 $.0030_{(3.13)}$, and the restriction passes a χ^2 test with a marginal significance level of .296. The parameter estimate indicates that a one standard deviation change in hours which relaxes overemployment or underemployment on the initial job or new job is associated with a 2.2% 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 <u>relative</u> to the preferred hours levels of particular workers. If this is the case, one would expect find that hours constraints affect the patterns of hours and wage tradeoffs <u>within</u> jobs. For example, workers who initially want to work less but cannot might be given larger raises if they are required to work more in the second period. An alternative hypothesis is that workers are sometimes offered new jobs with the same employer which involve 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 $[.5/(\phi H)][W/H]$, where ϕ is the parameter in (3) and (4). This inverse relationship 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 (eg., 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 equation 5) was obtained by replacing actual levels of hours constraints (in equation 4) with indicators of hours constraints and by replacing the actual wage change with the change in the log of the wage, one may interpret α as roughly equal to $[\phi/w]$ times the mean absolute value of actual minus desired hours for individuals who are constrained.[14] 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 the parameter ϕ. The elasticity β can be estimated as:

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

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 2.92. Since the mean of hours is 43.25 and the estimate of α is .0030, the implied estimate of β is .26.

This estimate is very rough and is calculated for illustrative purposes. However, it 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 which attempt to account for underemployment or unemployment (see Ham (1982, 1986)). Our estimates are 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 (1986) 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.[15]

VI. CONCLUSION

This paper examines how hours constraints affect the patterns of hours-wage tradeoffs which 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 which offer hours-wage combinations on the labor supply schedule or a market hours-wage locus. Consequently, individual workers will tradeoff changes in 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 on hours-wage tradeoffs associated with job mobility is warranted.[16]

ENDNOTES

1.See Lewis (1969), Rosen (1969), Barzel (1973) and Deardorf and Stafford (1976). There is also some empirical evidence to support the view that firms place significant constraints on hours worked. Gustmann and Steinmeir (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 (1985) analyze a labor supply model in which workers choose among a finite number of job offers with the same wage but different hours levels.

2.See also Ehrenberg and Schumann (1981), Ashenfelter (1980), Ham (1982, 1985), and Rosen and Quandt (1976).

3.We assume that decisions are based on a one period utility function rather than a multi-period utility function. The use of a multi-period model would complicate the analysis considerably. 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 multi-period search model of the labor market with fixed hours offers. However, Kiefer's model does not distinguish between offers from the current firm and outside offers. His framework is well suited for the analysis of transitions among employment, unemployment, and nonparticipation, which is the focus of his paper. With some major modifications, it might be possible to use Kiefer's model to study transitions from one employer to another, which is our main concern.

4.The substitution of W_1 for W_M is only valid if the change in W_1 (conditional on H_1 and $W_1>W_M$) with respect to 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. For example, suppose 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.

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 result in further biases.

6.We discovered after essentially completing this draft that due to a programming error the 1982 and 1983 observations for blacks were excluded. Restoring these observations had almost no effect on the results.

7.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.

8. The wording of the survey questions used to construct $UNDER_j$, $OVER_j$ and CON_j are as follows. CON_j equals 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?" $UNDER_j$ 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?" $OVER_j$ 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.

9. 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.

10.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.

11.We obtain results similar to these using a much larger sample which was not restricted to persons for whom data on the wage change was available.

12. 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 $UNDER_0$ equal 0. These numbers are consistent with Figure 1. The results for constraints on the new job are qualitatively the same for the large and small samples.

13.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 (6) 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 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 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. Murphy and Topel (1986) and Solon (1986) discuss econometric issues relevant to the use of first difference wage models to examine compensating differentials.

14. This may be seen more clearly by rewriting (4) as:

$$W_M - W_0 = K_1 + \phi(H_1 - H_0)[\ |H_0 - S_0|(OVER_0 - UNDER_0) + |H_1 - S_1|(OVER_1 - UNDER_1)]$$

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:

$$W_M - W_0 = K_1 + \phi|H-S|(H_1 - H_0)[\ OVER_0 - UNDER_0 + OVER_1 - UNDER_1\ ] \quad .$$

Likewise, if one restricts the parameters α_{01}-α_{14} to equal α, equation 5 becomes:

$$\log(W_1) - \log(W_0) = K_2 + \alpha(H_1 - H_0)[\ OVER_0 - UNDER_0 + OVER_1 - UNDER_1\ ] \quad .$$

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

15. 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 31.74 and 95.5, while the covariances of the two hours change measures are 15.6 and 82.3. This evidence suggests that measurement error might account for 13.8% of the variance in (H1 - H0) for quits. If one were to adjust all coefficients involving this variable by (95.5/82.3), one would obtain a corrected estimate of α of .0035 and a corrected estimate of β of .224.

16. A serious omission of our study is the failure to consider hours on other jobs. It would also be useful to distinguish among jobs which permit workers to vary hours, jobs which require fixed hours, and jobs in which the required hours vary over time, perhaps using industry or occupation proxies as in Abowd and Ashenfelter (1981) and Murphy and Topel (1986). 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) which contain information on hours constraints. However, a definitive analysis of the

role of hours constraints in job mobility and hours-wage tradeoffs will require a new data collection effort. Ultimately, it would be desireable to provide a joint analysis of labor supply, employer determination of hours, the mobility decision and the tradeoff between hours and wage changes.

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FIGURE 1

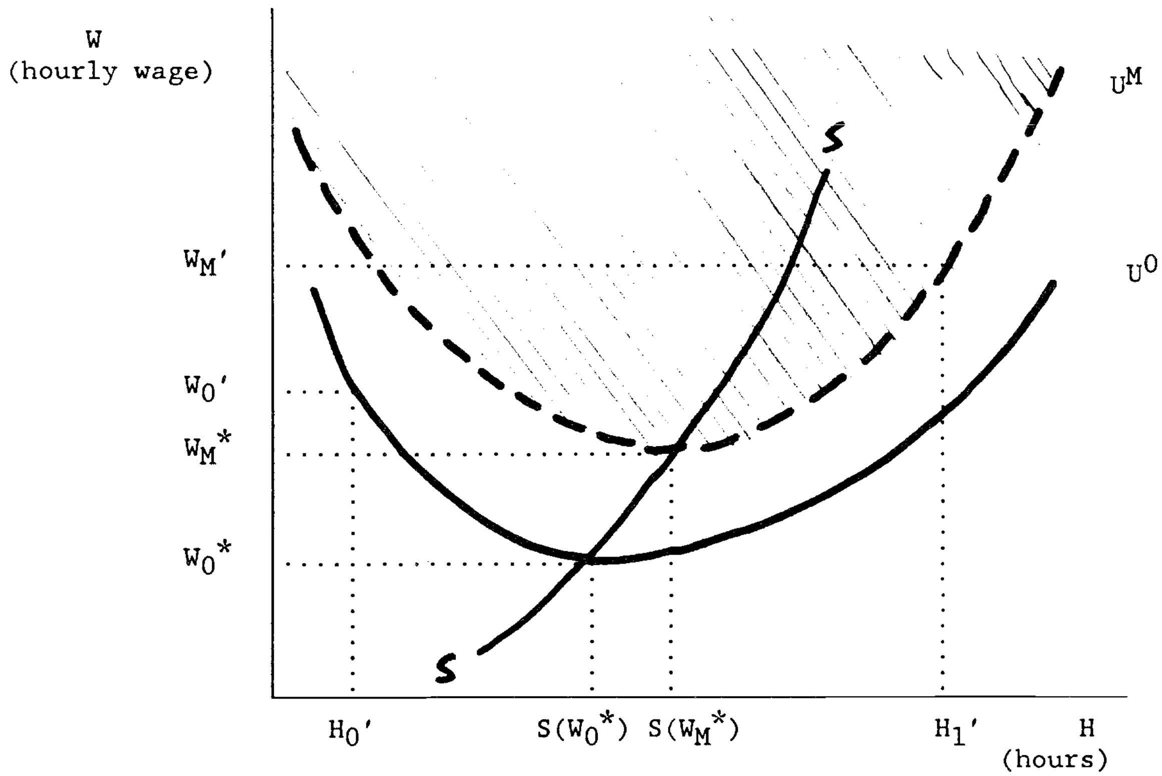

TABLE 1
PROBIT EQUATIONS - DETERMINANTS OF HOURS CONSTRAINTS*
(t-statistics in parentheses)

DEPENDENT VARIABLE:	UNDER (1 if underemployed)		OVER (1 if overemployed)		
	PARAMETER ESTIMATE (1a)	PARTIAL EFFECT ON PROBABILITY AT SAMPLE MEAN (1b)	PARAMETER ESTIMATE (2a)	PARTIAL EFFECT ON PROBABILITY AT SAMPLE MEAN (2b)	SAMPLE MEANS (3)
INTERCEPT	2.01 (16.15)	.627	-2.306 (14.34)	-.2459	
OLDER (1 if age ≥ 55)	-.0281 (.45)	-.0088	-.0538 (.63)	-.0057	.105
RACE (1 if black)	.1843 (6.63)	.0575	-.2216 (4.79)	-.0236	.309
MARRIED (1 if married)	.0832 (2.09)	.0259	-.1113 (1.92)	-.0119	.889
DISABLED (1 if health limitation)	.0091 (.20)	.0028	.0346 (.52)	.0037	.079
EDUCATION	-.0864 (18.39)	-.0269	-.00055 (.08)	-.00006	11.66 (3.09)
EXPERIENCE	-.0028 (.49)	-.0009	-.0153 (1.83)	-.0016	19.32 (10.71)
EXPERIENCE^2	-.00038 (2.62)	-.00012	.00054 (2.57)	.00006	488.14 (469.90)
HOURS/WEEK	-.0367 (17.42)	-.0114	.0207 (9.17)	.0022	43.25 (7.17)
CHI-SQUARE	1063.0		144.04		
D.F.	8		8		
PROB > F	.1E-6		.1E-6		

*12,711 observations. 26.1% of the sample reports UNDER = 1. 5.6% of the sample reports OVER = 1. In column 3, standard deviations are in parentheses.

TABLE 2

DESCRIPTIVE STATISTICS, WAGE AND HOURS CHANGES, FOR QUITTERS BY CONSTRAINT CLASSIFICATION

ΔW = change in ln(wage)

ΔH = change in hours/week

	$OVER_1 = 1$ 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	OBS = 26	OBS = 3	OBS = 34
	MEAN (ΔW) = .1274	MEAN (ΔW) = .1014	MEAN (ΔW) = -.1086	MEAN (ΔW) = .0867
	VAR (ΔW) = .0136	VAR (ΔW) = .1355	VAR (ΔW) = .0923	VAR (ΔW) = .1138
	MEAN (ΔH) = .8000	MEAN (ΔH) = -1.154	MEAN (ΔH) = -14.00	MEAN (ΔH) = -2.000
	VAR (ΔH) = 1.700	VAR (ΔH) = 145.18	VAR (ΔH) = 511.00	VAR (ΔH) = 156.00
	COV (ΔW,ΔH) = .0197	COV (ΔW,ΔH) = .2618	COV (ΔW,ΔH) = 6.862	COV (ΔW,ΔH) = .8567
$OVER_0 = 0$ $UNDER_0 = 0$ (satisfied, initial job)	OBS = 16	OBS = 225	OBS = 66	OBS = 307
	MEAN (ΔW) = .0340	MEAN (ΔW) = .0801	MEAN (ΔW) = .0913	MEAN (ΔW) = .0801
	VAR (ΔW) = .0985	VAR (ΔW) = .0975	VAR (ΔW) = .0743	VAR (ΔW) = .0921
	MEAN (ΔH) = 6.250	MEAN (ΔH) = 1.147	MEAN (ΔH) = -.7424	MEAN (ΔH) = 1.007
	VAR (ΔH) = 385.93	VAR (ΔH) = 105.75	VAR (ΔH) = 75.27	VAR (ΔH) = 114.43
	COV (ΔW,ΔH) = 1.660	COV (ΔW,ΔH) = -.1774	COV (ΔW,ΔH) = -.1867	COV (ΔW,ΔH) = -.1050
$UNDER_0 = 1$ (underemployed, initial job)	OBS = 5	OBS = 78	OBS = 56	OBS = 139
	MEAN (ΔW) = .0246	MEAN (ΔW) = .0903	MEAN (ΔW) = .1147	MEAN (ΔW) = .0978
	VAR (ΔW) = .1573	VAR (ΔW) = .1239	VAR (ΔW) = .0618	VAR (ΔW) = .0986
	MEAN (ΔH) = 15.800	MEAN (ΔH) = 4.667	MEAN (ΔH) = .2143	MEAN (ΔH) = 3.273
	VAR (ΔH) = 280.20	VAR (ΔH) = 136.38	VAR (ΔH) = 61.48	VAR (ΔH) = 119.30
	COV (ΔW,ΔH) = 3.495	COV (ΔH,ΔH) = -.3138	COV (ΔH,ΔH) = -.4515	COV (ΔW,ΔH) = -.3138
ROW TOTAL ($OVER_0$ = 0 or 1, $UNDER_0$ = 0 or 1)	OBS = 26	OBS = 329	OBS = 125	OBS = 480
	MEAN (ΔW) = .0501	MEAN (ΔW) = .0842	MEAN (ΔW) = .0970	MEAN (ΔW) = .0857
	VAR (ΔW) = .0879	VAR (ΔW) = .1060	VAR (ΔW) = .2627	VAR (ΔW) = .0952
	MEAN (ΔH) = 7.038	MEAN (ΔH) = 1.799	MEAN (ΔH) = -.6320	MEAN (ΔH) = 1.450
	VAR (ΔH) = 300.198	VAR (ΔH) = 118.24	VAR (ΔH) = 79.62	VAR (ΔH) = 120.156
	COV (ΔW,ΔH) = 1.426	COV (ΔW,ΔH) = -.1729	COV (ΔW,ΔH) = -.1139	COV (ΔW,ΔH) = -.0908

TABLE 3

CHANGE IN WAGE EQUATIONS, PARAMETERS FOR QUITTERS*

OLS, dependent variable: $\Delta \ln(\text{wage})$

VARIABLE:	EXPECTED SIGN	PARAMETER (1a)	OLS t-stat (1b)	WHITE t-stat (1c)	PARAMETER (2a)	OLS t-stat (2b)	WHITE t-stat (2c)	PARAMETER (3a)	OLS t-stat (3b)	WHITE t-stat (3c)
1. QUIT	(+)	.0197	1.12	.236	.0192	1.02	.63	.0150	.77	.46
QUIT MULTIPLIED BY:										
2. CON_0	(-)	.0279	1.41	.749	.0247	1.25	.73	.0282	1.40	.82
3. CON_1	(+)	-.00125	.074	.036	-.0060	.35	.20	-.0115	.58	.33
4. $UNDER_0$	(?)	-.00041	.019	.009	.0081	.31	.20	-.0010	.04	.02
5. $OVER_0$	(?)	.0109	.33	.17	.0211	.52	.33	.0316	.76	.47
6. $UNDER_1$	(?)							.0395	1.44	.92
7. $OVER_1$	(?)							-.0613	1.31	.82
8. $\lvert \Delta H \cdot UP \rvert$	(?)	-.000038	.036	.003	.00055	.36	.24	.00021	.13	.08
9. $\lvert \Delta H \cdot DOWN \rvert$	(?)	.0019	1.31	.23	.00246	1.43	.83	.0040	2.03	1.18
10. $\lvert \Delta H \cdot UP \rvert \times UNDER_0$	(-)				-.0023	1.03	.56	-.0019	.86	.48
11. $\lvert \Delta H \cdot UP \rvert \times OVER_0$	(+)				.0067	1.52	2.03	.0068	1.53	1.94
12. $\lvert \Delta H \cdot DOWN \rvert \times UNDER_0$	(+)				.0036	.89	.83	.0036	.85	.81
13. $\lvert \Delta H \cdot DOWN \rvert \times OVER_0$	(-)				-.0061	1.47	.71	-.0062	1.39	.77
14. $\lvert \Delta H \cdot UP \rvert \times UNDER_1$	(-)							-.0030	.93	.73
15. $\lvert \Delta H \cdot UP \rvert \times OVER_1$	(+)							.0054	1.79	1.12
16. $\lvert \Delta H \cdot DOWN \rvert \times UNDER_1$	(+)							-.0044	1.21	.84
17. $\lvert \Delta H \cdot DOWN \rvert \times OVER_1$	(-)							-.0064	1.38	1.64
R-SQUARE		.064			.065			.0671		
DFE		12675			12667			12655		

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	.0488	.0504	.0599	.1063
ROWS (14-17) are jointly insignificant			.0749	.1623

*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
CHANGE IN WAGE EQUATIONS, PARAMETERS FOR STAYERS
OLS, dependent variable: $\Delta\ln(\text{wage})$

VARIABLE:	EXPECTED SIGN	PARAMETER (1a)	OLS t-stat (1b)	WHITE t-stat (1c)	PARAMETER (2a)	OLS t-stat (2b)	WHITE t-stat (2c)	PARAMETER (3a)	OLS t-stat (3b)	WHITE t-stat (3c)
NO QUIT MULTIPLIED BY:										
1. CON_0	(-)	.0074	1.85	1.29	.0073	1.83	1.78	.0058	1.45	1.39
2. CON_1	(+)	-.0071	1.95	1.38	-.0070	1.93	1.89	-.00056	.14	.13
3. $UNDER_0$	(?)	-.00071	.16	.13	-.0016	.33	.35	.0036	.73	.77
4. $OVER_0$	(?)	-.0019	.27	.18	-.0027	.32	.35	-.0043	.48	.51
5. $UNDER_1$	(?)							-.0183	3.62	3.87
6. $OVER_1$	(?)							.0044	.49	.46
7. $\|\Delta H \cdot UP\|$	(?)	-.0020	4.97	2.56	-.0024	5.07	3.34	-.0026	5.07	3.58
8. $\|\Delta H \cdot DOWN\|$	(?)	.00099	2.54	1.69	.0012	2.68	1.84	.0015	2.94	2.04
9. $\|\Delta H \cdot UP\| \times UNDER_0$	(-)				.0014	1.62	1.21	.00089	1.00	.76
10. $\|\Delta H \cdot UP\| \times OVER_0$	(+)				.0013	.66	.52	.0015	.73	.59
11. $\|\Delta H \cdot DOWN\| \times UNDER_0$	(+)				-.0011	1.09	.82	-.001	.97	.77
12. $\|\Delta H \cdot DOWN\| \times OVER_0$	(-)				-.0005	.36	.28	-.00009	.06	.05
13. $\|\Delta H \cdot UP\| \times UNDER_1$	(-)							.0019	1.74	1.51
14. $\|\Delta H \cdot UP\| \times OVER_1$	(+)							-.0005	.39	.27
15. $\|\Delta H \cdot DOWN\| \times UNDER_1$	(+)							-.0003	.29	.23
16. $\|\Delta H \cdot DOWN\| \times OVER_1$	(-)							-.0035	1.69	1.61
R-SQUARE		.0639			.065			.067		
DFE		12675			12667			12655		

TABLE A.1
Means and Standard Deviations
Selected Variables Used in Regression Analysis

	Full Sample		Non-Quitters		Quitters	
OBS.	12711		12231		480	
	MEAN	STD.DEV	MEAN	STD.DEV	MEAN	STD.DEV
QUIT	0.0377	0.1906				
$\Delta\ln(wage)$	0.0314	0.1850	0.0292	0.1781	0.0857	0.3084
CON_0	0.6105	0.4876	0.6112	0.4874	0.5937	0.4916
CON_1	0.6065	0.4885	0.6077	0.4882	0.5750	0.4948
$UNDER_0$	0.2626	0.4400	0.2615	0.4394	0.2895	0.4540
$OVER_0$	0.0560	0.2299	0.0554	0.2288	0.0708	0.2568
$UNDER_1$	0.2607	0.4390	0.2608	0.4390	0.2604	0.4393
$OVER_1$	0.0560	0.2299	0.0560	0.2300	0.0541	0.2265
$\|\Delta H.UP\|$	1.7196	4.4256	1.6250	4.2024	4.1291	7.9210
$\|\Delta H.DOWN\|$	1.7823	4.3163	1.7471	4.2366	2.6791	5.9364
$\|\Delta H.UP\|$ x $UNDER_0$	0.5167	2.6229	0.4836	2.4386	1.3625	5.4739
$\|\Delta H.UP\|$ x $OVER_0$	0.3408	2.0175	0.3379	2.0038	0.4145	2.3416
$\|\Delta H.DOWN\|$ x $UNDER_0$	0.0775	0.9542	0.0731	0.8756	0.1895	2.1381
$\|\Delta H.DOWN\|$ x $OVER_0$	0.1450	1.4049	0.1377	1.3426	0.3312	2.5127
$\|\Delta H.UP\|$ x $UNDER_1$	0.3095	1.8968	0.2968	1.8343	0.6333	3.0737
$\|\Delta H.UP\|$ x $OVER_1$	0.5275	2.5215	0.5169	2.4908	0.7979	3.1981
$\|\Delta H.DOWN\|$ x $UNDER_1$	0.1586	1.5641	0.1456	1.4103	0.4875	3.7438
$\|\Delta H.DOWN\|$ x $OVER_1$	0.0839	0.9622	0.0830	0.8955	0.1062	2.0226