

The Impact of 9/11 on Hours of Work  
in the United States

Julie L. Hotchkiss and Olga Pavlova

Working Paper 2004-16a  
September 2004

## The Impact of 9/11 on Hours of Work in the United States

Julie L. Hotchkiss and Olga Pavlova

Working Paper 2004-16a  
September 2004

**Abstract:** The purpose of this paper is to determine whether workers' commitment to the labor force declined after 9/11, as many popular press accounts at the time suggested it would. The results indicate that any measured decline in hours spent working was the result of economic conditions rather than changes in desired hours of work. Controlling for economic conditions, hours of work after 9/11 actually increased on average compared to before 9/11; no significant change in hours spent working occurred among residents of New York City, however.

JEL classification: J22, Z19

Key words: labor supply, impact of 9/11, hours of work

---

The views expressed here are the authors' and not necessarily those of the Federal Reserve Bank of Atlanta or the Federal Reserve System. Any remaining errors are the authors' responsibility.

Please address questions regarding content to Julie L. Hotchkiss, Research Economist and Associate Policy Advisor, Federal Reserve Bank of Atlanta and Associate Professor of Economics, Georgia State University, 1000 Peachtree Street, N.E., Atlanta, Georgia 30309-4470, 404-498-8198, 404-498-8058 (fax), [julie.l.hotchkiss@atl.frb.org](mailto:julie.l.hotchkiss@atl.frb.org), or Olga Pavlova, Ph.D. candidate, Department of Economics, Andrew Young School of Policy Studies, Georgia State University, Atlanta, Georgia 30303, 404-651-2878, [prcop@langate.gsu.edu](mailto:prcop@langate.gsu.edu).

Federal Reserve Bank of Atlanta working papers, including revised versions, are available on the Atlanta Fed's Web site at [www.frbatlanta.org](http://www.frbatlanta.org). Click "Publications" and then "Working Papers." Use the WebScriber Service (at [www.frbatlanta.org](http://www.frbatlanta.org)) to receive e-mail notifications about new papers.

# The Impact of 9/11 on Hours of Work in the U.S.

## I. Introduction and Background

After the terrorist attacks of September 11, 2001, many Americans re-evaluated their personal and professional priorities. The popular press abounded with declarations of how people were going to change the way they lived.<sup>1</sup> The most common resolution was to "spend less time working and more time with family." This resolution amounts to a shift in one's preferences toward more leisure time. The purpose of this paper is to establish whether these new personal commitments reported by the media were isolated exceptions, or whether they were indicative of a broad, wide-reaching change in the behavior among the American population.

The broad implications of a shift toward more leisure time are lower incomes, reduced consumer demand, and lower productivity growth. The focus of this paper is not on aggregate hours, but on the individual, personal decisions following a major dramatic, national disaster. Clearly, individual behavior combines to produce an aggregate picture, but the interest here is on the behavior of the individual. There are also other individual behavior changes (such as job changes, migration, fertility, marital, and other familial changes) that may not be reflected in changes in hours of work. However, the expressed desire to work less and play more was very clear and will be the focus of this paper.<sup>2</sup>

---

<sup>1</sup> For example, see Joyner (2002) and Shellenbarger (2002a, 2002b).

<sup>2</sup> For a review of studies of the immediate financial impact of the event of 9/11/01, see the report by the Government Accounting Office found at <<http://www.gao.gov/cgi-bin/getrpt?GAO-02-700R7>>.

## II. Methodology and Data

A standard linear hours equation is specified to model observed labor supply behavior. The labor supply equation takes the form:<sup>3</sup>

$$H = \beta W + \delta Y + Z\gamma + \varepsilon, \quad (1)$$

where  $H$  is the number of total actual weekly hours,  $W$  is weekly earnings,  $Y$  is non-labor income,  $Z$  are other factors that are expected to influence labor supply (taste shifters and other exogenous determinants of actual hours), and  $\varepsilon$  is a random error term. To determine the impact of a single event, such as the 9/11 terrorist attack, equation (1) is modified through the addition of a single dummy variable indicating the time period after the event to see if there was a one-time, permanent shift in weekly hours worked. The impact on different demographic groups (such as women, men, those living in the immediate vicinity of the attacks, and those with children) will be explored through separate empirical analyses.

Equation (1) will be estimated via maximum likelihood Tobit. This estimation strategy will allow us to make inferences about the population, rather than merely about individuals who have decided to enter the labor force. This is important, since the attacks of 9/11 may have systematically affected the decision to enter the labor market. In order to be able to estimate equation (1) as a Tobit, all regressors must be observed for all individuals, whether working or not. This is not a problem for standard demographics, such as age, race, education, and non-labor income. Weekly earnings, however, are not observed for non-workers.<sup>4</sup> To obtain an

---

<sup>3</sup> This labor supply function corresponds to the well-behaved indirect utility function

$$V(W, Y) = e^{\delta W} \left( Y + \frac{\beta}{\delta} W - \frac{\beta}{\delta^2} + \frac{Z\gamma}{\delta} \right) \text{ (see Killingsworth 1983).}$$

<sup>4</sup> The model was estimated also as a truncated regression (allowing us to include some additional regressors not observed for non-workers, such as occupation and industry). The conclusion regarding the impact on 9/11 on hours work does not change under this alternative estimation strategy. We present the Tobit results since we believe this observation scheme makes use of

estimate of earnings for everyone to be used in the Tobit regression, a first-stage estimation is performed. Consistent coefficients with which we can predict weekly earnings for everyone are obtained from the maximum likelihood joint estimation of weekly earnings and the employment probability.<sup>5</sup> The resulting estimated earnings are used for everyone in the Tobit estimation.<sup>6</sup>

The data used for this analysis come from the basic monthly Current Population Survey (CPS) for the period of January 2000 through December 2002. The sample is limited to the working-age population between (and including) 25 and 64 years old. Those currently in the armed forces, the self-employed, and those employed in the agriculture industry are excluded from the analysis. The sample only includes individuals from the outgoing rotation groups (month 4 and 8 in the survey cycle); it is for these respondents that current labor market information (such as hours of work and earnings) is available.<sup>7</sup>

The labor supply variable ( $H$ ) is a person's total weekly hours. This is distinct from either number of hours "usually" worked or the number of hours worked on one's "main job," and is designed to capture actual total number of hours spent working in the labor market for pay. The wage ( $W$ ) variable is a person's weekly earnings; this is calculated based on

---

information on both workers *and* non-workers, yielding greater confidence in the generalizability of the results.

<sup>5</sup> See Greene (2003: 782-787) for a description of this estimation strategy and the likelihood function. The Appendix contains the results from this first-stage estimation. All estimation results reported in this paper were obtained using the software package STATA (see StataCorp 2003). Data manipulation prior to estimation was performed using SAS statistical software (see SAS 1999-2001).

<sup>6</sup> An alternative would be to use estimated earnings only for the non-workers and observed earnings for the workers. This strategy resulted in identical conclusions regarding the impact of 9/11 on hours of work.

<sup>7</sup> All results are reported un-weighted. Conclusions from the analysis using weights were identical to those not using weights. It is not clear that the weights are appropriate given that samples across multiple months were combined (Hotchkiss, forthcoming).

information on hours of work and pay periodicity if the person was not paid on a weekly basis.<sup>8</sup> Total family income is only reported in categories. Consequently, non-labor income ( $Y$ ) is determined by subtracting weekly earnings from the median value of the household's weekly income category. Other regressors included in the estimation include age; age squared; education; number of children under six; and indicators for region, non-metropolitan residence, gender, race, marital status, multiple jobs, and quarterly cycles. An indicator for whether the observation is pre- or post-9/11 will be the focus in determining whether there was a structural shift in desired hours of work. The variables are detailed in Table 1, which reports means for the full sample.

**[Table 1 here]**

On average over the time period, workers work just over 40 hours per week and earn an average of \$683.46 per week. Average age of the sample is about 43 years and 29 percent of the sample have a college degree or higher education. About half of the sample is women, one third is single, and 16 percent are nonwhite.

Basic monthly CPS does not report the number of children of an individual, which is expected to be an important determinant of labor supply, especially for women. The survey nevertheless reports age, own line number, a line number of a parent, and a line number of a spouse. The number of own children under six years old of an individual is imputed using age, own line number, and pointer to the line number of the parent variables. The total number of children under six years old consists of an individual's own children plus spouse's children of that age. The total number of children is then matched to all the parents.

---

<sup>8</sup> While the dependent variable is *total* hours worked during the week, the weekly earnings variable corresponds to the earnings on the person's main job. Only six percent of earners have more than one job and earnings on one's main job is expected to be a good proxy for one's opportunity cost of time.

Monthly unemployment rates by industry are collected from the Bureau of Labor Statistics. The CPS and BLS definitions of industries are consistent through January 2003 when the new NAICS definitions were implemented. Unemployment rates for government workers serve as a proxy for the unemployment rate facing the public administration industry. All public administration employees are government workers and the unemployment rates between these closely related groups are expected to be similar and to move in the same direction. The unemployment rate for a non-worker was calculated as a weighted average of all workers across industries in that person's state. The unemployment rate is included in the labor supply equation in order to capture labor demand influences on actual hours worked. Without any control for demand factors, one could easily confound an impact of the events in September 2001 on hours worked with an impact of the declared end of a recession in November 2001.

#### IV. Results

This section presents an initial graphical look at how working hours has changed over the time period investigated, the Tobit estimation results for the full sample, followed by a discussion of coefficient estimates of the parameters of interest for various sub-samples. The first-stage estimation of predicted earnings is contained in the Appendix.

##### A. A First Look at Hours of Work

Figure 1 depicts the average total hours worked per week for every month beginning in January 2000 through December 2002 for men, women, and for residents of New York City. Recall that this measure is distinct from either the number of hours on one's main job or the "usual" number of hours that one works during the week. The goal is to capture actual

behavioral adjustments at the time of the survey. The CPS survey is administered on the 18th of the month, so the September 2001 survey reflects a post-9/11 environment.

**[Figure 1 here]**

It is not at all clear from Figure 1 that actual hours worked shifted permanently downward post-9/11. There is a definite drop in hours worked in September for residents of New York City, reflecting the tremendous interruption to life in New York City that occurred on September 11. The drop in hours, however, appears to be short-lived as hours worked re-bounds to pre-9/11 levels by December 2001. These raw averages, of course, do not control for any demographic or economic conditions.

B. Tobit Results: Full Sample

Table 2 contains the Tobit estimation results for the full sample. Column 1 contains the specification without the unemployment rate as a regressor, and column 2 contains the unemployment rate.<sup>9</sup> In Specification 1, the coefficient on Post-9/11 is negative and significantly different from zero at the 90 percent confidence level. The implication from this specification is that average hours after 9/11 are significantly lower (albeit by a small amount) than average hours of work before 9/11. This decline in hours, however, seems to be all attributable to labor market forces. After including the unemployment rate as a regressor (whose

---

<sup>9</sup> Indicators for education greater than high school were dropped from the estimation because of the multicollinearity of that regressor with the predicted earnings variable. In addition, inclusion of occupation and industry dummy variables (while not possible in a Tobit specification) did not alter the conclusions when included in a Truncated Regression version of the Tobit estimation. Further, since CPS respondents are interviewed for four months, out of the survey for eight months, then interviewed for another four months, there is a good chance that an individual will appear twice in the sample. Controlling for the presence of multiple observations through cluster analysis did slightly increase the standard errors, but rarely changed the significance levels of the coefficients, and did not change any conclusions from the analysis.



coefficient is negative and highly significant), the coefficient on Post-9/11 becomes positive. It is important to note, as well, that all of the rest of the coefficients across specifications remain virtually unchanged by the inclusion of the unemployment rate as a regressor.

**[Table 2 here]**

The new coefficient on Post-9/11 translates into an average *increase* of one and one-third hours of work per week for the population and an average increase of roughly 0.9 hours of work per week among the already employed. The source of the increased hours may very well be explained by the fact that the U.S. economy was in the process of coming out of a recession (which officially ended in November 2001). Employers typically initially adjust to demand increases that accompany economic recovery by making employment adjustments on the intensive, rather than on the extensive, margin. That is, they increase workers' hours before hiring new workers.

Nonetheless, this increase in actual hours is not consistent with proclamations of reducing one's commitment to the labor market. There is some reason to believe, however, that the impact of the terrorist attacks may vary across demographic groups or geographic locations.

C. Tobit Results: Sub-samples

Table 3 contains the parameter estimate for the Post-9/11 indicator from the specifications with and without the unemployment rate for a variety of demographic and geographic sub-samples.<sup>10</sup> The first row of Table 3 repeats the coefficients for the full sample.

---

<sup>10</sup> The full set of estimated coefficients are available from the authors upon request. Geographic sub-samples were chosen based on their geographic association with the location of the catastrophes. There is also reason to believe that men and women may adjust their labor supply differently in response to exogenous shocks (for example, see Smith and Ward 1985, and McGrattan and Rogerson 1998).

The largest significant decline in hours in Specification 1 is among residents of New York City. This would make sense, given the magnitude of the emotional and economic toll of the attack in New York City. After controlling for the unemployment rate, however, the coefficient on Post-9/11 becomes essentially zero.

**[Table 3 here]**

The largest increase in hours, while controlling for the unemployment rate, is found among women with children less than six years old. This increase in labor supply may be capturing an added-worker effect that resulted from the poor labor market conditions for men that continued past the end of the recession into 2002.

V. Conclusions and Implications

The evidence presented in this paper indicates that Americans did not reduce their commitment to the labor market post-9/11 as many had declared they would following the terrorist attacks in New York, Washington, and Pennsylvania. After controlling for the continuing weakness of the labor market (through the unemployment rate), hours worked per week were *higher* after September 2001 than before. There are several caveats, however, that prevent us from concluding that the terrorist attacks of 9/11 had no impact on the labor market of the United States. First of all, it is almost impossible to tell exactly what role the attacks played in the weak labor market recovery from the recession that ended in November 2001. Second, this analysis of hours of work does not capture other labor supply adjustments that may have been precipitated by the events of 9/11. For example, this analysis does not capture any occupational changes that may have been made; geographic moves (say, closer to immediate

family) that may have taken place; or adjustments in work arrangements, such as working more hours at home rather than in the office.

There is no doubt that the terrorist attacks had many long-term and far-ranging implications for the way Americans think about their lives and their place in the world. However, it is also clear from the analysis contained in this paper that one thing the events of 9/11 did *not* do is dampen the American work ethic or drive.

## References

- Greene, William H. *Econometric Analysis* 5th ed. Upper Saddle River, NJ: Prentice-Hall, 2003.
- Hotchkiss, Julie L. "A Closer Look at the Employment Impact of the ADA." *Journal of Human Resources* (Winter 2005): forthcoming.
- Joyner, Tammy. "A Driven Nation Turns Inward." *Atlanta Journal and Constitution* (28 April 2002): Q1.
- Killingsworth, Mark. *Labor Supply*. Cambridge: Cambridge University Press, 1983.
- McGrattan, Ellen and Richard Rogerson. "Changes in Hours Worked Since 1950." *Quarterly Review* (Winter 1998): 2-19.
- SAS. Statistical software version 8.2. Cary, NC: SAS Institute, Inc., 1999-2001.
- StataCorp. *Stata Statistical Software: Release 8.0*. College Station, TX: Stata Corporation, 2003.
- Shellenbarger, Sue. "There Were Many Resolutions Made After Sept. 11; Some Were Even Kept." *Wall Street Journal* (8 August 2002): D1.
- Shellenbarger, Sue. "Trends Point to Future of More-Focused Work, Parenting and Learning." *Wall Street Journal* (9 January 2002): B1.
- Smith, P. and P. Ward. "Time Series Growth in the Female Labor Force." *Journal of Labor Economics* Vol. 3 No.1, part 2 (January 1985): S59-S90.

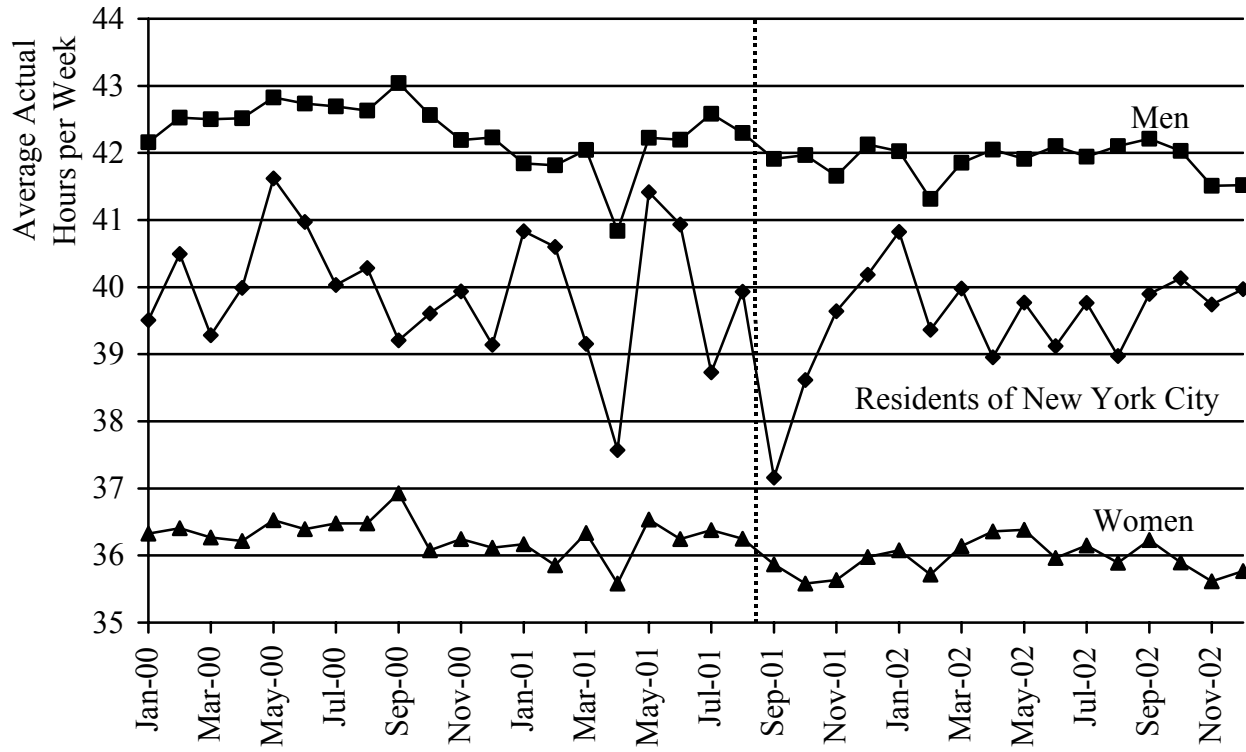


Figure 1. Average total weekly hours of work, January 2000-December 2002

Table 1. Sample means and standard deviations, January 2000-December 2002.

Variables	Mean (std dev)
Hours of work (workers)	40.45 (12.03)
Actual weekly earnings (workers)	\$683.46 (476.74)
Predicted weekly earnings	\$851.11 (190.37)
Non-labor income	\$493.42 (470.50)
Number of Children < 6 years	0.23 (0.56)
Age	42.82 (10.62)
Unemployment Rate	5.01 (1.4)
Education less than high school=1	0.11
Education college or more=1	0.29
Northeast=1	0.21
Midwest=1	0.24
South=1	0.30
West=1	0.25
Non-metropolitan=1	0.22
Female=1	0.54
Nonwhite=1	0.16
Single=1	0.34
Second Job = 1	0.04
Number of Observations	489,237
Number of Workers	353,061

Notes: Weekly earnings are real values in 2000 dollars.

Table 2. Tobit estimation results of actual hours worked, full sample.

Variable	Specification 1	Specification 2
Constant	4.8613* (0.6223)	10.1327* (0.6385)
Predicted weekly earnings	0.0148* (0.0002)	0.0143* (0.0002)
Non-labor income	-21.91* (0.0849)	-21.87* (0.0848)
Number of Children < 6 years	-4.5371* (0.0693)	-4.5325* (0.0692)
Age	1.8697* (0.0288)	1.8729* (0.0288)
Age Squared/100	-27.334* (0.3255)	-27.375* (0.3251)
Education < high school	-11.9448* (0.1269)	-12.7003* (0.1208)
Midwest	1.7965* (0.1049)	1.8026* (0.1047)
South	0.3879* (0.1007)	0.3750* (0.1005)
West	-0.6649* (0.1036)	-0.6417* (0.1034)
Non-metropolitan	-1.4104* (0.0919)	-1.3795* (0.0922)
Female	-4.9785* (0.0893)	-5.2899* (0.0896)
Nonwhite	-2.7275* (0.0985)	-2.8533* (0.0984)
Single	-5.9243* (0.0820)	-5.9284* (0.0819)
Second Job	20.05* (0.1686)	19.9563* (0.1683)
Quarter 2	0.0038 (0.1000)	-0.4582* (0.1006)
Quarter 3	-1.3856* (0.0999)	-1.9105* (0.0999)
Quarter 4	0.1010 (0.1012)	-0.6092* (0.1030)
Post-9/11	-0.1831 <sup>+</sup> (0.0726)	1.3238* (0.0839)
Unemployment Rate	--	-1.0202* (0.0286)
Log-likelihood	-1,740,840	-1,740,202
Number of Observations	489,237	

Notes: Standard errors are in parentheses. \*, <sup>+</sup>, <sup>^</sup> indicate significance at the 99, 95, and 90 percent confidence levels, respectively.

Table 3. Tobit estimation results of actual hours worked, coefficient on post with and without unemployment rate for selected sub-samples.

Variable	Coefficient on Post-9/11 Indicator	
	Specification 1 (Unemployment rate not a regressor)	Specification 2 (Unemployment rate is a regressor)
Full Sample (n=489,237)	-0.1831 <sup>+</sup> (0.0726)	1.3238* (0.0839)
Women (n=262,552)	0.1019 (0.1076)	2.7632* (0.1259)
Women w/children < 6 (n=45,603)	0.5558 <sup>^</sup> (0.2863)	3.6775* (0.3328)
Men (n=226,685)	-0.5370* (0.0966)	0.2742 <sup>+</sup> (0.1115)
Men w/children < 6 (n=38,766)	-0.8753* (0.1906)	0.2600 (0.2218)
Residents of New York State (n=26,554)	-0.1234 (0.3345)	1.8070* (0.3852)
Residents of New York City (n=13,086)	-1.1730 <sup>+</sup> (0.5068)	0.3688 (0.5795)
Residents of New Jersey (n=13,508)	-0.7677 <sup>^</sup> (0.4089)	0.8413 (0.4761)
Residents of Pennsylvania (n=18,404)	0.1577 (0.3657)	2.5700* (0.4321)
Residents of D.C. (n=5,386)	0.4659 (0.6779)	1.3835 <sup>^</sup> (0.7344)
Residents of Maryland (n=7,298)	0.0709 (0.5288)	-0.0898 (0.5905)
Residents of Virginia (n=8,481)	-0.4905 (0.5060)	0.5248 (0.5732)

Notes: Standard errors are in parentheses. \*, +, ^ indicate significance at the 99, 95, and 90 percent confidence levels, respectively.



### Appendix: First-stage Estimation of Weekly Wage.

Table A1. ML joint estimation of earnings equation and employment probability.

Variable	Dep Variable = Real Weekly Earnings	Dep Variable = Prob of Employment
Constant	225.56* (12.34)	0.5426* (0.0387)
Age	23.6729* (0.5815)	0.1086* (0.0017)
Age Squared/100	-201.5257* (6.7464)	-1.5013* (0.0190)
Education < high school	-117.3341* (2.5369)	-0.7703* (0.0064)
Education >= college	324.1889* (1.5507)	0.4280* (0.0055)
Midwest	-42.5442* (2.0597)	0.0463* (0.0066)
South	-30.5616* (1.9968)	-0.0903* (0.0062)
West	-6.0129* (2.0640)	-0.0540* (0.0064)
Non-metropolitan	-105.9928* (1.7098)	-0.2151* (0.0052)
Female	-210.5829* (1.4098)	-0.2662* (0.0046)
Nonwhite	-40.4743* (1.9760)	-0.2496* (0.0058)
Single	-34.0659* (1.5040)	-0.4526* (0.0050)
Quarter 2	-3.8521^ (1.9916)	0.0012 (0.0063)
Quarter 3	3.1910 (1.9639)	-0.0176* (0.0062)
Quarter 4	1.7812 (1.9593)	-0.0276* (0.0064)
Post 9/11	--	0.0808* (0.0048)
Unemployment Rate	--	-0.0623* (0.0017)
Non-labor income/1000	--	-1.4740* (0.0048)
Number of Children < 6 years	--	-0.2205* (0.0040)
Correlation between error terms	-0.6590* (0.0022)	
Log-likelihood	-2,929,898	
Number of Observations	489,237 (367,687 employed)	

Notes: Standard errors are in parentheses. \*, +, ^ indicate significance at the 99, 95, and 90 percent confidence levels, respectively. Note that some usual regressors for earnings equations (such as occupation and industry dummy variables) can not be included in this estimation since the purpose is to predict wage for non-workers, for whom we do not have observations on those variables.