Continuation of NLS Discussion Paper 92-4
Part 2 of 3

This version of the paper was split for web delivery.

6. A Specification Characterizing the Duration of Unemployment Between Jobs

The central question addressed in the subsequent empirical analysis is the following: Given the onset of nonemployment (i.e. the initiation of a nonemployment spell), what is the relationship between UI entitlements and the accumulative amount of unemployment that an individual experiences before he or she returns to employment? To answer this question within the framework presented in the previous section, one can interpret the variable U as the total number of weeks of unemployment that an individual reports during a spell of nonemployment, with observations on U available for a random sample of nonemployment episodes; the variable ℓ corresponds to the length of these nonemployment spells measured in weeks; and the fraction ρ represents the proportion of a nonemployment spell reported as unemployment.

While knowledge of the distribution $f(U|R, PA)$ formulated in the following analysis to answer the question posed above provides much of what is needed to predict many of the combined effects of UI programs, it falls short of supplying all that is required to evaluate the total effects of UI policies on unemployment. Because work-history variables make up a part of the conditioning elements PA, $f(U|R, PA)$ ignores the potential influence of UI on the initiation of nonemployment episodes or on any other aspect of work or earnings activities. Consequently, the empirical framework developed below is essentially conditional in spirit in that it estimates the amount unemployment experienced by individuals who are known to have just left employment with recent work records of a particular nature. Thus, the estimated effects presented below represent the total effects of UI policies only if one is willing to presume that the influence of UI programs on employment experiences is negligible. If one does not accept such a presumption, then carrying out the conditional analysis considered here is a necessary step in the development of a complete description of the influence of UI programs on unemployment. Pursuing a framework capable of predicting the full impact of UI policies requires one to combine the sort of analysis considered in this paper with a model of the effects of UI policies on the employment-nonemployment decision and on earnings.[11]

6.1 *A Sample Linking UI Entitlements and Unemployment Durations*

To construct reliable measures of a youth's UI entitlements and receipt of benefits, this paper analyzes a subsample of 3028 individuals drawn from the randomly chosen nationally representative sample of 6,111 youths in the YNLS. A detailed description of the sample selection criteria is presented in Appendix B. In short, inclusion in the subsample required a youth to meet the following 5 conditions: (1) interviewed in each of the first 7 years; (2) worked at least once since January 1979; (3) have valid beginning and ending dates for time periods spent employed, between jobs and in the military; (4) left school and did not return prior to the 1985 interview date; and (5) have a reasonably accurate and complete time series of weekly earnings beginning with January 1978 or the last date of school attendance. The subsample contains 1409 men and 1619 women who experience 4031 and 4250 episodes of nonemployment respectively.

Summary statistics of nonemployment spells and the demographic characteristics of individuals at the beginning of spells are presented in Table 6.1-M for men and in Table 6.1-W for women. Each table reports results for nonemployment spells divided into three distinct groups: the top group presents statistics for spells in which an individual is not eligible to receive UI benefits; the middle group summarizes the characteristics of spells in which a youth is eligible to receive UI payments but fails to do so; and the lower group describes spells associated with the receipt of UI benefits at some time during the nonemployment episode.[12] A casual examination of these summary statistics indicates that UI recipients are slightly older, are more likely to be on layoff, and experience more unemployment.

Tables 6.2–M and 6.2–W present summary statistics of the work history variables that enter into the determination of persons' UI entitlements as well as the imputed measures of UI benefits obtained for the eligible youths in the YNLS, using the broad definition of

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[11] In particular, one needs to develop and estimate a specification a distribution of the form $f(PA|R)$ or $f(PA|R, Z)$ which determines how work-history variables H vary across different policy regimes. For the analysis presented here, H not only incorporates all of the aspects of earnings that go into the determination of UI benefits, it also implicitly contains information signifying the termination of employment in the immediate past.

[12] Note, the same individual may be associated with all three spell catagories.

TABLE 6.1-M

Summary Statistics of Demographics and Nonemployment Spells for Males
Number of Individuals in Sample = 1409

Variable	Mean	Std.Dev.	Min.	25%	50%	75%	Max.
Spells for which individual is not eligible for UI: number of spells = 2122							
Age	20.94	2.36	15.0	19.0	21.0	22.0	27.0
Years of Education	11.77	2.06	7.0	11.0	12.0	12.0	19.0
Percent Non-White	0.21						
Spell Length	16.01	26.39	1.0	3.0	6.0	19.0	337.0
Weeks of Unemployment	6.86	15.32	0.0	0.0	1.0	7.0	259.0
Percent of Spell Unemployed	0.39	0.45	0.0	0.0	0.1	1.0	1.0
Fraction Entirely OLF	0.47						
Fraction entirely UE	0.30						
Fraction on Layoff	0.12						
Fraction returning to original Employer	0.30						
Spells for eligible nonrecipients: number of spells = 1190							
Age	20.73	2.28	16.0	19.0	20.0	22.0	28.0
Years of Education	11.55	1.77	7.0	11.0	12.0	12.0	18.0
Percent Non-White	0.21						
Spell Length	12.95	19.76	1.0	2.0	5.0	14.0	172.0
Weeks of Unemployment	7.59	13.06	0.0	1.0	3.0	8.0	126.0
Percent of Spell Unemployed	0.64	0.43	0.0	0.1	1.0	1.0	1.0
Fraction Entirely OLF	0.23						
Fraction entirely UE	0.53						
Fraction on Layoff	0.42						
Fraction returning to original Employer	0.24						
Spells for UI recipients: number of spells = 719							
Age	21.99	2.25	17.0	20.0	22.0	24.0	28.0
Years of Education	11.61	1.47	7.0	12.0	12.0	12.0	18.0
Percent Non-White	0.13						
Spell Length	17.66	22.42	1.0	4.0	10.0	22.0	239.0
Weeks of Unemployment	14.59	17.63	1.0	3.0	9.0	19.0	216.0
Percent of Spell Unemployed	0.87	0.28	0.1	1.0	1.0	1.0	1.0
Fraction Entirely OLF	0.00						
Fraction entirely UE	0.79						
Fraction on Layoff	0.73						
Fraction returning to original Employer	0.40						

TABLE 6.1-W

Summary Statistics of Demographics and Nonemployment Spells for Females
Number of Individuals in Sample = 1619

Variable	Mean	Std.Dev.	Min.	25%	50%	75%	Max.
Spells for which individual is not eligible for UI: number of spells = 2924							
Age	21.18	2.46	15.0	19.0	21.0	23.0	27.0
Years of Education	12.03	1.92	7.0	12.0	12.0	13.0	18.0
Percent Non-White	0.18						
Spell Length	29.07	48.44	1.0	3.0	10.0	33.0	330.0
Weeks of Unemployment	5.15	12.72	0.0	0.0	0.0	4.0	139.0
Percent of Spell Unemployed	0.25	0.38	0.0	0.0	0.0	0.5	1.0
Fraction Entirely OLF	0.55						
Fraction entirely UE	0.16						
Fraction on Layoff	0.08						
Fraction returning to original Employer	0.30						
Spells for eligible nonrecipients: number of spells = 906							
Age	20.82	2.24	16.0	19.0	21.0	22.0	27.0
Years of Education	12.02	1.94	7.0	12.0	12.0	12.0	18.0
Percent Non-White	0.12						
Spell Length	22.21	38.82	1.0	3.0	8.0	20.0	289.0
Weeks of Unemployment	5.54	11.02	0.0	0.0	2.0	6.0	137.0
Percent of Spell Unemployed	0.47	0.44	0.0	0.0	0.3	1.0	1.0
Fraction Entirely OLF	0.33						
Fraction entirely UE	0.36						
Fraction on Layoff	0.24						
Fraction returning to original Employer	0.19						
Spells for UI recipients: number of spells = 420							
Age	21.75	2.25	17.0	20.0	22.0	23.0	27.0
Years of Education	11.88	1.46	7.0	12.0	12.0	12.0	18.0
Percent Non-White	0.11						
Spell Length	26.37	39.04	1.0	5.0	12.0	32.0	297.0
Weeks of Unemployment	13.43	17.98	1.0	2.0	7.0	18.0	115.0
Percent of Spell Unemployed	0.72	0.39	0.1	0.4	1.0	1.0	1.0
Fraction Entirely OLF	0.00						
Fraction entirely UE	0.60						
Fraction on Layoff	0.56						
Fraction returning to original Employer	0.32						

TABLE 6.2-M

Summary Statistics of Work History and UI Entitlements for Males
Number of Individuals in Sample = 1409

Variable	Mean	Std.Dev.	Min.	25%	50%	75%	Max.
Spells for which individual is not eligible for UI: number of spells = 2122							
Base Period Earnings	4890	5780	0	640	2760	7200	54600
High Quarter Earnings	1890	1780	0	500	1610	2730	21990
Average Weekly Earnings	157	212	0	58	136	211	949
Weeks of Work	24.92	19.45	0.00	7.00	21.00	46.00	52.00
Ratio of Base Period to High Quarter Earnings	1.91	1.24	0.00	1.00	1.77	2.96	4.00
Fraction Satisfying Earnings Requirement	0.53						
Spells for eligible nonrecipients: number of spells = 1190							
Base Period Earnings	7380	5080	380	3680	6190	9680	37940
High Quarter Earnings	2610	1580	190	1510	2280	3250	16100
Average Weekly Earnings	188	199	20	113	160	229	1090
Weeks of Work	38.88	12.69	7.00	29.00	42.00	51.00	52.00
Ratio of Base Period to High Quarter Earnings	2.78	0.78	1.05	2.14	2.84	3.44	4.00
Weekly Benefit Amount	81.60	40.97	10.00	48.00	76.00	108.00	221.00
Weeks of Eligibility	23.24	6.23	1.00	19.00	26.00	26.00	55.00
Fraction Who Meet Stricter Eligiblity Condition	0.58						
Spells for UI recipients: number of spells = 719							
Base Period Earnings	11090	7040	2100	6470	9800	14480	54590
High Quarter Earnings	3580	2120	1240	2210	3250	4420	21990
Average Weekly Earnings	260	148	93	164	234	327	1331
Weeks of Work	41.06	13.69	12.00	34.00	47.00	52.00	52.00
Ratio of Base Period to High Quarter Earnings	2.98	0.90	1.30	2.41	3.24	3.72	4.00
Weekly Benefit Amount	98.52	49.99	25.00	68.00	97.00	134.00	223.00
Weeks of Eligibility	22.22	9.76	1.00	20.00	26.00	26.00	55.00
Fraction of Second Spells in Benefit Year	0.22						

TABLE 6.2-W

Summary Statistics of Work History and UI Entitlements for Females
Number of Individuals in Sample = 1619

Variable	Mean	Std.Dev.	Min.	25%	50%	75%	Max.
Spells for which individual is not eligible for UI: number of spells = 2924							
Base Period Earnings	3630	4300	0	270	2030	5650	32260
High Quarter Earnings	1380	1340	0	220	1150	2080	11580
Average Weekly Earnings	108	93	0	33	100	157	768
Weeks of Work	24.59	19.97	0.00	5.00	21.00	46.00	52.00
Ratio of Base Period to High Quarter Earnings	1.85	1.30	0.00	1.00	1.72	3.02	4.00
Fraction Satisfying Earnings Requirement	0.54						
Spells for eligible nonrecipients: number of spells = 906							
Base Period Earnings	5690	3590	300	2920	4840	7570	27010
High Quarter Earnings	2030	1120	220	1280	1810	2590	9860
Average Weekly Earnings	142	75	17	93	129	180	519
Weeks of Work	39.34	11.88	6.00	30.00	42.00	51.00	52.00
Ratio of Base Period to High Quarter Earnings	2.75	0.78	1.06	2.09	2.77	3.45	4.00
Weekly Benefit Amount	69.37	36.15	10.00	41.00	63.00	90.00	196.00
Weeks of Eligibility	22.93	6.24	1.00	19.00	26.00	26.00	50.00
Fraction Who Meet Stricter Eligiblity Condition	0.39						
Spells for UI recipients: number of spells = 420							
Base Period Earnings	7450	3750	150	4820	7310	9580	21770
High Quarter Earnings	2480	1190	150	1770	2300	2920	8920
Average Weekly Earnings	172	81	20	126	160	206	1011
Weeks of Work	42.45	12.33	13.00	34.00	49.00	52.00	52.00
Ratio of Base Period to High Quarter Earnings	2.96	0.84	1.00	2.40	3.08	3.69	4.00
Weekly Benefit Amount	81.70	39.36	10.00	58.00	78.00	102.00	197.00
Weeks of Eligibility	22.92	8.49	1.00	20.00	26.00	26.00	50.00
Fraction of Second Spells in Benefit Year	0.19						

eligibility discussed in Section 4. In keeping with the format of the previous tables, Tables 6.2-M and 6.2-W divide nonemployment spells into three distinct groups determined by the eligibility and recipiency status of youths during each nonemployment spell they experience. As expected, both the work history variables and the UI entitlement variables increase as one moves down the groupings.

6.2 *Defining Variables in the Empirical Specifications*

Applying the framework presented in Section 5 to investigate the question posed above requires choices for all variables appearing in formula (5.6), which includes U, δ, Z, E, H, M and T. With U representing accumulative unemployment between jobs, the indicator variable δ signifies whether an individual is a UI recipient during the relevant spell of nonemployment, taking a value of 1 if the person collects UI benefits and a value of 0 otherwise. The demographic characteristics considered in the following empirical analysis include the variables

$$
(6.1)\qquad
\begin{aligned}
Z\ :\ \text{AGE} &= \text{age of an individual at the beginning of a} \\
&\qquad \text{nonemployment spell;} \\
\text{EDU} &= \text{education of an individual at the beginning of a} \\
&\qquad \text{nonemployment spell;} \\
\text{RACE} &= \text{dummy variable that takes a value of 1 if an individual's} \\
&\qquad \text{race is non-caucasian;} \\
\text{MARRIED} &= \text{dummy variable that takes a value of 1 if an individual is} \\
&\qquad \text{married at the beginning of a nonemployment spell;} \\
\text{NUMKIDS} &= \text{the number of children in household at the beginning} \\
&\qquad \text{of a nonemployment spell; and} \\
\text{Gender} &= \text{sex of individual.}
\end{aligned}
$$

This leaves the variables E, H, M and T whose specification must capture the structural features of UI programs.

As noted in Section 5, the relationships linking UI entitlements and work-history variables are quite intricate. The two variables comprising UI entitlements are

$$(6.2) \qquad \begin{aligned} E \ : \ WBA &= \text{weekly benefit amount; and} \\ WE &= \text{weeks of eligibility.} \end{aligned}$$

The determination of these entitlements depends on an individual's work-history variables

$$(6.3) \qquad \begin{aligned} H \ : \ AWE &= \text{average weekly earnings;} \\ BPE &= \text{base period earnings;} \\ HQE &= \text{high quarter earnings; and} \\ PQ &= \text{1 if individual quit job for personal reasons or} \\ &\qquad \text{without good cause, and } = 0 \text{ otherwise.} \end{aligned}$$

Besides $PQ = 0$, the values of the above earnings variables must fall into particular regions for individuals to qualify for benefits (i.e., for WBA and WE, to be nonzero).[13] Assuming eligibility, State UI systems use a variety of formulae relating the variables AWE, BPE and HQE to assign WBA and WE.[14] These formulae can depend on sophisticated interactions involving the various earnings measures, and all programs introduce nonlinearities through lower and upper thresholds in benefits. To capture these interactions and nonlinearities, the following empirical analysis introduces a set of dummy variables that designate which of a series of brackets contain the combination of AWE, BPE and HQE associated with an individual at the onset of a nonemployment spell.

Measures of WE used in the following empirical analysis also take into account the availability of both extended benefits and supplemental unemployment compensation. Through the extended benefits program, in conjuction with the Federal Government, States provide up to 13 additional weeks of UI benefits during periods of unusually high state unemployment. In addition, from September 1981 through March 1985 an additional 8 to 16 weeks of UI benefits were available to individuals who qualified for extended benefits through the Federal Supplemental Compensation program. If either of these additional benefits were available to an individual during a nonemployment spell and he or she qualified for these

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[13] In this analysis, recall that the fact that a person started a nonemployment spell is implicitly also a part of H, but it need not be made explicit in the empirical specification considered below.

[14] Note that programs using information on weeks worked in the base year (WW) are simply combining information on AWE and BPE since $WW = BPE/AWE$.

benefits, WE at the beginning of the spell is equal to the number of weeks of regular benefits available plus the appropriate number of weeks of extended and supplemental benefits.

The inclusion of extended benefits in the determination of UI entitlements means that macroeconomic variables in the form of the States' unemployment rates enter as arguments of the Φ functions given by (5.2). To account for this factor, and to control for the effects of aggregate economic conditions, the following empirical work incorporates the macroeconomic variables[15,16]

$$
\begin{aligned}
M\ :\ UNRATE =\ & \text{the unemployment rate of the state in which} \\
& \text{an individual resides at the beginning of the} \\
& \text{relevant nonemployment spell; and} \\
EBDUM =\ & \text{dummy variable that takes a value of 1 when extended} \\
& \text{benefits apply in an individual's states of residency during} \\
& \text{the relevant nonemployment spell.}
\end{aligned}
\tag{6.4}
$$

Finally, the only quantity left unspecified is the variable T, which characterizes the taxation structure of UI systems in the financing of programs. To admit the possibility that such program features may have important consequences on the duration of unemployment between jobs, the subsequent empirical work considers only a single measure specified as

$$
\begin{aligned}
UITAX =\ & \text{average tax rate in a State's UI system in which an} \\
& \text{individual resides during the calendar year when a} \\
& \text{nonemployment spell begins.}
\end{aligned}
\tag{6.5}
$$

The data used for $UITAX$ is the total amount of UI tax collections divided by the total amount of wages paid in covered employment in the relevant state and calendar year.[17] Admittedly, this variable can at best serve as only a very crude proxy for marginal tax rates faced by firms in a state, which are the rates relevant for assessing the overall UI subsidy

[15] In the subsequent empirical work, UNRATE is the unemployment rate for the state in question reported for the mid-month of the quarter closest to the start of the nonemployment spell. We obtained this data from the *Monthly Labor Review*.

[16] We are grateful to David Card for supplying us with the data on the variable $EBDUM$ which he originally obtained from the U.S. Department of Labor.

[17] The tax rate data is obtained from the annual issues of "Unemployment Insurance Financial Data" published by the U.S. Department of Labor.

due to incomplete experience ratings. Movements in average tax rates can to some extent capture shifts in UI tax schedules that occur as states adjust rates to cover outlays. It is these shifts that we hope to control with the inclusion of UITAX. This quantity, like those making up M, varies more across states than over time for the same state and, consequently, these quantities in part capture permanent state effects.

6.3 *Representative Cases*

To evaluate the implication of the distributions estimated below, the following discussion compares results for three representative worker types subject to four UI policy regimes which typify the structure of state programs. The cases considered here are prototypes of the data used in this paper to estimate UI effects.

The three worker types are:

$$
\begin{array}{llllll}
 & H_\ell : & AWE = \$100 & HQE = \$1000 & BPE = \$1500 & PQ = 0 \\
(6.6) & H_m : & AWE = \$200 & HQE = \$2000 & BPE = \$8000 & PQ = 0 \\
 & H_h : & AWE = \$500 & HQE = \$5000 & BPE = \$20000 & PQ = 0.
\end{array}
$$

Type H_ℓ is a low-intensity worker who earns \$100 a week for 15 weeks in the base year and 10 weeks in the high quarter; type H_m is a medium-intensity worker who earns \$200 a week for 40 weeks in the base year and 10 weeks in the high quarter; and type H_h is a high-intensity worker who earns \$500 a week for 40 weeks in the base year and for 10 weeks in the high quarter.

The four representative UI policy regimes considered below are:

$$
(6.7)\quad
\begin{aligned}
R_1 &: \text{ eligible if } BPE \geq HQE * 1.5 \text{ and } HQE \geq \$1000 \\
&\quad \text{given eligible}: WBA = .5\ AWE \text{ up to a maximum of } \$150 \\
&\quad\quad WE = .27\ (BPE/WBA) \text{ up to a maximum of } 26 \\
R_2 &: \text{ eligible if } BPE \geq HQE * 1.5 \text{ and } HQE \geq \$1000 \\
&\quad \text{given eligible}: WBA = .5\ AWE \text{ up to a maximum of } \$200 \\
&\quad\quad WE = 26 \\
R_3 &: \text{ eligible if } BPE \geq HQE * 1.5,\ HQE \geq \$1000 \text{ and } WW = BPE/AWE \geq 20 \\
&\quad \text{given eligible}: WBA = .6\ AWE \text{ up to a maximum of } \$250 \\
&\quad\quad WE = 26 \\
R_4 &: \text{ eligible if } BPE \geq HQE * 1.5,\ HQE \geq \$1000 \text{ and } WW = BPE/AWE \geq 20 \\
&\quad \text{given eligible}: WBA = .6\ AWE \text{ up to a maximum of } \$250 \\
&\quad\quad WE = 39
\end{aligned}
$$

Generally these policy regimes offer successfully higher WBA and WE. Regimes R_3 and R_4 impose a more stringent eligibility criteria since they add the restriction that an individual must work at least 20 weeks in the base year to the other threshold requirements on earnings. Under these various programs, the three persons with work histories designated by (6.6) are assigned:

$$
(6.8) \quad
\begin{aligned}
\text{Worker type } H_\ell \;:\; \text{under } R_1 &: WBA = 50\ ,\ WE = 8 \\
R_2 &: = 50\ ,\ = 26 \\
R_3 &: = 0\ ,\ = 0 \\
R_4 &: = 0\ ,\ = 0 \\[1em]
\text{Worker type } H_m \;:\; \text{under } R_1 &: WBA = 100\ ,\ WE = 20 \\
R_2 &: = 100\ ,\ = 26 \\
R_3 &: = 120\ ,\ = 26 \\
R_4 &: = 120\ ,\ = 39 \\[1em]
\text{Worker type } H_h \;:\; \text{under } R_1 &: WBA = 150\ ,\ WE = 26 \\
R_2 &: = 200\ ,\ = 26 \\
R_3 &: = 250\ ,\ = 26 \\
R_4 &: = 250\ ,\ = 39
\end{aligned}
$$

Of course, all of these UI entitlement assignments presume that each individual in question did not quit his or her job for personal reasons or left employment under other circumstances that would result in disqualification.

7. The Influence of UI Programs on Nonemployment

This section describes the specification and the estimation of the duration distribution associated with the lengths of nonemployment spells, referred to as $f(\ell|\delta, E, T, PA)$ in the previous discussion. This type of distribution permits investigation of the effects of UI programs on the lengths of nonemployment spells, whereas the goal of most other work in this area has been to assess the effects of UI on unemployment spells. The implication of this analysis for durations of unemployment will be taken up in Section 10 where these results are combined with findings developed in the next two sections.

7.1 *Duration Distributions and Survivor Functions*

A duration distribution characterizes the likelihood that an individual experiences a particular number of weeks in a specific labor market status given initial entry into the status. A formulation for such a distribution is given by

$$f(\ell|X) = S(\ell-1)\,[1 - P(X,\ell)] \tag{7.1}$$

with

$$S(\ell-1) = \prod_{t=1}^{\ell-1} P(X,\, t) \tag{7.2}$$

where $P(X,\, t)$ represents a probability that conditions on the variables X and t. The function $f(\ell|X)$ specifies the probability that duration in a status will last exactly ℓ weeks for individuals falling into a category characterized by attributes X who are known to have entered the status at some time. The literature designates the quantity $S(\ell-1)$ as the survivor function; it indicates the probability that individuals in this category will experience at least $\ell-1$ weeks in the status. For the problem of concern in this analysis, $f(\ell|X) = f(\ell|\delta, E, T, PA)$; that is ℓ corresponds to the duration of a nonemployment spell and the covariates X include all the variables incorporated in the attributes δ, E, T, H, Z and M.

In the specification of the probabilities $P(X,\, t)$, the variables X are set at the time of entry into the status, and the variable t represents the level of duration accumulated up to the point of evaluation. The literature terms the influence of t on P as duration dependence. If

$P(X, t)$ increases (decreases) as a function of t, then positive (negative) duration dependence is said to exist.

Proposing a specification for f and S requires the acquisition of some basic information concerning the appropriate functional form for the probabilites $P(X, t)$. Learning about two aspects of this functional form are critical prior to estimation. The first involves the nature of duration dependence applicable for the data under investigation, which primarily determines how P varies with t. The second concerns the possibility that the central features of duration dependence change as one alters the values of X. An indication of such a possibility means that one must admit an interaction between X and t in the specification of P to capture the underlying nature of the relationship.

7.2 *Exploratory Data Analysis*

Plotting hazard rates is a popular mode for presenting information about the character of duration dependence. A hazard rate is defined as follows:

$$H(\ell) = f(\ell)/S(\ell - 1) = 1 - P(X, \ell). \tag{7.3}$$

One can construct estimates of $H(\ell)$ for nonemployment spells by selecting a sample composed of all the separate observations on spell lengths associated with some value of the attributes X. Calculating the fraction of all spells that end in exactly ℓ weeks estimates $f(\ell)$, and computing the fraction of all spells that exceeds $\ell - 1$ weeks estimates $S(\ell - 1)$. Plotting $H(\ell)$ against ℓ indicates how $P(X, \ell)$ varies as a function of ℓ.

Figures 7.1–M and 7.1–W present graphs of empirical hazards for nonemployment spells;[18] the designation "M" indicates graphs for the sample of men and "W" signifies graphs for women. In this exploratory data exercise, the covariates X merely consist of the UI-receipt indicator variable δ. Each figure reports two plots: one for occurrences during which UI receipt took place at any time during the spell (i.e. for nonemployment spells associated with $X = \delta = 1$); and a second plot for occurrences in which no UI benefits are collected (i.e. when $X = \delta = 0$).

These figures reveal two important properties of duration dependence in nonemployment episodes. First, the probability P is not a monotonic function of t. It initially increases in

[18] The calculation of these hazards assumes two-week intervals.

FIGURE 7.1-M
Empirical Hazard Rates for Nonemployment Spells
By UI Status

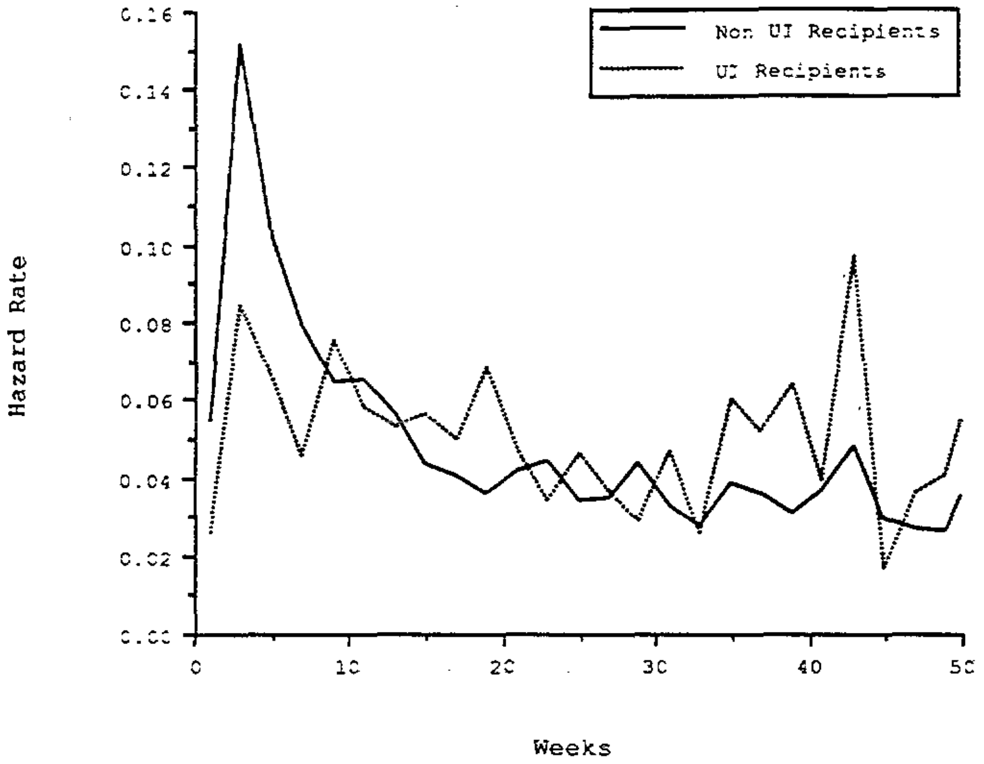
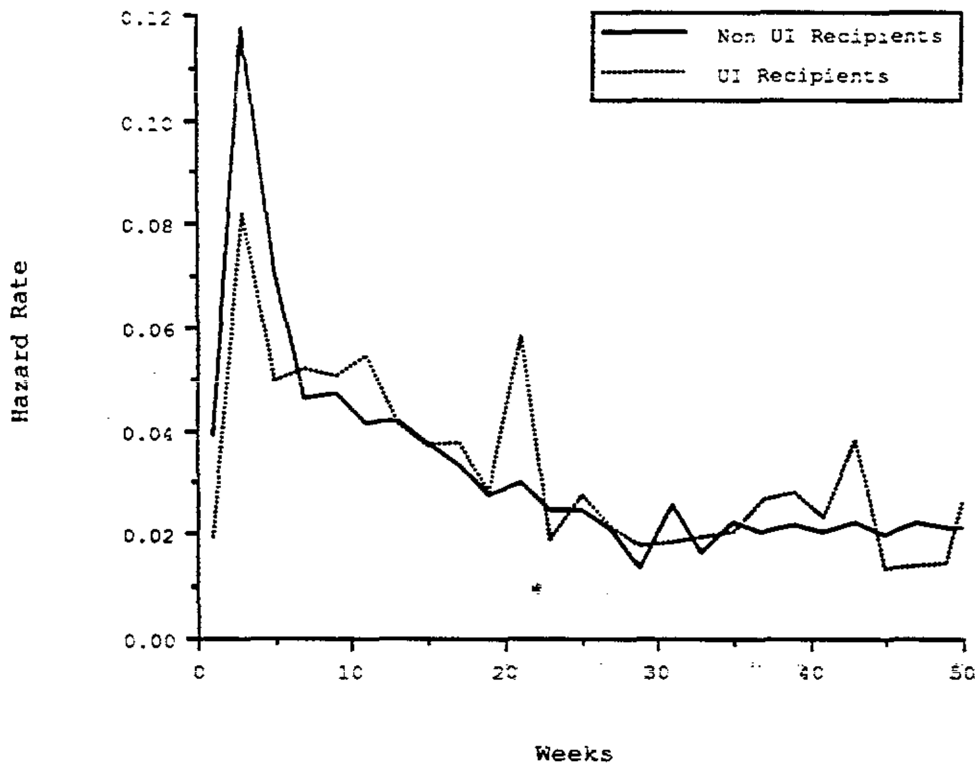


FIGURE 7.1-W
Empirical Hazard Rates for Nonemployment Spells
by UI Status



t, then sharply decreases, and then slowly declines for durations above 10 weeks. Second, there are differences in the form of duration dependence between UI and non-UI episodes. For non-UI episodes, there is a more exaggerated movement in the hazard at low values of t than at the higher values.

At first impression, one might suspect that these findings are in conflict with those obtained in the existing literature. Beginning with the work of Moffitt (1985), several studies have developed a body of evidence to support the contention that an important and complicated interaction effect exists between UI receipt and duration dependence. This evidence applies to data on duration of unemployment, and it shows that the likelihood of leaving unemployment increases near the exhaustion of UI benefits. Unfortunately, there is no simple way of translating these implications for unemployment durations into an analyses of the lengths of nonemployment spells.

To examine whether our data set supports these implications, Figures 7.2–M and 7.2–W present plots of hazard rates for a concept of unemployment duration that more closely matches the measures used in other studies. In particular, these figures interpret "ℓ" in (7.1)–(7.3) as the accumulative number of weeks of UI receipt within single UI-benefit years, which we imputed from our data.[19]

The picture portrayed by these figures is in agreement with the evidence in the literature that hazard rates associated with unemployment durations tend to rise near points at which UI benefits become exhausted (i.e. at 26 and 39 weeks). Especially in the case of men, the plot in Figure 7.2–M reveals the predicted upturns.

7.3 *An Empirical Specification for Spell Lengths in Nonemployment*

These findings indicate that empirical specifications of the probabilities $P(X, t)$ must admit non-montonic duration dependence and allow the form of this dependence to vary according to the attributes X. While the above data analysis explicitly considers only

[19] Our data do not provide information on the number of weeks an individual collected UI during a nonemployment spell, but do indicate the months in which UI collection took place. To impute our measure of ℓ, we assumed that a benefit year began with an individuals' first week of eligibility in the first month of declared receipt. We calculated ℓ as the maximum number of weeks since the start of a benefit year during those months in which UI benefits were collected and an individual was eligible for benefits. The calculation of the hazard rates presented here assumes three-week intervals.

FIGURE 7.2-M
Empirical Hazard Rate for Weeks of UI Receipt
During a Benefit Year

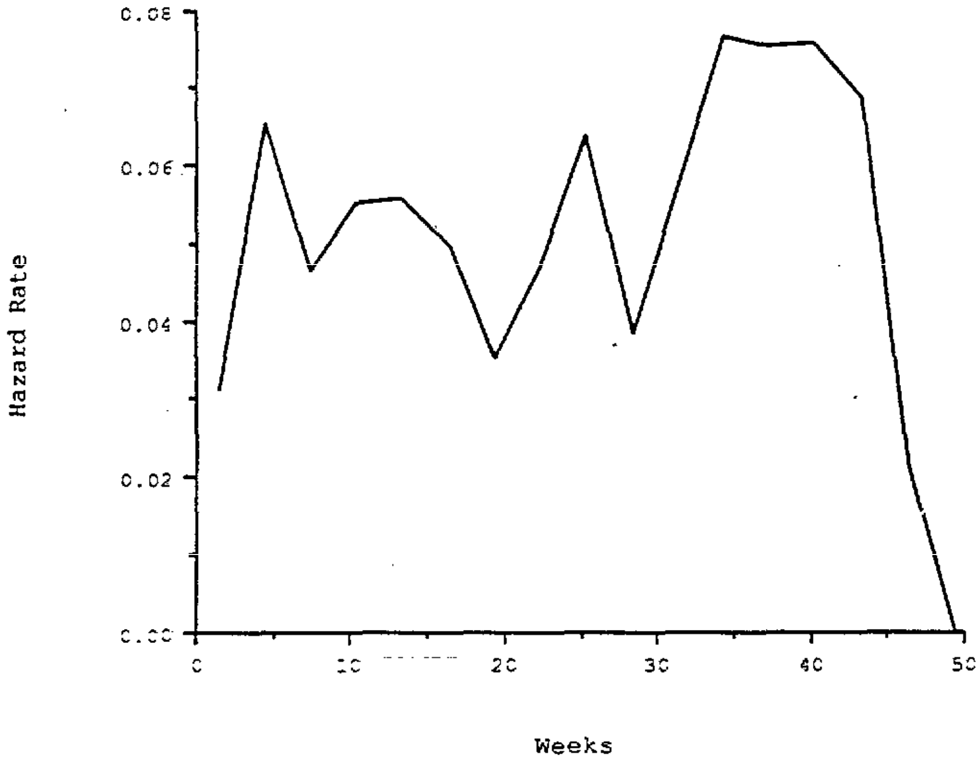
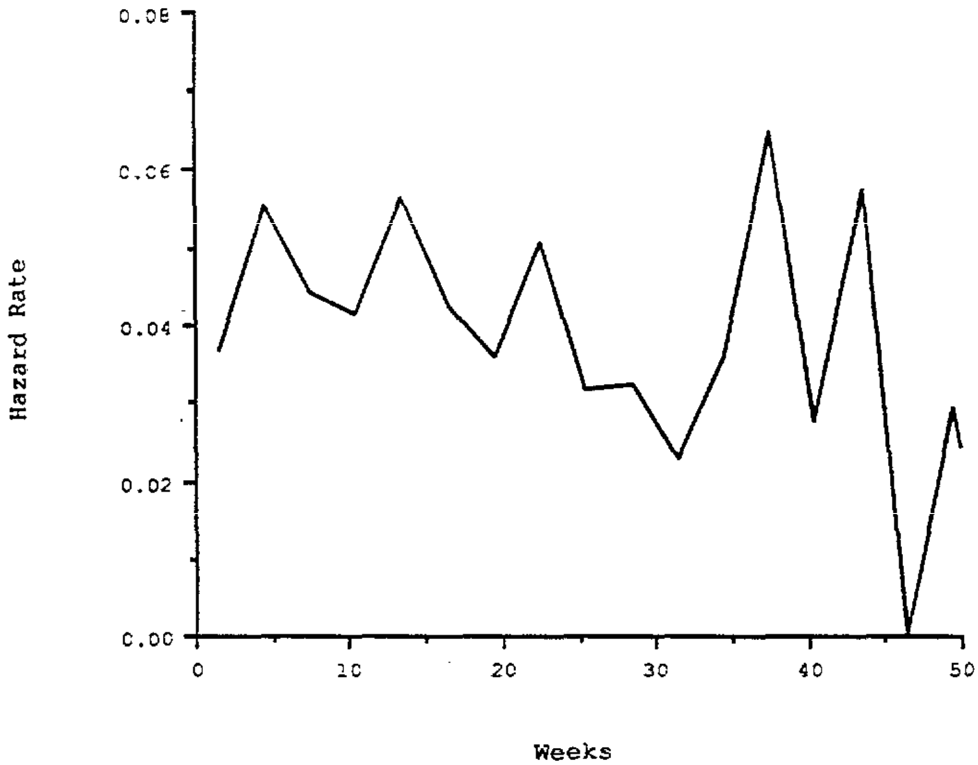


FIGURE 7.2-W
Empirical Hazard Rate for Weeks of UI Receipt
During a Benefit Year



the role of δ as a determinant of duration characteristics, the evidence in the literature and presented in Figures 7.2 clearly suggests that sophisticated interactions are operative between duration and UI entitlements. Accounting for such features rules out "proportional hazards" as a specification for P, which represents one of the most popular choices in the unemployment literature.

The following specification for the probability $P(X,t)$ incorporates the desired features:

(7.4) $$P(X,t) = \frac{1}{1+e^{X_1\beta+g(t,X_2,\alpha)}} .$$

where X_1 and X_2 are vectors of variables made up of the covariates X, β is a parameter vector,

(7.5) $$g(t,X_2,\alpha) = \sum_{j=1}^{K} [\Phi_j(t) - \Phi_{j-1}(t)] \; [\alpha_{0j}X_2 + t\cdot\alpha_{1j}X_2 + t^2\alpha_{2j}X_2]$$

with $\Phi_j(t)$ denoting the cumulative distribution function of a normal random variable possessing mean μ_j and variance σ_j^2, and the α_{ij}'s in (7.5) represent parameter vectors. Specification (7.4) models P as a logit function.

The function $g(t,X_2,\alpha)$ determines the duration properties of nonemployment spells. The presence of X_2 in g allows duration dependence to vary according to all the attributes included in X_2. To describe the characteristics of g, suppose X_2 for the moment only consists of an intercept; so $\alpha_{0j}X_2 + t\alpha_{1j}X_2 + t^2\alpha_{2j}X_2 = \alpha_{0j} + \alpha_{1j}t + \alpha_{2j}t^2$. The presence of the *cdf*'s in (7.5) permit one to incorporate spline features in g so that the quadratic polynomial $\alpha_{0j} + \alpha_{1j}t + \alpha_{2j}t^2$ represents g over only a prespecified range of t. In particular suppose one wishes to set $g = \alpha_{01} + \alpha_{11}t + \alpha_{21}t^2$ for values of t between 0 and t^* and to set $g = \alpha_{02} + \alpha_{12}t + \alpha_{22}t^2$ for values of t between t^* and some upper bound $\bar{t}$. To create a specification of g that satisfies the property, assign $K = 2$ in (7.5); fix the three means determining the *cdf*'s as $\mu_0 = 0$, $\mu_1 = t^*$, $\mu_2 = \bar{t}$; and pick very small values for the three standard deviations σ_0, σ_1, and σ_2. These choices for the μ's and the σ's imply that the quantity $\Phi_1(t) - \Phi_0(t) = 1$ over the range $(0,\ t^*)$ and $= 0$ elsewhere, and the quantity $\Phi_2(t) - \Phi_1(t) = 1$ over the range $(t^*,\ \bar{t})$ and $= 0$ elsewhere. Accordingly, g possesses the desired property. Further, $g(t,X_2,\alpha)$ is differentiable in t. With the values of the μ_i and the σ_i set in advance of estimation, $g(t,X_2,\alpha)$ is strictly linear in the parameters α and in known functions of t and X_2. One can control where each spline or polynomial begins and ends by adjusting the values of the μ's. Also one can control how quickly each spline cuts in and out by adjusting the values of the σ's, with higher values providing for a more gradual and smoother transition from one polynomial to the next.

In the subsequent estimation dealing with nonemployment spells, we pick a specification of $g(t, X_2, \alpha)$ by setting $K = 3$ in (7.5), with $\mu_0 = 0$, $\sigma_0 = 0.5$, $\mu_i = 7$, $\sigma_1 = 0.5$, $\mu_2 = 39$, $\sigma_2 = 2$, $\mu_3 =$ above value of highest spell length. Thus, the polynomial $\alpha_{01} + t\alpha_{11}X_2 + t^2\alpha_{21}X_2$ determines g from 0 to about 7 weeks. Over the 6 to 8 week range, g switches to the polynomial $\alpha_{02}+t\alpha_{12}X_2+t^2\alpha_{22}X_2$ which determines its value until about 39 weeks. Over the 35 to the 43 week interval, g again switches to become the polynomial $\alpha_{03}+t\alpha_{13}X_2+t^2\alpha_{23}X_2$ which it remains for the highest values of duration. The empirical analysis estimates the α coefficients.

The following analysis considers several specifications of the explanatory variables incorporated in X_1 and X_2. A full quadratic (i.e. linear, squares and interaction terms) in the demographic characteristics AGE and EDU listed in (6.1) make up X_1, along with the RACE dummy variable. In the case of women, specifications also include the MARRIED and the NUMKIDS variables. Analyses are done separately for men and women, so all of X implicitly accounts for fully interacted gender effects. All the other variables are made a part of X_2 to allow for interactions with duration. The analysis considers two specifications of the UI entitlement variables listed in (6.2), including

$$\text{(7.6)} \qquad \begin{aligned} &E_1 \;:\; WBA \text{ and } WE \text{ ; and} \\ &E_2 \;:\; \text{all terms of a full quadratic in } WBA \text{ and } WE\,. \end{aligned}$$

In the construction of X_2, the components of E are fully interacted with the indicator variable δ for UI receipt. The empirical work investigates five specifications of the work-history variables listed in (6.3) given by

$$(7.7)\quad \begin{aligned} &H_1 : AWE \text{ and } PQ; \\ &H_2 : \text{dummy variables for brackets of } AWE \text{ and } PQ; \\ &H_3 : AWE, HQE, BPE \text{ and } PQ; \\ &H_4 : \text{all terms of a full quadratic in } AWE, HQE \text{ and } BPE \text{ and } PQ; \text{ and} \\ &H_5 : \text{dummy variables indicating brackets for combinations of} \\ &\qquad AWE, HQE, \text{ and } BPE \text{ and } PQ. \end{aligned}$$

Consideration of H_1 provides a basis for comparison with much of the existing literature, and H_2 admits the possibility of nonlinearities in AWE. Specification H_3 expands the set of work-history variables to include other determinants of UI benefits, and H_4 admits simple interactions and nonlinearities in these quantities. Our preferred specification H_5 allows for sophisticated forms of both interactions and nonlinearities in work-history quantities.[20] Finally, X_2 incorporates the macroeconomic variables $UNRATE$ and $EBDUM$ and the UI taxation rate variable $UITAX$ listed in (6.4) and (6.5).

7.4 *Estimation Results*

To estimate the distribution $f(\ell|X)$, we apply conventional maximum likelihood methods of the sort found in duration analysis to compute values for the coefficients β and α appearing in specification (7.4). Our sample consists of observations on nonemployment spell lengths. Our procedure accounts for right censoring when spells are interrupted in progress. We estimate distinct models for men and women.

We explored a wide variety of alternative empirical specifications for the distribution $f(\ell|X)$. To capture differences in duration dependence between UI and non-UI recipients, the following results incorporate the variables δt , $(1-\delta)t$, δt^2 and $(1-\delta)t^2$ among the interactions $t\,X_2$ and $t^2\,X_2$ appearing in the functions g given by (7.5). After accounting for recipiency status, likelihood ratio tests at conventional levels of significance indicate acceptance of the restriction that no other variables need be incorporated in X_2 in interactions

[20] Specifically, H_5 is made up of dummy variables that indicate the region containing the combination of the three variables AWE, HQE and BPE. In the case of men, H_5 consists of 22 variables; H_5 incorporates 15 variables in the case of women. Appendix B describes the precise formulation of these specifications.

with the polynomial terms t and t^2, including either UI-entitlement or work-history variables.[21] Regarding the inclusion of entitlement variables in X_2 not involved in interactions with the t and t^2 terms, allowing for distinct effects of these variables according to recipiency status means entering the quantities $\delta\, WBA$, $\delta\, WE$, $(1-\delta)\, WBA$ and $(1-\delta) WE$ as components of X_2. Likelihood ratio tests accept linearity in UI benefit variables favoring specification E_1 over E_2 (defined by (7.6)) when interacted with either δ or $(1-\delta)$. Further, empirical results indicate that UI entitlement variables are not important determinants of nonrecipients' behavior, supporting the elimination of the interactions of UI benefits and the non-UI indicator $(1-\delta)$.[22] Finally, conventional testing procedures indicate the significance of both nonlinearities and mutual interactions in work-history variables,[23] which led us to incorporate the most flexible form of H given by H_5 (involving the set of bracket variables in (7.7)) as components of X_2.

Tables 7.1–M and 7.1–W present coefficient estimates and standard errors for two specifications of the probability $P(X, t)$ consistent with the test results described above: model A and model B. The letters "M" and "W" associated with each table indicate whether the estimates refer to men or women. Model A is a specification that incorporates both of the entitlement variables WBA and WE as factors influencing the nonemployment spell lengths of UI recipients, with separate effects permitted for durations of 1–7, 8–39, and 40+ weeks (i.e. in the different splines). Inspection of the results reveals that the variable $\delta\, WE$ enters

[21] Thus, in the specification of g in (7.5), one can accept the hypothesis that $t\alpha_{1j} X_2 + t^2\alpha_{2j} X_2 = (\alpha_{11j}\, t + \alpha_{12j}\, t^2)\,\delta + (\alpha_{21j}\, t + \alpha_{22j}\, t^2)\ (1-\delta)$, where the coefficients α_{11j}, α_{12j}, α_{21j} and α_{22j} are free parameters. We also considered measuring duration as $(t - WE)$ rather than just as t in an attempt to capture the notion of time left until UI exhaustion, but the variables $(t - WE)$ and $(t - WE)^2$ never entered specifications significantly.

[22] While likelihood ratio tests formally reject the hypothesis that the variable $(1-\delta)\, WBA$ does not enter as a component of X_2 for the 1–7 week spline in the specification reported below, the evidence indicates that this variable becomes insignificant if one allows quit variables to have effects that varies by worker type. Because this more complex specification implies essentially the same predictions as the ones described below based on a simple specification that merely excludes $(1-\delta)\, WBA$ with only PQ entered as a single component of X_2, we report estimates only for this more straightforward parameterization.

[23] One cannot, of course, apply likelihood ratio statistics to test among the five specifications of work history variables because these specifications are nonnested. While H_1, H_3 and H_4 are mutually nested, as are H_2 and H_5, these two groups are not nested. Likelihood ratio tests reject H_1 and H_3 in favor of H_4, and reject H_2 in favor of H_5. Our impression is that one would accept H_5 over H_4 using an Akaike information test. We choose H_5 as our base specification to guard against biases in estimates of UI entitlement effects.

TABLE 7.1-M

Parameter Estimates of Nonemployment Duration Probabilities

Estimates of P(X,t)

(Standard Errors in Parentheses)

	Model A			Model B		
Log Likelihood	-12940.985			-12942.573		
Variables in X_1						
AGE	-0.2472 (0.1208)			-0.2559 (0.1206)		
EDU	0.1284 (0.0920)			0.1273 (0.0917)		
AGE*EDU	-0.0011 (0.0045)			-0.0010 (0.0045)		
AGE^2	0.0060 (0.0030)			0.0062 (0.0032)		
EDU^2	-0.0036 (0.0032)			-0.0036 (0.0032)		
RACE	-0.2837 (0.0481)			-0.2829 (0.0486)		
Variables in X_2	Spell Length 1-7 Weeks	Spell Length 8-39 Weeks	Spell Length 40+ Weeks	Spell Length 1-7 Weeks	Spell Length 8-39 Weeks	Spell Length 40+ Weeks
PQ	0.0351 (0.0568)	-0.2446 (0.0728)	0.0657 (0.1528)	0.0317 (0.0568)	-0.2443 (0.0727)	0.0661 (0.1526)
UITAX	-0.0570 (0.0589)	0.0304 (0.0678)	-0.1007 (0.1817)	-0.0540 (0.0589)	0.0300 (0.0675)	-0.1021 (0.1789)
UNRATE	-0.0025 (0.0112)	-0.0168 (0.0125)	-0.0032 (0.0259)	-0.0023 (0.0112)	-0.0168 (0.0124)	-0.0030 (0.0256)
EBDUM	-0.3448 (0.0611)	-0.3837 (0.0683)	-0.0704 (0.1461)	-0.3480 (0.0610)	-0.3831 (0.0679)	-0.0704 (0.1457)
$(1-\delta)$	-0.7386 (1.3824)	-0.1921 (1.3327)	-1.1449 (1.3416)	-0.6460 (1.3796)	-0.0992 (1.3298)	-1.0521 (1.3357)
$(1-\delta)*t$	0.2699 (0.0757)	-0.0849 (0.0210)	-0.0135 (0.0075)	0.2686 (0.0757)	-0.0849 (0.0210)	-0.0135 (0.0075)
$(1-\delta)*t^2$	-0.0482 (0.0105)	0.0015 (0.0005)	0.00003 (0.00003)	-0.0480 (0.0105)	0.0015 (0.0005)	0.00003 (0.00003)
δ	-1.706 (1.4323)	0.3611 (1.3807)	-1.0309 (1.6911)	-1.3550 (1.4168)	0.4463 (1.3741)	-0.9501 (1.6805)
$\delta*t$	0.5115 (0.1998)	-0.0813 (0.0374)	-0.0017 (0.0242)	0.5074 (0.1997)	-0.0812 (0.0374)	-0.0017 (0.0241)
$\delta*t^2$	-0.0787 (0.0273)	0.0016 (0.0009)	-0.0001 (0.0001)	-0.0785 (0.0273)	0.0016 (0.0009)	-0.0001 (0.0001)
δ*WE	-0.0177 (0.0083)	-0.0215 (0.0068)	0.0011 (0.0182)	-0.0144 (0.0081)	-0.0216 (0.0065)	0.0004 (0.0156)
δ*WBA	0.0033 (0.0019)	-0.0001 (0.0019)	-0.0004 (0.0049)			

TABLE 7.1-W

Parameter Estimates of Nonemployment Duration Probabilities

Estimates of P(X,*t*)

(Standard Errors in Parentheses)

	Model A			Model B		
Log Likelihood	-14678.397			-14680.740		
Variables in X_1						
AGE	-0.1564 (0.1114)			-0.1556 (0.1115)		
EDU	0.3399 (0.0974)			0.3412 (0.0973)		
AGE*EDU	-0.0159 (0.0048)			-0.0159 (0.0048)		
AGE^2	0.0071 (0.0030)			0.0071 (0.0030)		
EDU^2	0.0041 (0.0029)			0.0041 (0.0029)		
RACE	-0.4115 (0.0532)			-0.4100 (0.0532)		
MARRIED	-0.2840 (0.0408)			-0.2845 (0.0408)		
NUMKIDS	0.0099 (0.0281)			0.0102 (0.0280)		
Variables in X_2	Spell Length 1-7 Weeks	Spell Length 8-39 Weeks	Spell Length 40+ Weeks	Spell Length 1-7 Weeks	Spell Length 8-39 Weeks	Spell Length 40+ Weeks
PQ	-0.0827 (0.0582)	-0.3606 (0.0632)	-0.1562 (0.0952)	-0.0850 (0.0581)	-0.3584 (0.0632)	-0.1580 (0.0951)
UITAX	-0.1404 (0.0606)	-0.0291 (0.0627)	-0.1409 (0.1127)	-0.1409 (0.0606)	-0.0275 (0.0628)	-0.1416 (0.1125)
UNRATE	0.0271 (0.0126)	0.0048 (0.0126)	-0.0098 (0.0173)	0.0266 (0.0126)	0.0050 (0.0126)	-0.0101 (0.0172)
EBDUM	-0.6565 (0.0663)	-0.5190 (0.0638)	-0.3548 (0.1115)	-0.6581 (0.0663)	-0.5182 (0.0637)	-0.3550 (0.1114)
$(1-\delta)$	-3.3601 (1.3102)	-2.6412 (1.2630)	-3.0886 (1.2636)	-3.3726 (1.3101)	-2.6586 (1.2629)	-3.1010 (1.2636)
$(1-\delta)*t$	0.4553 (0.0786)	-0.0744 (0.0188)	-0.0176 (0.0038)	0.4558 (0.0786)	-0.0745 (0.0188)	-0.0176 (0.0038)
$(1-\delta)*t^2$	-0.0818 (0.0109)	0.0011 (0.0004)	0.00004 (0.00001)	-0.0818 (0.0109)	0.0011 (0.0004)	0.00004 (0.00001)
δ	-3.7805 (1.4408)	-1.4847 (1.3869)	-2.9705 (2.2505)	-3.3931 (1.4289)	-1.7000 (1.3792)	-2.8211 (2.1865)
$\delta*t$	0.5647 (0.2697)	-0.0600 (0.0535)	0.0089 (0.0485)	0.5609 (0.2697)	-0.0604 (0.0533)	0.0089 (0.0479)
$\delta*t^2$	-0.0802 (0.0356)	0.0006 (0.0013)	-0.0002 (0.0003)	-0.0801 (0.0356)	0.0006 (0.0104)	-0.0002 (0.0003)
δ*WE	-0.0284 (0.0117)	-0.0389 (0.0105)	-0.0243 (0.0190)	-0.0266 (0.0115)	-0.0391 (0.0104)	-0.0243 (0.0187)
δ*WBA	0.0050 (0.0030)	-0.0025 (0.0024)	0.0021 (0.0056)			

as significant determinants of spell lengths, but the variable δWBA never enters according to conventional t-tests. Likelihood ratio tests further indicate that weekly benefit amounts are insignificant factors when one entertains their joint elimination from all splines.[24] In recognition of these findings, the estimation reported for model B excludes WBA as a determinant of nonemployment durations.

7.5 *Implications of the Empirical Findings*

These empirical results support the contention that the benefits offered by UI programs influence the amount of time that youths spend between jobs. While the weekly benefit amounts paid by programs have essentially no effect on the durations of nonemployment spells, the number of weeks of UI eligibility offered by a program does have a significant impact on spell lengths. Referring to the estimates associated with model B, for UI recipients an increase in WE raises the probability of remaining in nonemployment (i.e. the probability $P(X,\, t)$) during the first 1–39 weeks of a spell experienced by men and has basically no effect on this probability after 39 weeks. (This implication follows from the observation that δWE has a negative coefficient in the splines 1–7 and 8–39 weeks and has a positive but insignificant coefficient in the 40+ week spline.) In the case of women UI recipients, an increase in WE raises the probability of staying in nonemployment throughout the entire length of a spell.

To explore the policy implications of these findings, Figures 7.3–M, 7.3–W, 7.4–M, 7.4–W and 7.5–M present plots of estimated survivor functions for nonemployment spells for several configurations of the covariates X. Associated with each figure title is a letter "M" or "W": the letter "M" denotes that the plots are for white men; and "W" signifies graphs for white women who are unmarried without children.[25] All figures present survivor plots associated with 25-year-old high-school graduates. The predictions rely on model B estimates in recognition of the evidence that weekly benefit amounts do not affect nonemployment durations.[26]

[24] According to our evidence, the finding that WBA is a statistically insignificant determinant of $f(\ell|X)$ does not change when one substitutes a measure of the wage replacement ratio for WBA. Wage replacement ratios, regardless of how they are measured, are also statistically insignificant at conventional levels of confidence.

[25] Further, it is assumed that an individual did not quit his or her job (so $PQ = 0$) and $EBDUM = 0$. The variables $UNRATE$ and $UITAX$ are set at their sample means which are 8% and 1.5% respectively.

[26] The predictions presented below do not change if one instead uses the estimates obtained for model A.

FIGURE 7.3-M
Survivor Functions for Work History H_1 Under Various UI Regimes

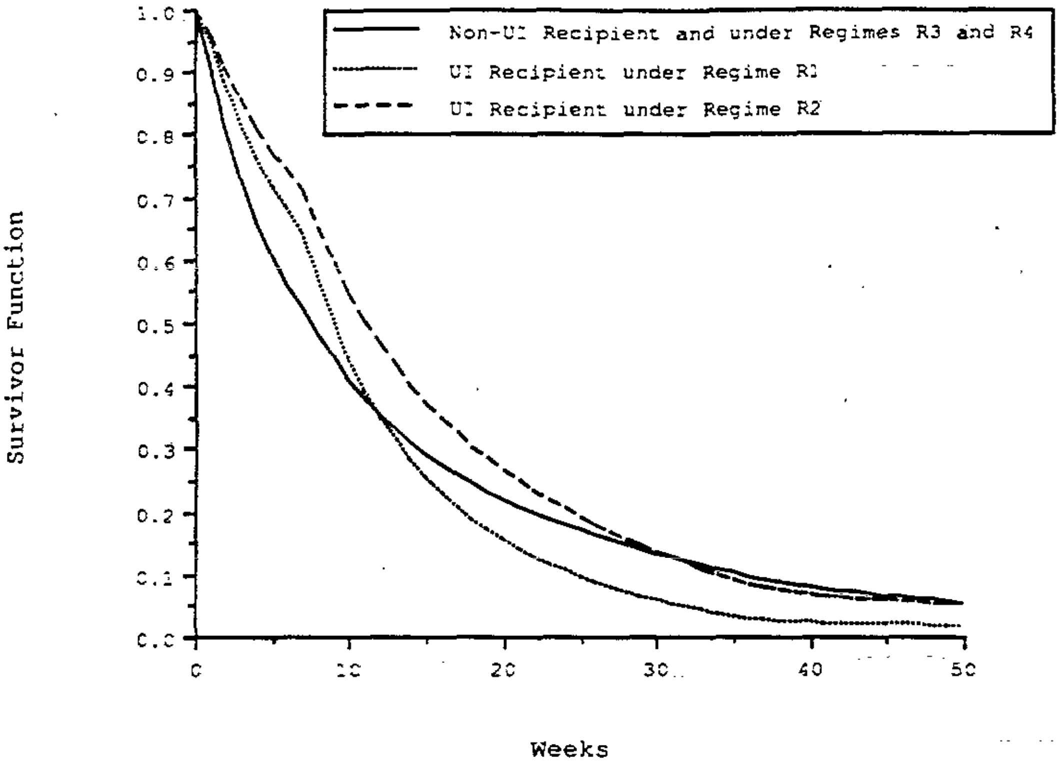


FIGURE 7.3-W
Survivor Functions for Work History H_1 Under Various UI Regimes

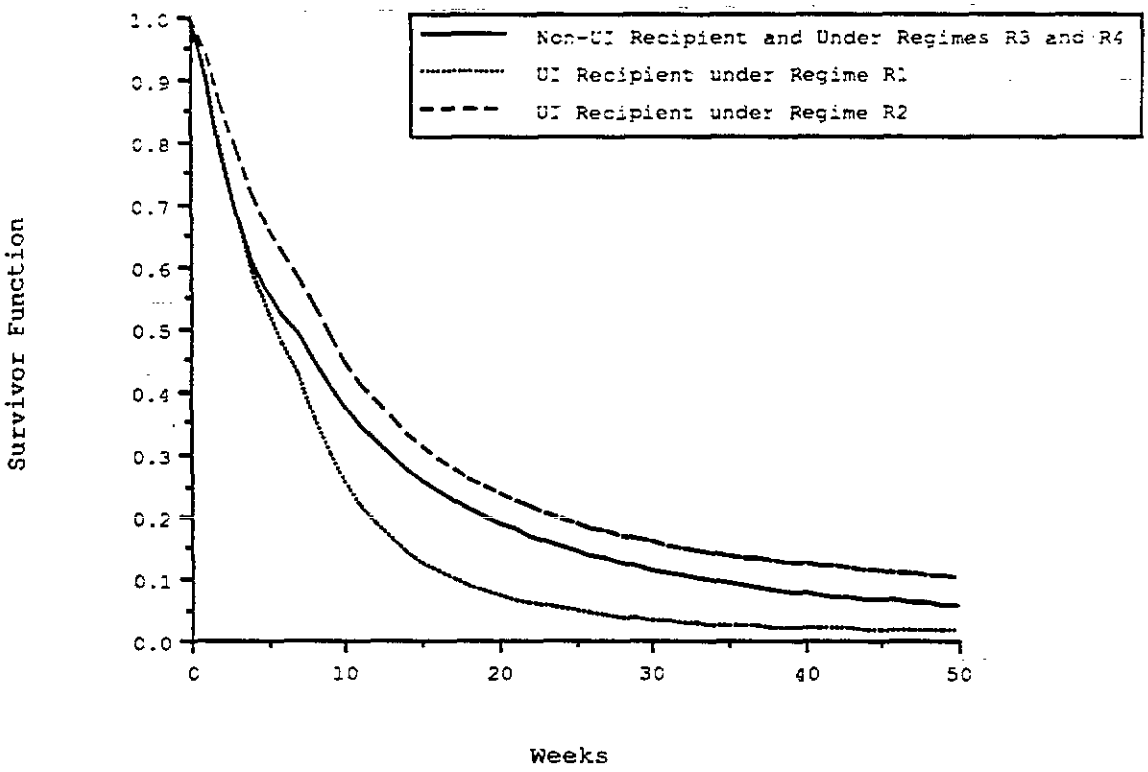


FIGURE 7.4-M
Survivor Functions for Work History H_m Under Various UI Regimes

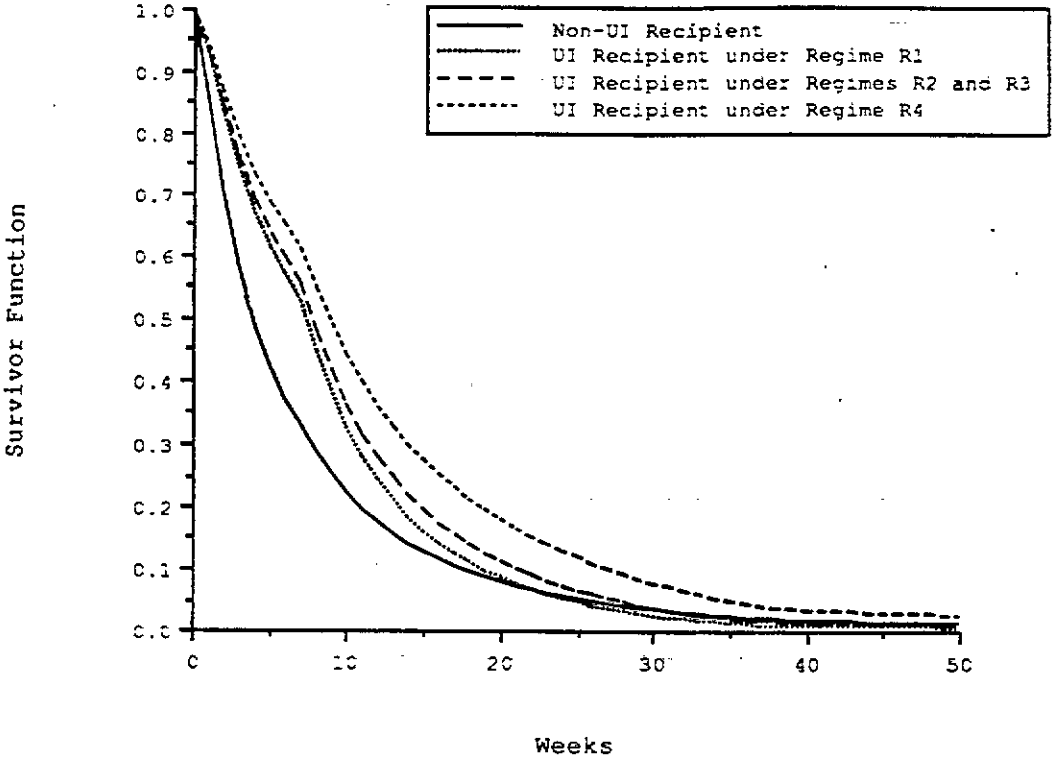


FIGURE 7.4-W
Survivor Functions for Work History H_m Under Various UI Regimes

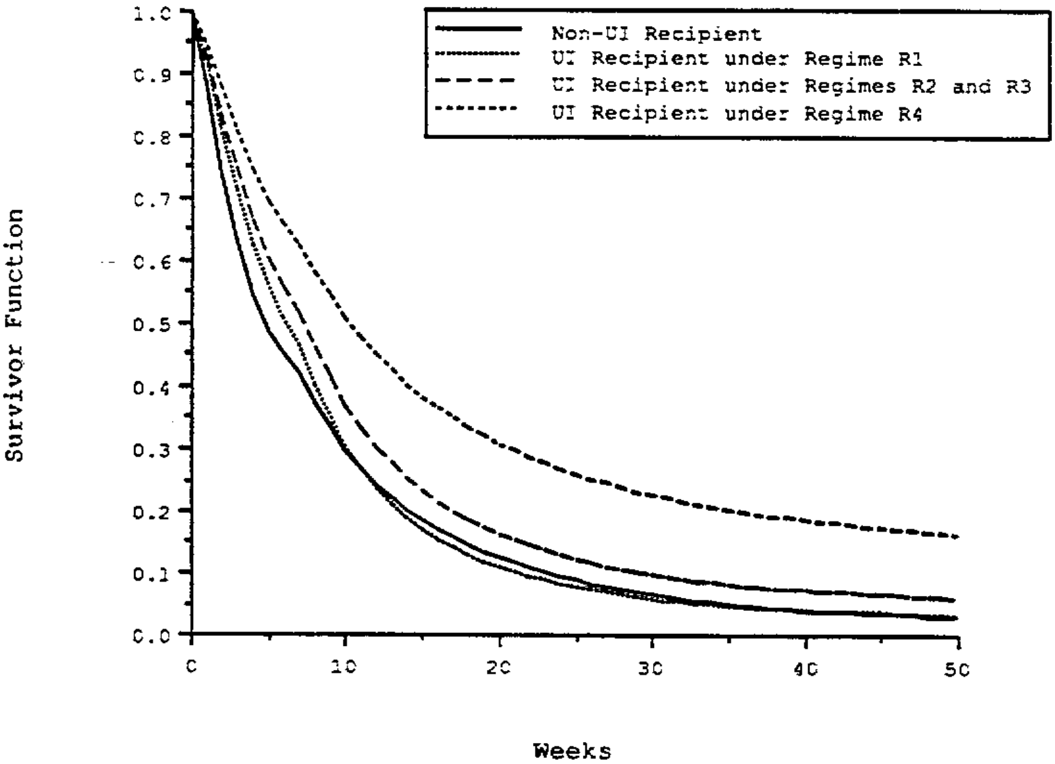
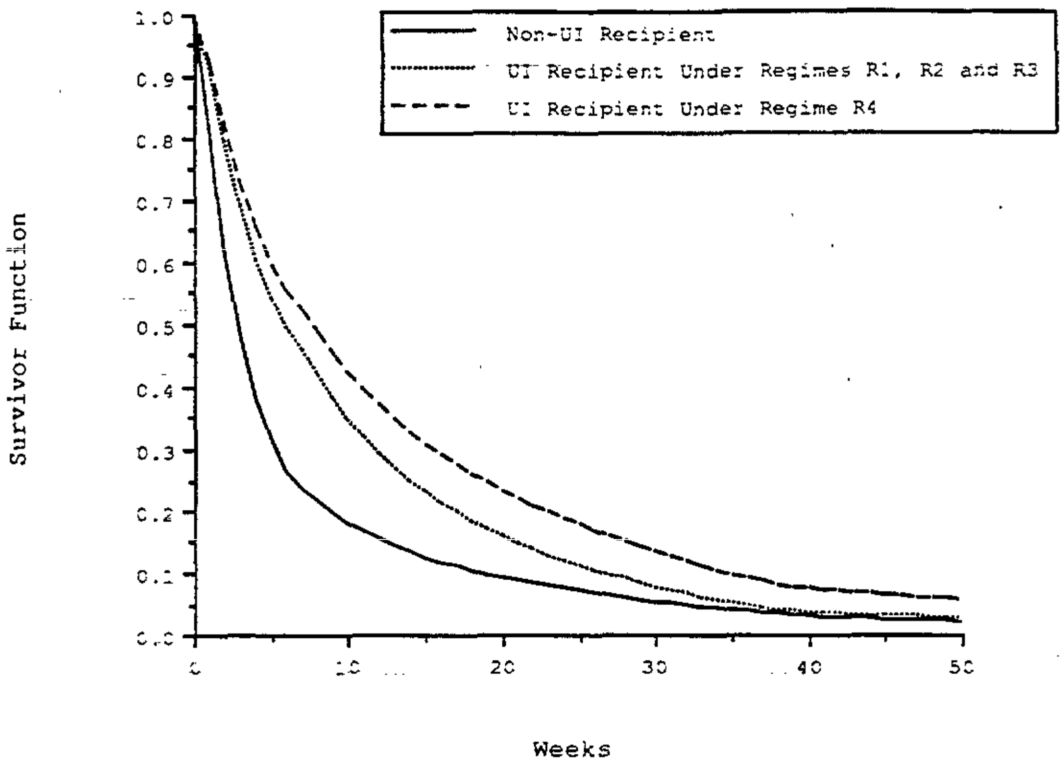


FIGURE 7.5-M
Survivor Functions for Work History H_h Under Various UI Regimes



These figures characterize survivor functions for the three representative worker types operating under the four prototype UI policy regimes described in Section 6.3 (see descriptions (6.6), (6.7) and (6.8)). Figures 7.3 portray the situation for a low-intensity worker (i.e. H_ℓ) under regimes R_3 and R_4 in which this individual is noneligible and a non-UI recipient during the nonemployment spell, and under regimes R_1 and R_2 as a UI recipient. Figures 7.4 characterize analoguous situations for a medium-intensity worker (i.e. H_m) as a non-UI recipient and as a recipient under regimes R_1, R_2, R_3 and R_4. As indicated in (6.8), the value of WE assigned to worker type H_m is the same under R_2 and R_3; so a single curve accounts for the effects of these regimes. Finally, Figure 7.5–M describes the circumstances for a high-intensity worker (i.e. H_h). For this worker type, WE is the same under R_1, R_2 and R_3, and a single plot summarizes their effect. A women's version of Figure 7.5–M is not presented because worker type H_h is quite atypical for women, as Table 6.2–W reveals.

Inspection of these figures suggests three conclusions. First, in the case of men, UI recipients experience longer nonemployment spells on average than non-UI recipients with the same attributes, at least up to the point where weeks of UI eligibility run out. Second, in the case of women, there is no systematic ranking of nonemployment durations between individuals collecting UI and those not receiving benefits. Third, regardless of whether one considers men or women, UI-recipients with more weeks of UI eligibility (i.e. higher WE) tend to experience longer spells.

Shifts in the WBA still have an imperceptable effect on nonemployment durations.

8. The Effects of UI on Unemployment Proportions

This section presents estimated variants of the distribution describing the proportion of a nonemployment spell categorized as unemployment. The previous discussion designates this time-proportion distribution as $f(\rho|\ell, \delta, E, T, PA)$, which one may simply write as $f(\rho|\ell, X)$ where the covariates X incorporate all the variables making up the measures δ, E, H, Z, M, and T. The estimation results obtained here provide an indication of the role that a youth's UI entitlements play in explaining his or her decision to report nonworking time as unemployment or as OLF.

8.1 *Specifying a Time-Proportion Distribution*

To admit a flexible form for $f(\rho \mid \ell, X)$, this analysis develops a statistical framework that predicts whether ρ falls within particular brackets. Divide the sample space of ρ into the three regions: $I_n = \{\rho : \rho = 0\}$; $I_s = \{\rho : 0 < \rho < 1\}$; and $I_a = \{\rho : \rho = 1\}$. The bracket I_n designates a situation in which no unemployment occurs during a nonemployment episode; the interval I_s signifies the reporting of some unemployment; and I_a denotes the circumstance in which an individual classifies all of a spell as unemployment. To refine the category of some unemployment, further divide the interval I_s into the following seven sub-brackets: $I_{s_1} = \{\rho : 0 < \rho \leq .15\}$; $I_{s_2} = \{\rho : .15 < \rho \leq .30\}$; $I_{s_3} = \{\rho : .30 < \rho \leq .45\}$; $I_{s_4} = \{\rho : .45 < \rho < .55\}$; $I_{s_5} = \{\rho : .55 \leq \rho < .70\}$; $I_{s_6} = \{\rho : .70 \leq \rho < .85\}$; and $I_{s_7} = \{\rho : .85 \leq \rho < 1\}$. Define the probabilities:

$$Pr_i(\ell, X) = \text{Prob}(\rho \,\varepsilon\, I_i \mid \ell, X) \qquad i = n, s, a, s_1, \ldots, s_7. \tag{8.1}$$

These quantities determine the likelihood that the value of ρ falls in the range covered by the interval I_i for a nonemployment spell characterized by attributes X that lasts ℓ weeks. Of course, $Pr_s(\ell, X) = \sum_{j=s_1}^{s_7} Pr_j(\ell, X)$.

The statistical model introduced to parameterize these probabilities is a member of the multinomial logit class. In particular, the specifications estimated in the subsequent analysis take the form:

$$Pr_i(\ell, X) = \frac{e^{X_1\beta_i + g(\ell, X_2, \alpha_i)}}{\sum_{j=n,s,a} e^{X_1\beta_j + g(\ell, X_2, \alpha_j)}}, \qquad i = n, s, a, \tag{8.2}$$

and

$$(8.3) \qquad Pr_k(\ell, X)/Pr_s(\ell, X) = \frac{e^{X_1\beta_k + g(\ell, X_2, \alpha_k)}}{\sum_{j=s_1}^{s_7} e^{X_1\beta_j + g(\ell, X_2, \alpha_j)}} \qquad k = s_1, \ldots s_7,$$

where all quantities are defined analogously to those appearing in (7.4). Since

$$Pr_{s_k}(\ell, X)/Pr_s(\ell, X) = \text{Prob}(\rho \in I_{s_k} \mid \rho \in I_s, \ell, X),$$

the quantities in (8.3) represent the probabilities that ρ falls in the sub-brackets I_{s_k} conditional on ρ being between 0 and 1. Thus, parameterization (8.2) models the events $\rho \in I_n$, $\rho \in I_s$ and $\rho \in I_a$ as a three-state multinomial logit, and parameterization (8.3) models the events $\rho \in I_{s_k}$ conditional on $\rho \in I_s$ as a seven-state multinomial logit. The functions $g(\ell, X_2, \alpha)$ appearing in these specifications capture how cell probabilities vary in response to changes in the lengths of nonemployment spells, instead of determining any sort of duration dependence which was their role in the previous discussion. The $g(\cdot)$ functions in (8.2) are specified in the same way as designated in Section 7.3, with splines turning on and off at 0, 7 and 39 weeks. The functions $g(\cdot)$ appearing in (8.3) have the same form for the splines 7–39 and 40+ weeks, but the splines covering the range 1–7 require modifications which are described below to account for the fact that ρ falls in some brackets with zero probability for each value of $\ell \leq 7$.

8.2 *Estimation Results for the Broad Classification of Unemployment Proportions*

Even a casual inspection of the findings reported in Tables 6.1–M and 6.1–W indicates that one captures most of the variation in the values of ρ across nonemployment spells in the YNLS by analyzing movement among the three categories: $\rho = 0$; $0 < \rho < 1$; and $\rho = 1$. For men, only about 20–25 percent of the spells involve time allocated to both unemployment and OLF during the spell (i.e. involve the situation $0 < \rho < 1$), regardless of whether one considers just UI recipients or not. For women, this figure rises to around 40 percent. Summarizing the movement of ρ among these broad classifications requires measurement of the three probabilities: $Pr_n \equiv Pr_n(\ell, X)$ = the likelihood of $\rho = 0$ or of no unemployment during a nonemployment spell; $Pr_s \equiv Pr_s(\ell, X)$ = the likelihood of $0 < \rho < 1$ or of some unemployment; and $Pr_a \equiv Pr_a(\ell, X)$ = the likelihood of $\rho = 1$ or of all unemployment.

To estimate these probabilities, we apply standard maximum likelihood procedures in a multinomial logit framework to compute values for the parameters β and α appearing in specification (8.2). Our sample consists of observations on the fractions of each nonemployment spell reported as unemployment. The values of the covariates X are set at the time of entry into the nonemployment spell associated with the observation. We estimate separate models for men and women.

The covariates X_1 and X_2 incorporated in specifications (8.2) of the probabilities Pr_n, Pr_s and Pr_a are made up of the same variables introduced in Sections 7.3 and 7.4. In particular, X_1 includes demographic characteristics. The set of interactions ℓX_2 and $\ell^2 X_2$ appearing in the functions $g(\cdot)$ – specified by (7.5) with ℓ replacing t – contain the terms $\delta \ell$, $(1-\delta)\ell$, $\delta \ell^2$ and $(1-\delta)\ell^2$, which allows for differences in the relationships linking nonemployment spell lengths and probabilities according to recipiency status.[27] Concerning the components of X_2 not involved in interactions with the ℓ and the ℓ^2 terms, the analysis incorporates the macroeconomic and the UI-tax-structure variables along with the flexible set of work-history variables designated by H_5 in (7.7).[28] In addition, the analysis includes the variables $\delta\, WBA$ and $\delta\, WE$ as components of X_2 to capture the effects of UI benefits on the fraction of a nonemployment spell reported as unemployment by UI recipients.[29] Likelihood ratio tests accept linearity in entitlement variables when interacted with δ. Further, test results support the elimination of the variables $(1-\delta)\, WBA$ and $(1-\delta)\, WE$ at conventional levels of confidence, which indicates that UI entitlements are not significant determinants of nonrecipients' behavior.

[27] It is crucial to recognize that no variables of the form δX_2 (i.e. interactions of variables with δ) enter the specification of the "no employment" probability Pr_n. If UI receipt is always accompanied by part of a nonemployment spell being reported as unemployment – which of course, should be the case – then an indication of UI receipt means that $Pr_n = \text{Prob}(\rho = 0 \mid \ell, X) = 0$. Formally, this implies that the β coefficient associated with the indicator variable in Pr_n takes a value of minus infinity. We set this coefficient to account for this fact. Also, this factor motivated us to normalize parameters associated with the probability corresponding to the event $\rho = 1$ rather than to the event $\rho = 0$. In the subsequent analysis, variables of the form δX_2 enter specifications of both of the other probabilities Pr_s and Pr_a.

[28] Likelihood ratio and Akaike Information test results indicate that the simpler specifications of the work-history variables given by H_1, H_2, H_3 and H_4 are rejected in favor of the more elaborate formulation H_5 as determinants of the probabilities Pr_n, Pr_s and Pr_a.

[29] For reasons described in footnote 27, these variables enter as determinants of the probabilities Pr_s and Pr_a, but $\delta\, WBA$ and $\delta\, WE$ are not entered in the specification of Pr_n.

Tables 8.1–M and 8.1–W present parameter estimates associated with the time proportion probabilities given by (8.2). As before, the designation "M" in a table heading identifies results for men and "W" denotes values for women. The first page of each table reports estimates corresponding to the "some unemployment" probability Pr_s, and the second page gives results for the "no unemployment" probability Pr_n (in which $\delta\, WBA$ and $\delta\, WE$ do not appear since $Pr_n = 0$ for UI recipients). As an arbitrary normalization, the coefficients in the "all unemployment" probability are set equal to zero; so Pr_s and Pr_n are measured relative to Pr_a. Two sets of estimates appear in each table: model A and model B. Model A is a parameterization that includes both of the UI benefit variables WBA and WE as determinants of the amount of unemployment experienced by UI recipients during nonemployment episodes. The analysis constrains coefficient estimates associated with these variables to be equal across the spell lengths of 1–7 and 8–39 weeks because only a small number of UI recipients have nonemployment spells less than 8 weeks.[30] Inspection of the findings for men reveals that the variable $\delta\, WBA$ enters as a significant determinant of the classification of ρ, but the variable $\delta\, WE$ never enters individually in any spline according to conventional t-tests or jointly in all splines according to a likelihood ratio test. For women, neither $\delta\, WBA$ or $\delta\, WE$ enters as a significant determinant of the likelihood that ρ falls in various regions, regardless of whether one applies individual or joint testing procedures. In recognition of these findings, model B reports parameter estimates with $\delta\, WE$ excluded in the case of men, and with both $\delta\, WBA$ and $\delta\, WE$ eliminated in the case of women.

Inspection of the results for model B reveals either small or nonexistent effects of UI entitlements on the likelihood that individuals shift their classification of nonemployment from partial to full unemployment given their recipiency status. According to the findings in Table 8.1–M, for men an increase in the weekly benefit amount reduces the probability Pr_s relative to Pr_a for nonemployment spell lengths in the range of 1–39 weeks – this is the meaning of the negative coefficient estimate on the variable $\delta\, WBA$ associated with this range

[30] In the case of men, only 34 UI recipients have spells 7 weeks or less. The number is 22 in the case of women. While we constrained the effects of the entitlement variables WBA and WE to be equal for recipients in the 1–39 week range, we allowed the polynomials in ℓ to vary freely with only the quadratic term in the 1–7 week splines eliminated.

TABLE 8.1-M

Parameter Estimates of Time Proportion Probabilities of Some, No, and All Unemployment

Estimates of Pr_s

(Standard Errors in Parentheses)

	Model A			Model B		
Log Likelihood	-3170.917			-3172.063		
Variables in X_1						
AGE	-0.2131 (0.3277)			-0.1890 (0.3277)		
EDU	-0.2441 (0.2448)			-0.2682 (0.2448)		
AGE*EDU	-0.0010 (0.0115)			-0.0005 (0.0115)		
Age^2	0.0037 (0.0079)			0.0037 (0.0079)		
EDU^2	0.0147 (0.0084)			0.0154 (0.0084)		
RACE	0.1077 (0.1169)			0.1152 (0.1167)		
Variables in X_2	Spell Length 1-7 Weeks	Spell Length 8-39 Weeks	Spell Length 40+ Weeks	Spell Length 1-7 Weeks	Spell Length 8-39 Weeks	Spell Length 40+ Weeks
PQ	0.5197 (0.2297)	0.0593 (0.1652)	-0.3030 (0.3467)	0.5244 (0.2296)	0.0620 (0.1653)	-0.3000 (0.3466)
UITAX	-0.0312 (0.2124)	-0.0035 (0.1538)	0.7088 (0.3687)	-0.0173 (0.2117)	0.0008 (0.1541)	0.7096 (0.3684)
UNRATE	-0.0569 (0.0427)	-0.0730 (0.0286)	-0.0551 (0.0566)	-0.0582 (0.0424)	-0.0698 (0.0285)	-0.0547 (0.0566)
EBDUM	-0.0983 (0.2321)	0.0190 (0.1561)	-0.7023 (0.3325)	-0.1028 (0.2320)	0.0373 (0.1556)	-0.6888 (0.3291)
$(1-\delta)$	-1.2605 (3.9029)	3.3234 (3.7218)	2.1887 (3.8612)	-1.3717 (3.9042)	3.1659 (3.7237)	2.0666 (3.8606)
$(1-\delta)*l$	1.7880 (0.4380)	0.0313 (0.0464)	0.0413 (0.0138)	1.7839 (0.4379)	0.0316 (0.0464)	0.0412 (0.0138)
$(1-\delta)*l^2$	-0.1591 (0.0515)	0.0002 (0.0011)	-0.0001 (0.00005)	-0.1586 (0.0515)	0.0002 (0.0011)	-0.0001 (0.00005)
δ	3.2388 (3.8770)	3.7037 (3.8488)	-3.5758 (4.1701)	3.6329 (3.8649)	4.1388 (3.8376)	-3.5218 (4.1532)
$\delta*l$	-0.0097 (0.1316)	-0.1309 (0.0891)	0.1241 (0.0407)	-0.0012 (0.1305)	-0.1307 (0.0889)	0.1235 (0.0405)
$\delta*l^2$		0.0042 (0.0020)	-0.0004 (0.0001)		0.0042 (0.0020)	-0.0004 (0.0001)
δ*WBA	-0.0071 (0.0033)		0.0044 (0.0098)	-0.0076 (0.0032)		0.0054 (0.0084)
δ*WE	0.0177 (0.0139)		0.0071 (0.0340)			

TABLE 8.1-M (cont.)

Parameter Estimates of Time Proportion Probabilities of Some, No, and All Unemployment

Estimates of Pr_n

(Standard Errors in Parentheses)

	Model A			Model B		
Log Likelihood	-3170.917			-3172.063		
Variables in X_1						
AGE	0.1902 (0.2924)			0.1946 (0.2926)		
EDU	-0.1603 (0.2424)			-0.1723 (0.2427)		
AGE*EDU	-0.0036 (0.0111)			-0.0038 (0.0111)		
AGE^2	-0.0049 (0.0073)			-0.0050 (0.0073)		
EDU^2	0.0165 (0.0078)			0.0168 (0.0076)		
RACE	-0.3695 (0.1163)			-0.3673 (0.1163)		
Variables in X_2	Spell Length 1-7 Weeks	Spell Length 8-39 Weeks	Spell Length 40+ Weeks	Spell Length 1-7 Weeks	Spell Length 8-39 Weeks	Spell Length 40+ Weeks
PQ	1.9100 (0.1231)	1.3348 (0.1774)	0.8829 (0.4601)	1.9103 (0.1231)	1.3359 (0.1774)	0.8858 (0.4600)
UITAX	-0.1281 (0.1381)	0.1722 (0.1911)	0.0196 (0.5940)	-0.1248 (0.1381)	0.1749 (0.1912)	0.0190 (0.5937)
UNRATE	-0.0531 (0.0264)	-0.1575 (0.0365)	-0.0083 (0.0820)	-0.0534 (0.0264)	-0.1561 (0.0365)	-0.0081 (0.0820)
EBDUM	0.1491 (0.1478)	0.3435 (0.1966)	-1.2794 (0.4579)	0.1477 (0.1478)	0.3520 (0.1965)	-1.2691 (0.4566)
$(1-\delta)$	-1.6657 (3.4422)	-0.8163 (3.3353)	-3.6433 (3.3596)	-1.6440 (3.4471)	-0.8144 (3.3402)	-3.6302 (3.5958)
$(1-\delta)*l$	0.4593 (0.1664)	-0.0515 (0.0517)	0.0413 (0.0253)	0.4585 (0.1664)	-0.0517 (0.0517)	0.0413 (0.0253)
$(1-\delta)*l^2$	-0.0729 (0.0234)	0.0013 (0.0013)	-0.0001 (0.0001)	-0.0728 (0.0234)	0.0013 (0.0013)	-0.0001 (0.0001)

TABLE 8.1-W

Parameter Estimates of Time Proportion Probabilities of Some, No, and All Unemployment

Estimates of Pr_s

(Standard Errors in Parentheses)

	Model A			Model B		
Log Likelihood	-3337.304			-3338.234		
Variables in X_1						
AGE	-0.1275 (0.3329)			-0.1286 (0.3325)		
EDU	-0.2303 (0.2931)			-0.2314 (0.2928)		
AGE*EDU	0.0162 (0.0138)			0.0164 (0.0138)		
AGE^2	-0.0036 (0.0087)			-0.0036 (0.0087)		
EDU^2	-0.0024 (0.0062)			-0.0027 (0.0061)		
RACE	-0.1848 (0.1439)			-0.1747 (0.1430)		
MARRIED	0.1765 (0.1158)			0.1717 (0.1186)		
NUMKIDS	0.2004 (0.0854)			0.2025 (0.0853)		
Variables in X_2	Spell Length 1-7 Weeks	Spell Length 8-39 Weeks	Spell Length 40+ Weeks	Spell Length 1-7 Weeks	Spell Length 8-39 Weeks	Spell Length 40+ Weeks
PQ	0.7971 (0.2144)	0.3457 (0.1770)	0.2909 (0.4479)	0.7923 (0.2136)	0.3439 (0.1770)	0.2841 (0.4454)
UITAX	-0.0134 (0.2290)	-0.2193 (0.1701)	0.4934 (0.4315)	-0.0082 (0.2275)	-0.2122 (0.1700)	0.5068 (0.4250)
UNRATE	-0.0367 (0.0473)	-0.1349 (0.0342)	-0.0737 (0.0733)	-0.0363 (0.0472)	-0.1339 (0.0339)	-0.0824 (0.0716)
EBDUM	-0.2524 (0.2588)	-0.0478 (0.1738)	-0.2343 (0.3822)	-0.2518 (0.2580)	-0.0437 (0.1731)	-0.2394 (0.3706)
$(1-\delta)$	-2.1372 (4.0388)	3.1426 (3.8889)	3.2672 (4.5213)	-2.1290 (4.0372)	3.1351 (3.8878)	3.3437 (4.5142)
$(1-\delta)*l$	1.8732 (0.4227)	0.1793 (0.0535)	0.0444 (0.0631)	1.8723 (0.4228)	0.1790 (0.0535)	0.0447 (0.0628)
$(1-\delta)*l^2$	-0.1637 (0.0500)	-0.0031 (0.0013)	-0.0001 (0.0004)	-0.1635 (0.0500)	-0.0031 (0.0013)	-0.0001 (0.0004)
δ	1.3425 (4.0091)	1.8005 (4.0577)	4.6489 (5.2444)	1.8422 (3.9741)	2.2195 (4.0112)	3.5046 (5.1781)
$\delta*l$	0.0178 (0.1674)	0.1295 (0.1124)	0.0195 (0.1093)	0.0088 (0.1667)	0.1295 (0.1105)	0.0133 (0.0951)
$\delta*l^2$		-0.0013 (0.0027)	0.00002 (0.0007)		-0.0013 (0.0027)	0.00004 (0.0006)
δ*WE	0.0063 (0.0179)		-0.0043 (0.0077)			
δ*WBA	0.0030 (0.0045)		-0.0329 (0.0365)			

TABLE 8.1-W (cont.)

Parameter Estimates of Time Proportion Probabilities of Some, No, and All Unemployment

Estimates of Pr_n

(Standard Errors in Parentheses)

	Model A			Model B		
Log Likelihood	-3337.304			-3338.234		
Variables in X_1						
AGE	-0.2287 (0.3072)			-0.2289 (0.3072)		
EDU	-0.0088 (0.2717)			-0.0102 (0.2717)		
AGE*EDU	0.0024 (0.0115)			0.0026 (0.0115)		
AGE^2	0.0041 (0.0078)			0.0040 (0.0078)		
EDU	0.0028 (0.0057)			0.0027 (0.0057)		
RACE	-0.4889 (0.1338)			-0.4827 (0.1335)		
MARRIED	0.7722 (0.1097)			0.7688 (0.1096)		
NUMKIDS	0.2701 (0.0787)			0.2717 (0.0787)		
Variables in X_2	Spell Length 1-7 Weeks	Spell Length 8-39 Weeks	Spell Length 40+ Weeks	Spell Length 1-7 Weeks	Spell Length 8-39 Weeks	Spell Length 40+ Weeks
PQ	1.9740 (0.1323)	1.2354 (0.1770)	1.0988 (0.4637)	1.9723 (0.1323)	1.2343 (0.1770)	1.0920 (0.4614)
UITAX	0.0581 (0.1461)	-0.0014 (0.1799)	0.4595 (0.4568)	0.0598 (0.1460)	0.0038 (0.1798)	0.4718 (0.4517)
UNRATE	-0.0362 (0.0298)	-0.1289 (0.0371)	-0.0436 (0.0761)	-0.0361 (0.0298)	-0.1283 (0.0370)	-0.0518 (0.0747)
EBDUM	-0.0487 (0.1659)	-0.1866 (0.1898)	-0.3381 (0.4098)	-0.0484 (0.1659)	-0.1839 (0.1895)	-0.3431 (0.4005)
$(1-\delta)$	1.5836 (3.7781)	1.4514 (3.6243)	0.4410 (4.3204)	1.5923 (3.7786)	1.4449 (3.6246)	0.5082 (4.3104)
$(1-\delta)*l$	0.2432 (0.1832)	0.1509 (0.0541)	0.0461 (0.0632)	0.2421 (0.1832)	0.1506 (0.0541)	0.0465 (0.0629)
$(1-\delta)*l^2$	-0.0368 (0.0257)	-0.0027 (0.0013)	-0.0001 (0.0004)	-0.0366 (0.0257)	-0.0027 (0.0013)	-0.0001 (0.0004)

– and it induces no significant change in probabilities for the 40+ week spells. This translates into the prediction that an increase in WBA raises the likelihood that a UI recipient claims all of a spell as unemployment for nonemployment durations of less than 40 weeks. In the case of women, the results for model A indicate the absence of significant UI entitlement effects; so model B excludes all UI benefit variables.

8.3 *Estimation Results for the Division of the Some Unemployment Classification*

Before one can fully explore the implications of these empirical findings, one requires more elaborate information about the variation of ρ within the "some unemployment" category. This involves estimating the way in which the event $\rho \in I_s$ breaks down into the seven sub-events $\rho \in I_{s_k}$, $s_k = s_1, \ldots s_7$. Specifications (8.3) represent the probabilities governing the allocation of ρ across the sub-intervals $I_{s_1}, \ldots, I_{s_7}$.

The forms of these specifications estimated here are quite simple due to the sparcity of observations in the interval $0 < \rho < 1$ and in order to avoid the introduction of a substantial number of parameters. The covariates X_1 and X_2 in (8.3) consist of only constant terms and indicators of UI receipt. In particular, X_1 incorporates the variable δ, and X_2 includes only an intercept term. After considerable exploratory data analysis, no other quantities appear to serve as important determinants of the variation of ρ among the intervals $I_{s_1}, \ldots, I_{s_7}$.

In specifying the splines making up the function $g(\ell, X_2, \alpha)$ in (8.3), one must introduce a modification to account for the fact that ρ falls in various combinations of the intervals with zero probability. We incorporate this modification via the specification

$$g(\ell, X_2, \alpha) = \left[\Phi_1(\ell) - \Phi_0(\ell)\right] \left[\psi d_k + \alpha_{01k} + \alpha_{11k}\ell + \alpha_{21k}\ell^2\right] \sum_{j=2}^{3} \left[\Phi_j(\ell) - \Phi_{j-1}(\ell)\right] \left[\alpha_{0jk} + \alpha_{1jk}\ell + \alpha_{2jk}\ell^2\right], \quad (8.4)$$

where d_k is a dummy varible defined below and the coefficient ψ has an assigned value that is large and negative. As in the former specification of g given by (7.5), relation (8.4) expresses g as a linear combination of three splines that turn on and off at 0, 7 and 39 weeks. Thus, the only difference in this specification and the former one concerns the presence of the quantity $\psi\, d_k$. For values of ℓ in which $\text{Prob}(\rho \in I_{s_k} \mid \rho \in I_s,\ \ell,\ X) = 0$, we set $d_k = 1$ (so, $\psi\, d_k$ is a large negative value); otherwise, we set $d_k = 0$.[31] In addition, because of the numerous instances when probabilities take zero values for the cases $\ell \leq 7$, one cannot estimate three free parameters in the first spline for all cells. In recognition of this situation, we eliminiate the minimal number of coefficients in each cell.[32]

To estimate these specifications of conditional probabilities, we apply a conventional maximum likelihood procedure for the multinomial logit model to compute values for the parameters β and α appearing in formulation (8.3). Our sample consists of observations on ρ for those nonemployment spells in which $0 < \rho < 1$. We estimate separate models for men and for women.

Tables 8.2–M and 8.2–W present parameter estimates for men and women, respectively. The analysis sets all coefficients associated with the cell $I_{s_6} = \{\rho : .70 \leq \rho < .85\}$ equal to zero to establish identification;[33] so no results appear for this cell. Consequently, all probabilities are measured relative to $Pr_{s_6}(\ell, X)/Pr_s(\ell, X)$.

8.4 *Implications of the Empirical Results*

To translate the above empirical findings into implications about the influence of UI policies, Tables 8.3–M and 8.3–W report predictions for time proportion probabilities for various worker types and UI program regimes. These tables present estimates of the probabilities $Pr_i = Pr_i(\ell, X)$ given by (8.2) for $i = n, s_1, \ldots, s_7, a$, which characterize the distribution $f(\rho|\ell, X)$ over the entire range of ρ from 0 to 1. The analysis creates predictions of these probabilities using the estimated specifications of (8.2) and (8.3) described above for models B. The tables report predictions of Pr_i for the three representative worker types and the four prototype UI program regimes described in Section 6.3 (see descriptions (6.6), (6.7) and (6.8)). The reference demographic group assumed in Table 8.3–M is 25-year-old white men

[31] Thus, for the cases $k = s_1, s_7$, $d_k = 1$ when $\ell = 1, 2, 3, 4, 5, 6$. For the cases $k = s_2, s_6$, $d_k = 1$ when $\ell = 1, 2, 3$. For the cases $k = s_3, s_5$, $d_k = 1$ when $\ell = 1, 2, 4$. For the case $k = s_4$, $d_k = 1$ when $\ell = 1, 3, 5, 7, 9$; in addition for this last case, $d_k = -1$ when $\ell = 2$ since the conditional probability equals one.

[32] More specifically, for the case $k = s_1, s_7$, one can incorporate only the intercept coefficient α_{01k}; and for the case $k = s_4$ one can admit only the intercept and the linear coefficients α_{01k} and α_{11k}.

[33] While normalization on a cell probability that can take a value of zero – which occurs for cell s_6 when $\ell = 1, 2, 3$ – may appear to leave the identification of parameters unresolved, such is not the case due to the implicit restrictions arising from the polynomials in the functions g which force probabilities to follow a simple pattern for the alternative values of ℓ.

TABLE 8.2-M

Parameter Estimates of Time Proportion Probabilities of Interior Cells

Estimates of $Pr_k(l,X)/Pr_s(l,X)$

(Standard Errors in Parentheses)

Name	Variables in X_1	Variables in X_2		
		Spell Length 1-7 Weeks	Spell Length 8-39 Weeks	Spell Length 40+ Weeks
$Pr(\rho \in I_{s_1} \mid \rho \in I_s)$				
Intercept		3.6610 (1.9468)	-2.0287 (1.1092)	1.7013 (2.0242)
Linear Term			0.1814 (0.1124)	-0.0258 (0.0501)
Quadratic Term			-0.0032 (0.0025)	0.0002 (0.0003)
δ	-1.2023 (0.4760)			
$Pr(\rho \in I_{s_2} \mid \rho \in I_s)$				
Intercept		9.1705 (11.6836)	-0.3084 (0.9738)	1.9429 (2.0407)
Linear Term		-4.0640 (4.7184)	0.0776 (0.1062)	-0.0387 (0.0503)
Quadratic Term		0.4440 (0.4674)	-0.0021 (0.0025)	0.0002 (0.0003)
δ	-1.0188 (0.4485)			
$Pr(\rho \in I_{s_3} \mid \rho \in I_s)$				
Intercept		3.1590 (26.6772)	-1.6498 (1.0073)	-1.4132 (2.6155)
Linear Term		-2.0278 (9.6181)	0.1935 (0.1077)	0.0380 (0.0655)
Quadratic Term		0.2877 (0.8606)	-0.0046 (0.0025)	-0.0002 (0.0004)
δ	-0.0374 (0.3873)			
$Pr(\rho \in I_{s_4} \mid \rho \in I_s)$				
Intercept		-3.2587 (1.9258)	-0.9868 (1.2660)	0.5398 (2.2127)
Linear Term		0.8002 (0.3947)	0.1002 (0.1368)	-0.0114 (0.0547)
Quadratic Term			-0.0028 (0.0032)	0.0001 (0.0003)
δ	-0.2126 (0.4276)			

TABLE 8.2-M (cont.)

Parameter Estimates of Time Proportion Probabilities of Interior Cells

Estimates of $Pr_k(l,X)/Pr_s(l,X)$

(Standard Errors in Parentheses)

Name	Variables in X_1	Variables in X_2		
		Spell Length 1-7 Weeks	Spell Length 8-39 Weeks	Spell Length 40+ Weeks
$Pr(\rho \in I_{s_5} \mid \rho \in I_s)$				
Intercept		2.8034 (26.6763)	-2.2058 (1.1730)	-0.4280 (2.0913)
Linear Term		-1.8858 (9.6179)	0.1962 (0.1217)	0.0067 (0.0511)
Quadratic Term		0.2735 (0.8606)	-0.0044 (0.0028)	0.00003 (0.0004)
δ	0.6294 (0.3689)			
$Pr(\rho \in I_{s_7} \mid \rho \in I_s)$				
Intercept		2.8011 (1.9922)	-2.1076 (1.0940)	1.1264 (2.5078)
Linear Term			0.1882 (0.1160)	-0.0248 (0.0631)
Quadratic Term			-0.0043 (0.0027)	0.0001 (0.0003)
δ	0.0184 (0.4204)			

TABLE 8.2-W

Parameter Estimates of Time Proportion Probabilities of Interior Cells

Estimates of $Pr_k(l,X)/Pr_s(l,X)$

(Standard Errors in Parentheses)

Name	Variables in X_1	Variables in X_2		
		Spell Length 1-7 Weeks	Spell Length 8-39 Weeks	Spell Length 40+ Weeks
$Pr(\rho \in I_{s_1} \mid \rho \in I_s)$				
Intercept		0.1423 (1.3759)	-1.0544 (1.1672)	4.8146 (1.6818)
Linear Term			0.2193 (0.1237)	-0.0705 (0.0399)
Quadratic Term			-0.0038 (0.0028)	0.0004 (0.0002)
δ	-1.3863 (0.4078)			
$Pr(\rho \in I_{s_2} \mid \rho \in I_s)$				
Intercept		3.7443 (11.7522)	0.6163 (1.1534)	4.5392 (1.6990)
Linear Term		-0.6852 (4.4537)	0.0968 (0.1246)	-0.0817 (0.0402)
Quadratic Term		0.0137 (0.4163)	-0.0026 (0.0029)	0.0004 (0.0002)
δ	-0.9877 (0.4265)			
$Pr(\rho \in I_{s_3} \mid \rho \in I_s)$				
Intercept		-16.8795 (23.1913)	1.4635 (1.2196)	2.7549 (1.7921)
Linear Term		6.6742 (8.2490)	-0.0797 (0.1311)	-0.0660 (0.0412)
Quadratic Term		-0.6341 (0.7269)	0.0018 (0.0030)	0.0004 (0.0002)
δ	-0.0064 (0.4236)			
$Pr(\rho \in I_{s_4} \mid \rho \in I_s)$				
Intercept		5.8524 (2.5059)	1.1177 (1.2421)	2.4964 (1.9112)
Linear Term		-0.8990 (0.4704)	-0.0114 (0.1356)	-0.0632 (0.0440)
Quadratic Term			-0.0004 (0.0032)	0.0004 (0.0002)
δ	0.0494 (0.4451)			

TABLE 8.2-W (cont.)

Parameter Estimates of Time Proportion Probabilities of Interior Cells

Estimates of $Pr_k(l,X)/Pr_s(l,X)$

(Standard Errors in Parentheses)

Name	Variables in X_1	Variables in X_2: Spell Length 1-7 Weeks	Spell Length 8-39 Weeks	Spell Length 40+ Weeks
$Pr(\rho \in I_{s_5} \mid \rho \in I_s)$				
Intercept		-14.7028 (22.8649)	0.7813 (1.2810)	2.8697 (1.8700)
Linear Term		5.0873 (8.0972)	-0.0087 (0.1399)	-0.0665 (0.0436)
Quadratic Term		-0.4346 (0.7109)	-0.0002 (0.0033)	0.0003 (0.0002)
δ	-0.2433 (0.4595)			
$Pr(\rho \in I_{s_7} \mid \rho \in I_s)$				
Intercept		0.1544 (1.5003)	-0.6097 (1.5176)	2.2625 (2.7291)
Linear Term			0.0474 (0.1610)	-0.0516 (0.0723)
Quadratic Term			-0.0011 (0.0037)	0.0002 (0.0004)
δ	0.6009 (0.4488)			

TABLE 8.3-M

Predictions of Time Proportion Probabilities

Nonemployment Duration	Employment History	UI Regime	UI Receipt	Pr_n	Pr_{s_1}	Pr_{s_2}	Pr_{s_3}	Pr_{s_4}	Pr_{s_5}	Pr_{s_6}	Pr_{s_7}	Pr_a
4 Weeks	H_l	All	No	0.26	0.00	0.05	0.00	0.05	0.00	0.06	0.00	0.57
	H_l	R_1,R_2	Yes	0.00	0.00	0.04	0.00	0.09	0.00	0.10	0.00	0.77
20 Weeks	H_l	All	No	0.08	0.06	0.06	0.06	0.05	0.04	0.04	0.04	0.56
	H_l	R_1,R_2	Yes	0.00	0.01	0.01	0.04	0.02	0.04	0.03	0.02	0.82
39 Weeks	H_l	All	No	0.10	0.18	0.12	0.05	0.04	0.05	0.10	0.06	0.30
	H_l	R_1,R_2	Yes	0.00	0.05	0.04	0.04	0.03	0.08	0.09	0.05	0.63
	H_m	All	No	0.23	0.00	0.03	0.00	0.04	0.00	0.05	0.00	0.65
4 Weeks	H_m	R_1,R_2	Yes	0.00	0.00	0.02	0.00	0.04	0.00	0.05	0.00	0.89
	H_m	R_3,R_4	Yes	0.00	0.00	0.02	0.00	0.04	0.00	0.04	0.00	0.90
	H_m	All	No	0.14	0.06	0.07	0.07	0.05	0.04	0.04	0.04	0.49
20 Weeks	H_m	R_1,R_2	Yes	0.00	0.01	0.01	0.03	0.02	0.04	0.02	0.02	0.85
	H_m	R_3,R_4	Yes	0.00	0.01	0.01	0.03	0.02	0.03	0.02	0.02	0.87
	H_m	All	No	0.14	0.16	0.11	0.05	0.04	0.04	0.09	0.06	0.32
39 Weeks	H_m	R_1,R_2	Yes	0.00	0.04	0.03	0.03	0.02	0.06	0.07	0.04	0.71
	H_m	R_3,R_4	Yes	0.00	0.03	0.03	0.03	0.02	0.06	0.06	0.04	0.73

TABLE 8.3-M (cont.)

Predictions of Time Proportion Probabilities

Nonemployment Duration	Employment History	UI Regime	UI Receipt	Pr_n	Pr_{s_1}	Pr_{s_2}	Pr_{s_3}	Pr_{s_4}	Pr_{s_5}	Pr_{s_6}	Pr_{s_7}	Pr_a
4 Weeks	H_h	All	No	0.36	0.00	0.02	0.00	0.03	0.00	0.03	0.00	0.55
	H_h	R_1	Yes	0.00	0.00	0.01	0.00	0.02	0.00	0.04	0.00	0.93
	H_h	R_2	Yes	0.00	0.00	0.00	0.00	0.02	0.00	0.02	0.00	0.96
	H_h	R_3, R_4	Yes	0.00	0.00	0.00	0.00	0.02	0.00	0.02	0.00	0.96
20 Weeks	H_h	All	No	0.24	0.05	0.06	0.06	0.04	0.04	0.04	0.04	0.44
	H_h	R_1	Yes	0.00	0.00	0.01	0.02	0.01	0.03	0.02	0.01	0.90
	H_h	R_2	Yes	0.00	0.00	0.01	0.01	0.01	0.02	0.01	0.01	0.93
	H_h	R_3, R_4	Yes	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.95
39 Weeks	H_h	All	No	0.18	0.15	0.10	0.05	0.03	0.04	0.09	0.05	0.31
	H_h	R_1	Yes	0.00	0.03	0.02	0.03	0.02	0.05	0.06	0.04	0.76
	H_h	R_2	Yes	0.00	0.03	0.02	0.02	0.02	0.04	0.05	0.03	0.79
	H_h	R_3, R_4	Yes	0.00	0.02	0.02	0.02	0.01	0.04	0.04	0.03	0.82

TABLE 8.3-W

Predictions of Time Proportion Probabilities

Nonemployment Duration	Employment History	UI Regime	UI Receipt	Pr_n	Pr_{s_1}	Pr_{s_2}	Pr_{s_3}	Pr_{s_4}	Pr_{s_5}	Pr_{s_6}	Pr_{s_7}	Pr_a
	H_l	All	No	0.24	0.00	0.06	0.00	0.07	0.00	0.02	0.00	0.61
4 Weeks	H_l	All	Yes	0.00	0.00	0.03	0.00	0.04	0.00	0.02	0.00	0.91
	H_l	All	No	0.29	0.13	0.10	0.04	0.05	0.04	0.02	0.02	0.31
20 Weeks	H_l	All	Yes	0.00	0.04	0.04	0.04	0.06	0.03	0.02	0.04	0.72
	H_l	All	No	0.26	0.24	0.09	0.07	0.03	0.04	0.03	0.03	0.21
39 Weeks	H_l	All	Yes	0.00	0.12	0.07	0.13	0.06	0.06	0.05	0.11	0.41
	H_m	All	No	0.25	0.00	0.06	0.00	0.09	0.00	0.03	0.00	0.56
4 Weeks	H_m	All	Yes	0.00	0.00	0.03	0.00	0.06	0.00	0.03	0.00	0.88
	H_m	All	No	0.42	0.13	0.10	0.04	0.05	0.04	0.02	0.02	0.18
20 Weeks	H_m	All	Yes	0.00	0.05	0.06	0.06	0.09	0.05	0.03	0.05	0.61
	H_m	All	No	0.31	0.24	0.09	0.07	0.03	0.04	0.03	0.03	0.16
39 Weeks	H_m	All	Yes	0.00	0.13	0.08	0.14	0.06	0.07	0.06	0.12	0.35

who are high-school graduates; and Table 8.3–W reports results for 25-year old women who are high-school graduates, unmarried and without children.[34]

Each table reports estimates for several configurations of the covariates ℓ and X: the length of the nonemployment spell ℓ varies in the first column; work histories identified by the three representative worker types change in the second column (with the results for H_ℓ listed first, for H_m second, and for H_h last); the four varieties of policy regimes vary in the third column; and an indicator of UI receipt adjusts in the fourth column. Because the WBA is the only UI benefit variable that serves as a significant determinant of the distribution of ρ in the case of men, Table 8.3–M combines predictions for UI policy regimes implying the same value of WBA into a single set of results. Thus, for worker type H_ℓ the table combines regimes R_1 and R_2, and it recognizes that this worker is ineligible for UI under regimes R_3 and R_4 and is therefore a nonrecipient. For worker type H_m, the table distinguishes between the WBA paid by regimes R_1 and R_2 from that paid by R_3 and R_4. For worker type H_h, the table reports results for the three distinct values of WBA paid by regime R_1, by regime R_2 and by regimes R_3 and R_4 available to this worker. Because UI entitlement variables are not significant determinants of the distribution of ρ in the case of women, Table 8.3–W reports predictions merely distinguishing whether an individual collects UI or not. No results appear in this latter table for worker type H_h in recognition of the rarity of this type among women.

The evidence presented in these tables supports two main conclusions. First, UI-recipients always report a substantially larger fraction of their nonemployment spell as unemployment, regardless of the other circumstances. Second, the predicted time proportion distributions for men reveal that unemployment makes up a greater fraction of nonemployment spells as one raises the WBA paid by a UI program, but the shifts in these distributions translate into minor effects. For example, movement from regime R_1 to R_3 or to R_4 for worker type H_h boosts his WBA from \$150 per week to \$250, and this leads to no more than a .06 change in the "all unemployment" probability. Of course, in the case of women there are no UI-entitlement effects admitted as a consequence of their insignificance in estimation.

[34] As in the previous predictions, individuals are assumed not to have quit their jobs; $EBDUM = 0$; and the variables $UNRATE$ and $UITAX$ as set equal to their sample mean.

9. Relating UI Entitlements and Recipiency

The full impact of UI policies is hidden in the empirical work done so far due to the treatment of recipiency status as an exogenous condition. The empirical findings of the previous sections indicate that the unemployment experiences of individuals who collect UI benefits during times of nonemployment differ quite substantially from the experiences of individuals who do not receive benefits. UI recipiency expands the lengths of nonemployment spells and leads to large changes in the fraction of each spell reported as unemployment. Consequently, even if UI entitlements were found to have no effect in the estimation presented up to this point, it is still the case that UI policies could have a major impact on the amount of unemployment by exerting a big influence on an individual's decision to collect UI and acquire recipiency status.

The importance of UI entitlements in influencing this decision is the topic to which we now turn. The distribution describing recipiency in the previous discussion is $f(\delta|E, T, PA)$, which one may simply write as $f(\delta|X)$ with the covariates X incorporating the variables E, $T\,H$, Z, and M.

9.1 *Estimating a Specification for the Recipiency Distribution*

The formulation of $f(\delta|X)$ estimated in the following analysis takes the form

$$f(\delta = 1|X) = Pr(\delta = 1|X) = \frac{1}{1 + e^{X\beta}} \tag{9.1}$$

which, of course, represents a standard logit. The variables making up X include the full set of demographic characteristics introduced in earlier specifications, the bracketed group of work-history variables H_5 given by (7.7), and the macroeconomic and UI-taxation variables listed in (6.4) and (6.5). The analysis incorporates three quantities capturing the influence of UI entitlements on recipiency: the two variables *WBA* and *WE* included in the empirical relationships considered above, and the product *WBA* $*$ *WE* which represents total UI benefits available to an individual during a nonemployment episode. The following estimation evaluates X at the start of spells.

To estimate the probabilities $Pr(\delta = 1|X)$, we apply maximum likelihood to compute values for the parameters β appearing in specification (9.1). Our sample consists of observations on whether UI collection took place during nonemployment spells associated with values of X which qualify an individual for compensation from the UI system. Clearly, for spells associated with combinations of X and work-history variables that render a person ineligible for UI receipt, $Pr(\delta = 1|X) = 0$. We estimate distinct models for men and women.

Tables 9.1–M and 9.1–W presents estimates of recipiency probabilities for three configurations of the UI entitlement variables, designated models A, B and C. Model A incorporates three UI-benefit quantities: WBA, WE and $WBA * WE$. Model B deletes the variable $WBA * WE$. Finally, model C retains those quantities that enter as significant determinants of recipiency.

9.2 *Implications of the Empirical Results*

The evidence presented in these tables indicates that the form of UI entitlements constituting the principal determinants of UI receipt differ according to whether one considers men or women. In the case of men, the key variable is the total value of benefits that an individual could collect throughout his nonemployment spell; with this total benefits variable included, both weekly benefit amount and the weeks eligible variables are statistically insignificant. Inspection of the estimates of model C in Table 9.1-M reveals that an increase in total benefits raises the probability of UI recipiency – this is the implication of the negative coefficient on $WBA * WE$. In the case of women, weeks of UI eligibility is the central factor determining UI receipt since WE is the only quantity that enters with statistical significance at conventional levels of confidence. Referring to the results of model C in Table 9.1–W indicates that a woman with a higher WE has a greater probability of collecting UI during a nonemployment episode.

To gauge the importance of UI entitlements on the likelihood of UI recipiency, Tables 9.2–M and 9.2–W report predictions of the probabilities $Pr(\delta = 0|X)$ and $Pr(\delta = 1|X)$ for the representative worker types and UI policy regimes considered in the previous discussion. The predictions come from the estimated specification (9.1), with the covariates X evaluated to identify 25-year-old individuals who are white, high-school graduates, unmarried and without children.

The evidence presented in these tables supports three basic conclusions. First, more generous UI programs encourage the collection of benefits. Second, increases in the probability

TABLE 9.1-M

Parameter Estimates of the UI Reciept Probability

Estimates of $Pr(\delta = 1 \mid X)$

(Standard Errors in Parentheses)

	Model A	Model B	Model C
Log Likelihood	-1023.115	-1025.413	-1024.782
Variable	Estimate	Estimate	Estimate
AGE	-0.9880 (0.4774)	-0.9860 (0.4793)	-0.9721 (0.4780)
EDU	-1.7163 (0.3502)	-1.6967 (0.3483)	-1.7061 (0.3487)
AGE*EDU	0.0493 (0.0164)	0.0486 (0.0164)	0.0490 (0.0162)
AGE^2	0.0062 (0.0108)	0.0064 (0.0109)	0.0060 (0.0108)
EDU^2	0.0296 (0.0114)	0.0296 (0.0116)	0.0296 (0.0114)
RACE	0.3433 (0.1589)	0.3409 (0.1587)	0.3439 (0.1583)
UITAX	-0.4476 (0.1397)	-0.4509 (0.1393)	-0.4528 (0.1385)
UNRATE	-0.0084 (0.0238)	-0.0103 (0.0237)	-0.0109 (0.0235)
EBDUM	-0.3878 (0.1196)	-0.3915 (0.1193)	-0.4073 (0.1180)
WBA	0.0086 (0.0051)	-0.0008 (0.0023)	
WE	0.0163 (0.0159)	-0.0122 (0.0067)	
WBA*WE	-0.0003 (0.0001)		-0.0001 (0.00005)

TABLE 9.1-W

Parameter Estimates of the UI Reciept Probability

Estimates of Pr(δ = 1 | X)

(Standard Errors in Parentheses)

	Model A	Model B	Model C
Log Likelihood	-692.853	-693.973	-694.201
Variable	Estimate	Estimate	Estimate
AGE	-0.4801 (0.5579)	-0.5269 (0.5570)	-0.5088 (0.5559)
EDU	-0.5455 (0.4669)	-0.5971 (0.4646)	-0.5861 (0.4644)
AGE*EDU	-0.0288 (0.0229)	-0.0273 (0.0229)	-0.0276 (0.0230)
AGE^2	0.0161 (0.0135)	0.0166 (0.0135)	0.0163 (0.0135)
EDU^2	0.0573 (0.0128)	0.0580 (0.0127)	0.0577 (0.0127)
RACE	-0.1952 (0.2012)	-0.2082 (0.2005)	-0.2005 (0.2004)
MARRIED	-0.2296 (0.1482)	-0.2310 (0.1480)	-0.2305 (0.1480)
NUMKIDS	0.0364 (0.1091)	0.0411 (0.1091)	0.0381 (0.1092)
UITAX	-0.5256 (0.1677)	-0.4982 (0.1649)	-0.4988 (0.1647)
UNRATE	-0.0292 (0.0311)	-0.0270 (0.0311)	-0.0261 (0.0310)
EBDUM	0.2010 (0.1565)	0.1938 (0.1560)	0.1834 (0.1543)
WBA	-0.0081 (0.0083)	0.0024 (0.037)	
WE	-0.0589 (0.0201)	-0.0328 (0.0087)	-0.0332 (0.0087)
WBA*WE	0.0003 (0.0002)		

TABLE 9.2-M

Predictions of the Probability of UI Receipt

Employment History	UI Regime	Pr(δ = 0)	Pr(δ = 1)
H [illegible]	R_1	0.77	0.23
H [illegible]	R_2	0.76	0.24
H [illegible]	R_3	NE	NE
H [illegible]	R_4	NE	NE
H [illegible]	R_1	0.52	0.48
H [illegible]	R_2	0.51	0.49
H [illegible]	R_3	0.50	0.50
H [illegible]	R_4	0.46	0.54
H [illegible]	R_1	0.28	0.72
H [illegible]	R_2	0.25	0.75
H [illegible]	R_3	0.23	0.77
H [illegible]	R_4	0.18	0.82

TABLE 9.2-W

Predictions of the Probability of UI Receipt

Employment History	UI Regime	Pr(δ = 0)	Pr(δ = 1)
H_1	R_1	0.83	0.17
H_1	R_2	0.73	0.27
H_1	R_3	NE	NE
H_1	R_4	NE	NE
H [illegible]	R_1	0.64	0.36
H [illegible]	R_2	0.59	0.41
H [illegible]	R_3	0.59	0.41
H [illegible]	R_4	0.48	0.52

of receipt associated with greater generosity are larger for women than for men; whereas probabilities change as much as .2 in the case of females, changes for men are only about one-half this size. Third, and not surprisingly, the earnings qualifications of a UI program for determining eligibility is a major source of control for effecting the likelihood of recipiency. For example, in the case of men, while programs R_3 and R_4 generally offer greater benefits to those who qualify, their more stringent eligibility criteria sharply curtail UI collection for low-intensity workers.

10. The Impact of UI Policies on the Duration of Unemployment

Combining the estimation results of Sections 7–9 provides the ingredients necessary to answer the question posed at the beginning of Section 6, which one may simply state as: Does the generosity of UI programs influence the amount of unemployment experienced between jobs? The following discussion proceeds in two steps: first, it constructs the distributions of the number of weeks of unemployment that occurs after job separation for UI and non-UI recipients; next, it integrates these results with the likelihood of UI recipiency to infer the full effects of UI policies on the accumulative amount of unemployment experiences.

10.1 *Comparing Unemployment Durations for UI and non-UI Recipient Populations*

One of the most popular distributions analyzed in the literature describes the duration of unemployment that occurs after exiting from a job for individuals who collect UI compensation. Such distributions are typically the focus of studies that use program data. In the framework developed above, the function $f(U|\delta, E, T, PA)$ characterizes the form of this distribution, with $f(U|\delta = 1, E, T, PA)$ describing the experiences of the UI-recipient population. These quantities summarize how the amount of unemployment varies as one shifts UI entitlements within populations selected according to their UI-collection status.

One can infer the properties of this distribution from the results presented in Sections 7 and 8. In particular, as indicated by formula (5.7), one can construct an estimate of $f(U|\delta, E, T, PA)$ by calculating a summation over the distributions $f(\ell|\delta, E, T, PA)$ and $f(\rho|\ell, \delta, E, T, PA)$. The former quantity is simply the nonemployment duration distribution estimated in Section 7, and the second is the time proportion distribution estimated in Section 8.

Tables 10.1–M and 10.1–W provide a general description of the unemployment duration distribution $f(U|\delta, E, T, PA)$ computed using the above procedure for various configurations of the covariates. As before, the designation "M" in the table numbering indicates that the predicted distributions refer to men who are members of the demographic group considered in Figures 7–M and Table 8.3–M, and "W" identifies the results for the comparable group of women. The tables report the 10, 25, 50, 75, 90 and 95 percentiles associated

TABLE 10.1-M

Predictions of the Distribution of Weeks of Unemployment by Recipiency Status

Employment History	UI Regime	UI Receipt	10%	25%	Median	75%	90%	95%
H_I	All	No	0	1	5	12	26	38
H_I	R_1	Yes	2	4	9	16	28	44
H_I	R_2	Yes	2	5	11	21	38	53
H_{II}	All	No	0	1	3	7	14	23
H_{II}	R_1	Yes	2	3	8	13	21	30
H_{II}	R_2	Yes	2	4	8	14	23	33
H_{II}	R_3	Yes	2	4	8	14	23	33
H_{II}	R_4	Yes	2	4	9	17	29	41
H_{III}	All	No	0	1	2	5	12	24
H_{III}	R_1	Yes	2	3	6	15	29	40
H_{III}	R_2	Yes	2	3	6	15	29	40
H_{III}	R_3	Yes	2	3	6	15	29	40
H_{III}	R_4	Yes	2	3	8	20	37	48

TABLE 10.1-W

Predictions of the Distribution of Weeks of Unemployment by Recipiency Status

Employment History	UI Regime	UI Receipt	10%	25%	Median	75%	90%	95%
H_1	All	No	0	1	3	8	17	29
H_1	R_1	Yes	1	3	6	10	17	25
H_1	R_2	Yes	2	4	8	16	30	49
H_π	All	No	0	1	2	5	12	22
H_π	R_1	Yes	2	3	6	11	20	34
H_π	R_2	Yes	2	3	7	13	24	43
H_π	R_3	Yes	2	3	7	13	24	43
H_π	R_4	Yes	2	4	9	18	42	82

with the constructions of the distribution $f(U|\delta, E, T, PA)$. The first column of the table specifies the work-history variables set according to the three representative worker types; the second column allows for adjustments in the entitlement variables in a way consistent with the four prototype UI policy regimes; and the third column designates whether results refer to a UI or to a non-UI recipient population.

The evidence presented in these tables convey three main findings. First, UI recipients typically experience substantially more weeks of unemployment between jobs than nonrecipients. This follows without exception in the case of men, and holds with only minor qualifications for low-intensity workers in the case of women. Second, changes in the weekly benefit amount offered by a UI program have no appreciable effect on the distribution of unemployment. Whether one considers either men or women, there is literally no difference in the percentiles associated with two distributions that describe the number of weeks of unemployment for two UI policy-regimes that pay different WBA's over the same length of time. Third, changes in the weeks of eligibility offered by a program induce considerable shifts in the distribution of unemployment, especially in that region of the distribution describing long durations. In the case of men, an extension of WE from 26 to 39 weeks leads to around only 1 to 2 more weeks of unemployment for a median individual who collects UI, but unemployment lengthens by 3 to 5 weeks for at least 25 percent of recipients and by 6 to 8 weeks for at least 10 percent of this group. The situation is quite comparable in the case of women except that there is even a more pronounced effect on the longer unemployment durations; the number of weeks of unemployment almost doubles for the top 10 percent of UI recipients.

10.2 *Comparing Unemployment Durations Across Policy Regimes*

One now has sufficient information to evaluate the comprehensive effects of UI policies on unemployment. The distribution $f(U|R, PA)$ quantifies these effects, and one can apply formula (5.6) using the results obtained above to develop estimates of this distribution. For a population at large characterized by the attributes PA, knowledge of $f(U|R, PA)$ determines the extent to which weeks of unemployment experienced between jobs adjusts in response to shifts in UI policy. The measured response implied by $f(U|R, PA)$ recognizes that UI receipt is an endogenous choice which may itself be dependent on the nature of the shift in UI policies.

Tables 10.2–M and 10.2–W characterize the properties of the distribution $f(U|R, PA)$ estimated using formula (5.6) and the empirical results reported in Sections 7–9. In presenting these implications, the population characteristics PA choosen as points of evaluation are the same as those assumed in previous predictions, which describe the behavior of a population consisting of 25-year old men or women who are white, high-school educated, unmarried and without children, who did not quit their job, and who live in a state with average unemployment and UI taxes. The first column of Tables 10.2 identifies the three representative worker types, and the second column designates the four UI policy regimes. The last group of columns report the 10, 25, 50, 75, 90, and 95 percentiles associated with the estimated distributions $f(U|R, PA)$.

The predictions of the comprehensive effects of UI programs presented in these tables highlight two major conclusions of this analysis. First, the size of the WBA paid by a UI program does not influence the number of weeks of unemployment reported between jobs. Second, a rise in the value of WE offered by a program does not alter the allocations of short durations of unemployment, but it makes the longer durations even longer by an increasing amount. These findings essentially mirror those described above in Tables 10.1 which distinguish results by UI recipiency status. Tables 10.2 show that there is no perceptable change in distribution of unemployment experienced by the nonemployed as one moves from a state with a low WBA to one with a high WBA, even when this increase boosts benefits by as much as $100 per week (for a high wage worker). Further, these tables show that unemployment distributions shift markedly beyond medians in a way to lengthen all durations greater than these points by an ever increasing amount when a state's UI program expands WE.

TABLE 10.2-M

Predictions of the Distribution of Weeks of Unemployment

Employment History	UI Regime	10%	25%	Median	75%	90%	95%
H_l	R_1	0	2	6	14	27	39
H_l	R_2	0	2	7	15	29	43
H_l	R_3, R_4	0	1	5	12	26	38
H_m	R_1	0	2	4	10	18	27
H_m	R_2	1	2	5	11	20	29
H_m	R_3	1	2	5	11	20	29
H_m	R_4	1	2	6	12	24	35
H_h	R_1	1	2	5	12	26	38
H_h	R_2	1	2	5	12	26	38
H_h	R_3	1	2	5	13	26	38
H_h	R_4	1	3	6	17	34	46

TABLE 10.2-W

Predictions of the Distribution of Weeks of Unemployment

Employment History	UI Regime	10%	25%	Median	75%	90%	95%
H_1	R_1	0	1	3	8	17	28
H_1	R_2	0	1	4	10	21	35
H_1	R_3, R_4	0	1	3	8	17	29
H_{π}	R_1	0	1	4	8	16	28
H_{π}	R_2	0	1	4	9	19	34
H_{π}	R_3	0	1	4	9	19	34
H_{π}	R_4	0	2	5	13	31	61

11. A Synthesis of the Empirical Findings and Closing Remarks

The empirical analysis of the previous sections offers a simple picture of the role of UI policies on both the amount of time that youths spend between jobs and the extent to which they classify this time as unemployment. The following discussion summarizes this picture and relates it to other results in the literature.

11.1 *Summary of the Findings*

For men, the above analysis indicates that an individual who collects UI compared to one who does not is likely to experience a longer spell of nonemployment, at least up to the exhaustion of UI benefits, and to categorize a larger fraction of this spell as unemployment. In total, UI recipients report more weeks of unemployment before returning to jobs.

Regarding the influence of UI entitlements on the experiences of men, these benefits alter individuals' activities through several routes. Concerning the effect of a rise in the weekly benefit amount paid by a program, the results show slight increases in recipiency and in the fraction of a nonemployment spell listed as unemployment; but this rise in *WBA* has essentially no effect on either the length of nonemployment spells or on the number of weeks of unemployment, irrespective of whether one considers the population at large or only the population of UI recipients. Turning to the effects of an increase in the weeks of eligibility offered by a program, this policy shift induces only a minor rise in the likelihood of recipiency, as is the case for an increase in *WBA*. However, in sharp contrast to the effects of *WBA*, an extention of *WE* lengthens both nonemployment spells and the amount of unemployment that occurs between jobs both for UI recipients and for the population at large. This extention does not influence short durations of either nonemployment or unemployment, but it leads to an expansion of the longer durations with the highest durations being stretched out the most.

The findings summarized above for young men also apply for describing the situation for young women with only two exceptions. First, while female UI recipients experience more unemployment than nonrecipients at least up to the point of benefits exhaustion as in the case for men, there is some ambiguity as to whether a similar relationship exists for women when comparing lengths of nonemployment spells. Second, the weekly benefit amount does not even play a slight role as a factor influencing women's experiences. In contrast to men, changes in *WBA* has no effect on the fraction of a nonemployment spell reported as unemployment, nor does it effect the likelihood that a women collects UI benefits. Whereas total UI benefits serve as the primary measure of UI entitlements determining UI recipiency status for men, the results for women indicate that only weeks of eligibility matter. Other than these two relatively minor exceptions, the influences of UI policies on women's experiences between jobs in nonemployment and in unemployment follow the same pattern as those outlined above for men.

11.2 *Comparision with Results in the Literature*

Relating our findings to those in other studies requires adjustments for differences in definitions of key variables, in empirical approaches adopted to develop results, and in sample compositions. Definitions of such variables as unemployment duration and UI entitlements vary considerably in the existing body of research. The largest group of studies relies on program data and defines unemployment as UI collection and duration as the number of weeks of UI receipt. Other studies use survey data and define unemployment more in accord with the CPS concept and duration as spell length which corresponds to an uninterrupted sequence of weeks. With regard to the notion of entitlements, program-data studies analyze the effects of both the weekly benefit amount and weeks of eligibility to capture the influence of UI policies, whereas survey-data studies consider only the weekly benefit amount as a measure of UI entitlements. The analysis presented here is entirely unique for it uses a definition of unemployment corresponding to one found in survey-data studies, a definition of the full complement of UI entitlements such as the one adopted in program-data studies, and a definition of duration representing the total amount of unemployment that occurs between jobs regardless of the number of spells involved in accumulating this total which is distinct from the ones used in other work.

Concerning differences in empirical approaches, the interpretation of what is meant by a UI effect varies across studies depending on the particular econometric framework applied to obtain estimates and on the sorts of variables incorporated to control for contaminating sources of variation. Some analyses estimate effects via a simple regression model in an attempt to measure movements in average durations, while other studies use transition-probability frameworks to determine the influence of UI on hazard rates. A necessary econometric feature needed to measure UI-entitlement effects reliably involves recognition of the important interactions among UI benefits and duration, thus creating a framework that permits the influence of UI programs to affect unemployment in a nonuniform manner varying with duration length. While a few program-data studies implement estimation approaches incorporating elementary versions of these interactions, this study is the first to do so using survey data. Further, to ensure that variation in UI benefits in estimation reflects differences in the generosity of UI policies rather than movements along UI schedules, an empirical procedure must in theory incorporate elaborate controls to account for those aspects of individuals' earnings histories that go into the computation of entitlements. Previous studies include only a subset of these controls, with none accounting for a set that is nearly as extensive as the one used in the empirical analysis presented here. Finally, to obtain reliable estimates of UI effects, an empirical approach must account for distinctions in the unemployment experiences of UI recipients versus nonrecipients and for the endogeneity of the choice to collect UI. Without admitting such distinctions, one cannot predict a variety of effects arising from alterations in UI programs, including comprehensive effects characterizing the influence UI policies on a nonemployed population considered in total. The empirical analysis of this report fully recognizes these distinctions and provides predictions of the role of UI on several aspects of nonemployment experiences. In contrast, program-data studies model only behavior associated with the unemployment of UI recipients, and survey-data studies entirely ignore the concept of recipiency status almost without exception.

Turning finally to differences in sample compositions, there are obvious qualifications requiring consideration in relating the findings presented here to those of other studies. The results obtained above describe the nonemployment activities of a young population, with men and women analyzed separately. Program-data studies restrict analyses to recipient populations of all ages; some consider only men, and other combine men and women. Survey-data studies investigate the experiences of a wide range of populations.

While a direct comparison of the findings obtained in this report with those available in the literature necessarily involves some ambiguities due to the differences cited above, there is value in undertaking such an exercise to place the results of the current study into context. The subsequent discussion carries out this exercise, first focussing on the estimated effects associated with the *WBA* portion of UI entitlements and then proceeding to an analogous comparison of the effects attributed to the *WE* portion.

Both program-data and survey-data studies offer predictions of the influence of the *WBA* on unemployment durations. Recent results based on program data generally suggest that a rise in the *WBA* induces an increase in weeks of unemployment, with a 10% raise in *WBA* predicted to generate anywhere from a 0.5 to a 2 week lengthening of insured unemployment.[35] Within the framework presented in this report, such a forecast most closely corresponds to the effect of *WBA* on the distribution $f(U|\delta = 1, E, T, PA)$. In sharp contrast to predictions of the program-data studies, the findings outlined in Section 10.1 indicate that changes in the *WBA* have no perceptable effect of this distribution. Of course, there are a variety of potential reasons for explaining this discrepancy, including the nontrivial observation that U in program data measures weeks of UI receipt instead of CPS-type unemployment. In studies relying on unemployment measures defined more in tune with the empirical analysis of this report (i.e. CPS-type measures), the evidence of the effects of the *WBA* on unemployment durations is far less conclusive. This evidence, based on various forms of survey-data, often reveals no significant effects of *WBA* on $f(U|\delta = 1, E, T, PA)$ or, more typically, on the distribution $f(U|R, PA)$.[36] These findings agree with the results obtained in Sections 10.1 and 10.2.

Only program-data studies offer a source for comparing predictions of the influence of *WE* on unemployment durations; no survey-data studies of which we are aware account

[35] This range of estimates comes from the studies of Classen (1979), (who predicts a 1-2 week increase), Newton and Rosen (1979) (who predict a 1–8 week increase), Moffitt (1985) (who predicts a 0.5 week increase) and Katz and Meyer (1988b) (who predict a 1–1.5 week increase). Hammermesh (1977) in his review of twelve U.S. studies concludes that the best prediction of the effect of a 10-percentage point increase in the gross replacement rate is a 0.5 week increase in insured unemployment.

[36] Barron and Mellow (1981), using a supplement of the CPS find that *WBA* becomes insignificant once one accounts for recipiency status. Clark and Summers (1982), using the CPS, obtain insignificance of *WBA* on transitions out of either unemployment or nonemployment, which are the transitions relevant for comparing the estimates presented in this report. Katz and Meyer (1988a), using a survey supplement to a program-data source, also find that *WBA* plays an insignificant role in these transitions.

for the effects of WE in estimation. Results from program data suggest that a 1 week increase in WE leads to a lengthening of insured unemployment somewhere in the 0–1 week range, evaluated for an "average" UI recipient.[37] The findings presented in this report fit within this range as long as one interprets the notion of an average individual broadly. Inspection of the results in Section 10.1 describing the impact of WE on the distribution $f(U|\delta = 1, E, T, PA)$ – which most closely approximates the effects obtained using program data – reveals that a 1 week increase in WE generates only about a 0.1 week lengthening of unemployment duration for the median nonemployment episode. For the longer episodes, however, the implied lengthening amounts to about 0.6 weeks. These predictions are clearly in general agreement with those advanced in the literature regarding the influence of WE on unemployment.

11.3 *Policy Implications*

The findings of this report suggest several implications concerning the role of UI policies on the amount of unemployment. At the most basic level, the results indicate that features of UI programs that change the size of weekly benefit amounts are not likely to affect unemployment, whereas features that alter the amount of weeks of eligibility are likely to shift unemployment for those individuals who experience the longer durations. Thus, changes in the maximum level of weekly benefits paid by a program can be expected to have no effect on unemployment. In contrast, the introduction of extended benefit programs can be expected to lead to greater unemployment with a more uneven distribution of experiences across nonemployed persons.

At a more subtle level, these implications highlight the importance of eligibility qualifications in UI programs. A casual comparison of UI regimes across states reveals that those programs paying higher benefits also apply more stringent qualification requirements. Such programs in effect offer higher weekly benefit amounts to those persons who qualify and at the same time assign zero weeks of eligibility to a greater fraction of the nonemployed population. Consequently, these programs are likely to induce less unemployment according

[37] This range of estimates comes from the studies of Classen (1979) (who predicts no significant effect), Newton and Rosen (1979) (who predict a 1 week increase), Moffitt (1985) (who predicts a 0.15 week increase), and Katz and Meyer (1988b) (who predict a 0.20 week increase).

to the implications cited above because the higher *WBA* paid by a program yields no change and the lowering of *WE* reduces the amount of unemployment.

A critical factor ignored throughout this discussion concerns the potential influence of UI policies on the work experiences of individuals. The conclusions drawn above presume that characteristics of UI regimes do not induce persons to change their employment activities. If this presumption is false, then policy shifts, such as increases in the weekly benefit amounts, can lead individuals to alter their worker-type classifications or to enter nonemployment when they would not otherwise. Such changes in work histories imply a different set of unemployment experiences according to the findings of this report. Developing an empirical framework to account for these possible work-experience effects of UI policies is not as difficult as one might expect. One can accomplish this task by adding an empirical model describing the earning and the job separation experiences of individuals while employed to the model outlined in Sections 5–9, which essentially makes work histories endogenous variables. We hope to pursue such an objective in future research.