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UNEMPLOYMENT INSURANCE AND LABOR FORCE TRANSITIONS

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Abstract

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This paper reports preliminary estimates of an econometric simulation model capable of a comprehensive evaluation of the effects of unemployment insurance on measured and actual employment, unemployment and non-participation. The data are longitudinal comprising information on 75,000 households sampled in the Current Population Surveys of March and April 1978. The simulation model is constructed from multinomial logit equations characterizing individuals' labor force transitions. These equations provide estimates of the effects of UI on job loss, labor force exit, and entry into the labor force, as well as the effect of UI on unemployment duration and temporary layoffs. The results are rather inconclusive, but suggest the importance of further research on UI and transitions in and out of the labor force.

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An unemployment rate above four percent was once regarded as synonymous with slack in the economy. That view is no longer widely held. Indeed, some observers today believe that rates of unemployment below 6 percent place unsustainable inflationary pressure on the economy. This change in viewpoint has been the result of both labor market developments and new perspectives on the causes of unemployment. The apparent upward trend in unemployment has been a source of major concern to policy-makers, and the focus of research by a number of economists. Central to most explanations of the rising "natural rate of unemployment" is the role of government transfer programs.

The impact of transfers on measured unemployment includes both real effects on the intensity of search and the willingness to accept offers, and a pure reporting effect. Where program participation depends on registration for possible employment, the measured rate of unemployment could be higher simply because some individuals change the way they report otherwise unchanged behavior. A full evaluation of the impact of transfers on conventional measures of labor market tightness requires an assessment of both real and reporting effects. While most analyses of transfer programs focus on changes in incentives to find jobs, their effect on the reporting of constant behavior may also be quite significant.

This study reports preliminary estimates of an econometric simulation model capable of a comprehensive evaluation of the effects of unemployment insurance on measured and actual employment,

unemployment, and non-participation. The data are longitudinal, comprising information from 75,000 households sampled in the CPS surveys of March and April 1978. A computer program is developed to impute UI benefits conditional on becoming unemployed to each individual in the sample. The program uses information on each state's benefit formula and eligibility rules, as well as information on Federal and state tax codes to calculate a hypothetical replacement rate for each individual in the March sample.

The simulation model is constructed from multinomial logit equations characterizing individuals' labor force transitions. These equations express an individual's probability of transiting between labor force states as a function of his characteristics and variables reflecting UI benefits (e.g., the replacement rate, and the potential duration of benefits). This technique makes it possible to estimate the impact of unemployment insurance on both the length of unemployment spells and their frequency. The former depends on UI effects on the probability of exit from employment, while the latter depends on UI effects on the probability of transition into unemployment. The model also can be used to examine the effect of UI reforms on both the level of employment and rate of non-participation.

The methodology and data used here have several advantages over previous studies of the effects of UI. Most important, they permit a comprehensive evaluation of the effects of the program. Previous studies have typically focused on the effects of unemployment insurance on just one labor force transition. Our study provides the

first estimate of UI effects on the rate of job loss, labor force exit, and labor force entrance into unemployment. The common data and methods in this study make it possible to combine the estimates of UI effects on individual transition probabilities to yield an estimate of its overall impact. Second, this evaluation of UI makes use of data from the CPS. As has been well documented,[1] measures of unemployment derived from different survey diverge widely. The use of CPS data means that the results obtained here can be used as a basis for evaluating the effects of UI on unemployment as it is officially measured. The focus here on the "reporting" as well as the behavioral effects of UI also improves the realism of our estimates of the impact of UI on measured unemployment. Recognizing reporting as well as behavioral effects is crucial when using CPS data, as almost half of all unemployment spells culminate in labor force withdrawal. A third advantage of the approach used here is that it takes account of the effect of UI on the composition of the unemployed and employed populations. Previous studies have been flawed by the failure to take account of the fact that UI will affect the mix of persons becoming unemployed. If for example, UI induces many short-term layoffs it may reduce the average duration of unemployment, even while increasing spell lengths for each individual. The transition probability approach taken here avoids this difficulty, because explicit account is taken of the effect of UI on the flow into unemployment.

Many previous efforts to evaluate the effects of unemployment insurance have failed to take account of the taxes which are neces-

sary to finance the system. This study also attempts an examination of the effects of the payroll taxes used to finance unemployment insurance on levels of employment and unemployment.

It should be clear at the outset that estimating the impact of social insurance programs on the measured unemployment rate is in no way equivalent to examining their desirability. One important goal of social insurance is to make it possible for persons for whom work is likely to be very burdensome (the aged or disabled) to subsist without holding jobs. An important function of unemployment insurance is facilitating the mobility between jobs which is necessary to accommodate changing product demands. This does mean encouraging persons to become unemployed. Moreover, reporting effects of social insurance programs have little welfare significance. If unemployment insurance encourages workers who would otherwise withdraw from the labor force to engage in nominal search activity and report themselves as unemployed, there is no real social cost.

However, an evaluation of the impact of social insurance programs on the level of unemployment is crucial to interpreting labor market conditions. If unemployment insurance has induced a large increase in the measured unemployment rate, then current high rates of unemployment are not a warrant for public policies to promote employment. If the increases in unemployment cannot be linked to unemployment insurance or other social programs, the case for policies to combat the increase may be strengthened.

The first part of the paper outlines a theoretical framework for examining the interactions between UI and measured employment. In Part II we describe the sample and the rather elaborate procedures used to impute benefits. The econometric methods and estimation results are discussed in the third section. The implications of the results for the effects of UI on measured unemployment, employment and labor force participation are taken up in Section IV. A final section of the paper discusses the implications of the results for interpreting data on unemployment, a number of limitations of the estimates, and directions for subsequent research.

I. A Theoretical Framework

The relationship between UI and unemployment has been extensively studied.[2] Most previous studies have focused on the relationship between unemployment duration and UI. This is only a small part of the story. There may also be important linkages between UI and the rate of flow into unemployment. Martin Feldstein has argued that UI encourages temporary layoffs and irregular work scheduling.[3] Daniel Hamermesh has suggested that UI may actually increase the labor force participation of some workers.[4] He points out that labor force entrance is more attractive if part of the compensation for employment includes the chance to take advantage of unemployment insurance. UI may also encourage quits in states where job leavers are eligible for benefits.[5]

In order to model these various effects it is necessary to use a framework which takes account of labor market dynamics. The approach taken here builds on the work of Hall, Perry, and Marston, which treats transitions between labor market states as a Markov process.[6] Specifically we assume that each individual's behavior can be characterized by a matrix of transition probabilities given by

$$P^i = \begin{bmatrix} p^i_{ee} & p^i_{eu} & p^i_{en} \\ p^i_{ue} & p^i_{uu} & p^i_{un} \\ p^i_{ne} & p^i_{nu} & p^i_{nn} \end{bmatrix} \qquad (1)$$

where, for example, p^i_{en} represents the probability that the ith worker would be not in the labor force (NILF) in month t+1, conditional on being employed in month t. Since a worker must always be in one of the three labor force states, the rows of p sum to 1.

From the transition probability matrix p^i, it is possible to calculate the proportion of the time individual i spends in each of the three labor force states. Let π^i_j be the fraction of time that individual i spends in state j. We solve for the π^i_j by finding the root of the linear equation system

$$p^i \pi^i = \pi^i \qquad (2)$$

for which $\pi^i_u + \pi^i_e + \pi^i_n = 1$.[7] The unemployment rate, the fraction of the labor force which is unemployed, is given by $\frac{\pi_u}{\pi_u + \pi_e}$. The steady state distribution of the population across labor market states can be found by averaging individual probabilities. That is,

$$\Pi_j = \frac{1}{N} \sum_{j=1}^{N} \pi^i_j \qquad (3)$$

where N is the size of the population. The aggregate unemployment rate is given by $\frac{\Pi_u}{\Pi_u + \Pi_e}$.

In Table 1 we provide averages of the individual transition probability matrices for various demographic groups from 1974. The striking feature of the table is the importance of flows into and out of the labor force. It is instructive to consider the group with the greatest labor force attachment and contact with the UI system, prime age males. Even though the participation rate in the group averages 92 percent, over one

Table 1

Transition Probabilities for Age and Sex Groups

1974 Annual Average

Probabilities	Total	Men			Women		
		16-19	20-24	25-59	16-19	20-24	25-59
Employment to Unemployment	0.254	0.284	0.287	0.309	0.250	0.255	0.172
Unemployment to Nonparticipation	0.208	0.286	0.133	0.105	0.318	0.159	0.272
Employment to Unemployment	0.020	0.045	0.032	0.011	0.033	0.026	0.012
Employment to Nonparticipation	0.033	0.102	0.033	0.004	0.133	0.047	0.042
Nonparticipation to Employment	0.050	0.144	0.180	0.071	0.093	0.071	0.050
Nonparticipation to Unemployment	0.020	0.085	0.079	0.032	0.067	0.034	0.013

Source: unpublished tabulations by the Bureau of Labor Statistics adjusted by the Urban Institute as described in J.E. Vanski, "Recession and the Employment of Demographic Groups: Adjustments to Gross Change Data," in Holt, C.C., et al, Labor Markets, Inflation, and Manpower Policies, Final Report to the Department of Labor, Washington, D.C.: The Urban Institute (May, 1975).

third of employment entrances came from outside the labor force, and 28 percent of employment spells ended in labor force withdrawal. This suggests the potential importance of UI effects on reported participation as well as on employment.[8]

The approach taken in this paper is to use multinomial logit analysis to estimate the impact of individual characteristics and UI on individual transition probability matrices p^i. These estimates are then combined using (2) and (3) to generate estimates of UI impacts on the unemployment and participation rates. This "transition probability" approach has the virtue of being closely linked to theories of labor market choice which emphasize the role of transition decisions. The use of Markov transition matrices as is done here involves the assumption that individuals' transition decisions do not depend on how long they have been in a state. This assumption of no state dependence has been examined in earlier work with mixed results. Econometric identification of state dependence is difficult because any heterogeneity among individuals in their transition probabilities will lead to apparent state dependence. The assumption here is necessitated by the absence of data on how long individuals have occupied their initial states.

UI and the Unemployed

The duration of unemployment spells has been the focus of most research on UI and the unemployed. In terms of the framework developed here, this is equivalent to studying the relationship between UI and the transition probabilities p^i_{ue} and p^i_{un}. The duration of completed spells of unemployment is related to the transition probabilities p^i_{ue} and p^i_{un} by the identity:

$$D^i_u = \frac{1}{p^i_{ue} + p^i_{un}} \quad . \tag{4}$$

In thinking about the impact of UI on the duration of unemployment it is crucial to distinguish between individuals who are searching for work, and those on layoff from jobs to which they are permanently attached.

We begin by analyzing the decision problem faced by workers who are eligible for UI but not attached to permanent jobs. Dale Mortenson's excellent theoretical study of the decision problem faced by these workers brings out the crucial effects.[9] He finds that the impact of an increase in the UI benefit level on the probability of reemployment is likely to be positive but is theoretically ambiguous. Increases in UI benefits will tend to increase the length of spells by reducing the opportunity cost of both leisure and job search. The consequent rise in the reservation wage tends to prolong unemployment. However, it is possible that for some workers this effect will be offset by another. Since jobs are not permanent, workers will recognize that the sooner they take a job, the sooner they will again be eligible for UI. This effect is likely to be particularly important for persons near exhaustion of benefits.

Mortenson's analysis does not treat the question of UI's impact on the probability of labor force withdrawal. Increases in UI are likely to reduce labor force withdrawal through both real and reporting effects. By raising the rewards of them working, increases in UI reduce the incentive to withdraw from the labor force. In most states, eligibility for UI requires a worker to be available and actively looking for work. When enforced this will cause some workers to search for work rather than withdrawing from the labor force. However this requirement is usually very poorly enforced. Disqualifications from UI are quite rare affecting fewer than 0.1 percent of claimants. Nonetheless, knowledge of the requirement is likely to lead at least some persons to profess to be looking for work even if they are not in fact seriously desirous of obtaining a job. This effect may also occur because workers regard mandatory registration with the state employment service as a form of job search.

It is important to be clear about the relationship between this analysis and statements about the impact of UI on the average duration of unemployment. The question examined here is the impact of an increase in UI on a given worker's probability of reemployment. The average duration of unemployment will be affected by changes in this probability, as well as by changes in the composition of the unemployed. Even if UI reduced the probability of exiting unemployment for any given individual, the average length of unemployment spells might also be reduced if persons with high reemployment probabilities were encouraged to become unemployed. This problem would seem to be a serious drawback of previous studies which have relied on comparisons of averages of unemployment durations.

Similar considerations suggest that increases in the potential remaining duration are likely to reduce the probability of unemployment exit by delaying returns to employment. An additional complication is posed by those who are waiting to receive benefits. This group (mostly quitters) will also be sensitive to increases in benefits, even though benefits are not received contemporaneously.

UI and Exit from Layoff Unemployment

Since the influential work of Feldstein[10] the importance of distinguishing between the behavior of workers attached and not attached to permanent jobs has been recognized. In an ex-post sense the duration of layoff spells is determined by the employer rather than the employee. In an ex-ante sense, of course, this is not the case. Explicit or more likely implicit contracts will determine the length and frequency of spells of temporary layoff unemployment. These contracts will depend on both workers' tastes and the availability of UI. The nature of these interactions is discussed in more detail in the next part of this section. However, in the presence of imperfect experience rating, increases in UI at the margin will lead to longer and more frequent layoffs.

A second consideration suggests a positive relationship between benefit levels and the length of spells of layoff unemployment. A large fraction, perhaps as great as 50 percent,

of those in the temporary layoff category do not in fact return to their original employer. For this group, the considerations discussed above for ordinary job losers should be relevant. It does not appear on theoretical grounds that there should be important effects of UI on labor force withdrawal from layoff unemployment.

UI and the Flow into Unemployment

Previous research on demographic, cyclical, and regional differences in unemployment rates has all found that most variations can be attributed to differences in the rate of flow into unemployment rather than the duration of unemployment spells. This suggests the importance of examining the relation between UI and the rate of entrance into unemployment. While most of the research in this area has examined the relationship between UI and temporary layoff unemployment, it is also likely that there are important effects of UI on permanent separations.

UI and Employment Exit

In order to examine the relationship between UI and permanent separations, it is necessary to provide a model for determining the duration of employment. We use the framework developed by Robert Hall to attack this problem.[11] The optimal separation rate is determined by the interaction of workers' tastes and employers' cost functions.

In general it is reasonable to suppose that employers have some optimal turnover rate. If jobs are too short, costs of

staffing and training become prohibitive. If they are too long, the ability to adjust to changing product market conditions is likely to be impaired. This suggests that the employers' isoprofit curves between wages and separation rates look like that depicted by EE in figure 1. Workers also are likely to prefer intermediate durations. If jobs are too short, they will have to incur excessive search costs. If they are too long, they lose flexibility.

The set of tangencies of indifference and iso-profit curves trace out an expansion path in wage separation space. The condition that the supply and demand for labor be equated determines the level of wages and separations. In general it is clear from the configuration of these curves that the optimum or, equilibrium separation rate can involve either a positive or negative rate of substitution between wages and separations.

Consider first the impact of introducing a non-experience-rated UI system. Employers' isoprofit curves are unaffected. However, since UI reduces the costs of changing jobs, it is reasonable to suppose that the shape of workers' indifference curves changes from I to II as shown in figure 1. At any given level of wages and the separation rate, the introduction of UI reduces the rate of substitution between wages and separations. Graphically, the associated slope of the indifference curve at each point declines. This means that the introduction of UI leads to a new equilibrium with a higher separation rate (S_2). The magnitude of the impact of UI on the equilibrium level of rates and separations depends on the shape of the indifference curves. The figure would seem to suggest

that UI represents a Pareto improvement. This is a consequence of deferring consideration of the taxes necessary to finance the program.

The basic result that UI raises the equilibrium separation rate should not be surprising. Since it subsidizes job search, it makes separation less costly for workers. This directly encourages quits. Employer initiated separations are also encouraged. Since workers will demand less compensation for a high risk of layoff, employers will find it profitable to shift to production methods involving a higher risk of separation.

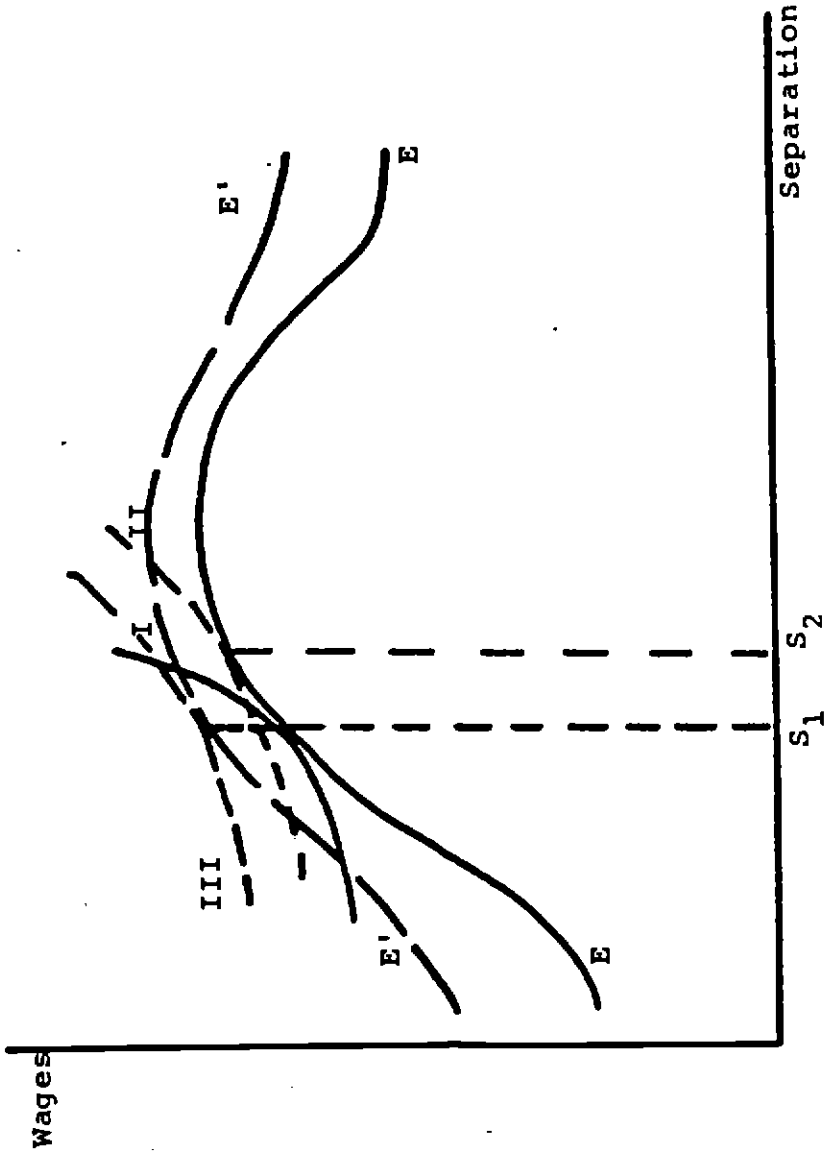
The UI system considered so far was not experience rated. That is, an employer's contribution to the system was assumed to be independent of his own separation experience. Consider now the extreme opposite case of perfectly experience-rated UI. In this case, depicted in figure 2, the employers' isoprofit curve is shifted in a fashion parallel to the change in workers' indifference curves. Hence the separation rate at the point of tangency is unaffected. A fully experience rated system of UI will have no impact on the separation rate.

This result can be seen intuitively. Efficiency considerations dictate an optimal rate of substitution between wages and separation rates. The announcement by the government that conditional on separation, the employer must make transfers to the employee will have income effects, but will not affect the optimal contract.

The extent of experience rating in the UI system is examined below. At this point, it is useful to point out that if wages are taxed, a fully experience rated system requires that the employer pay the full UI costs of separations, and that the government receive the revenue it would have received if the UI

Figure 2

Equilibrium Wages and Separations with Experience Rating



benefits had been paid out as wages. If UI benefits are not taxes, and if the firm is not charged for the government's forgone revenue on those benefits, there will be an inducement toward separations. Thus, even if the UI system is perfectly experience-rated internally, there is still a distortion because of forgone tax revenue on benefits.

This analysis suggests that UI is likely to increase the separation rate. This conclusion is not affected by taking account of additional complexities. In many states, separations labeled as quits leave the worker ineligible for UI. This will tend to reduce the effect considered here, and give a strong inducement for quits to be labelled as job loss. If implicit contracts can be enforced, even separations induced by the employee will be labeled as quits. If one assumes that implicit contracts are not enforceable, and that employers are indifferent to their reputations, then only quit decisions will be affected by the level of UI benefits.

A final issue is the state occupied by persons exiting from employment. The prediction is an unambiguous increase in the probability of transiting from employment to unemployment. The effects of an increase in UI on the rate of transition from employment to NILF is ambiguous since workers who would otherwise enter this state, are likely to become unemployed instead in order to collect benefits.

This analysis suggests that the effect of UI on the permanent separation rate is theoretically unambiguous. However, UI may have an ambiguous effect on the division of separations between quits and job loss.

UI and Permanently Attached Workers

The relationship between UI and temporary layoff unemployment has been extensively studied. Martin Feldstein has presented a theoretical analysis demonstrating that the introduction of an imperfectly experience-rated UI system encourages this form of unemployment.[12] The nature of long term contract arrangements has been discussed in detail by Robert Hall.[13] He shows that optimal contracts involve employing workers wherever their marginal product exceeds their marginal valuation of time out of work. Since UI raises the marginal valuation by workers of time out of work, it increases the number of states of the world where workers are laid off. This effect will occur unless firms are perfectly experience rated, in which case the UI system will have no impact on layoff unemployment.

UI and Labor Force Entrance

As Daniel Hamermesh has pointed out, the entitlement effect of unemployment insurance is likely to increase labor force entrance. This effect is similar to the proemployment effects for the unemployed described above. The ability to collect UI after a spell of work raises the effective wage and so is likely to encourage labor force entrance. This entry may be through either the unemployment or NILF states. Some workers outside the labor force, may be immediately eligible for benefits if they reenter the unemployment state. For this group, who have been recently employed, the impact of UI is likely to be particularly pronounced.

In Table 2, the conclusions of this section are summarized. The theoretical analysis leads to predictions regarding the effects of UI on all the transition probabilities except for the movement between nonparticipation and employment. Note that the effect of UI on total unemployment is almost certain to be positive, since the transition rate into unemployment from each of the alternative states is increased.

Financing the UI System

The unemployment insurance system is financed partially out of a payroll tax levied at a variable rate on the first six thousand dollars of income on a given job. This tax, which reduces after-tax wages, will tend to discourage transitions into employment, and to encourage labor force withdrawal. It will tend to offset the entitlement effect of UI discussed above. In considering UI reform, it may be reasonable to assume that the taxes and benefits are changed simultaneously. Alternatively, it may be appropriate to consider the case where marginal UI funds come from other expenditure programs so that the tax system is unaffected. Both cases are considered in the empirical work below.

Table 2

Effect of Unemployment Insurance on Labor Market Transition Probabilities

Initial Labor Market State	Final Labor Market State		
	Employment	Unemployment	Non-participation
Employment	-	++	-
Unemployment	-	++	--
Nonparticipation	?	++	-

II. Imputing Unemployment Insurance Benefits

A complete analysis of UI and labor market flows imposes formidable information requirements. We not only require an estimate of the level and potential duration of benefits received by the unemployed, but what the system would provide other individuals if they were to join the jobless ranks. Furthermore, theory suggests that the variables affecting economic decisions are the after tax replacement ratios; thus we require an estimate of the applicable marginal tax rate. In order to derive these data, we have designed a computer program embodying federal tax rules and each state's UI laws and tax codes. The UISIM program determines UI eligibility, calculates basic and dependent benefits (where available), establishes the maximum allowable duration of benefits, and estimates federal and state marginal tax rates.

The program has been designed to use information from the annual work experience survey conducted in March 1978 as a supplement to the regular Current Population Survey. Federal extended benefits and supplemental assistance were not in force at that time, so that variation in UI parameters depended only on differences in state laws. Since information on income and work experience in the CPS is not as detailed as the law requires, a number of assumptions underlie our calculations.[14]

The UI System: Rules and Definitions

An individual's participation in the UI system--the level and duration of benefits--is conditioned by previous work experience. The specific rules for eligibility, benefit amounts, and duration are determined by each state. Though no two states are identical, a number of common elements are present. In order to highlight the basic structure of the system, table 3 presents key rules for a hypothetical "typical" state.

Within limits, the weekly benefit amount in our typical state is defined as 1/26 of the individual's wages in the high quarter of the base period (i.e., four quarters prior to the quarter in which the claim is filed); the minimum and maximum benefit limits are $20 and $110 respectively.[15] To be eligible for benefits a claimant must be available for and actively seeking work, and must not have left the last job voluntarily, without "good cause."[16] In addition, base-period earnings must be at least $800, and must exceed 125 percent of high quarter wages. Once determined, benefits are fixed for a period (52 weeks) called the benefit year.[17] Within that period, all eligible claimants receive benefits for at least 10 weeks; the maximum number of weeks for receipt of benefits is 26. Actual potential duration is chosen so that total potential benefits are less than or equal to one-third of base period earnings.

While variations on this theme are legion, the basic structure--eligibility for and level of benefits linked to past work experience, minima and maxima for benefits and duration, etc.-- is found in each state. Most of the interstate variations reflect

Table 3

Parameters of the Unemployment Insurance System in a Typical State and Common Variations

	Parameter	Typical State	Common Variations
1)	Weekly benefit amount (WBA)	•1/26 of high quarter wages (HQW) min = \$20 max = \$110	•50 percent of average weekly wage (AWW)
2)	Eligibility	•able/available for work •base period earnings $\geq$ 1.25 x HQW and > \$800 •quit disqualification	•earnings test supplemented by a weeks of employment requirement •quitters qualified after waiting period
3)	Maximum potential duration of benefits	•given WBA, choose the longest duration (DUR) possible subject to $10 \leq DUR \leq 26$ and WBA x DUR $\leq$ 1/3 of base period earnings	•maximum of 39 weeks •secondary limit based on weeks of employment

Source: U.S. Department of Labor, Employment and Training Administration, Unemployment Insurance Service, Comparison of State Unemployment Insurance Laws, (GPO, 1978).

either different numerical formulas (e.g., 1/23 versus 1/26) or different reference values (e.g., average weekly instead of high quarter wages). Actual formulas can be quite complex. In 12 states, for example, the fraction of high quarter wages received in weekly benefits depends on previous work experience and earnings. There are two variations, however, of a more fundamental nature. Twelve states provide additional benefits to claimants with dependents (usually ranging from $3-5 per dependent per week), and 16 states allow quitters to receive benefits after a waiting period has elapsed; the waiting period varies from 5-14 weeks. Although these provisions are found in a minority of states, they are potentially applicable to a significant fraction of the unemployed. In March of 1978, for example, states with dependents' benefits accounted for 32 percent of all the unemployed; for quitters' benefits, the figure was 24 percent.

The UISIM Program

Our model of the UI system incorporates the rules for eligibility and the determination of benefits and taxes for each state. The basic structure of the simulator is outlined in Figure 4. The program is designed to use information available in the CPS work experience survey conducted in March 1978. Information on family income, marital status, and dependents is used to calculate federal and state marginal tax rates, including social security taxes.[18] Data on weeks worked and wage and salary income from the previous year provide the basis for determining eligibility and the level of benefits. For those out of the

labor force in March of 1978 who had no work experience in 1977, we imputed an average weekly wage (described below). The output of the program consists of a weekly benefit, maximum potential duration, the quit disqualification period (where applicable), the marginal tax rate, and weeks of employment needed to qualify for benefits (NILF only).

The federal tax module in the program is based on previous work conducted at the National Bureau of Economic Research. We modified the NBER's TAXSIM program to work with CPS data, and to interact with a new state tax module especially developed for UISIM. State income taxes have not received as detailed attention in the public finance literature or the empirical work on UI as taxes at the federal level. While state marginal tax rates are much lower than the federal rates, they are not insignificant. In several states, marginal rates as high as 10% are not uncommon. Moreover, variation across states and across income classes within states may be important. In light of these considerations it seems inappropriate both to ignore state taxes and to apply an average for each state. UISIM thus includes a module with an income tax algorithim for each state. Both the federal and state tax modules incorporate provisions in force as of March

Given an individual's basic earnings and employment information, the bulk of the program is a relatively straightforward and mechanical application of tax laws and state UI rules. There are three parts of UISIM, however, which required a good measure of approximation. First, in order to derive marginal tax rates we had to determine whether an individual would itemize

deductions and how large the deductions would be. Information from the CPS by itself provides no guidance. Our approach to the problem involved two steps. We first used tax return information from the NBER TAXSIM file to calculate the frequency of itemization and average deductions for itemizers by income class and filing status.[19] The second step was to calculate two marginal tax rates, one assuming the standard deduction and the other assuming average itemized deductions as estimated from the sample of returns in TAXSIM. We then computed a weighted average with weights based on the frequency of itemization.

The second major area of uncertainty in the design of the simulator was the calculation of potential duration and the problem of the benefit year. At the time an initial claim is filed, weekly benefits and maximum duration are determined and fixed for a period of 52 weeks called the benefit year. If the individual files another claim (i.e., begins a second spell of unemployment) within the benefit year, benefits available for the second spell are equal to the initial entitlement minus benefits already paid in the benefit year. For individuals with no unemployment in 1977 (i.e., the previous year) this presents no problem, since the current spell of unemployment (captured in March) can be taken as the first spell of the benefit year. For those with previous unemployment, however, the calculation is more complex. The easiest way to illustrate our approach is to consider the case of an individual who had just become unemployed at the time of the survey (i.e., March) and who had one 10-week spell of unemployment in the previous year.

In calculating maximum continuous duration of benefits in the current spell there are three possibilities.[20] If last year's spell of unemployment began before March, the current spell marks the beginning of a new benefit year and the individual receives the maximum duration consistent with previous work experience; let this amount be MAX. If last year's spell began after March (actually after the week of the March survey), one of two conditions holds. Assume that the survey occurs in week number 10, and define the critical week (CW) to be

$$CW = MAX - U_{t-1} + 10$$

where U_{t-1} is weeks of unemployment last year (10 in our example).[21] If last year's spell began after the critical week, say in week number 38, the individual is still in the first benefit year, and will exhaust benefits before the beginning of the second benefit year is reached; maximum potential duration is thus $MAX - U_{t-1}$ (note that we assume in this example that the current spell has just begun). If U_{t-1} began after March but before CW, the individual will reach the end of the first benefit year without exhausting benefits, and will be allowed to begin a new benefit year with a new MAX (call it MAX2) and weekly benefit. MAX2 will be conditional on whatever work experience has been accumulated during the base period (which now includes some part of the old benefit year). If the individual meets eligibility requirements for the second benefit year, maximum potential duration (continuous) for the current spell would be $MAX - U_{t-1} + MAX2$.[22]

Unfortunately, the annual work experience survey does not tell us when spells of unemployment occur. Thus, in order to

derive an expected maximum potential duration, we compute a weighted average of the three possibilities. The weights are determined under an assumption that the probability of becoming unemployed is distributed uniformly across weeks. For the individual in our example, the calculation is as follows

$$DUR = w_1(MAX) + w_2(MAX - U_{t-1}) + w_3(MAX - U_{t-1} + MAX2)$$

where

$$w_1 = \frac{10}{52}\ ,\ w_2 = \frac{CW - 10}{52}\ ,\ \text{and}\ w_3 = 1 - w_1 - w_2\ .$$

The third major issue in the design of the simulator was the whole problem of people out of the labor force at the time of the survey. The CPS provides sufficient information to determine current eligibility status and, where applicable, to calculate marginal tax rates, weekly benefits, and potential duration. Thus some in the NILF group have enough work experience and previous earnings to qualify for benefits immediately. Others would be eligible for benefits only after some minimum period of work experience. For individuals currently ineligible we calculated taxes and UI benefits assuming that weeks employed just satisfied minimum requirements. The applicable weekly wages were either taken from the previous year where available or imputed using an earnings function. The earnings function was estimated using data on the employed population from the May 1978 CPS; estimated earnings were corrected for selectivity bias using Mills' ratio.[23]

Simulation Results

The use of CPS information necessarily entails significant assumptions in the design of the simulator. It is clear that some error is possible because work experience data is not as detailed as the law requires, and because some tax information has to be estimated. Furthermore, the raw CPS data, particularly reported annual income, may not be accurate. With respect to the parameters of the UI system, however, substantial effort has been made to ensure their accuracy. We have made extensive use of internal Department of Labor documents made available to us by the Employment and Training Administration. We have also directly verified provisions for a large number of the states, and in a few instances have engaged in extensive discussions with state officials to determine the appropriate specifications.

The results of the simulation suggest that the program provides a plausible description of the unemployment insurance system. Table 4 presents estimates of the distribution of marginal tax rates after-tax replacement ratios and potential durations for the employed and the unemployed. If we look first at tax rates for the employed, the results appear to be consistent, both internally and with estimates generated by existing tax simulation models. The exclusion of wage income above $50,000 and the underreporting of other incomes appear to have only moderate effects on the overall distribution of rates. The fact that the bulk of the unemployed are found in the bottom tax bracket reflects the marginal income position of many of these individuals, as well as the use of previous year's income which

Table 4

Estimated Marginal Tax Rates, Replacement Ratios, and Potential Durations of Employed and Unemployed

(Percent unless otherwise indicated)

Parameter	Employed	Unemployed
Marginal tax rates		
0	1.0	1.6
0-20	17.0	53.3
20-30	31.7	26.7
30-40	33.6	14.3
40-50	12.3	3.3
Over 50	4.3	0.7
Replacement rates		
0	19.2	60.7
0-25	1.1	1.5
25-40	7.2	2.8
40-60	25.2	10.8
60-80	39.9	18.4
Over 80	7.4	5.8
Potential durations (weeks)		
0	19.3	61.1
0-5	0.1	2.9
5-10	0.4	5.9
10-15	1.6	8.5
15-20	2.0	8.0
Over 20	76.7	13.4

may understate potential earnings.

The evidence on net replacement ratios accords with previous estimates. For the unemployed we find that 61 percent receive no benefits, while those who do, have an average replacement ratio of 66.6 percent. This compares with 55 percent reported in Feldstein.[24] It should be noted that the calculations for the unemployed assume that all leavers are ineligible for benefits. The calculations for the employed predict what they would receive if they were to lose their jobs. We find that 19 percent are ineligible for benefits, while 40 percent of the unemployed would receive benefits replacing 60-80 percent of the after-tax wage.

It is instructive to compare the employed and unemployed groups after adjusting for eligibility. If we look only at those receiving or potentially receiving benefits, we find that close to 15 percent of the unemployed recipients have replacement ratios above 0.8; the comparable figure for the employed is 0.9 percent. The other categories are quite close together, with a greater fraction of the employed in the lower ranges. These calculations are suggestive of the disincentive effects of UI.

The distribution of durations for the unemployed and employed appear quite reasonable. After correcting for eligibility, we find that more than 34 percent of the unemployed have a potential duration which exceeds 20 weeks while 7.5 percent are within 5 weeks of exhausting remaining benefits.

The remainder of the eligible unemployed are quite evenly distributed between 5 and 20 weeks. Among the employed the distribution is skewed toward eligibility for long durations. Clearly work of the employed group has accumulated sufficient wage credits and work experience to qualify for weeks close to the maximum (usually 20 weeks).

As a further check on the consistency of the program, we compared predicted benefits with those actually paid out in March 1978.[25] Estimates of weekly benefits are quite close to the actual values, while the program overestimates total weeks compensated by about 9 percent.

	Actual	Predicted
Average weekly benefits	$85.45	$83.51
Total weeks compensated (millions)	11.124	13.08

One explanation of the difference is the tendency for only some leavers to receive benefits, a fact that we have not reflected in the predicted values. Both the internal checks on consistency and the actual-predicted comparisons suggest that UISIM provides plausible, relatively accurate values of the principal variables of interest.

Empirical Analysis

Data from the monthly Current Population Survey is used in this section to examine the impact of UI on labor market transitions. The CPS focuses principally on labor market activity, but also provides a good deal of information about other personal and family characteristics. Information on family members is generally provided by one (presumably knowledgeable) member of the household. In addition to the regular or basic questionnaire, the Census Bureau administers short supplementary questionnaires on a variety of topics. Data on usual weekly earnings, for example, are obtained in May, while school attendance is dealt with in October. The supplement to the March CPS referred to earlier covers employment and earnings experience in the previous year and is the most extensive of the supplementary interviews.

Our analysis of UI and labor market transitions is based on the flows between labor market states captured in the March and April 1978 Current Population Surveys. The structure of the CPS allows us to follow individuals through four months of labor market activity. A given household in the survey is interviewed in four consecutive months, then is dropped from the survey for eight months before returning for a final four months of interviews. By watching individuals and households in successive months, flows between labor market states can be estimated.

The probability framework relating UI to transitions assumes that alternative states of the labor market are clearly defined, and that changes in status reflect meaningful changes in behavior.

It is well known, however, that the definitions of unemployment and not-in-labor-force in the CPS are somewhat ambiguous. Observed movements into and out of these states may occur because otherwise unchanged behavior is reported in a different way. While the results should thus be interpreted with caution, it is our view that the estimated transition probabilities convey useful information. Clearly, reporting problems are likely to be less important in flows involving employment. Moreover, the available information on reasons for unemployment can be used to enhance the reliability of results. The layoff category, for example, is likely to be somewhat less affected by arbitrary distinctions.

Variable Definition and Empirical Specification

The theoretical analysis has treated unemployment insurance as an exogenous aspect of the choice set facing individuals and firms. Yet the discussion in Section II makes clear that both the level and duration of benefits depend on previous work experience and earnings. These factors are likely to have an independent effect on transitions. In order to isolate the effects of UI it is necessary to control for the level of wages and weeks worked. Transition decisions are also influenced by differences in opportunities and constraints related to demographic characteristics, marital status, education, and local labor market conditions. Table 5 presents definitions and mean values of the variables in the CPS which we use to control for these factors.

Table 5

Basic Current Population Survey Variables, by Labor Market State

Variable (mean)	Labor Market State [a] Employ-ment	Employ-ment	Non-Partic pation
UIBEN replacement ratio: ratio of benefits to after tax wage	0.494	0.249	0.48
AWW average weekly wage	198.56	111.96	68.05
WKSWKD weeks worked in 1977	44.75	21.35	5.08
age	38.05	29.76	48.3
marital status by sex			
MARRYM (1 = male, married; 0 = other)	0.43	0.23	0.1
MARRYW (1 = female, married; 0 = other)	0.24	0.18	0.4
SINGLEM (1 = male, single; 0 = other)	0.16	0.33	0.1
SINGLEF (1 = female, single; 0 = other)	0.17	0.26	0.2
SCHOOL years of schooling	12.5	11.5	11.0
SMSA 1 = living in SMSA; 0 = otherwise	0.58	0.57	0.5
CCITY 1 = living in central city; 0 = otherwise	0.23	0.27	0.2
UMARCH state unemployment rate in March 1978	6.43	6.79	6.4
HSGRAD 1 = high school grad; 0 = otherwise	0.78	0.61	0.5
WKSND weeks needed to qualify for benefits	-	-	9.1
RACE 1 = nonwhite; 0 = otherwise	0.10	0.23	0.1

[a]Numbers in survey sample: employed, 43,593; unemployed, 3,057; nonparticipant, 24,173.

Two specifications are used to estimate the impact of UI on transitions between labor market states. The first and simplest is the linear probability model given by

$$p^i_{hk} = a_o + b_1 UIBEN_i + \sum_{j=2}^{n} b_j x^i_j \qquad (5)$$

where p^i_{hk} is the probability of transition from h to k, and x^i_j represents the jth characteristic for the ith individual. In estimation, p^i_{hk} takes on the value 1 if a transition occurred from month t (March) to month t+1 (April), and zero otherwise. The assumption of linearity in equation (4) has significant limitations. First, the data come in the form of observations on the labor force states individuals occupy in succeeding months. Since the dependent variable is essentially trichotomous (movement into one of three states), there is no natural scale, and standard regression techniques are inappropriate. A linear specification also fails to enforce the constraint that the probabilities lie between 0 and 1.

Because of these limitations, the linear probability model is only used to illustrate the effect of alternative specifications. Inferences about the effects of UI on specific transitions, and analysis of the overall impact of UI on unemployment and labor force participation, will make use of estimates based on the cumulative logistic probability function. In this framework, the logarithm of the odds of a transition occurring (rather than the probability) is a linear function of the characteristics of the individual. Although in the present case there are three possible

states, and three transition probabilities for a given base period, the logistic form and the adding up constraint imply that coefficients for only two of the transitions need be estimated; the third equation can be derived from the other two.

In order to illustrate the approach more formally, consider the case of the transitions out of unemployment. The model is given by: [26]

$$\ln\left(P^i_{ue}/P^i_{uu}\right) = \alpha_{ue} + \beta_{ue}\ \text{UIBEN} + \sum_{j=2}^{n} \gamma_j\ x^i_j\ ; \qquad (6)$$

$$\ln\left(P_{un}/P_{uu}\right) = \alpha_{un} + \beta_{un}\ \text{UIBEN} + \sum_{j=2}^{n} \delta_j\ x^i_j\ , \qquad (7)$$

where the x^i_j are defined as before, and the β's measure the effect of UI on the odds of a transition relative to remaining unemployed. Similar models can be written for transitions out of employment and into the labor force. Estimates of the coefficients in these models are obtained by maximizing the likelihood function.[27] The coefficients can be used to derive an estimate of the derivative of a given probability with respect to UIBEN. The formula for P_{ue}, is for example,

$$\frac{\partial P_{ue}}{\partial \text{UIBEN}} = \hat{\beta}_{ue}\ (1-P_{ue})\ P_{ue} \qquad (8)$$

where $\hat{\beta}_{ue}$ is the estimated coefficient on UIBEN.

Throughout the analysis, the effect of UI on the transition probabilities is captured by the replacement ratio. Theory provides little guidance about the form this variable ought to take. Our use of a linear specification reflects the fact that more complicated nonlinear expression failed to dominate the simple approach. We examined several alternative UI variables, including category dummies, a quadratic term, and linear splines. The results were uniform and consistent; none of the variants produced significant value added when compared to the linear form.

In addition to its linearity, UIBEN also stands alone in capturing the effects of UI. We found that maximum potential duration provided little additional insight or explanatory power. Moreover, since duration is likely to interact with UIBEN, its presence in the equation significantly complicates attempts to use parameter estimates to assess the impact of changes in replacement rates. We did find, however, that other aspects of the UI system, notably adjustments for weeks of employment needed for eligibility, were important. These will be noted and reported below.

The expected impact of UI on the transitions has been extensively discussed. Other variables are expected to have a significant influence on movements in the labor market. Wide variations across demographic groups in the propensity to leave and enter the labor force or employment are well known. For a given demographic mix conditions in the local labor market as measured by the state unemployment rate influence available opportunities. We expect individuals in states with higher rates of unemployment to have greater difficulty in finding work and to be at a greater risk of job loss. It is possible that job finding and labor force entrance will be affected by residential location. SMSA and CCITY are included to capture the possibility of mismatches between the location of jobs and workers.

The demographic variables and other personal characteristics are included to control for differences in preferences and individual opportunity. As noted above the generosity of UI is likely to be related to personal factors which themselves are correlated with transition decisions. Two of the most important of these variables are weeks worked last year (WKSWKD) and average weekly wage (AWW). The weeks variable is designed to capture two effects. First, it is likely to be highly correlated with job tenure and thus will capture some of the effects of seniority on the possibility of layoff and recall. Second, it should reflect both attachment to the labor force and personal stability. If these are important aspects of individual heterogeneity, WKSWKD may help to isolate the effects of UI which do not depend on individual quality. The wage plays a similar role.

Transitions from Unemployment

Table 6 presents the coefficients estimated from a multinomial logit model of transitions from unemployment. Estimates are presented by destination state (e.g. employed, NILF) for the total unemployed population, and for each of three unemployment groups: those on layoff, quitters and other job losers (including reentrants). In the layoff and loser regressions UIBEN is entered as calculated by UISIM. In the quit regression, however, an adjustment was made to reflect the possibility of outright disqualification and the effect of the waiting period where applicable. Where quitters are disqualified we set UIBEN to zero. For potentially eligible quitters, an adjusted UIBEN is given by:

$$UIBEN_i^* = UIBEN_i \left(\frac{k - q_i}{k}\right) \qquad (9)$$

where q is the number of weeks a quitter must wait until benefits will be received, and k is the expected remaining duration of the unemployment spell. The parameter k is given by

$$k = \frac{1}{p_{ue} + p_{un}} \qquad (11)$$

Average values of p_{ue} and p_{un} for the entire quit sample were used to calculate average k. Variation in $UIBEN^*$ thus reflects variation in UIBEN and q.

Looking just at the results for the three categories of unemployment, the effect of UI is generally inconsistent with expectations, although the large standard errors preclude clear conclusions. We do find negative effects among those on layoff, where the impact of UI on withdrawal from the labor force is quite

Table 6

Transitions Out of Unemployment by Reason of Unemployment

Specification	CONS	UIBEN	SMSA	CCITY	RACE	WAGE	WKSWKD	UMARCH	SCHOOL
Unemployment to Employment									
layoff	- .541	- .700	-.120	-.054	-.585	-.002	.027	0.195	-.014
	(.756)	(.436)	(.190)	(.273)	(.328)	(.001)	(.008)	(.072)	(.059)
quit	-2.150	.185	-.204	.471	-.452	.001	.013	-.102	.115
	(.938)	(.719)	(.190)	(.264)	(.356)	(.001)	(.004)	(.067)	(.067)
loser	.898	.269	.112	-.581	-.469	-.0004	.007	-.111	-.064
	(.369)	(.135)	(.096)	(.129)	(.121)	(.0003)	(.003)	(.030)	(.028)
total	.469	.162	-.036	-.254	-.560	-.0001	.012	-.076	-.055
	(.325)	(.180)	(.102)	(.124)	(.123)	(.0003)	(.003)	(.028)	(.025)
	.092	.032	-.007	-.050	-.110	-.00001	.002	-.015	-.011
Unemployment to Not-In-Labor Force									
Layoff	-2.331	-1.878	-.129	.663	-1.187	-.003	.012	0.200	.072
	(1.345)	(.778)	(.247)	(.406)	(.624)	(.001)	(.015)	(.085)	(.091)
quit	-2.518	1.557	.658	-.173	.440	.002	-.010	-.022	.107
	(.987)	(.766)	(.317)	(.348)	(.345)	(.001)	(.005)	(.041)	(.081)
loser	- .417	.132	-.153	.127	.055	-.002	-.012	.006	.023
	(.100)	(.217)	(.101)	(.126)	(.117)	(.0004)	(.004)	(.016)	(.008)
total	-1.273	.116	-.067	.213	.067	-.002	-.020	.028	.057
	(.386)	(.230)	(.118)	(.131)	(.117)	(.0006)	(.004)	(.031)	(.029)
	- .207	.019	-.011	.035	.011	-.0003	-.003	.004	.009

Note: Standard errors are in parentheses; the value given below the standard error for the total results is the derivative of the probability with respect to the variable. All equations include age-sex dummies, and controls for marital status and high school graduation.

strong. Among the other groups, however, the coefficients are positive though relatively imprecise. When the evidence is pooled by estimating the model for the total sample, we find very weak and insignificant effects. In addition to the logit coefficients, we report the derivatives of the probability for the total sample. It can be seen that the estimated effects are not only statistically weak, but substantively small. In the case of entering employment for example, the derivative (0.032) implies that changing the replacement rate by 0.10, would change the probability of finding a job by 0.003. This compares with an average job finding probability of 0.31.

In light of the strong theoretical arguments and previous empirical evidence on duration and transitions, the relatively weak effects of UI are surprising. Furthermore, the positive effects for losers and quitters remain a puzzle. A possible explanation of the findings for job losers and of the general imprecision of UI estimates in Table 6 is individual heterogeneity. If unmeasured quality differences are positively correlated with eligibility for UI (and the level of benefits), as well as the likelihood of finding work, then the coefficient of UI would be biased upward.

A possible correction for this heterogeneity problem is to introduce the duration of the current spell of unemployment as a control variable. The argument is simply that current duration indicates the degree of success in finding work and is thus an indicator of individual quality. While this procedure apparently does reduce the upward bias, the general character of the results is unaffected. The signs remain unchanged, while the size of the coefficients declines slightly.

The heterogeneity argument does not explain the positive effect of UI on labor force withdrawal by quitters. It would seem that more able individuals would find work more easily whether the previous separation were initiated voluntarily or not. A somewhat more plausible explanation is the absence of any controls for other income, especially the income of the spouse. Since marginal tax rates are based on family income, secondary earners may have both high replacement rates and high family income. Without controls for other income strong income effects could lead to individuals with high replacement rates leaving the labor force. Once again, however, it is not clear why this effect should apply only to quitters. And indeed adding other income variables has only negligible effects. The impact of UI on labor force exit by quitters remains paradoxical.

Transitions from Employment

In contrast to rather weak results on the unemployed, the evidence on the impact of UI on employment decisions is quite strong. Two sets of estimates are presented. We first use the linear probability model to study the impact of UI on unemployment transitions, with particular emphasis on subsamples defined by the reason for becoming unemployed. For comparison, linear probability estimates for the total sample are provided. In the second set, estimates for the total sample are provided. Linear probability models are used because the computational cost of multinomial logit with many destination states is prohibitive. In the second set, we estimate the transitions from employment using the multinomial logit framework and present coefficient estimates and the associated derivatives. The linear probability estimates in Table 7 reveal a significant positive effect on the flow into unemployment. The bulk

Table 7

Transitions from Employment

Specification	CONS	UIBEN	SMSA	CCITY	RACE	WAGE ($\times 10^{-3}$)	WXSWKD ($\times 10^{-2}$)	DMARCH ($\times 10^{-2}$)	SCHOOL ($\times 10^{-2}$)	R^2	SEE
Linear Probability Models											
Employment to Unemployment (P_{eu})											
total	.049	.008	-.002	.002	.002	-.008	-.077	.090	-.091	.016	.011
	(.004)	(.002)	(.001)	(.001)	(.002)	(.004)	(.005)	(.035)	(.026)		
layoff	.013	.005	-.001	.001	.0001	-.001	-.023	.069	-.050	.004	.003
	(.002)	(.001)	(.001)	(.001)	(.0010)	(.002)	(.002)	(.018)	(.013)		
loser	.029	.0001	-.001	.0001	.004	-.005	-.046	.031	-.025	.013	.006
	(.003)	(.0016)	(.001)	(.001)	(.001)	(.003)	(.003)	(.026)	(.020)		
quit	.007	.002	.0000	.0010	-.002	-.002	-.009	-.009	-.015	.003	.002
	(.002)	(.001)	(.0003)	(.0006)	(.0007)	(.002)	(.002)	(.010)	(.011)		
Employment to Not-in-Labor Force (P_{en})											
total	.148	-.042	.0003	.0000	-.0001	-.038	-.200	.046	-.002	.062	.027
	(.006)	(.003)	(.002)	(.002)	(.003)	(.006)	(.007)	(.053)	(.040)		
Multinominal Logit											
Employment to Unemployment											
Total	-1.804	.791	-.142	.119	.088	-2.552	-5.133	9.048	-9.442		
	(.354)	(.238)	(.116)	(.135)	(.149)	(.561)	(.403)	(3.108)	(2.517)		
	- .020	.009	-.002	.001	.001	- .028	- .057	.100	- .104		
Employment to Not in Labor Force											
Total	-2.171	.694	-.002	.114	.025	-3.491	-3.570	4.878	2.221		
	(.276)	(.158)	(.085)	(.098)	(.112)	(.446)	(.271)	(2.358)	(1.896)		
	- .045	-.014	-.0000	.002	.001	- .072	- .074	.101	.046		

Note: Standard errors are in parentheses. Each regression includes age-sex dummies and controls for marital status and high school graduation.

of this effect occurs in the layoff group, where the UIBEN coefficient is well over half the size of the average transition probability from employment to layoff unemployment. These results are consistent with the evidence presented by Feldstein. While the layoff group dominates in the UI effect, we also find a statistically significant, positive impact on quit behavior. The flow of other job losers, however, appears to be unaffected by rates of replacement.

The theory suggests that the flow out of employment will depend on the extent of experience rating of firms. The UI tax system allows only partial experience rating over a limited range of tax rates and previous unemployment behavior. Maximum and minimum tax rates are built into all the state tax laws. These have the effect of setting the marginal cost of a layoff to the firm (net of separation costs) to zero. The experience rating hypothesis was tested using data on fraction of covered weeks at the minimum and maximum in each state. Using various combinations of minima and maxima, we found experience rating to have no effect on the flow out of employment. The conclusion applied to transitions into all of the different states of unemployment and NILF.

We agrued earlier that UI may raise the gain to labor force attachment and thus reduce the probability of leaving the labor force from employment. The evidence in Table 7 indicates overwhelming support for this hypothesis. It appears that higher UI benefits encourage labor force withdrawal. While the direction of the

Table 7

Transition From Employment: Linear Probability Estimates

Specification	CONS	UIBEN	SMSA	CCITY	RACE	WAGE ($X10^{-3}$)	WKSWKD ($X10^{-2}$)	UMARCH ($X10^{-2}$)	SCHOOL ($X10^{-2}$)	R^2	SEE
Employment to:											
Unemployment (p_{eu})											
total	.049 (.004)	.008 (.002)	-.002 (.001)	.002 (.001)	.002 (.002)	-.008 (.004)	-.077 (.005)	.090 (.035)	-.091 (.026)	.016	.011
layoff	.013 (.002)	.005 (.001)	-.001 (.001)	.001 (.001)	.0001 (.0010)	-.001 (.002)	-.023 (.002)	.069 (.018)	-.050 (.013)	.004	.003
loser	.029 (.003)	.0001 (.0016)	-.001 (.001)	.0001 (.001)	.004 (.001)	-.005 (.003)	-.046 (.003)	.031 (.026)	-.025 (.020)	.013	.006
quit	.007 (.002)	.002 (.001)	.0000 (.0003)	.0010 (.0006)	-.002 (.0007)	-.002 (.002)	-.009 (.002)	-.009 (.010)	-.015 (.011)	.003	.002
Not-in-Labor Force (p_{en})											
total	.148 (.006)	-.042 (.003)	.0003 (.002)	.0000 (.002)	-.0001 (.003)	-.038 (.006)	-.200 (.007)	.046 (.053)	-.002 (.040)	.062	.027

Note: Each regression includes age-sex dummies and controls for marital status and high school graduation.

effect is consistent with the theory, the magnitude of the impact in the linear probability model is implausible. The logic of the connection between UI and labor force withdrawal requires an ofsetting flow into unemployment. This is because the decision to remain employed is based on the attractiveness of becoming unemployed at some point in the future. If the negative effect of UI on p_{en} were due to the attractiveness of unemployment we would expect to see a flow into unemployment of comparable magnitude.

Much of the disparity in the estimates disappears in the logit framework. There we find that the derivative of UI in the p_{eu} equation is 0.009, while the estimated effect in the p_{en} equation is -0.014. Although the p_{en} effect is still somewhat larger, (in absolute value), the difference between them is not statistically significant.[28] It appears that imposition of linearity distorts the evidence on labor force withdrawal. When a more appropriate functional form is applied estimates are obtained which are reasonably consistent with the notion of off-setting flows. Overall, the evidence points to UI as a major factor in decisions to leave employment.

Transitions into the Labor Force

Estimates of the effect of UI on movements into the labor force are examined in Table 8. Both linear probability results and results from the logit specification are presented. The results are based on an estimate of what benefits would be available if one were eligible and became unemployed.[29] We have also calculated the number of weeks of employment needed to qualify for benefits, and estimated its impact.

It is evident in both sets of results that UI encourages the flow into unemployment through the benefit structure. In column 2, however, we find that eligibility rules and attachment tests appear to cut the other way. The results indicate a negative effect of WKSND, while UIBEN is positive and statistically significant. The sign of WKSND seems reasonable. We would expect that individuals with a requirement of a week or two would appear in the unemployment category sooner and more readily than those where weeks needed were sizable. This is particularly true in light of the fact that an important part of the NILF group (10 percent) has accumulated sufficient weeks and earnings to qualify for benefits. While a large number of those individuals are likely to have quit their most recent job, it is quite likely that some significant number are esentially eligible for benefits immediately.

The contrast with the flow into employment is symmetric; higher benefits are associated with reduced movements into employment while weeks needed has a positive association. It is likely

that the signs of these effects are more than coincidence. One explanation for the negative effect of benefits on P_{ne} is that those with very attractive replacement ratios choose to enter unemployment. Likewise, the weeks needed variable reveals the eligibility effect--people choosing to enter employment over remaining NILF or becoming unemployed tend to require more weeks worked in order to qualify for benefits.

In order to simplify later analysis of UI and rates of employment and unemployment, we have dropped WKSND from the logit specification. The evidence in Columns (5)-(8) is consistent with our previous remarks: UI has a positive effect on the flow into unemployment, and tends to reduce the flow into employment. As in the case of movements out of employment, we find that decisions regarding labor force entry are apparently interrelated, although the orders of magnitude of the derivatives suggest that unmeasured differences in individuals may be affecting the results.

In summary, the evidence in Tables 6-8, points to a significant and consistent impact on the flow into unemployment out of employment, a strong effect on P_{en}, generally mixed results for the unemployed, and some indication that flows into the labor force are influenced by UI.

Estimating the Impact of UI on the Unemployment Rate

This section uses estimates of the multinominal logit model to assess the impact of UI on the measured rate of unemployment, on the employment ratio and the non-participation rate. At the outset it is important to realize that the estimates here can only be regarded as an approximation to a fully dynamic stochastic simulation.

The approach we have adopted makes use of the steady state relationship between transition probabilities and the fraction of the population in the three labor market categories. If we let P indicate the 3x3 matrix of probabilities, and use Π to represent the 3x1 vector of proportions then we know that in steady state, $P\Pi=\Pi$. The P matrix is not of full rank, but we can use the fact that the elements of Π sum to one, together with the steady state identity, to solve for Π as a function of P.

The first step in estimating the impact of UI is to obtain an estimate of Π using actual values of the independent variables including UIBEN. A P matrix is estimated for each individual using the logit coefficients in tables 6-8 (total sample estimates) and the individual's characteristics. We then solve for the Π vector associated with each individual (i.e. the fraction of time the individual could expect to spend in each state) and cumulate across individuals to get the aggregate proportions.

In order to gauge the impact of UI, two situations are examined. In the first, we reduce potential UI benefits by 10 percent, while potential UI benefits are eliminated completely in

the second. In both cases, a new P matrix and a new $\bar{x}$ are calculated for each individual, and new aggregate steady state proportions are derived. These can be compared to the original steady state estimates to see the change induced by UI.

Table 9 presents estimates of the impact of UI on the employment ratio, the unemployment rate and the rate of non-participation. The first line presents average values of these indicators as measured by the CPS during 1978. The unemployment rate averaged 6.0 percent in that year, while a little over 59 percent of the population was employed. The estimated effect of UI is examined in lines 2-5. In Line 2, the change in UI is applied to the whole sample, and the difference between the steady state proportions with and without the change is reported. The first entry in the employment column, for example, indicates that reducing UI by 10 percent would lower the steady-state fraction of the population employed by 0.02 percentage point. Unemployment would be reduced by 0.08 point, and nonparticipation would increase by a similar amount.

When UI benefits are eliminated, however, these magnitudes are much larger. In the case of unemployment, for example, we estimate that elimination of UI would lower the unemployment rate by more than half of a percentage point. With the overall rate on the order of 6 percentage points, the effect is sizable. Coupled with a decline in the employment ratio of 0.62 point, the unemployment effect leads to a significant increase in the rate of non-participation. Indeed, the dominant effect of UI in these data appears to be its impact on movements into and out of the labor force. As the

Table 8

Transition From Unemployment by Reason: Linear Probability Estimates

Specification	CONS	UIBEN	SMSA	CCITY	RACE	WAGE ($X10^{-2}$)	WKSWKD ($X10^{-1}$)	UMARCH	SCHOOL	R^2	SEE
Unemployment to:											
Employment (p_{ue})											
layoff	0.345	-.048	-.015	-.044	-.086	-.022	.055	.035	-.006	.060	.242
	(.195)	(.106)	(.057)	(.078)	(.087)	(.020)	(.022)	(.019)	(.015)		
loser	0.515	.053	.029	-.106	-.081	.001	.019	-.020	-.013	.073	.184
	(.074)	(.043)	(.025)	(.028)	(.025)	(.008)	(.008)	(.006)	(.006)		
quit	.066	-.071	-.082	.106	-.111	.001	.034	-.016	.015	.088	.218
	(.198)	(.141)	(.060)	(.069)	(.078)	(.013)	(.015)	(.014)	(.015)		
Not-in-Labor Force (p_{un})											
layoff	.113	-.126	-.013	-.054	-.058	-.019	.052	.007	.005	.109	.071
	(.106)	(.058)	(.031)	(.042)	(.047)	(.011)	(.120)	(.010)	(.008)		
loser	.142	-.014	-.036	.054	.043	-.028	-.036	.007	.011	.107	.168
	(.071)	(.041)	(.023)	(.027)	(.024)	(.008)	(.008)	(.006)	(.005)		
quit	.103	.251	.091	-.042	.091	.021	-.022	-.001	.011	.141	.137
	(.157)	(.111)	(.047)	(.055)	(.061)	(.011)	(.012)	(.011)	(.012)		

Note: Each regression includes age-sex dummies and controls for marital status and high school graduation.

TABLE 9

IMPACT OF UI ON EMPLOYMENT AND UNEMPLOYMENT:

No Change in Wage

Simulated Situation	Labor Force State: Employment Ratio	Unemployment Rate	Not-in-Labor Force Ratio
1. Actual Rates 1978	59.4	6.0	36.8
Change in Rates			
2. Total Sample UI down 10%	-0.02	-0.08	0.08
3. No UI	-0.62	-0.65	1.11

coefficient estimates suggested, it is likely that transitions into and out of employment play a significant role in the overall effect.

The estimates in Table 9 are derived under assumptions about changes in UI, but no changes in other variables are introduced. Many of the independent variables would be unaffected, but it is likely that wages, in particular, would be affected by changes in UI. Table 10 presents estimates of the UI impact on labor market states allowing for the effect of taxes on wages. We assume that the burden of the UI tax falls entirely on labor, so that reductions in the tax are fully reflected in an increase in the wage. The tax rate used was 0.86 percent. It was calculated by dividing total unemployment insurance receipts by total wage and salary income for 1978. The rate is small both because the UI tax applies only to a portion of total earnings and because the rate is not large to begin with.

The basic algorithm used to identify the effect of UI is the same, with the only change being an adjustment in the wage in addition to changes in UI. It is clear from the table that the tax adjustment has little impact on the estimated UI effect. In the results for elimination of UI, for example, comparison with Table 9 shows that employment would fall somewhat less, and non-participation would rise somewhat less if wages were adjusted for tax changes. But the differences are trivial. At least with the estimated coefficients and tax rates used here, failure to address

TABLE 10

IMPACT OF UI ON EMPLOYMENT AND UNEMPLOYMENT

Wages Adjusted for Tax Changes

Simulated Situation	Labor Force State: Employment Ratio	Unemployment Rate	Not-in-Labor Force Ratio
Actual Rates 1978	59.4	6.0	36.8
Change in Rates			
Total Sample			
UI Down 10%	0.00	-0.08	-0.06
No UI	-0.59	-0.65	1.09

the tax issue has a negligible effect on inferences about the UI effect.

Overall, the results suggest that UI has a sizable impact on the rates of unemployment and labor force participation. Taken literally, the estimates indicate that the growth of UI over the last decade may have played an important role in the upward trend in participation. However, the estimates also imply that UI raises employment, a result which probably reflects the relative size of the UI effect in the p_{en} and p_{eu} equations. Since these estimates may reflect errors of measurement, or non-linearities in the UI variable, further analysis seems in order.

In spite of the preliminary nature of the evidence, the analysis does underscore the importance of studying the effect of UI on other labor market groups besides the unemployed. Much empirical work in this area has concentrated on the behavior of the unemployed, but the impact of UI is clearly much broader. It appears that transitions into and out of the labor market, particularly in and out of employment, play a central role in the overall effect of UI.

Conclusions

The results in this paper are all based on microeconometric evidence. The information used is basically a comparison of the behavior of persons receiving high UI benefits with those receiving lower benefits. This approach assumes that the effect of a general change in UI would simply be the sum of the individual effects. Previous experience suggests that extrapolating micro-relationships to the macro sphere is perilous. Here we list some of the biases in our procedure.

First, the estimates reported here may underestimate the impact of UI on some of the transition probabilities. Consider, for example, the relation between UI and temporary layoffs. Employers can tailor their layoff policy to the UI situation of their typical worker but not to each individual worker. Hence increases in the general level of UI will tend to cause greater increases in layoffs than would be implied by comparisons of individuals receiving more or less generous benefits. A similar point applies with respect to permanent separations.

Second, the calculation described here depends on the assumption that the transition probabilities are determined independently. While this is reasonable in considering cross-sectional variation among workers, it may not be tenable in assessing policies with large impacts. Consider, for example, a measure that sharply reduced the flow from unemployment to employment. This would raise employers' hiring costs, and so would be likely to reduce the optimal separation rate. A similar point applies to the relation between the flows from nonparticipation to unemployment and from unemployment to employment.

Third, changes in UI may have important macro effects. The role of UI as an automatic stabilizer has been discussed frequently. As important may be the program's impact on the extent of wage rigidity. By making unemployment more palatable UI is likely to reduce the downward pressure it places on wages. This will tend to reinforce the stickiness of wages, which according to many theories is the cause of unemployment. The cross-sectional analysis presented here has no way of taking account of these effects.

Fourth, there are strong reasons to believe that the effects of UI depend on the overall unemployment rate. The rate of unemployment was 6.0 percent in 1978. The results might be very different at business cycle troughs and peaks. One would expect that the effect of UI is most pronounced when the labor is in excess demand, and least pronounced when jobs are being rationed. These propositions could in principle be tested by replicating this study with data sets drawn at different parts of the business cycle.

Beyond the difficulties inherent in the microeconometric approach taken here, there are a variety of ways in which the results can be refined. The preliminary results regarded here consider only small variations in theoretical form. Only crude account is taken of the potential duration of UI benefits. A crucial problem is errors in variables. The UI variables used here necessarily involve some imputation error. Perhaps more important, there is evidence that the dependent variables suffer from significant measurement error. It appears that the rate of flow between labor force states may be exaggerated by as much as a

factor of two or three. In future work we hope to address these issues. It is also hoped that it will be possible to explore a broader menu of alternative reforms.

Several conclusions emerge from our research at this stage. UI has large effects on the decisions to seek and leave employment. The possibility of becoming eligible for benefits attracts many workers into the labor force. The program also encourages persons leaving employment to enter unemployment rather than the NILF state. To some extent this may be a reporting rather than a behavioral effect. Taken together these results imply that UI has a substantial positive effect on labor force participation. Our econometric estimates suggest that eliminating the program would reduce the labor force participation rate by about 1 percent. This drop-off would come from a decline of about half a percent in the employment ratio, and about two-thirds of a percent in the employment rate.

Our results suggest that a focusing on unemployment effects of UI as has been done in most previous research may be very misleading. Our estimates imply that the program simultaneously increases both employment and unemployment. Future research should concentrate on the direct employment impact of the UI program.

These results must be used cautiously in interpreting labor market developments. The effects of the UI program probably increased somewhat during the 1970's as benefits and coverage levels were raised. Of equal importance, rising marginal tax rates, due

primarily to increasing Social Security payroll taxes, raised replacement rates. The results suggest that these developments may have contributed to the increase in the national unemployment rate and participation rate which were observed during the decade. Since the increase in the level of the average replacement rate was probably less than twenty percent, it is doubtful that the effects studied here can account for a large part of the movements which have taken place. It may be that other social insurance programs have contributed to the remaining increase. This question is left for future research.

Footnotes

[1] For example, see Richard Freemand and James Medoff, "Why do Youth Unemployment Rates Differ Across Labor Market Surveys?" in Richard Freeman and David Wise, eds., The Youth Labor-Market Problem: Its Nature, Causes, and Consequences University of Chicago Press, 1982).

[2] An excellent survey of this large literature is Alan Gustman, "Analyzing the Relation of Unemployment Insurance to Unemployment," National Bureau of Economic Research working paper 512 (Cambridge: NBER, July 1980).

[3] Martin Feldstein, "The Effect of Unemployment Insurance on Temporary Layoff Unemployment," American Economic Review, Vol. 68 (December 1978), pp. 834-46.

[4] Daniel S. Hamermesh, "Entitlement Effects, Unemployment Insurance and Employment Decisions." Economic Inquiry, vol. 17 (July 1979), pp. 317-32.

[5] The quantitative importance of this effect has been questioned in Stephen Marston, "Unemployment Insurance and Voluntray Employment," Report to the National Commission o Unemployment Compensation, October 1979.

[6] Prominent contributions include Rober Hall, "Why is the Unemployment Rate so High at Full Employment?" Brookings Papers on Economic Activity, 1970:3, pp. 369-410; George Perry, "Unemployment Flows in the U.S. Labor Market," BPEA 1972:2, pp. 245-92; and Stephen T. Marsten, "Employment Instability and High Unemployment Rates," BPEA, 1976:1, pp. 169-210.

[7] Note that any one equation of system 2 is linearly dependent on the others. Hence, a unique root satisfying $\pi\frac{i}{i} + \pi\frac{i}{e} + \pi\frac{i}{n} = 1$ exists. This theorem, which is proved in any textbook in Markov processes assumes that all the p^{i}_{jk} are positive. The vector Π can be calculated as the eigenvector corresponding to the unit eigenvalue of the matrix P. The vector Π is the ergodic steady state corresponding to the matrix P.

[8] A much more extensive discussion of the significance of observed labor force transitions may be found in Kim Clark and Lawrence Summers, "Labor Market Dynamics and Unemployment: A Consideration," BPEA, 1979:1, and Kim B.

[9] Dale T. Mortenson, "Unemployment Insurance and Job Search Decisions," Industrial and Labor Relations Review, Vol. 30 (July 1977), pp. 505-17.

[10] Martin S. Feldstein, "The Importance of Temporary Layoffs: An Empirical Analysis," BPEA, 1975:3, pp. 725-45.

[11] Robert Hall, "A Theory of the Natural Unemployment Rate and the Duration of Unemployment," Journal of Monetary Economics, Vol. 5 (April 1979), pp. 153-69.

[12] Martin Feldstein, "Temporary Layoffs in the Theory of Unemployment," Journal of Political Economy, vol. 84 (October 1976), pp. 937-57.

[13] Robert E. Hall, "Employment Fluctuations and Wage Rigidity," BPEA, 1980:1, pp. 91-141.

[14] The work experience survey provides no information on the pattern of earnings (high quarter, low quarter, etc.) throughout the year, nor on the timing of spells of unemployment. Furthermore, earnings above $50,000 are not reported, and nonwage and salary income tend to be underreported.

[15] In this example, the benefit year is specifically individually determined. In a few states the benefit year is fixed for all individuals, by statute, but administrative rulings have the effect of making it specific to the individual.

[16] The definition of "good cause" varies greatly by state; while usually restricted to action by the employer, a number of states make exceptions for "compelling personal reasons."

[17] Three states and the District of Columbia employ a "bracket step down" in determining eligibility. If a claimant does not meet the basic test, a second, less restrictive, test is applied; passthe the second test brings a lower benefit. The number of such brackets ranges from three to five. U.S. Department of Labor, Employment and Training Administration, Unemployment Insurance Service, Comparision of State Unemployment Insurance Laws (GPO, 1978), pp. 3-28.

[18] The program for calculating tax rates uses a modified version of the federal and state tax simulation models developed at the National Bureau of Economic Research.

[19] For a description of TAXSIM see Martin Feldstein and Daniel Frisch, "Corporate Tax Integration: The Estimated Effects on Capital Accumulation and Tax Distribution of Two Integration Proposals," National Tax Journal, vol. 30 (March 1977), pp. 37-52. The data are based on 1976 returns and were updated to reflect 1978 income levels.

[20] The "continuous" aspect of this calculation deserves emphasis. Note that we ignore the possibility that an individual could exhaust benefits, wait for a short period until the beginning of a new benefit year, and resume receipt of benefits if qualified. Our calculation stops at the point of exhaustion unless a new benefit year is reached.

[21] Since the individual is assumed to have just become unemployed at the time of the survey, there is no need to adjust for weeks of benefits already received in the current spell. The adjustment incorporated in the program is as follows: if U_t is weeks in the current spell, $CW = MAX - U_{t-1} + 10$. Our calculation assumes that all weeks of unemployment in the previous year were accumulated in one spell. This formula

assumes no overlap between benefit years. The true formula is weeks to exhaust + MAX2. We have no information on the point at which the spell of unemployment began and therefore have ignored the overlap problem. The effect is to overstate somewhat potential duration.

22 The possibility of overlapping benefit years may reward some individuals who have experienced some unemployment in the previous year. Consider the case of two individuals, each laid off at the same time. Assume that one has no previous unemployment experience, while the other was unemployed for 4 weeks 9 months ago. Given sufficient earnings and weeks of unemployment, the first individual will begin a benefit year and have a maximum potential duration of 26 weeks. The second individual, however, will reach the end of the first benefit year in 12 weeks, and subject to eligibility tests, will receive an additional 26 weeks in the second benefit year. Thus the individual with unemployment experience has a potential duration of 38 weeks, while the first individual has 26.

23 The sample used to estimate the earnings function was composed of employed individuals who participated in both the March and May 1978 CPS. The specification included controls for years of schooling, race, age, region, weeks worked in the previous year, location (S.M.S.A., central city), sex,

marital status, and Mills' ratio. The dependent variable was the log of usual weekly earnings. Mills' ratio was estimated using a probit model of employment status. For Mills' ratio, see James J. Heckman, "The Common Structure of Statistical Models of Truncation, Sample Selection and Limited Dependent Variables and a Simple Estimator for Such Models," Annals of Economic and Social Measurement, vol. 5 (Foll 1976), pp. 475-92. The results are available on request.

[24] Feldstein, "The Effect of Unemployment Insurance."

[25] U.S. Department of Labor, Unemployment Insurance Statistics, March 1978, table 3c.

[26] In the general case, a given probability for the i^{th} individual can be written as

$$P_j^i = \frac{e^{x_i \beta_j}}{1 + \sum_{j=1}^{+-1} e^{x_i \beta_j}}$$

where j indexes choices, and the Xs are characteristics. The likelihood function can be formed as a product of the appropriate probabilities, and maximized with conventional non-linear techniques.

[27] Such models have been developed and used in several places. See Daniel McFadden, "Conditional Logit Analysis of Qualitative Choice Behavior," in Paul Zarembka, ed., Frontiers in Econometrics (Academic Press, 1974), pp. 105-42, for a discussion and review of the statistical literature.

[28] Inspection of the data set for left-out variables that may lie at the foot of the unrealistic p_{en} coefficient suggests one possibility. Because of technological differences and differences in required skill and ability, an individual's occupation and industry may be an important determinant of labor force exit. In order to test this possibility we estimated a new set of regressions with broad industry and occupation dummies. In doing this we run the risk of "overcontrolling" possible effects of UIBEN which may work through occupational choice or the decision of where to work. The results are instructive. We find that the industry and occupation dummies reduce the coefficient of UIBEN on p_{en} from 0.042 to 0.027. All of the impact occurs through the occupation variables, suggesting that the omitted variables of interest have to do with skills and training, rather than conditions of demand or risk shifting through contracts. This view is supported in the layoff regression. There we find that the industry and occupation dummies have virtually no effect on any of the previous coefficients.

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[29] Where wage data were not available, we imputed a wage based on an earnings function (see footnote 23).