WORKING
PAPER

The Effect of the UI Wage Replacement Rate on Reemployment Wages

A Dynamic Discrete Time Hazard Model with Unobserved Heterogeneity

ZAFAR NAZAROV

WR-734

December 2009

This paper series made possible by the NIA funded RAND Center for the Study of Aging (P30AG012815) and the NICHD funded RAND Population Research Center (R24HD050906).

LABOR AND POPULATION

The effect of the UI wage replacement rate on reemployment wages: a dynamic discrete time hazard model with unobserved heterogeneity

December 2009

Abstract

This study estimates the effect of the UI wage replacement rate on reemployment wages using the sample of men in the 1996 and 2001 Surveys of Income and Program Participation. We model employment search behavior in a dynamic discrete time hazard setting with three possible outcomes: finding a full-time job, finding a part-time job, or staying unemployed (continuing the job search). We find that reemployment wages, particularly part-time wages, decrease with the UI wage replacement rate. Furthermore, the wage replacement rate depresses the prospect of finding full-time work while increasing the prospect of finding part-time work.

Keywords: UI wage replacement rate, reservation wage, reemployment wage, duration of unemployment, part-time employment, dynamic discrete time hazard model.
JEL Codes: J31, J64**,** J65

1. Introduction

The disincentive effect of Unemployment Insurance (UI), represented by the duration of benefits, the amount of weekly benefits, and the wage replacement rate, on the prospect of reemployment is well documented in the literature (Meyer, 1990; Katz and Meyer, 1990; Bover et al., 2002). Surprisingly, little attention has been paid to the effect of UI on re-entry wages after the spell of unemployment. If UI benefits depress the chances of finding a job and if an increase in the generosity of the program consequently leads to prolonged unemployment, then we would expect firms to discriminate against workers based on the duration of unemployment (Vishwanath, 1989; van der Berg, 1999). The stigma factors may include the belief that prolonged unemployment is a possible signal of a worker's low productivity or of human capital depreciation.

The existing empirical evidence, based on unemployment spells of U.S. workers, is inconclusive about the effect of UI on the direction and magnitude of the wage premium after the period of unemployment. For example, the results from the Addison and Blackborn's (2000) study are very sensitive to the sample size and set of covariates used in the model. Although for some specifications they find a negative association between UI and reemployment wages, the final conclusion of the study is that relationships between some UI characteristics and reemployment wages are positive. Another, more recent study by McCall and Chi (2008) finds evidence of a positive association between weekly benefits and reemployment wages, though this effect dissipates after 34 weeks of unemployment, and as unemployment progresses further, the effect becomes negative.

The results of any study that explores reemployment wages of workers after a period of unemployment are tremendously sensitive to the accuracy of information about the duration of unemployment and first accepted wages. The above studies use the employment history of displaced workers from surveys in which workers are asked about possible sources of unemployment and the length of unemployment in the preceding 2–5 year period after the job loss.[1] Therefore, the results may be biased due to inaccurate recall of the exact duration of unemployment and level of reemployment wages.[2] In contrast, this study uses the unemployment history of workers from the Survey of Income and Program Participation (SIPP). One of the advantages of the SIPP is that it contains monthly information on workers' employment status, and a sample of SIPP participants is interviewed every four months for several years. The short period between interviews helps to calculate with greater precision the duration of unemployment and determine as accurate as possible post-unemployment wages at the start of the first job after the period of unemployment.

In our empirical model, the main characteristic of UI that we model is the simulated wage replacement rate for each worker. We also use state-level characteristics, such as the average duration of UI benefits and the average weekly benefits. The inclusion of state-level information allows for additional sources of variation across states and time. The eligibility criteria and generosity of UI vary substantially across states. Furthermore, state authorities occasionally change the rules and level of weekly benefits as macroeconomic conditions in the state change. However, we recognize that, in reality,

[1] Addison and Blackburn (2000) use the Displaced Worker Surveys for 1988, 1990, and 1992, which identify workers who were displaced from their jobs in the preceding 5-year period. McCall and Chi (2009) use the National Longitudinal Surveys from 1979 to 2002. The time gap between waves of the survey is 2 years.

[2] The reemployment wages in these studies are assumed to be equal to wages on the day of the interview.

the state-level information may have a very weak influence on the worker's decision-making process. For instance, in our case, for a substantial fraction of workers who quit their previous jobs and therefore are not eligible for UI benefits, any changes in the UI program might not have any effect on their job search strategies. Therefore, we put more weight on the estimate of the effect of the UI individual-level characteristic represented by the wage replacement rate on the post-unemployment wages of workers.

Our empirical model is based on the assumption that the wage replacement rate indirectly affects reemployment wages through the duration of unemployment and the type of employment. Therefore, we also provide estimates for the effect of the duration of unemployment and part-time employment on reemployment wages. We hypothesize that the most recent unemployment spell may have a negative effect on reemployment wages due to the employer's belief that a worker loses some portion of transferable human capital during a prolonged unemployment spell (van der Berg, 1999). An additional consideration is that the longer a worker stays unemployed, the higher the propensity to accept a part-time job due to a gradual decline in his or her reservation wage. Therefore, we expect that the empirical model should provide evidence of the existence of a full-time wage premium.

Our empirical model is similar the model used by McCall and Chi (2008). However, there are several important differences. First, we allow for different exit strategies, such as part-time and full-time reemployment. Second, we explicitly model the non-random selection of workers into unemployment. Third, we estimate the indirect effect of the wage replacement rate on reemployment wages.

Using the sample of men in the 1996 and 2001 panels of the SIPP, we find a negative association between the wage replacement rate and post-unemployment wages. This finding implies that the generosity of UI reduces workers' reemployment wages. We also find that the wage replacement rate affects the prospects of part-time and full-time reemployment in different ways. In particular, the hazard rate of part-time reemployment increases with the wage replacement rate, while, in contrast, the hazard rate of full-time reemployment decreases with this characteristic of the UI program. Our policy simulation results also show that part-time wages are affected the most by the existence of the UI program.

The remainder of this paper is organized as follows. Section 2 provides conceptual framework. Section 3 explains the empirical model and the method of estimation. Section 4 discusses the data source and construction of the wage replacement rate. Section 5 discusses the primary findings of the study, and Section 6 presents our conclusions.

2. Background

The main purpose of this paper is to explore the indirect effect of the UI program's wage replacement rate on reemployment wages. We expect that an increase in the wage replacement rate negatively affects the worker's reemployment wage. Our expectation is based on a simple search model in which the worker's reservation wage is positively affected by the generosity of the UI program (Mortensen, 1977). An increase in the reservation wage, first, increases the duration of unemployment (Mortensen, 1977). Consequently, the negative association between the duration of unemployment and the

reemployment wage (Vishwanath, 1989) leads to a negative association between the wage replacement rate and the reemployment wage.

Figure 1 shows the relationship between the wage replacement rate and the reemployment wage through the duration of unemployment. In this figure, the wage offer distribution is downward sloping, reflecting the fact that offered wages decrease with the duration of unemployment (Vishwanath, 1989; Belzil 1995). Clearly, the replacement rate diminishes as unemployment persists (Cahuc and Zylbergberg, 2004); therefore, the reservation wage in the figure is also downward sloping. As a result of an increase in the generosity of the UI program, the reservation wage curve shifts to the right, indicating an increase in the duration of unemployment and, at the same time, a decrease in the reemployment wage.

A study of the direct effect of the generosity of the UI program on the duration of unemployment and the effect of the latter on wages would be incomplete without considering the possible types of reemployment that a typical worker faces during a spell of unemployment. First, the propensity to accept part-time versus full-time work may differ over time as general economic conditions (such as the UI program's eligibility criteria and the generosity of benefits) change. Second, part-time jobs may compensate substantially less than full-time jobs. Ignoring these facts in the analysis of the relationship between the UI policy characteristics and post-unemployment wages may lead to erroneous conclusions.

3. Empirical model

Figure 2 motivates our empirical model by presenting all possible employment states and transitions faced by a worker, according to most surveys. The first wave of a

survey gives us the initial pool of workers in different employment states. The substantial fraction of workers in this pool might be employed in the first reference month of the survey, while the remainder might be unemployed or out of the labor force. For those who are unemployed, the exact durations of unemployment are not observable; these observations are referred to as *left-censored*. Further, following the workers, who were employed in the first reference month of the survey, economists may observe that some workers experience at least one incidence of unemployment in the succeeding months. For some fraction of workers, information on reemployment wages and types of reemployment is complete, while for the rest of workers, information on reemployment wages and types of reemployment is incomplete, or *right-censored*. The issue of right-censoring arises because either the survey ends before workers find any jobs or workers voluntarily leave the sample.

The above discussion highlights three econometric issues. The first is the issue of left-censoring due to the absence of any information on some workers' initial duration of unemployment. The second is the non-random transition of workers from employment to unemployment. The final issue is the non-random transition of workers from unemployment to part-time or full-time employment.

To address the first issue, we introduce a logit equation that controls for the worker's employment status at the first reference month of the survey. The set of covariates in the logit equation includes age, race, education, the region of residency and state unemployment rate included in vector **X**, and an unobserved time-invariant worker characteristic noted by **v**:

$$\ln[\Pr(q_{i1}=1)/\Pr(q_{i1}=0)] = X_{it}b_q + v_{q,i}.$$

The second econometric issue is the non-random selection of workers into unemployment. Some workers may avoid unemployment in order to escape a sudden income shock or may voluntarily separate from the previous employer in order to get a better productivity match with another employer. One of the ways to avoid this issue is to include in the sample only workers who were laid off by their employers. This is the most common approach in the literature, but it substantially decreases the sample size of unemployed workers and allows us to make inferences only for the laid-off segment of the unemployed population. To ensure that the sample of unemployed workers is as complete as possible, and to address the issue of the non-random selection of workers into unemployment, another logit equation is added to the empirical model. In this logit equation, it is assumed that the log of odds of worker i's employment decision at period t follows the following process:

$$\ln[\Pr(e_{it}=1 \mid e_{it-1}=0)/\Pr(e_{it}=0 \mid e_{it-1}=0)] = X_{it}b_e + Z_{it}c_e + v_{e,i}.$$

The set of controls explaining the worker's labor force participation decision includes the same set of variables given in vector **X** and the time-invariant unobserved factor **v**. Furthermore, the probability of being employed is a function of the UI program characteristics included in vector **Z**. By adding **Z** in the above equation, we can estimate the effect of the wage replacement rate on the worker's labor market participation.

In this study, the final econometric issue, the worker's transition from unemployment to employment, is represented by a discrete time hazard model similar to those in Bover et al. (2002)[3] and McCall and Chi (2008). According to a standard search model, in each period, the unemployed worker receives at least one wage offer and the

[3] Both studies assume only a single hazard: return to full-time reemployment.

worker accepts a wage offer if it is higher than his or her reservation wage. Therefore, the worker's unemployment decision is modeled in the dynamic hazard setting by allowing UI program characteristics to vary over time. Furthermore, this flexible specification of the worker's job search process allows search outcomes to be represented as competing risks. In particular, in our case, the log of odds that outcome $d = 0,1,2$ (0 = unemployed, 1 = part-time employment, and 2 = full-time employment) will occur at any given period t is given by

$$\ln[\Pr(d_{it} = 1 \mid d_{it-1} = 0) / \Pr(d_{it} = 0 \mid d_{it-1} = 0)] = X_{it} b_d + Z_{it} c_d + D_{it} g_d + v_{d,i}.$$

The vector of parameters $\mathbf{b_d}$ in the above equation measures the effects of sociodemographic variables on part-time and full-time probabilities. These effects are restricted to be constant over time but vary across outcomes. The vector of UI characteristics **Z** consists of time-varying exogenous variables, which have direct impacts on the reservation wages (Kiefer and Neumann, 1979), and vector **c** measures the effect of these variables on both hazards. To capture time dependency of reservation wages, an additive dummy variable (**D**) for each quarter of unemployment is added to the model, allowing us to identify the effect (**g**) of an additional quarter of unemployment on reemployment probabilities (Bover et al. (2002)). Two variables in the transition-to-employment equation represent family characteristics, **F**. These variables identify the effect of the number of children younger than 18 years old in the worker's family and the effect of the worker's marital status. Finally, **v** is assumed to be a time-invariant worker characteristic, which affects worker reemployment opportunities.

The wage equation in this study consists of the worker's accepted wage as a dependent variable and the observed duration of unemployment and type of

reemployment as covariates. Both are included in vector **L**. The worker's reemployment wage may also vary by his or her sociodemographic characteristics, included in **X**. Some worker's time-invariant unobserved characteristics may also affect the reemployment wage and, in the above specification, they are included in **v**. Finally, a mean zero and an identically independent error term, **u**, conclude the possible factors that determine the worker's reemployment wage:

$$\ln W_{it} = X_{it} b_w + L_{it} q + v_{w,i} + u_{w,it}.$$

Assuming that variables in the vector **X** are not correlated with the unobserved error terms **v** and **u**, and that the latter two terms do not correlate with each other, we expect two potential endogeneity problems in the above wage equation. The duration of unemployment and type of reemployment may correlate with unobserved factors. For instance, the more motivated worker may be more likely to find any type of job more quickly, or an employer may offer a higher wage to the more motivated worker even if he or she experienced a prolonged unemployment spell. We assume that the UI program characteristics affect the reemployment wage only through the duration of unemployment and type of reemployment. Therefore, UI program characteristics may serve as instruments to solve the above-discussed endogeneity problems.

We could simply use an IV approach to consistently estimate parameters of interest without estimating the more complicated model. However, such a simple solution has a substantial limitation. Several studies (Addison and Portugal, 1989; Seninger, 1997) model the first stage with a Tobit model. Such a model ignores the dynamic features of the UI program and does not allow for multiple exit strategies. The eligibility criteria and UI benefit levels change throughout the spell of unemployment, and the propensity of

finding a part-time or full-time job varies with changes in UI program characteristics. This argument justifies the use of the model proposed by this study.

To estimate the mixed continuous discrete model represented by four equations with endogenous explanatory variables in the wage equation, we use the discrete factor method (Mroz and Guilkey, 1995; Mroz, 1999) in this study. Instead of imposing a parametric joint distribution for unobserved factors $\mathbf{v_{j,}}$, the study uses a step function with a finite number of points to approximate the distribution of the unobserved factors (Heckman and Singer, 1984). In the discrete factor method, the parameters determining the step function are estimated jointly with other parameters of the model. Furthermore, the flexible specification of the common unobserved worker heterogeneity component, $\mathbf{v_{j,l}}$ in all equations, allows for correlation across the system of equations and correlation across competing risks.

Identification in this model is secured by exclusion restrictions and the dynamic structure of the model.

Along with the wage replacement rate, we include the state-level time-variant exogenous variables in $\mathbf{Z}$ that allow for identification through theoretical exclusion restrictions. Using a simple search model as a framework, we speculate that the individual-level wage replacement rate and the state average duration and amount of UI benefits have a direct impact on reservation wages and, consequently, on employment decisions, but these factors have only an indirect impact on reemployment wages through the duration of unemployment and type of reemployment. Therefore, these variables are excluded from the wage equation.

The dynamic structure also secures the identification of this model (Mroz and Surette, 1998; Mroz and Savage, 2007). For instance, the transition-to-employment equation represents the probability of finding a part-time or full-time job at period t, conditional on not finding any job at period t–1. The wage replacement rate at period t–1 has a direct impact on the worker's unemployment decision at period t–1, but it does not directly affect the worker's decision to stay unemployed at period t. However, the wage replacement rate at period t–1 indirectly affects the worker's employment decision at period t through his or her employment decision at period t–1, which is why it can serve as the additional instrumental variable. The same argument holds for the other time-variant exogenous variables in this study, which implies multiple sources of identification through the dynamic structure of the model.

4. Data and the construction of the wage replacement rate

The data source for our study is the Survey of Income and Program Participation (SIPP). The SIPP contains detailed information on workers' demographic and job characteristics. Sample SIPP participants are interviewed every four months for several years. In the 1996 panel, respondents were interviewed over a period of 48 months,[4] while in the 2001 panel they were interviewed for only 36 months. As discussed earlier, one of the advantages of the SIPP over other surveys is that it contains monthly information on workers' employment status. This information helps us precisely calculate the duration of unemployment spells and determine wages and working hours at the first job after the period of unemployment.

[4] In our study, we use only the first 36 months of the 1996 panel.

Figure 3 shows that the sample consists of 35,873 male workers.[5] In the sample, 5,424 workers were unemployed at the first survey wave. Information about these workers is included only in the equation that controls for the left-censoring issue, and they are not followed after the first wave. In the remaining portion of the sample, 2,847 workers were unemployed at some point during the next three years. These numbers imply that almost 9% of workers in the sample experienced at least one incidence of unemployment in the succeeding months. Only 3,022 workers who reported incidences of unemployment in the succeeding months had complete unemployment spells,[6] though for 40 workers, information about first starting wages was not recoverable. For 653 workers, the exact durations of unemployment are not observable due to the right-censoring problem.[7] Among those whose spells were complete, 490 workers ended up with part-time jobs. This number implies that the part-time reemployment rate is 22% for men.

The state identifier in the survey helps merge information about the monthly unemployment rate and the average duration and amount of UI benefits by state. These state-level time-variant variables are extracted from U.S. Department of Labor data. Data from the Bureau of Labor Statistics provides information on consumer price indices from December 1995 through December 2003. All variables are normalized to 1995 dollars.

One of the key predictors in this study is the predicted UI program wage replacement rate for which a worker is eligible. To calculate this predictor, we first simulate UI benefits for each worker as a function of the average monthly earnings in the

[5] Anyone in the panels who was employed in agricultural or construction industries was dropped from the sample. Furthermore, self-employed workers are not included in the final sample.
[6] Complete unemployment spells are spells for which reemployment is observable before the last month of the panels.
[7] The right-censored observations are observations for which unemployed spells are not complete at the end of the panels.

past 8 months, plus some sociodemographic characteristics of the worker and state-specific characteristics, such the unemployment rate, the average duration of UI benefits, and the average benefit amount.[8] The parameters used in the simulation of UI benefits come from the regression of the actual benefit amounts on the predictors, which define the level of benefits, controlling for the possible sample selection of workers into the UI program. The latter is performed by simultaneously estimating both UI benefits and UI program participation specifications using only the sample of unemployed workers in the 1996 and 2001 panels.[9] The variables included in the UI program participation equation and the estimates from both equations are presented in the appendix.

5. Results

5.1 The effect of unemployment duration on reemployment wages

In the empirical model, we assume that the wage replacement rate affects reemployment wages through unemployment duration and type of reemployment. If the results of the empirical model do not provide any support of the existence of any associations between unemployment duration and wages or part-time reemployment and wages, then we can conclude that the wage replacement rate does not affect reemployment wages or does not affect them through channels assumed in this paper.

In the first two columns of Table 1, we report the results of the wage equation obtained using OLS. Assuming the orthogonal relationship between the duration of unemployment and the error term, the duration of unemployment parameter is –0.020 ($p<0.001$). This estimate implies that a one-month increase in the duration of

[8] Sociodemographic variables include whether a worker is married and the number of children less than 18 years old in the family. In some states, these worker-specific characteristics define the level of benefits.
[9] According to Gruber (1997), only 60% of eligible workers actually receive UI benefits during unemployment.

unemployment decreases men's average wages by 2.0%. Furthermore, using the same method of estimation, we find that the part-time reemployment parameter has a value of –0.21 ($p<0.001$), which can be interpreted as a 21% full-time wage premium for those who find full-time jobs.

We should be careful, however, in making any inferences on the basis of the results obtained using OLS. The next two columns of Table 1 confirm our expectation that OLS provides biased estimates for the parameters of interest. In particular, Table 1 demonstrates that after controlling for unobserved worker heterogeneity, the size of the duration effect decreases to 0.015 ($p<0.001$), which can be translated as a 1.5 % decrease in reemployment wages due to a one-month increase in the duration of unemployment. The size of the part-time versus full-time wage differential substantially increases after controlling for unobserved heterogeneity. The estimate implies that, on average, full-time jobs pay 32% more than part-time jobs.

The results provide an idea of the direction of bias by comparing estimates obtained using the method without controlling for unobserved heterogeneity with the estimates obtained using the method, which allows for a more complicated error structure.

The decrease in magnitude of the duration-of-unemployment parameter in the wage equation implies that a more motivated and able worker avoids substantial wage loss even after prolonged unemployment. We can speculate that the accumulated human capital may depreciate at a slower rate for this worker or that employers may distinguish him or her from the pool of unemployed workers and may offer a higher wage. The increase in magnitude of the part-time employment parameter may indicate that the more

motivated and able worker's part-time wage is significantly higher than the part-time wage of the less able and motivated worker. Therefore, in the OLS, the part-time employment parameter captures the positive effect of unobserved factors on wages.

There are several other differences in favor of the more complicated model. In Table 1, we observe that the parameters of some demographic variables, such as race, education, and region of residency, have different magnitudes after controlling for unobserved worker heterogeneity. For example, a 19% wage disadvantage among black workers is reduced to 15% by the addition of unobserved parameters. The likelihood ratio test for the joint significance of the heterogeneity parameters provides additional evidence in favor of the more complicated model. The calculated statistic for the test is 688.18 (p-value <0.001). The test confirms that the model with controls for the possible correlations between variables of interest and unobserved factors provides significant improvement in the value of the log likelihood function compared with the simpler model.

5.2 Selection into unemployment and back to employment[10]

The distinctive feature of our empirical model is that we control for the non-random selection of workers into unemployment. The first column of Table 2 provides a glimpse into the estimates for the transition-to-employment equation, and we would like to draw attention to two important facts. First, because of the statistical significance at the ≥10% level of the substantial number of the estimates in Table 2, we can conclude that the transition from employment to unemployment is not a random event. Second, based on the sign and magnitude of the wage replacement rate parameter, we can speculate that

[10] The results from the logit equation, which controls for the left-censoring issue, are not presented in this paper but can be requested from the author.

a worker with a high replacement rate has a higher likelihood of being displaced by an employer compared with a worker with a low replacement rate. This finding is somewhat similar to those of Baker and Rea (1998) and Jurjda (2002), who report the increasing hazard of unemployment among UI-eligible workers.

The next four columns in Table 2 demonstrate the estimates from the transition-to-employment equation. We find that a higher average duration of UI benefits in a given state also decreases the likelihood of any type of reemployment. This fact is compatible with the findings of the other studies (McCall and Chi, 2008; Bover et al., 2002) that the longer one receives UI benefits, the longer one would stay unemployed.

We also find evidence that the wage replacement rate has a significant impact on the reemployment hazards. First, an increase in the wage replacement rate increases the probability of part-time reemployment. At the same time, as expected, a higher wage replacement rate diminishes the prospect of finding a full-time job.

The negative effect of the wage replacement rate on the full-time reemployment hazard can be explained by the fact that an increase in the replacement rate increases the worker's reservation wage, decreasing the number of acceptable full-time vacancies in the labor market and depressing the prospect of full-time reemployment.

We can explain the positive effect of the wage replacement rate on part-time reemployment by the eligibility rules of the UI program in the United States. The existing eligibility rules allow a worker receiving UI benefits to accept a part-time job without losing any benefits if his or her earnings from part-time employment do not exceed a

certain amount.[11] A worker with a high replacement rate may be inclined to accept a part-time job as a temporary solution to his or her progressing unemployment.[12]

Figure 4 provides additional evidence that the propensity of finding a part-time or full-time job changes over time and that these hazards vary as unemployment progresses.[13] The distinctive feature of Figure 4 is that both hazards decrease with the duration of unemployment, though at different rates. The probability of part-time reemployment is almost four times lower than the probability of full-time reemployment for the first four months of unemployment. However, the two hazards eventually converge after 18 months of unemployment, which may serve as additional evidence that a discouraged worker who initially had a strong preference for full-time reemployment accepts a part-time job as a solution to prolonged unemployment.

Additional consideration must be paid to the "kink" points in the above figures, which are typical features every four months in the survey data. These kink points are an indication of the fact that, although the SIPP contains monthly information about workers' employment status, interviews are conducted every four months. As mentioned earlier, the duration of unemployment in this study is measured using information on workers' employment status assuming that workers correctly recall their employment status within the four months prior to each interview. The possible discrepancies in responses due to the time lag between the actual referenced period and the interview period may be responsible for "recall" bias. Therefore, instead of monthly duration

[11] Also referred to as the "disregard level."
[12] McCall (1996, 1997) finds that the UI program positively affects the worker's part-time reemployment probability.
[13] Both probabilities are calculated for the average man at a given period of time using a parametric bootstrapping procedure with 250 iterations. The wideness of lines represents a 95% confidence interval for these probabilities.

dummies, four quarterly dummies are used in the transition-to-employment equation that produces four kink points in the figures.[14]

5.4 Simulation

The main question of interest this study is the indirect effect of the wage replacement rate on reemployment wages. To quantify the size of this effect, we simulate a 10% decrease in the wage replacement rate. Along with the log of wages for workers,[15] we compute the change in the fraction of unemployed workers who find part-time jobs and the percentage change in the part-time and full-time wage differential due to the policy change.

As expected, the proposed decrease in the wage replacement rate increases average reemployment wages. A simple comparison of the estimates for the mean of the log of wages in columns 2 and 4 of Table 3 reveals that the average wages increase by 1.1% after a 10% reduction in the wage replacement rate. This implies that the wage elasticity with respect to the wage replacement rate is –0.11 and reemployment wages are moderately sensitive to changes in the wage replacement rate.

These interesting results can be observed for the effects of the change in the wage replacement rate on part-time versus full-time reemployment wages and the fraction of part-time workers. A 10% decrease in the wage replacement rate increases average part-time wages by 2.5% and average full-time wages by only 0.4%. The effect on part-time wages is more than six times higher than the effect on full-time wages. At the same time,

[14] The baseline if the duration of unemployment is greater than 16 months. Four quarterly dummies include whether worker is unemployed from 1 to 4 months, 5 to 8 months, 9 to 12 months, or 13 to 16 months. Only a few workers stay unemployed more than 16 months.

[15] It should be noted that distribution of the duration of unemployment is skewed, with a high concentration of workers with low durations of unemployment and very few workers with prolonged unemployment spells. In this case, the mean of the distribution is not a very informative statistic, and it is extremely sensitive to very high values of unemployment duration. Therefore, only effects of exogenous changes in the UI program on wages are presented in this paper.

the proposed policy decreases the fraction of the workers who find part-time jobs. A 10% decrease in the wage replacement rate decreases the fraction of part-time workers by 1.2%.

Using the results from the policy simulation, we can draw a conclusion that the UI program affects part-time and full-time wages differently. A fraction of workers who are most affected by the decrease in the wage replacement rate may transition more rapidly from unemployment to full-time employment after the policy change. Some of these workers would have found part-time jobs if the wage replacement rates were at the previous levels, and we suspect that these workers are less motivated and able workers. The movement of these workers from part-time employment to full-time employment negatively affects the mean of full-time wages because these workers possess unobserved characteristics that negatively affect wages. However, we expect that the average duration of unemployment for full-time workers decreases after the policy change. The latter fact should have a positive impact on full-time wages. As a result, the combined effect of a decrease in the wage replacement rate on full-time wages is positive, mostly because the duration effect compensates for the first effect.

The departure of some fraction of the less motivated and able workers with lower-than-average part-time wages to full-time employment increases the mean of part-time wages. In the meantime, after the policy change, it takes also longer (on average) to find a part-time job. In contrast, this fact depresses the mean of part-time wages. However, the combined effect is positive, mostly because less motivated workers had a large, damaging impact on the mean of part-time wages before the policy change.

6. Conclusion

Using the 1996 and 2001 panels of the SIPP, we find evidence of the existence of a negative association between the wage replacement rate and post-unemployment wages. Moreover, our results show that the wage replacement rate increases the probability of part-time reemployment while at the same time decreasing the probability of full-time reemployment. Furthermore, our results show that reemployment wages substantially decrease as unemployment progresses. Finally, we find that part-time jobs compensate significantly less than full-time jobs.

One of the possible shortcomings of this study is that it ignores the other possible mechanisms of the effect of UI on reemployment wages. The generosity of UI may increase the resources devoted to the employment search that may lead to higher reemployment wages. We do not incorporate this possible mechanism in our empirical model because we cannot observe the monetary resources that a worker allocates to the job search during the period of unemployment. This would be important to tackle in future research.

References

Addison, J. & Blackburn, M. (2000). The Effects of Unemployment Insurance on Postunemployment Wages. *Labour Economics*, 7*,* 21-53.

Addison, J. T. & Portugal, P. (1989). Job displacement, relative wage changes, and duration of unemployment. *Journal of Labor Economics*, 7(3), 281-302.

Baker, M. & Rea, S. (1998). Employment Spells and Unemployment Insurance Eligibility Requirements. *Review of Economics and Statistics*, 80*,* 80-94.

Belzil, C. (1995). Unemployment duration stigma and re-employment earnings. *The Canadian Journal of Economics*, 28(3), 568-585.

Bover, O., Arellano, M., & Bentolila, S. (2002). Unemployment Duration, Benefit Duration and the Business Cycle. *The Economic Journal*, *112*(479), 223-265

Cahuc, P., & Andre, Z. (2004). *Labor Economics.* Cambridge, Massachusetts: The MIT Press.

Cameron, C., & Trivedi, P. (2005). Microeconometrics: Methods and Applications. *New York: Cambridge University Press*.

Gruber, J. (1997). The Consumption Smoothing Benefits of Unemployment Insurance. *The American Economic Review*, 87*(*1), 192-205.

Heckman, J. & Singer, B. (1984). A Method for Minimizing the Impact of Distributional Assumptions in Econometric Models for Duration Data. *Econometrica*, 52(2), 271-320.

Jurajda, S. (108). Estimating the Effect of Unemployment Insurance Compensation on the Labor Market Histories of Displaced Workers. *Journal of Econometrics*, 108, 227-252.

Katz, L. & Meyer, B. (1990). The Impact of the Potential Duration of Unemployment Benefits on the Duration of Unemployment. *Journal of Public Economics*, 41*,* 45-72.

McCall, B. P. (1996). Unemployment Insurance Rules, Joblessness, and Part-Time Work. *Econometrica*, 64(3), 647-682.

McCall, B. P. (1997). The Determinants of Full-Time versus Part-Time Reemployment following Job Displacement. *Journal of Labor Economics*, 15(4), 714-734.

McCall, B. & Chi, W. (2008). Unemployment Insurance, Unemployment Durations and Re-employment Wages. *Economics Letters*, 99*,* 115-118.

Meyer, B. (1990). Unemployment Insurance and Unemployment Spells. *Econometrica*, 58(4), 757-782.

Mortensen, D. (1977). Unemployment Insurance and Job Search Decisions. *Industrial and Labor Relations Review*, 30*,* 505-517.

Mroz, T. A. & Guilkey, D. K. (1995). Discrete Factor Approximations for Use in Simultaneous Equation Models With Both Continuous and Discrete Endogenous Variables. *Working Paper*, 1-45.

Mroz, T. A. (1999). Discrete Factor Approximations in simultaneous equation models: Estimating the impact of a dummy endogenous variable on a continuous outcome. *Journal of Econometrics*, 92, 233-274.

Mroz, T. & Savage, T. (forthcoming). The long-term effects of youth unemployment. *Journal of Human Resources*.

Mroz, T. & Surette, B. Post-Secondary Schooling and Training Effects on Wages and Employment. *Working Paper*, 1-95.

Seninger, S. (1997). Jobless spells and re-employment wages. *Applied Economics*, 29(9), 1169-1177.

Van Der Berg, G. & Van Ours, J. (1999). Duration dependency and heterogeneity in French youth unemployment durations. *Journal of Population Economics*, *12*(2), 273-285.

Vishwanath, T. (1989). Job Search, Stigma Effect, and Escape Rate from Unemployment. *Journal of Labor Economics*, 7(4), 487-502.

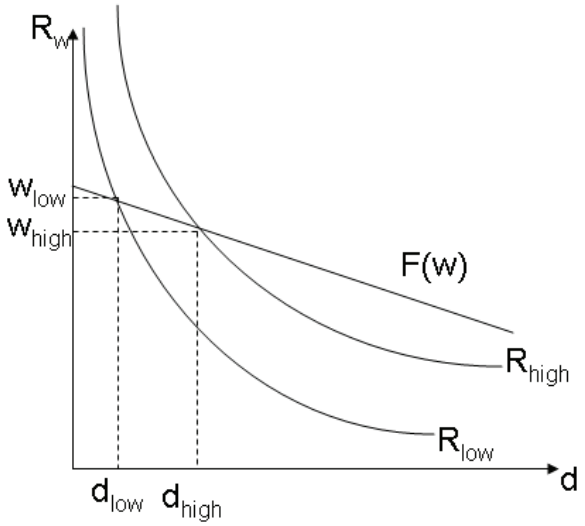

Figure 1. The relationship between wage and duration of unemployment

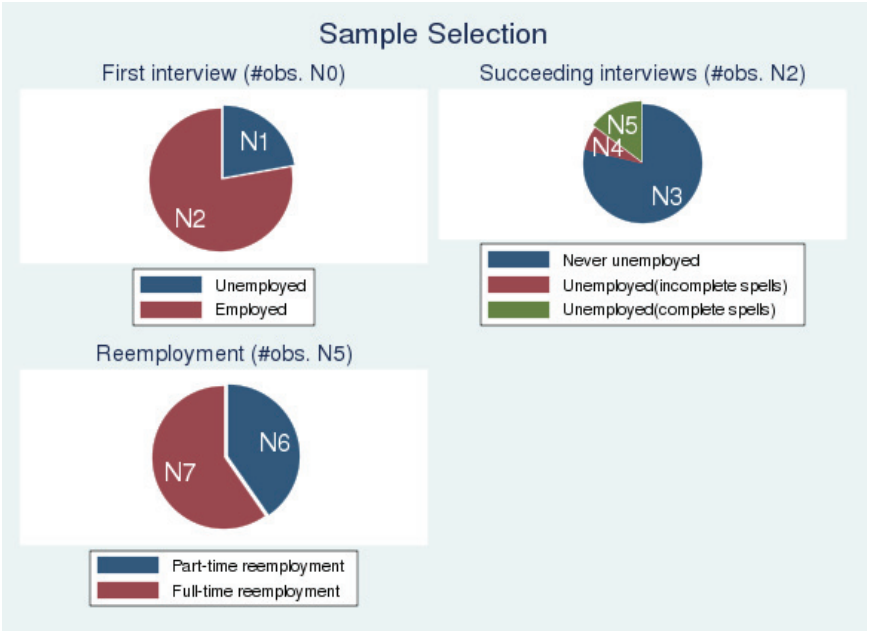

Figure 2. Employment states and transitions of workers in longitudinal surveys

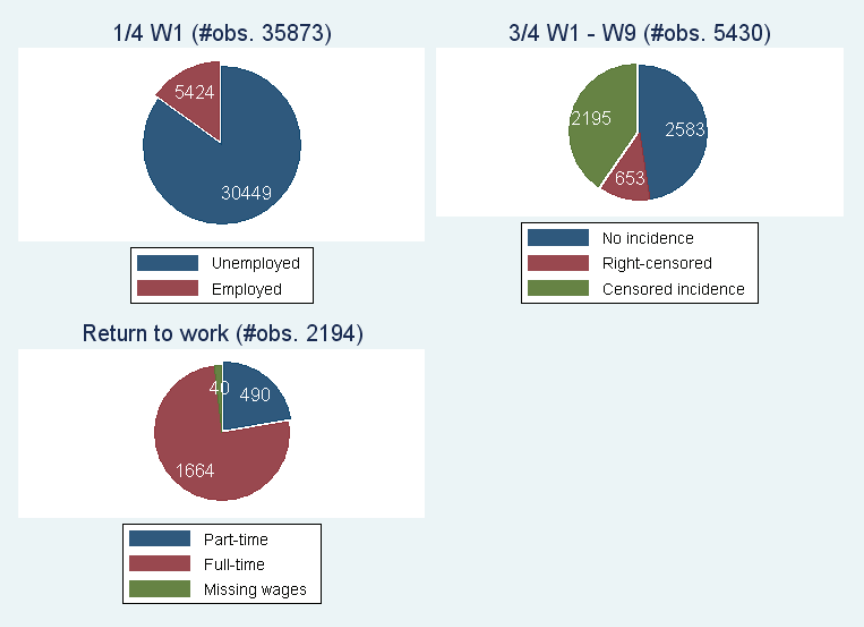

Figure 3. Employment states and transitions of male workers in the 1996-2001 panels of the SIPP

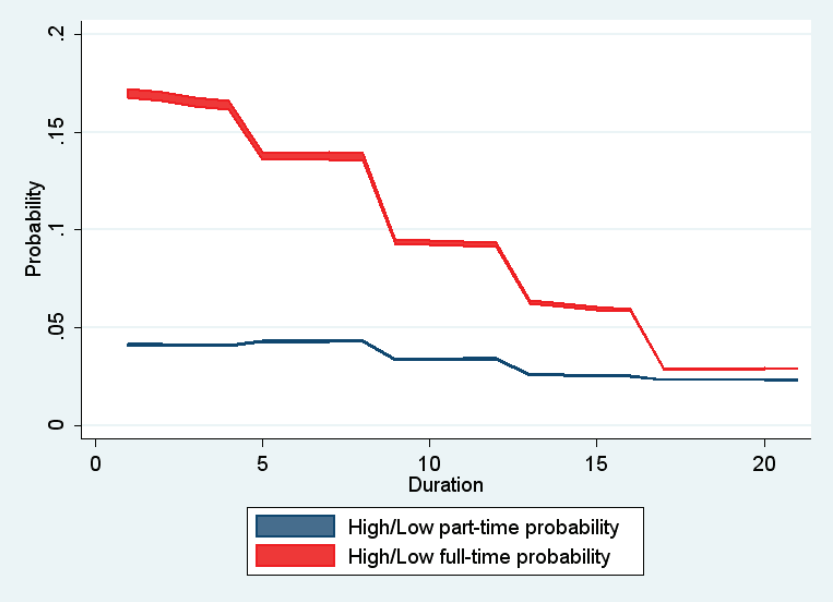

Figure 4. Simulated part-time versus full-time probabilities for the average man based on the estimates of the model with unobserved heterogeneity

Table 1. Wage estimates (comparison of OLS and DFM)

	OLS		DFM	
	Est.	z-stat.	Est.	z-stat.
Constant	1.840	0.111	1.866	0.101
Unemployment rate	0.041	0.016	0.039	0.013
Duration of unemployment	–0.020	0.004	–0.015	0.004
Part-time reemployment	–0.209	0.042	–0.324	0.047
Year				
1997	0.114	0.050	0.101	0.044
1998	0.232	0.071	0.231	0.059
2001	0.231	0.049	0.180	0.042
2002	0.220	0.054	0.200	0.046
2003	0.208	0.063	0.186	0.056
Region				
Southwest	–0.126	0.054	–0.186	0.047
Northeast	0.059	0.053	0.023	0.046
Midwest	–0.039	0.049	–0.053	0.043
Southeast	–0.032	0.047	–0.079	0.042
Race				
Black	–0.187	0.041	–0.145	0.050
Asian	–0.115	0.088	–0.103	0.102
Other	–0.008	0.072	–0.044	0.079
Education				
High school	0.131	0.045	0.092	0.045
Some college	0.223	0.047	0.214	0.055
College	0.505	0.055	0.453	0.093
Advanced degree	0.723	0.069	0.573	0.096
Age				
From 30 to 40	0.031	0.041	0.054	0.036
From 40 to 50	0.094	0.040	0.106	0.040
From 50 to 60	0.018	0.050	0.083	0.044
Above 60	0.272	0.117	0.295	0.095
Unobserved heterogeneity				
Mass point1	0.000	0.000	0.000	0.000
Mass point2			–5.602	0.565
Mass point3			2.332	0.197
Mass point4			–1.882	0.241
Mass point5			0.907	0.264

Table 2. Results from the model with unobserved heterogeneity for the Employment-to-Unemployment and Unemployment-to-Employment equations

	E-to-U transition		U-to-Part-time work transition		U-to-Full-time work transition	
	Est.	z-stat.	Est.	z-stat.	Est.	z-stat.
Constant	3.983	0.823	–5.072	1.279	–2.087	0.863
# children under 18	—	—	0.002	0.045	0.010	0.023
Married	—	—	0.144	0.113	0.175	0.059
Unemployment rate	–0.078	0.024	0.052	0.051	–0.070	0.026
WRR of UI	–0.022	0.002	0.011	0.002	–0.005	0.001
Average duration of UI	0.002	0.006	–0.005	0.016	–0.015	0.009
Average amount of UI	0.189	0.161	0.097	0.245	–0.102	0.160
State dependency						
from 1 to 4 months	—	—	0.631	0.274	1.884	0.210
from 5 to 8 months	—	—	0.673	0.273	1.686	0.214
from 9 to 12 months	—	—	0.365	0.301	1.238	0.229
from 13 to 16 months	—	—	0.055	0.359	0.795	0.266
Year						
1997	0.167	0.074	–0.019	0.163	–0.042	0.089
1998	0.302	0.101	–0.003	0.186	–0.100	0.097
2001	–0.369	0.063	–0.182	0.164	–0.124	0.088
2002	–0.238	0.092	–0.255	0.168	–0.113	0.089
2003	0.101	0.121	–0.554	0.198	–0.165	0.105
Region						
Southwest	–0.156	0.086	0.006	0.194	–0.075	0.096
Northeast	–0.012	0.078	0.025	0.167	–0.098	0.087
Midwest	–0.013	0.075	0.190	0.165	0.035	0.083
Southeast	–0.077	0.071	0.153	0.159	–0.105	0.082
Race						
Black	–0.631	0.089	–0.030	0.145	–0.313	0.080
Asian	–0.817	0.179	0.128	0.351	–0.255	0.202
Other	–0.349	0.106	–0.451	0.238	–0.357	0.121
Education						
High school	0.710	0.119	–0.241	0.149	0.155	0.078
Some college	0.785	0.141	0.161	0.149	0.218	0.079
College	0.852	0.176	0.213	0.196	0.243	0.088
Advanced degree	0.952	0.193	0.572	0.199	0.173	0.105
Age						
From 30 to 40	0.140	0.068	–0.057	0.156	–0.282	0.080
From 40 to 50	0.319	0.068	–0.229	0.161	–0.376	0.082
From 50 to 60	0.361	0.089	–0.397	0.182	–0.549	0.092
Above 60	0.345	0.180	–0.514	0.332	–1.098	0.227
Unobserved heterogeneity						
Mass point1	0.000	0.000	0.000	0.000	0.000	0.000
Mass point2	5.928	0.492	0.524	0.800	0.225	0.709
Mass point3	–0.124	0.904	1.419	0.418	–0.452	0.332
Mass point4	2.936	0.926	0.509	0.322	–0.239	0.315
Mass point5	–1.455	0.670	1.417	0.639	–0.106	0.278

Table 3. The effect of the wage replacement rate on wages and the proportion of part-time workers

	Men			
	Baseline		–10% WRR	
Variable	Mean	Std	Change	St. Err.
Overall log of hourly wage rate	2.451	0.089	0.011	0.0002
Log of hourly part-time wage rate	2.313	0.142	0.025	0.0006
Log of hourly full-time wage rate	2.493	0.082	0.004	0.0001
Fraction of part-time workers	0.243	0.033	0.013	0.0002
Full-time vs. part-time wage diff.	0.179	0.106	–0.021	0.0007

Appendix.

Table A.1. UI benefit estimation

	Benefit equation		Participation equation	
	Est.	Std. Err.	Est.	Std. Err.
State unemployment rate	–0.079	0.013	0.063	0.013
# children under 18	0.063	0.012	–0.040	0.011
Married	–0.083	0.030	0.107	0.028
Log of Earnings	0.218	0.016	—	—
Race				
Black	—	—	–0.122	0.026
Asian	—	—	–0.289	0.070
Other	—	—	–0.129	0.037
Education				
High school	—	—	0.133	0.027
Some college	—	—	0.185	0.027
College	—	—	0.091	0.031
Professional degree	—	—	0.070	0.036
Age				
from 30 to 40	—	—	0.030	0.031
from 40 to 50	—	—	0.121	0.031
from 50 to 60	—	—	0.162	0.033
from 60 and above	—	—	0.189	0.052
UI program				
Average benefit duration	–0.004	0.004	0.006	0.004
Average benefit amount	0.184	0.079	0.425	0.080
State residency				
Southeast	—	—	–0.203	0.030
Northeast	—	—	–0.020	0.029
Midwest	—	—	–0.100	0.030
Southwest	—	—	–0.207	0.033
State Dependency				
from 1 to 4 months	–0.807	0.127	1.521	0.095
from 5 to 8 months	–0.815	0.128	1.483	0.096
from 9 to 12 months	–0.430	0.133	0.947	0.102
from 13 to 16 months	–0.096	0.155	0.474	0.120
Year				
1998	–0.062	0.050	0.083	0.046
1999	–0.093	0.058	0.034	0.053
2001	–0.092	0.050	0.116	0.046
2002	–0.086	0.048	0.263	0.045
2003	0.061	0.053	0.275	0.050
rho	—	—	–0.950	0.003
sigma	—	—	0.989	0.018
lambda	—	—	–0.940	0.020
Constant	6.579	0.453	–5.141	0.435