Unemployment Insurance Take-up
And Reemployment

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Introduction

In Canada, the unemployment insurance system plays an important role in the way its labor market works, and the many evaluation studies recently conducted show the attention that authorities and academics pay to its different aspects. Most studies of the Canadian Employment system ultimately aim at measuring and balancing the positive social aspects of the system - income support - and its negative economic aspects - its disincentive effects. This paper concentrates on the second aspect. Our goal is to model the process that brings an unemployed worker back to employment, after a transition trough the unemployment insurance system or not. The aim is to get a better measure of the Unemployment Insurance disincentive effect to unemployed workers by developing a new model of transition between unemployment, employment and unemployment insurance take up.

Our first section will present the problems associated with the estimation of the unemployment insurance system disincentive effects and our proposed solution. Section 2 will present the econometric techniques used. In section 3, we will present the data. In section 4 we will we will present and discuss the results or the estimations.

Finally, in section 5, we will present some simulations based on our econometrics to illustrate and analyze our results.

1 Unemployment Insurance and Reemployment

The impact of unemployment insurance on reemployment have been extensively studied in the last decade in Canada and elsewhere (see for example, Ham and Rea (1987), Meyer (1990), Katz and Meyer (1990), Hunt (1995), Belzil (1995), Christofides and McKenna (1996), among many others). Such a development is certainly not unrelated to the development of new micro datasets and new econometric techniques (Atkinson and Micklewright (1991), Kiefer (1988)).

A puzzling phenomenon which has been given much attention recently is the case of unemployed workers who are eligible but never claim unemployment insurance benefits.(See for example Blank and Card (1991), Anderson and Meyer (1994), McCall (1995) or Storer and Van Audenrode (1995) for Canada). It has also been studied in Europe for other social programs (Oorschot (1991)). This phenomenon, which can be interpreted as a rational choice by individuals comparing the costs of applying (information costs, stigma, costs of claiming..) and the benefits of the program, has important implications for the efficiency and adequacy of the program (see Duclos (1995)).

The main problem associated with the existence of eligible non claimant unemployed workers is that it might bias the estimation of the disincentive effect of the program. This is particularly clear in a context where persons dynamically revise their decision to claim benefits comparing the costs they suffer with their expectations of future admissibility (Blank and Ruggles (1996)).

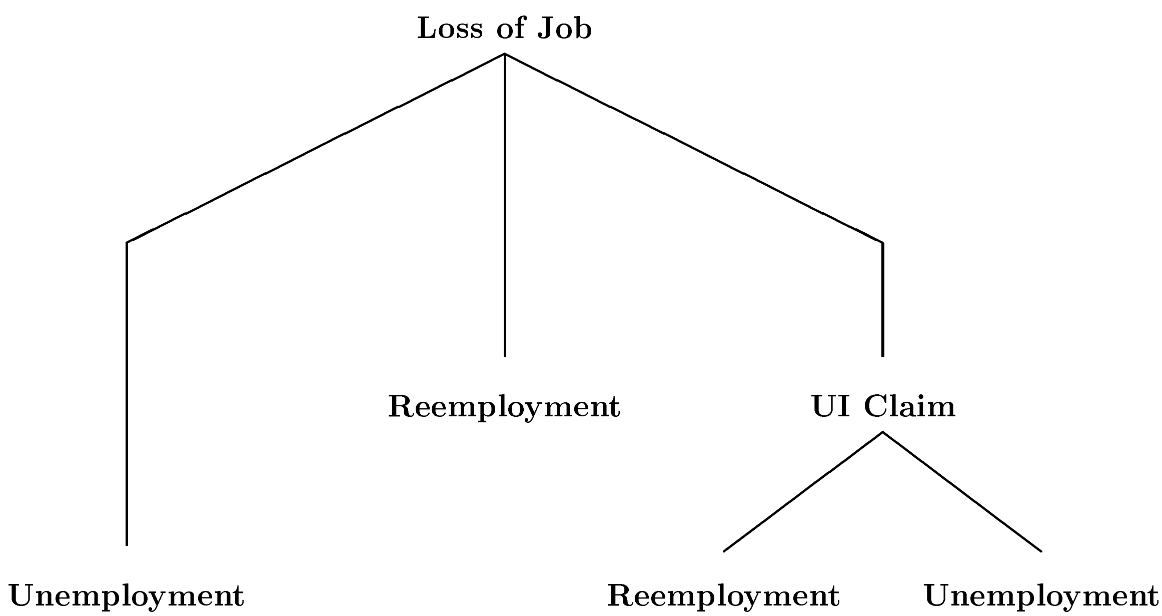
Several preceding studies have shown the potential for bias in the estimation of UI disincentive effects (Addison and Portugal (1990), Storer and Van Audenrode (1995)). To understand the sources of that bias, it is important to take into account that an individual's decision to claim UI benefits can be endogenous to her preferences of behavior. In this study, we will concentrate essentially on the source of bias which can be caused by the fact that an unemployed can link her decision to claim to her expectation regarding her chances of rapid return to work. Intuitively, it is simple to understand that, if there are some fixed costs associated with UI claim, people who expect short spells of unemployment are less likely to claim (since their expected benefits are lower) than people who expect long spells. In this case, if a simple correlation is measured between unemployment duration and UI status, one can falsely reach the conclusion that UI leads to longer spells of unemployment. In fact, this correlation might to some extend be due to reverse causation of long spells leading people to claim.

Previous attempts to account for this potential source of bias (Addison and Portugal (1990) or Storer and Van Audenrode (1995), for example) have tried to deal with this problem by looking at the impact of UI eligibility rather than UI claim as the relevant indicator of UI status. In doing so, the authors would avoid the potential source of bias associated with the act of claiming. The shortfall of that method was, however, to treat the question of the decision to claim as completely irrelevant. In doing so, these estimations fail to answer another crucial question related to the measure of the UI disincentive effect: Is the decision to claim completely random? More clearly, one could imagine the other extreme scenario where some people decide from the onset of their spell that they won't claim UI benefits (for whatever reason not related to their expectation of reemployment) and behave as if non-eligible. If this behavior were to be widespread, the use of eligibility status would not be an appropriate measure of UI status and UI claim would be the relevant variable. If the decision to claim is completely endogenous to expected unemployment duration and orthogonal to the other (observed or unobserved) characteristics of the unemployed, then eligibility is the proper variable to measure the impact of UI on unemployment duration. If, on the other hand, claim is endogenous to some of the unemployed (observed or unobserved) characteristics and orthogonal to expected unemployment duration, then claim is the right variable. Finally, one could also imagine that the act of claiming could lead to behavioral changes. Some people might change their behavior once they have claimed. In this case again, the use of eligibility would not be a satisfactory measure of UI disincentive effect.

The originality of this work is to try to study the decision to claim benefits by eligible workers jointly with their reemployment behaviors. Our aim is to try and better understand the mechanisms that lead to the decision to claim by an unemployed worker and the behavioral changes that might occur after the claim is made. The novelty in this work is that it will jointly model claim and reemployment behaviors of eligible workers.

In our model, a newly unemployed worker faces the following dilemma: find a new job, claim UI benefits, or do nothing of the above and remain unemployed. If she claims, she faces the new dilemma of finding a new job or remaining unemployed. Figure 1 represents the decision tree the unemployed worker is faced with.

Figure 1: Decision Tree



This joint estimation will allow us to better understand the mechanisms leading to the decision to claim UI benefits. It will also permit us to compare reemployment hazards of people who claim with people who don't claim at comparable point in time. We will use maximum likelihood estimations, allowing error terms to be correlated through joint distribution of mass points (as in Heckman and Singer (1984) for a univariate case).

2 Methodology

Our statistical model is inspired from the very large econometric and statistic literature on duration models (see for example Kalbfleisch and Prentice (1980), Kiefer (1988), Blank (1989), Grourieroux (1989), Katz and Meyer (1990), Lancaster (1990) and Meyer (1990)).

In our model, X_i is a vector of characteristics for individual i and β is the vector of coefficients associated with it. Our model will consist of a simple model of reemployment hazard (for those who claim benefits) nested into a competing risk model of reemployment vs. claim.

In a first step, unemployed workers face multiple possible ways to exit unemployment: UI claim or reemployment. This is known in the literature as a competing risk model. As customary in these models (Kalbfleisch and Prentice (1980), Blank (1989)), the two alternatives are considered to be independent from each other and can be modeled as having each its own hazard function. We define $\lambda_w(t)$ as the hazard function associated with reemployment, and $\lambda_u(t)$ as the hazard function associated with the probability of claiming UI. The assumption of independence allows us to write the hazard function of the competing risk model as:

$$\lambda_{cr}(t) = \lambda_w(t) + \lambda_u(t) \tag{1}$$

Our maximum likelihood function for that step will be:

$$l_i(\beta; X_i) = f_{w,i}(t_{w,i})^{\alpha_{w,i}} \; f_{u,i}(t_{u,i})^{\alpha_{u,i}} \; S_{cr,i}(t_{1,i})^{1-(\alpha_{w,i}+\alpha_{u,i})} \tag{2}$$

where:

- $S_{cr,i}(t_{1,i})$ is the survival function of the competing risk at time $t_{1,i}$
- $f_{w,i}(t_{w,i})$ is the density function of an observed transition to reemployment at time $t_{w,i}$
- $f_{u,i}(t_{u,i})$ is the density function of an observed transition to UI at time $t_{u,i}$
- $\alpha_{w,i}$ equals 1 if the individual is reemployed, and 0 otherwise
- $\alpha_{u,i}$ equals 1 if the individual claims UI, and 0 otherwise
- we note that $\alpha_{w,i} + \alpha_{u,i}$ equals 1 if the spell of unemployment is not censored, and 0 if the spell is censored at time $t_{1,i}$

In the second step, for those individuals who have claimed UI, a traditional reemployment hazard will be nested in the likelihood function. The likelihood function then becomes:

$$l_i(\beta; X_i) = \underbrace{f_{w,i}(t_{w,i})^{\alpha_{w,i}}\ f_{u,i}(t_{u,i})^{\alpha_{u,i}}\ S_{cr,i}(t_{1,i})^{1-(\alpha_{w,i}+\alpha_{u,i})}}_{\textit{Competing Risk}} \underbrace{[f_{w_{|u},i}(t_{w_{|u},i}|t_{u,i})^{\delta_i}\ S_{w_{|u},i}(t_{2,i}|t_{u,i})^{(1-\delta_i)}]^{\alpha_{u,i}}}_{\textit{Single Risk}} \tag{3}$$

where:

- $S_{w_{|u},i}(t_{2,i}|t_{u,i})$ is the survival function of the single risk at time $t_{2,i}$, conditional upon UI claim at time $t_{u,i}$
- $f_{w_{|u},i}(t_{w_{|u},i}|t_{u,i})$ is the density function of a transition to reemployment at time $t_{w_{|u},i}$, conditional upon UI claim at time $t_{u,i}$
- δ_i equals 1 if the spell of unemployment is not censored and equals 0 if it is censored at time $t_{2,i}$, conditional upon a UI claim at time $t_{u,i}$

Once again using the common terminology in this literature, we will define our baseline hazard to be distributed following a Weibul distribution[2]. To account for the potential presence of unobserved heterogeneity, we use a mass point approach comparable to that used in Blank (1989). In this method it is assumed that there are n different unobserved type in the population and the probability that an individual is part of group i is π_i, where $\sum_{i=1}^{n} \pi_i = 1$.

In our model, we will set $n = 2$ for each of the potential exits. We will therefore have six different mass points:

- ξ_1 and ξ_2, associated with immediate reemployment,
- γ_1 and γ_2, associated with UI claim. and,
- ϕ_1 and ϕ_2, associated with reemployment after UI claim

There are eight possible combinations of these parameters. $\pi_{j,k,m}$ represents the probability associated with one of these combinations ξ_j, γ_k and ϕ_m, with $\sum_{j=1}^{2}\sum_{k=1}^{2}\sum_{m=1}^{2} \pi_{j,k,m} = 1$.

Taking that into account, the likelihood function defined in (3) can be interpreted as the likelihood associated with one combination π and can be rewritten as:

$$\begin{aligned} l_i^{j,k,m}(\beta; X_i) =& f_{w,i}^{j,k}(t_{w,i})^{\alpha_{w,i}} \; f_{u,i}^{j,k}(t_{u,i})^{\alpha_{u,i}} \; S_{cr,i}^{j,k}(t_{1,i})^{1-(\alpha_{w,i}+\alpha_{u,i})} \\ & [f_{w_{|u},i}^{m}(t_{w_{|u},i}|t_{u,i})^{\delta_i} \; S_{w_{|u},i}^{m}(t_{2,i}|t_{1,i})^{(1-\delta_i)}]^{\alpha_{u,i}} \end{aligned} \tag{4}$$

and we will estimate:

$$L(\beta) = \prod_{i=1}^{N} \left[\sum_{j=1}^{2}\sum_{k=1}^{2}\sum_{m=1}^{2} \pi_{j,k,m} \; l_i^{j,k,m}(\beta; X_i) \right] \tag{5}$$

[2]As shown in Kalbfleish and Prentice (1980), the Weibull distribution is a special case of both proportionnal and accelerated failure hazards.

3 Data

We use the 1995 Canadian Out of Employment Panel (COEP) a panel survey developed by Statistics Canada on behalf of Human Resources Development Canada. This dataset is made of two separate cohorts which are representative of job losers in Canada around February and April 1995, respectively. Each cohort has been interviewed twice about six months and one year after their job loss.

These data include information on the cause of the loss of job; on the characteristics of the lost job; and on the socio-economic background of the respondents. In addition, detailed information were provided on their attitude with respect to UI: whether or not the person intended to claim benefits; whether she received benefits or not; why she did not claim (if she didn't); or why she delayed her claim, if she did so. When the unemployed found a new job before the second interview, information where provided on the characteristics on that new job and on the duration of the spell of unemployment between the date of job loss and the first time she returned to work.

We determined the UI eligibility of the respondents using both survey information and the data from the administrative files merged into the COEP. First, we excluded from the sample all these workers who separated from their previous employer voluntarily, those retiring, those leaving because of disability, sickness or injury, and those going on maternity (paternity) leave. Second, we limited the sample to workers between 16 and 65 years of age.

For those left in the sample, the following algorithm was used to assess eligibility. If the respondent had filed a claim with HRDC and that claim has been accepted, we consider her to be eligible. If she did not successfully file a claim, we will assess her eligibility using he employment history, as recorded in her Records of Employment (ROE). Using the ROE's filed in her name over the year preceding her separation, we will measure the number of insurable weeks of work she earned in the 52 weeks preceding her job loss. The final eligibility will be assessed by comparing that number of insurable weeks to the unemployment rate in her UI economic region.

After these computations, we were left with 4,660 observations of respondents that were UI eligible at the time of their loss of job. 1,740 of them will return to work without claiming UI benefits. 345 of them will not be reemployed by the time they were interviewed for a second time, yet did not claim UI despite the fact that they could have. The remaining 2,575 actually claim their benefits. 663 of them will not be reemployed by the time of the second survey.

Figure 2 presents this distribution of the sample and the duration of unemployment associated with the different subsamples following the scheme developed in figure 1. This figure clearly shows that the average spell of unemployment for a job loser who is reemployed before the second survey is higher by 8.3 weeks if he claims UI benefits. As all surveys are conducted at approximately the same time after displacement, the average duration of a censored spell is close to one year, whether or not that person claimed.

Table 1 and 2 present the characteristics of the workers who claim and do not claim benefits. From table 1, it is clear that those workers who claim have longer eligibility, tend to live in Eastern Canada and are generally less educated, a characteristic often associated with longer spells. There are relatively few striking characteristics about those who do not claim. The only difference with those who claim seems to be the fact that they are eligible for far less many weeks than those who claim. This can be interpreted two ways. If the decision to claim is a rational cost benefit analysis made by each unemployed, it is not surprising to see that those with less expected benefits claim less. An alternative explanation would be to think that these lower benefits reflect a lower attachment to the labor force and that this lower level of attachment results in lower UI take up.

Table 2 shows that, conditional on UI claim, the probability of reemployment appears to be linked to other characteristics of the unemployed. Unionized workers, and those who anticipated to be recalled appear to be more likely to be reemployed, while regional and educational differences seem to play a less important role.

4 Results

Table 3 presents the results of the joint estimation when no constraints are imposed on the parameters of the model. To interpret correctly the estimated parameters, it is important to look at their impact in all three branches of our problem. The first two columns of results indicate how quickly these persons will either leave unemployment or claim UI benefits; the third one will indicate how quickly she leaves unemployment conditional upon having claimed UI benefits.

Age is negative and significant in all three cases. This indicates that older workers are less likely to leave joblessness, either with or without claiming UI. The fact that these older people also tend to be less likely to claim UI seems to indicate a lower level of attachment to the labor market. The same result holds for minority.

At the other extreme unionized workers, workers who expected to be recalled and more mobile workers (they own a car) appear to be more likely to find a job immediately. They also tend to claim UI faster and to find a job faster after having claimed.

Advance notices only speed up reemployment after a claim is made. High wages workers will claim faster than others, and conditional upon having claimed are more likely to find a new job quickly. On the other hands, workers eligible for a great many weeks of benefits are more likely to claim, less likely to find a job immediately and less likely to find a job after having claimed. Strangely, a high regional unemployment rate appears only to slow down the process of claiming UI, but not the return to employment. Less educated workers appear to be more likely to claim, but education does not seem to have any significant impact on reemployment in this framework.

Unemployed workers from Ontario are more likely to return to employment without claiming. Those from Quebec are more likely to claim quickly. Conditional upon claim, those from the prairies will find faster reemployment.

Several of the possible combinations of mass points appear to have very low estimated probability of occurrence. In table 4, we restricted several of these combinations to zero. The restrictions cannot be rejected at any conventional level of significance and imply little changes for the other parameters.

In table 5, we show the estimated distribution of the different combinations of unobserved heterogeneity parameters. We have characterized all three pairs of parameters according to whether they implied fast or slow exits. This table shows that two-thirds of the unemployed workers have all of the positive unobserved characteristics. They either find a job quickly, or claim quickly. Once they have claimed, they tend to leave unemployment quickly too. For a little less than 20% of the sample, UI claim appears to work as a wake-up call. They are slow claiming. They don't tend to find a job quickly before claiming, but once they have claimed, they are fast leaving unemployment. For ten percent of the sample, UI appears to be the last resort solution. They tend to find jobs quickly and delay their claim. Finally, we only identify 3.7% of our sample as 'Globe and Mail' unemployed: they are fast to claim and slow to find a new job.

Finally, in Table 6, we imposed that the coefficients for the "exits to reemployment" branches of the model either with or without claiming to be identical. This restriction is strongly rejected, indicating that some behavioral changes take place when people actually claim UI benefits. In addition, the distribution parameter on reemployment appears to be very different before and after claim. This behavioral differences justifies the next exercise.

5 Simulations

In order to illustrate the impacts of some of our results, we present here a few estimations based on simulations. These simulations will allow us to present in a first step the impact of an incorrect modelization of UI take up on the estimation of its disincentive effect. In a second step, we will try to produce a correct estimate of the disincentive effect based upon our econometric results.

5.1 Impact of an incorrect methodology

To illustrate the impact of an incorrect inclusion of UI variables in an econometric model, we performed the following exercise.

First we generated 2,330 spells of unemployment following an exponential distribution with a hazard of 3.730% (an average duration close to 27 weeks, the average duration of those workers who claimed UI). We generated 2,330 other spells with a hazard of 9.551% (an average duration close to 11 weeks, the average duration of those who do not claim UI).

Second, we generated for all these spells a distribution of durations before claiming UI, also using an exponential distribution with hazard equal to 11.11% (an average duration close to 9 weeks, the average lag for people in our sample to claim UI). When in our simulation, the duration to claim was shorter than the duration to reemployment, we will say that in this observation UI was claimed. Symmetrically, when the duration to reemployment was shorter than the lag to claim, we say that UI was not claimed.

Third, we censored some of our observations using an uniform distribution between 25 and 47 weeks. If the duration generated through this uniform distribution is shorter than the one generated in the first step, the spell of unemployment is censored. This data generating process gave us 3,014 observations where UI was claimed and 749 observations where the spell of unemployment was censored.

Table 7 presents the results of this exercise. In this sample, we present the results of the estimation of a simple duration model, first on each subsample separately, second on the full sample. The results clearly show that when a simple dummy variable that is equal to one when UI is claimed in the observation is introduced, this variable is strongly significant and negatively affects reemployment probabilities. This happens despite the fact that UI claim has been generated in a purely random fashion. Even when this variable is set to be equal to one only when UI is actually received (which should control for the fact that some people might delay their claim for a long time), the variable remains often significant.

Table 8 shows that when unobserved heterogeneity is introduced, the structure of our population is approximated quite correctly[3]. When a UI dummy is introduced, we are unable to fully estimate all the parameters. While the point estimate is negative, either we cannot estimate its standard error or it is not significant. This exercise shows the spurious correlation that can be introduced in the estimation of UI disincentive effect when the claim process isn't correctly modeled. The last results

[3]The estimated proportions π_1 and pi_2 are not significantly different from 0.5.

tend to show that to some extent, this problem can be partially corrected when unobserved heterogeneity is correctly accounted for. Yet the tendency to overestimate the UI disincentive effect remains.

5.2 Behavioral Changes

In the preceding exercise, the decision to claim is taken to be completely exogenous and random. Yet our results indicate that once people have claimed, their behaviors change. The decision to claim isn't a non-informative event. In this section, we try to show that, thanks to our methodology, we can get a very precise idea of the true UI disincentive effect. To get a better idea of the impact of claiming on behaviors, we performed computed expected durations of spells of unemployment under different scenarios.

In table 9, we present the expected durations of spells and the marginal impact of different variables. It reflects the fact that unemployed workers finding reemployment through UI claim spent much more time unemployed than those who don't. The impact of observable characteristics on expected duration reflects the estimated coefficients.

The table shows that the average unemployed will wait for about 6 weeks before claiming. When claiming, she will take another 29 weeks before returning to work. On the other hand, those who don't claim, return to work within slightly less than 18 weeks.

To measure the impact of behavioral changes on these differences in expected durations of unemployment, in Table 10 we computed the same expected durations for the model where all estimated the coefficients in the immediate reemployment branch of our problem and in the reemployment after UI claim have been forced to be identical[4]. In that case, table 10 shows that the unemployed person would only have taken 15 1/2 weeks to be reemployed - a figure very close to the estimated 17.6 weeks for those who are reemployed without claiming UI. This is not really surprising,

[4]This includes the distribution parameter of the Weibull function.

since in this case, claiming is treated as a purely random event that does not affect in any way the unemployed's behavior.

6 Conclusions

In this paper, we have proposed and implemented a method to modelize the decision to claim UI benefits by unemployed workers. Two major results deserve some attention.

First, as it has been shown in previous studies by Blank and Card (1991) , Addison and Portugal (1990) or Storer and Van Audenrode (1995), the existence of a relatively large number of workers eligible to UI who chose not to claim benefits can potentially lead to severe overestimation of the impact of UI on unemployment duration. Our simple simulations show how a simple binary variable controlling for whether an unemployed worker claimed UI or not can be found to significantly affect unemployment duration in a setup where it shouldn't[5]. This underscores the need for a correct model of the existence of these eligible non-claimers, a model that we propose here.

Second, we show that the fact that some people actually claim UI benefits is not a purely random event. Unemployed workers who actually claim do behave differently from those equally eligible who do not claim. In this exercise, we estimate this behavioral effect to imply an additional 17 weeks of unemployment.

Our results, which have to be taken with caution at this stage[6], seem to indicate that the disincentive effect of UI comes less from the eligibility it grants to unemployed workers in itself (our estimates indicate here that 20 weeks of benefits would increase unemployment duration by only one and a half week), but from the different behavior of those who actually chose to claim these benefits. Since we have controlled for many observed and unobserved characteristics of these unemployed workers, it remains to be understood why such different behaviors occur.

[5]This would be even more true if a "received UI" variable had been used instead of a "claim" variable.

[6]One major restriction in this exercise is the imposition of the Weibull distribution on the hazard.

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Appendix A Computation of the predicted behavior

Here is an overview of the formulas we used for the computation of the predicted behavior.

$$Prb(u) = \frac{1}{N} \sum_{i=1}^{N} \sum_{j,k,m=1}^{2} \Pi_{j,k,m} \left[\int_0^{65} f_{u,i}^{j,k}(u)\, du + 65\, C_{u,i}^{j,k}(u,w) \right] \tag{6}$$

$$Prb(w) = \frac{1}{N} \sum_{i=1}^{N} \sum_{j,k,m=1}^{2} \Pi_{j,k,m} \left[\int_0^{65} f_{w,i}^{j,k}(w)\, dw + 65\, C_{w,i}^{j,k}(u,w) \right] \tag{7}$$

where:

$\Pi_{j,k,m}$ is associated with $(\xi_j, \gamma_k, \phi_m)$ and has been previously estimated.

and:

$$\begin{aligned}
f_{u,i}^{j,k}(u) &= \lambda_{u,i}^{k}(ui)\, S_{cr,i}^{j,k}(u,w) \\
f_{w,i}^{j,k}(w) &= \lambda_{w,i}^{j}(w)\, S_{cr,i}^{j,k}(u,w) \\
C_{u,i}^{j,k}(u,w) &= \left(\frac{f_{u,i}^{j,k}(u=65)}{f_{u,i}^{j,k}(u=65) + f_{w,i}^{j,k}(w=65)} \right) S_{cr,i}^{j,k}(u=65, w=65) \\
C_{w,i}^{j,k}(u,w) &= \left(\frac{f_{w,i}^{j,k}(w=65)}{f_{u,i}^{j,k}(u=65) + f_{w,i}^{j,k}(w=65)} \right) S_{cr,i}^{j,k}(u=65, w=65)
\end{aligned}$$

$$\mathrm{E}[u|\text{exit via } u] = \frac{1}{Prb(u)} \frac{1}{N} \sum_{i=1}^{N} \sum_{j,k,m=1}^{2} \Pi_{j,k,m} \left[\int_0^{65} u\, f_{u,i}^{k}(u)\, du + 65\, C_{u,i}^{j,k}(u,w) \right] \tag{8}$$

$$\mathrm{E}[w|\text{exit via } w] = \frac{1}{Prb(w)} \frac{1}{N} \sum_{i=1}^{N} \sum_{j,k,m=1}^{2} \Pi_{j,k,m} \left[\int_0^{65} w\, f_{w,i}^{j}(w)\, dw + 65\, C_{w,i}^{j,k}(u,w) \right] \tag{9}$$

$$
\begin{aligned}
\mathrm{E}[w_{|u}|\text{exit via } u] = & \frac{1}{Prb(u)} \frac{1}{N} \sum_{i=1}^{N} \sum_{j,k,m=1}^{2} \Pi_{j,k,m} \Bigg[\\
& \int_0^{65} \int_u^{65} (w_{|u})\, f^m_{w_{|u},i}(w_{|u}|u)\, f^k_{u,i}(u)\, d(w_{|u})\, du + \\
& 65 \int_0^{65} f^{j,k}_{u,i}(u)\, exp\left(- \int_u^{65} \lambda^m_{w_{|u},i}(v)\, dv \right) du + 65\, C^{j,k}_{u,i}(u,w) \Bigg]
\end{aligned} \tag{10}
$$

where:

$$
f^m_{w_{|u},i}(w_{|u}|u) = \lambda^m_{w_{|u},i}(w_{|u})\, exp\left(- \int_u^{w_{|u}} \lambda^m_{w_{|u},i}(v)\, dv \right)
$$

$$
\mathrm{E}[w_{|u} - u] = \mathrm{E}[w_{|u}] - \mathrm{E}[u] = Prb(u)\, \mathrm{E}[w_{|u} - u|\text{ exit via } u] \tag{11}
$$

$$
\mathrm{E}[w_{|u} - u|\text{ exit via } u] = \mathrm{E}[w_{|u}|\text{exit via } u] - \mathrm{E}[u|\text{exit via } u] \tag{12}
$$

$$
\mathrm{E}[total] = Prb(u)\, \mathrm{E}[w_{|u}|\text{exit via } u] + Prb(w)\, \mathrm{E}[w|\text{exit via } w] \tag{13}
$$

Table 1: Competing Risk Model

Competing Risk Model (4660 observations)						
Variables	**Initial exit via reemployment** (1740 observations)		**Initial exit via UI claim** (2575 observations)		**Initial exit censored** (345 observations)	
	Mean	**Standard error**	**Mean**	**Standard error**	**Mean**	**Standard error**
Unemployment(Nb. of weeks)	11.1	12.9	27.4	18.8	51.4	10.2
UI benefits			2.5	1.3		
Age	30.6	9.8	31.0	9.9	32.8	10.8
Wage of job lost (log.)	2.71	0.62	2.66	0.59	2.71	0.69
Eligibility weeks	23.1	16.7	30.9	12.8	19.7	18.7
Regional Unemployment Rate	10.6	3.5	11.3	3.9	10.6	3.7
Male	61.2%	48.7%	57.6%	49.4%	55.7%	49.8%
Married	68.8%	45.9%	68.7%	46.4%	65.2%	47.7%
Minority	19.4%	39.5%	20.3%	40.2%	23.8%	42.6%
Unionized	39.8%	49.0%	33.4%	47.2%	28.1%	45.0%
Notice	21.9%	41.4%	21.8%	41.3%	22.3%	41.7%
Recall expectation	60.3%	48.9%	62.7%	48.4%	34.8%	47.7%
Car-owner	37.5%	48.4%	36.7%	48.2%	28.7%	45.3%
Province:						
Maritime	10.5%	30.6%	14.3%	35.0%	9.6%	29.5%
Quebec	27.8%	44.8%	35.7%	47.9%	27.5%	44.7%
Ontario	38.2%	48.6%	29.5%	45.5%	34.8%	47.7%
Prairies, Yukon and NWT	15.0%	35.7%	11.0%	31.3%	18.8%	39.2%
British Columbia	8.6%	28.0%	9.6%	29.5%	9.3%	29.1%
Education:						
Elementary or less	4.9%	21.7%	7.3%	26.0%	5.2%	22.3%
High school	20.9%	40.7%	25.0%	43.3%	23.2%	42.3%
High school diploma	31.3%	46.4%	29.4%	45.6%	28.4%	45.2%
Postsecondary and other	23.3%	42.3%	20.0%	40.0%	21.4%	41.1%
University	19.5%	39.6%	18.3%	39.7%	21.7%	41.3%

Unemployment: Number of weeks before returning to work

UI benefits: Number of weeks before receiving UI benefits

Figure 2: Distribution of Sample and Unemployment Duration

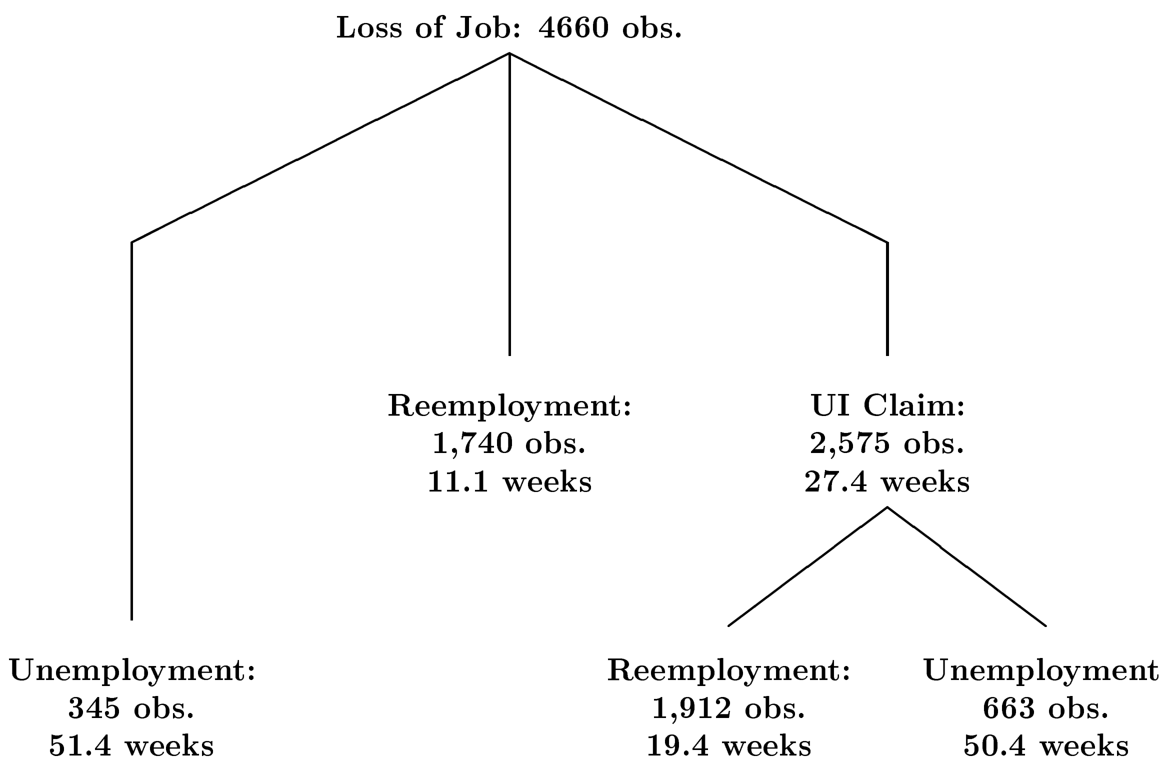

Table 2: Initial exit via UI claim

Initial exit via UI claim(2575 observations)						
Variables	**Secondary exit via reemployment** (1912 observations)		**Secondary exit censored** (663 observations)			
	Mean	**Standard error**	**Mean**	**Standard error**	**Mean**	**Standard error**
Unemployment(Nb. of weeks)	19.4	13.8	50.4	10.7	27.4	18.8
UI benefits	2.4	1.1	2.6	1.6	2.5	1.3
Age	30.7	9.6	31.9	10.4	31.0	9.9
Wage of job lost (log.)	2.69	0.58	2.55	0.61	2.66	0.59
Eligibility weeks	30.0	12.9	33.5	12.0	30.9	12.8
Regional Unemployment Rate	11.3	3.8	11.3	3.9	11.3	3.9
Male	58.7%	49.3%	54.1%	49.9%	57.6%	49.4%
Married	69.5%	46.0%	66.4%	47.3%	68.7%	46.4%
Minority	18.5%	38.8%	25.5%	43.6%	20.3%	40.2%
Unionized	36.8%	48.2%	23.8%	42.6%	33.4%	47.2%
Notice	23.6%	42.5%	16.4%	37.1%	21.8%	41.3%
Recall expectation	66.8%	47.1%	50.7%	50.0%	62.6%	48.4%
Car-owner	38.5%	48.7%	31.5%	46.5%	36.7%	48.2%
Province:						
Maritime	14.3%	35.0%	14.3%	35.1%	14.3%	35.0%
Quebec	35.6%	47.9%	36.2%	48.1%	35.7%	47.9%
Ontario	29.0%	45.4%	30.3%	46.0%	29.5%	45.5%
Prairies, Yukon and NWT	11.8%	32.3%	8.6%	28.1%	11.0%	31.3%
British Columbia	9.3%	29.1%	10.6%	30.8%	9.6%	29.5%
Education:						
Elementary or less	6.9%	25.3%	8.4%	27.8%	7.3%	26.0%
High school	24.9%	43.3%	25.3%	43.5%	25.0%	43.3%
High school diploma	29.4%	45.6%	29.3%	45.5%	29.4%	45.6%
Postsecondary and other	19.2%	40.0%	20.2%	40.2%	20.0%	40.0%
University	18.9%	39.1%	16.7%	37.4%	25.7%	43.7%

Unemployment: Number of weeks before returning to work

UI benefits: Number of weeks before receiving UI benefits

Table 3: Competing Risk Model *(Joint Estimation Results)*

Competing Risk Model *(Joint Estimation Results)*						
	Initial exit via Reemployment		**Initial exit via UI claim**		**Secondary exit via reemployment**	
Variables	**Parameters**	**t-values**	**Parameters**	**t-values**	**Parameters**	**t-values**
xi_1 (ξ_1)	-3.9430	-120.51				
xi_2 (ξ_2)	-1.8188	-27.37				
$gamma_1$ (γ_1)			-1.0139	-101.77		
$gamma_2$ (γ_2)			-4.7354	-66.59		
phi_1 (ϕ_1)					-3.3325	-19.99
phi_2 (ϕ_2)					-5.2000	-1.42
Age	-0.0054	-2.79	-0.0012	-2.10	-0.0084	-2.94
Wage of job lost (log.)	0.0227	0.72	0.0299	2.97	0.1956	3.97
Eligibility weeks	-0.0037	-3.29	0.0022	4.63	-0.0075	-3.50
Regional Unemployment Rate	-0.0044	-0.68	-0.0106	-5.49	-0.0093	-1.01
Male	0.0619	1.64	-0.0104	-0.90	0.1788	3.15
Married	0.0592	1.45	-0.0106	-0.87	0.0548	0.93
Minority	-0.1106	-2.39	-0.0410	-3.04	-0.2079	-3.08
Unionized	0.2739	6.69	0.0463	3.69	0.2555	4.22
Notice	0.0096	0.23	0.0236	1.76	0.2029	3.14
Recall expectation	0.2993	7.35	0.0087	0.77	0.4201	7.05
Car-owner	0.1060	2.82	0.0252	2.18	0.1581	2.81
Province:						
Maritime	-0.0546	-0.76	0.0243	1.29	0.0645	0.72
Quebec						
Ontario	0.1705	3.46	-0.0845	-5.47	-0.0087	-0.12
Prairies, Yukon and NWT	0.0141	0.22	-0.1334	-6.76	0.2227	2.37
British Columbia	-0.0860	-1.12	-0.0836	-4.54	-0.0396	-0.38
Education:						
Elementary or less	-0.0980	-1.02	0.0263	1.10	-0.0705	-0.57
High school	-0.0774	-1.29	0.0518	3.17	0.0605	0.70
High school diploma	0.0492	0.94	0.0099	0.65	0.0749	0.91
Postsecondary and other	0.1011	1.87	0.0251	1.46	0.0584	0.66
University						
Distribution parameter: (s)	0.6479		0.3168		1.0840	
Probability						
Π_{111}	0.01%					
Π_{112}	3.70%					
Π_{121}	19.81%					
Π_{122}	0.01%					
Π_{211}	66.45%					
Π_{212}	0.01%					
Π_{221}	10.01%					
Π_{222}	0.00%					
Objective function value : -11169.2056						

Table 4: Competing Risk Model *(Results with restrictions on probability)*

Competing Risk Model ***(Joint Estimation Results with restrictions on probability)***						
	Initial exit via Reemployment		**Initial exit via UI claim**		**Secondary exit via reemployment**	
Variables	**Parameters**	**t-values**	**Parameters**	**t-values**	**Parameters**	**t-values**
xi_1 (ξ_1)	-3.9430	-121.56				
xi_2 (ξ_2)	-1.8188	-39.56				
$gamma_1$ (γ_1)			-1.0139	-102.69		
$gamma_2$ (γ_2)			-4.7354	-67.10		
phi_1 (ϕ_1)					-3.3325	-37.52
phi_2 (ϕ_2)					-5.1989	-2.43
Age	-0.0055	-2.80	-0.0012	-2.10	-0.0084	-2.96
Wage of job lost (log.)	0.0227	0.73	0.0300	2.98	0.1957	4.00
Eligibility weeks	-0.0037	-3.31	0.0022	4.63	-0.0075	-3.51
Regional Unemployment Rate	-0.0044	-0.68	-0.0106	-5.49	-0.0093	-1.01
Male	0.0619	1.64	-0.0104	-0.90	0.1788	3.16
Married	0.0592	1.45	-0.0106	-0.87	0.0548	0.93
Minority	-0.1106	-2.40	-0.0410	-3.06	-0.2079	-3.10
Unionized	0.2739	6.88	0.0463	3.71	0.2555	4.30
Notice	0.0097	0.23	0.0236	1.76	0.2029	3.15
Recall expectation	0.2993	7.60	0.0087	0.78	0.4201	7.20
Car-owner	0.1060	2.83	0.0252	2.18	0.1581	2.82
Province:						
Maritime	-0.0546	-0.77	0.0243	1.29	0.0645	0.72
Quebec						
Ontario	0.1705	3.52	-0.0845	-5.51	-0.0087	-0.12
Prairies, Yukon and NWT	0.0141	0.22	-0.1334	-6.77	0.2227	2.38
British Columbia	-0.0860	-1.12	-0.0836	-4.54	-0.0396	-0.38
Education:						
Elementary or less	-0.0980	-1.02	0.0263	1.10	-0.0705	-0.57
High school	-0.0774	-1.29	0.0518	3.18	0.0604	0.70
High school diploma	0.0492	0.94	0.0099	0.66	0.0749	0.91
Postsecondary and other	0.1011	1.87	0.0251	1.47	0.0585	0.66
University						
Distribution parameter: (s)	0.6479		0.3168		1.0840	
Probability						
Π_{111}	0.00%					
Π_{112}	3.71%					
Π_{121}	19.82%					
Π_{122}	0.00%					
Π_{211}	66.46%					
Π_{212}	0.00%					
Π_{221}	10.01%					
Π_{222}	0.00%					
Objective function value : -11169.2055						

Table 5: Distribution of Heterogeneity Parameters

Parameter Combination	Immediate Exit to Reemployment	Exit to UI	Exit to Reemployment After UI Claim	Proportion in Sample
ξ_2, γ_1, ϕ_1	Fast	Fast	Fast	66.5%
ξ_1, γ_2, ϕ_1	Slow	Slow	Fast	19.8%
ξ_2, γ_2, ϕ_1	Fast	Slow	Fast	10.0%
ξ_1, γ_1, ϕ_2	Slow	Fast	Slow	3.7%

Table 6: Competing Risk Model *(Results with restrictions on the β)*

Competing Risk Model ***(Joint estimation results with restrictions on the β)***				
	Initial or secondary exit via reemployment		**Initial exit via UI claim**	
Variables	**Parameters**	**t-values**	**Parameters**	**t-values**
Constant	-1.1034	-25.52		
xi_1 (ξ_1) and phi_1 (ϕ_1)	-3.9116	-92.95		
xi_2 (ξ_2) and phi_2 (ϕ_2)	-1.9571	-56.80		
$gamma_1$ (γ_1)			-1.0089	-101.34
$gamma_2$ (γ_2)			-4.7527	-65.37
Age	-0.0078	-4.31	-0.0011	-1.93
Wage of job lost (log.)	0.0621	2.10	0.0301	3.04
Eligibility weeks	-0.0036	-3.18	0.0019	4.03
Regional Unemployment Rate	-0.0134	-2.33	-0.0101	-5.28
Male	0.1799	5.09	-0.0085	-0.74
Married	0.0554	1.46	-0.0055	-0.46
Minority	-0.1293	-3.04	-0.0377	-2.81
Unionized	0.3432	9.19	0.0494	3.97
Notice	0.0808	1.99	0.0233	1.74
Recall expectation	0.3980	11.14	0.0094	0.86
Car-owner	0.1495	4.24	0.0234	2.05
Province:				
Maritime	0.0386	0.64	0.0225	1.19
Quebec				
Ontario	0.1167	2.60	-0.0780	-5.12
Prairies, Yukon and NWT	0.1019	1.73	-0.1240	-6.34
British Columbia	-0.0773	-1.16	-0.0843	-4.68
Education:				
Elementary or less	0.0206	0.25	0.0235	0.98
High school	0.0535	0.97	0.0490	3.00
High school diploma	0.1477	2.95	0.0077	0.51
Postsecondary and other	0.1608	3.06	0.0179	1.06
University				
Distribution parameter: (s)	0.7832		0.3184	
Probability				
Π_{11}	13.93%			
Π_{12}	19.57%			
Π_{21}	54.92%			
Π_{22}	11.58%			
Objective function value : -11256.33				

Table 7:

Single risk model, $\lambda = 0.03730$ *(2330 observations)*						
					(Punctual effect of UI)	
Variables	**Parameters**	**t-values**	**Parameters**	**t-values**	**Parameters**	**t-values**
Cte	-3.3073	-137.32	-1.8399	-45.59	-3.2386	-79.16
UI			-1.8078	-34.71	-0.1031	-2.03
Objective function value :	-3543.34		-3065.25		-7260.09	

Single risk model, $\lambda = 0.09551$ *(2330 observations)*						
					(Punctual effect of UI)	
Variables	**Parameters**	**t-values**	**Parameters**	**t-values**	**Parameters**	**t-values**
Cte	-2.3789	-115.29	-1.5387	-48.85	-2.3632	-78.13
UI			-1.2577	-28.55	-0.0298	-0.73
Objective function value :	-3739.41		-3333.86		-7517.82	

Single risk model with two heterogeneous group *(4660 observations)*						
					(Punctual effect of UI)	
Variables	**Parameters**	**t-values**	**Parameters**	**t-values**	**Parameters**	**t-values**
Cte	-2.8856	-194.01	-1.6560	-68.56	-2.7659	-116.13
UI			-1.6433	-49.54	-0.1982	-6.37
Objective function value :	-7699.08		-6617.52		-15177.99	

Table 8:

Single risk model with heterogeneity *(4660 observations)*				
Variables	**Parameters**	**t-values**	**Parameters**	**t-values**
Cte_1	-2.1598	-11.69	-1.6561	
Cte_2	-3.2398	-27.30	-1.6561	
UI			-1.6431	
Probability				
Π_1	61.33%		15.40%	
Π_2	38.67%		84.60%	
Objective function value :	-7658.61		-6617.52	

Single risk model with punctual effect of UI *(4660 observations)*				
			(With heterogeneity)	
Variables	**Parameters**	**t-values**	**Parameters**	**t-values**
Cte_1	-2.7659	-116.13	-2.2068	-10.72
Cte_2			-3.2261	-21.88
UI	-0.1982	-6.37	-0.0429	-1.01
Probability				
Π_1			41.45%	
Π_2			58.55%	
Objective function value :	-15177.99		-15155.54	

Table 9: Predicted behavior

Variables	Prb(w)	E[w|exit via w]	E[u|exit via u]	E[$w_{\|u}$|exit via u]	E[$w_{\|u} - u$]	E[$w_{\|u} - u$| exit via u]	E[$total$]
Whole sample	**0.3996**	**16.8638**	**6.0712**	**35.5882**	**17.7207**	**29.5170**	**28.1050**
Average individual	**0.3887**	**17.6053**	**5.9991**	**35.1873**	**17.8432**	**29.1881**	**28.3534**
Age	-0.0010	0.0868	0.0253	0.2336	0.1580	0.2083	0.1950
Wage of job lost (log.)	0.0009	-0.4666	-0.1601	-4.7655	-2.8364	-4.6054	-3.1060
Eligibility weeks	-0.0012	0.0481	0.0123	0.0617	0.0648	0.0494	0.0773
Regional Unemployment Rate	0.0008	0.1008	0.0343	0.6281	0.3400	0.5938	0.4091
Male	0.0161	-0.9070	-0.2453	-3.1003	-2.1703	-2.8550	-2.4962
Married	0.0155	-0.8652	-0.2336	-0.9194	-0.8616	-0.6859	-1.1704
Minority	-0.0164	1.7992	0.4987	6.0792	3.9815	5.5805	4.7740
Unionized	0.0648	-4.2096	-1.2988	-8.0151	-5.5616	-6.7163	-7.4284
Notice	-0.0013	-0.2413	-0.0877	-4.5263	-2.6807	-4.4386	-2.8432
Recall expectation	0.0766	-4.4525	-1.2743	-9.1606	-6.4534	-7.8864	-8.3172
Car-owner	0.0215	-1.6861	-0.5114	-4.4691	-2.9623	-3.9577	-3.7058
Province:							
Maritime	-0.0157	0.7126	0.1945	-1.8582	-0.8295	-2.0527	-0.6237
Quebec							
Ontario	0.0595	-2.5121	-0.6000	1.7064	-0.4631	2.3064	-1.2298
Prairies, Yukon and NWT	0.0336	-0.1812	-0.0763	-1.1313	-1.5902	-1.0549	-1.3209
British Columbia	-0.0020	1.4639	0.3706	3.8433	2.1868	3.4727	2.9575
Education:							
Elementary or less	-0.0251	1.3451	0.3849	0.6094	0.8769	0.2245	1.3190
High school	-0.0239	0.8785	0.2353	-3.0404	-1.3827	-3.2757	-1.1904
High school diploma	0.0098	-0.7779	-0.2297	-2.0403	-1.3763	-1.8105	-1.7102
Postsecondary and other	0.0203	-1.6126	-0.4899	-2.7950	-1.9550	-2.3051	-2.6684
University							

Prb(u)=1-Prb(w)

Table 10: Predicted behavior ($\beta_{w_{|u}} = \beta_w$)

Variables	Prb(w)	E[w|exit via w]	E[u|exit via u]	E[$w_{\|u}$|exit via u]	E[$w_{\|u} - u$]	E[$w_{\|u} - u$| exit via u]	E[$total$]
Whole sample							
Average Individual	**0.3887**	**17.6053**	**5.9991**	**15.5080**	**5.8129**	**9.5088**	**16.3232**
Age	-0.0010	0.0868	0.0253	0.0838	0.0457	0.0585	0.0828
Wage of job lost (log.)	0.0009	-0.4666	-0.1601	-0.7631	-0.3762	-0.6030	-0.6458
Eligibility weeks	-0.0012	0.0481	0.0123	0.0117	0.0109	-0.0006	0.0234
Regional Unemployment Rate	0.0008	0.1008	0.0343	0.2062	0.0976	0.1719	0.1667
Male	0.0161	-0.9070	-0.2453	-0.5877	-0.3573	-0.3424	-0.6831
Married	0.0155	-0.8652	-0.2336	-0.5533	-0.3381	-0.3197	-0.6468
Minority	-0.0164	1.7992	0.4987	1.9245	1.0509	1.4259	1.8435
Unionized	0.0648	-4.2096	-1.2988	-3.7499	-1.9556	-2.4511	-3.8225
Notice	-0.0013	-0.2413	-0.0877	-0.4982	-0.2389	-0.4105	-0.4015
Recall expectation	0.0766	-4.4525	-1.2743	-3.4169	-1.8743	-2.1427	-3.7381
Car-owner	0.0215	-1.6861	-0.5114	-1.6345	-0.8670	-1.1231	-1.6105
Province:							
Maritime	-0.0157	0.7126	0.1945	0.2660	0.1939	0.0715	0.3997
Quebec							
Ontario	0.0595	-2.5121	-0.6000	-1.0846	-0.8329	-0.4846	-1.5996
Prairies, Yukon and NWT	0.0336	-0.1812	-0.0763	0.8648	0.2242	0.9412	0.4936
British Columbia	-0.0020	1.4639	0.3706	1.9489	0.9865	1.5783	1.7572
Education:							
Elementary or less	-0.0251	1.3451	0.3849	0.7713	0.4851	0.3864	0.9272
High school	-0.0239	0.8785	0.2353	0.0114	0.0852	-0.2239	0.2775
High school diploma	0.0098	-0.7779	-0.2297	-0.7374	-0.3989	-0.5077	-0.7329
Postsecondary and other	0.0203	-1.6126	-0.4899	-1.5780	-0.8361	-1.0880	-1.5495
University							

Prb(u)=1-Prb(w)