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The Duration of Unemployment Insurance Payments

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Abstract

Administrative data associated with the operation of the Canadian unemployment insurance program that span the period 1971 to early 1990 are used to examine the determinants of the duration of benefit receipt separately for males and females. Parametric models of the hazard rate governing the transition from the receipt of U.I. benefits to full-time employment are estimated in the manner of Follman, Goldberg, and May [1990]. This method permits the influence of individual co-variates to vary over the course of a spell. The main results are: the benefit rate has a clear and significant effect on the spell durations of females but no effect on the durations experienced by males; regional unemployment rates strongly affect male durations but have little effect on those for females; and finally, the difference between the genders, and the significance of the model, disappears as the point of benefit exhaustion approaches.

Introduction

The trade-off between the adequacy of unemployment insurance benefits and the disincentive effects associated with them has been an often debated aspect of the Canadian program. The broad reforms introduced in 1972 coupled with the development of search-theoretic models of unemployment resulted in a great deal of attention being devoted by economists to the possible disincentives associated with lower entrance requirements, higher benefit rates, and longer benefit durations. Grubel, Maki, and Sax [1975], Green and Cousineau [1976], Kaliski [1976], Lazar [1978], and Rea [1977] are some examples of the early literature that attempted to quantify the impact of the program on the unemployment rate, while Beach and Kaliski [1983], Keil and Symons [1990], Milbourne, Purvis, and Scoones [1989], and Phipps [1990a, 1990b] have examined the possible consequences of more recent legislative changes and proposed changes. This latter literature has typically paid much closer attention to which aspects of the unemployment insurance system have the most important consequences for labour sector behaviour and the aggregate unemployment rate. Such information is certainly a prerequisite for the appropriate conduct of policy. While it is easy to agree with Pal [1985] that the main reason for much of the legislative attention that the Canadian unemployment insurance program has received over the course of the 1970s and 1980s is the attempt by the federal government to contain program costs, most changes have nonetheless always contained, as in the case of Bill C-21 which was passed into law in 1990, the explicit objective of "a reduction of work disincentives in the UI program." [Employment and Immigration Canada, 1989:5].

Unfortunately, there does not appear to be a consensus from these recent studies either on the magnitude of the impact of the program on the unemployment rate, or upon which program parameters are most important in determining this impact when it is claimed to be significant. Milbourne, Purvis and Scoones argue that the unemployment insurance system is the major cause of the persistently high unemployment rates experienced in Canada during the 1980s, and that the major reason for this is the generosity and manner in which the duration of benefits are determined. Keil and Symons also claim that the unemployment insurance is the major cause of high unemployment rates, but that the benefit rate is the determining program parameter. Phipps [1990a], on the other hand, is just as emphatic that the U.I. program has virtually no disincentive effects. She presents simulation results of the implementation of such radical program changes as those advocated by the Forget and the MacDonald Commissions that reveal no impact upon labour supply. [Commission of Inquiry on Unemployment Insurance, 1986; Royal Commission on the Economic Union and Development Prospects for Canada, 1985].

In spite of the fact that the underlying theory generates hypotheses about individual behaviour, these more recent studies, like the earlier studies, are for the most part based upon aggregate data. Atkinson and Micklewright [1985] have criticized much of the British literature for this reason. The use of aggregate data often requires that some summary or average measure of program generosity be developed and used as a proxy for the situation that individuals actually face. They note that these approximations often are not related to actual circumstances, and may exaggerate the disincentive effects of the program. It seems much more appropriate to test these hypotheses using micro-data on individuals that receive unemployment insurance, and then to extrapolate to the aggregate level.[1]

While the use of micro-survey and administrative data has been extensive in the United States and in Great Britain, their use in Canada has been relatively rare.[2] Phipps [1990a], in using the Family Expenditure Survey and imputing unemployment insurance benefits to the individuals in the sample, distinguishes her study from many of the others, while Glenday and Jenkins [1981a, 1981b] and Ham and Rea [1987] are the only examples of studies that use administrative data. The Ham and Rea paper is distinguished by its use of appropriate data and econometric methodology to examine the impact of unemployment insurance on the duration of unemployment spells in Canada. Their study finds that the behaviour of individuals is influenced by the duration of their potential benefits. In particular they reach the conclusion that as the point of benefit exhaustion approaches individuals tend either to search more intensively for a job or to become more willing to accept job offers. In other words, the duration of unemployment spells is inversely related to the number of weeks of benefit entitlement. Ham and Rea are not able to uncover a statistically significant influence of the benefit rate (the ratio of benefits to earnings) upon the duration of a spell of unemployment, but their results do show that the prevailing level of aggregate demand, as measured by the unemployment rate, is also an important determinant of the duration of unemployment spells.

The research presented in this paper is also addressed to the behaviour of individuals while in receipt of unemployment insurance benefits. Like Ham and Rea [1987] administrative data drawn from the very operation of the program are used, but a number of extensions are made. First, the analysis examines both males and females and uses a much larger sample size. The Ham and Rea study is restricted to 1,058 unemployment spells drawn from a sample of 282 males that experienced unemployment insurance benefits at some point between 1975 and 1980. The current study uses 12,314 observations on females and 20,236 observations on males over the period 1971 to March 1990. It is hoped that this larger sample will not only permit an examination of the differences between males and females, but also offer a more precise estimation of any possible determinants of their behaviour. Second, a slightly broader definition of "unemployment" is used that might be more properly called a period of benefit receipt. This definition recognizes the fact that the Canadian unemployment insurance system permits claimants to earn as much as 25 per cent of their weekly benefits in part-time employment without any penalty. Such periods are included in the definition of spell duration. This implies that the analysis is addressed to the length of time that it takes the individual to escape from benefit receipt into full-time employment. This definition should offer a more accurate indication of the manner in which individuals use the program, and how policy changes will influence not only their behaviour but also program costs. Third, the econometric methodology used accepts the result of Ham and Rea that spell durations will be influenced by the length of potential benefits, but it controls for this influence in a novel way that permits the parameter estimates of the model to vary once the individual approaches exhaustion of his or her benefits. As a result a profile of the individual characteristics and circumstances that are associated with job finding at the point of benefit exhaustion can be constructed.

The methodology is described in the next section; a description of the data and the results is presented in a subsequent section. A final section summarizes the major conclusions. The results reveal significant differences in the behaviour of male and female U.I. claimants. Among other things it is found that the benefit rate does not influence the behaviour of males, but that it does have a large and significant impact on the behaviour of females. An increase in the benefit rate of 5 percentage points, for example from 60 per cent to 65 per cent of weekly insured earnings, increases the spell duration of the average female by about 3 weeks. The spell durations of males are sensitive to the state of aggregate demand with every 4 percentage point increase in the regional unemployment rate leading to a one week increase in the duration of male unemployment spells. The influence of aggregate demand on the spells of females is not robust to the specification of the model. There are also other important differences in the way in which a host of control variables influence the duration of benefit receipt between the genders, and it is found that while the approaching exhaustion of benefits does appear to lead to changes in individual behaviour most of the factors that influence spell duration before exhaustion have no influence within four weeks of benefit exhaustion. When exhaustion approaches, males and females are, with some minor exceptions, much more alike in their behaviour.

Econometric Methodology

Economic analyses of the disincentive effects of unemployment insurance usually follow one of two approaches. The first is to adopt the standard neoclassical model of labour supply. This is a static model of an individual's choice between income and leisure over some time horizon, which is usually, and arbitrarily, assumed by the analyst to be a year. It is claimed that the availability of unemployment insurance benefits alters the dimensions of the trade-off that individuals face, and hence influences their labour supply. A model of this sort has been used by among others Rea [1977], and in an amended manner by Phipps [1990a]. The second approach is to adopt a search theoretic model of individual behaviour. This framework focuses upon the dynamic process of movement between unemployment and employment. It depicts the individual in a situation of uncertainty as to the location of jobs. Unemployment is considered as a search for an acceptable job. It is often claimed that the unemployment insurance system by reducing the costs of searching decreases the number of jobs that are deemed acceptable and hence increases the duration of unemployment. Ham and Rea [1987] adopt this framework.

This is also the framework used here. The basic results of search theory can be summarized in terms of the following equation:

$$\lambda_i(\mathbf{X},t) = \rho_i(\mathbf{X},t)\ [1 - F(w_i^*(\mathbf{X},t))] \qquad (1)$$

The probability that individual i, with characteristics and circumstances represented by the vector $\mathbf{X}$, will find employment after having spent t periods unemployed is given by λ_i. This conditional probability is referred to as the hazard rate, and may vary over the course of the individual's unemployment spell. It is inversely related to the duration of the spell, the higher the hazard rate the lower the spell duration. The hazard rate, in turn, is determined by two conceptually distinct factors: the rate at which job offers are received by the individual, ρ_i, and the fraction of offers that are deemed to be acceptable, $[1\text{-}F(w_i^*)]$. Search theory addresses itself to the decision process that underlies this latter factor.

A "rational" unemployed individual when confronted with a job offer must choose to either accept the offer, or to reject it with the intention of continuing to search for a better offer. Jobs are characterized solely by the wage rate, w, attached to them. Wages are distributed with a density function $f(w)$, and associated cumulative distribution function $F(w)$. The individual will reject an offer whenever the expected benefit of doing so exceeds the expected cost. The cost of rejecting an offer are the foregone earnings, while the benefit of rejection is the expected increase in earnings of continuing to search. The wage rate that places the individual on the margin of indifference between rejecting and accepting an offer is termed the "reservation wage," w^*. The individual will accept all job offers that have a wage above the reservation wage, and reject all job offers with a wage below. As Atkinson and Micklewright [1985] have stressed, this framework makes sense only when individuals are in a position to make choices. It may well be that an individual has a reservation wage below the lowest possible job offer that he or she could receive. In that cause the individual will accept any job offer, and the hazard rate will be determined solely by the rate at which job offers arrive.

The availability of unemployment insurance benefits will lower the costs of rejecting any given offer, and will therefore imply that the individual's reservation wage will be higher. In this sense the fraction of job offers that are acceptable falls, and the duration of unemployment is consequently longer. Generally, this influence is measured by the so-called "replacement rate," the ratio of benefits to expected earnings in the prospective job. In what follows this ratio is referred to as the benefit rate. The higher the benefit rate, the lower the cost of continued job search, the higher the reservation wage, and the longer the expected duration of a spell of unemployment. The potential duration of benefits will also influence individual behaviour. The closer the individual comes to the exhaustion of benefits the more likely that the reservation wage will fall, or that search intensity will increase. Once again, this will be so when individuals are in a position to choose, otherwise the availability of benefits will have no influence on the duration of a spell of unemployment.

It is not possible to empirically distinguish between the role played by ρ_i and that played by $[1-F(w_i^*)]$ in determining the hazard rate. As a result almost all empirical studies are based upon a reduced form model of equation (1). Factors on both the demand and the supply side of the market will determine the rate of job offer arrivals and the distribution of wages. For example, ρ is determined by the state of aggregate demand and by the characteristics and search intensity of the individual, while $f(w)$ will be determined by the characteristics of the industry that the individual seeks jobs from as well as his or her personal characteristics and skills. Indeed, many of the elements of this model are inherently unobservable, such as search intensity and the expectation that the individual has of the wage offer distribution.

Even so the examination of the duration of unemployment spells is, in this way, closely tied to a theoretical framework. The use of hazard rates is not only theoretically appealing, it also offers an empirical approach that permits individual behaviour to be charted over the course of their unemployment spell, and that is capable of handling certain peculiarities of the data, namely that unemployment spells may not all be observed to be complete. There is a direct relationship between the duration of unemployment spells and the hazard rate. If unemployment spells are distributed with density $g(t)$, and cumulative distribution function $G(t)$, and if the Survivor function is defined as $S(t) = 1\text{-}G(t)$ then the hazard rate is:

$$\lambda(t) = g(t)/S(t) \tag{2}$$

This is equivalent to $-d\ln S(t)/dt$, which in turn implies that $S(t) = \exp(-\int_0^t \lambda(u)du)$. Thus, specifying a functional form for the hazard rate is equivalent to specifying a density for the distribution of spells since $g(t) = \lambda(t)\exp(-\int_0^t\lambda(u)du)$. The likelihood function for estimation purposes can therefore be written as:

$$\Pi_{i=1}^{N} g(t_i)^{1-di}\,[1 - G(t_i)]^{di} \tag{3}$$

Where $d_i = 0$ if the spell is observed to be completed, and $d_i = 1$ if it is an incomplete spell. The latter type contain only the information that the spell has lasted up to some specified time, and hence contribute a probability, given by the Survivor function, to the sample likelihood. Making the appropriate substitution implies that equation (3) may also be expressed as:

$$\Pi_{i=1}^{N} S(t_i)\,\lambda(t_i)^{1-di} \tag{3a}$$

The choice of a functional form for the hazard function is central to the empirical investigation of spell durations. The actual functional form chosen must be sufficiently flexible to avoid the possibility of misspecification. Ham and Rea choose a specification that is very flexible. However, their procedure, like that of most studies, restricts the parameter estimates of the model co-variates to be the same throughout the course of the spell. Follmann, Goldberg, and May [1990] have argued that the influence of co-variates may vary over certain intervals of the spell such as, for example, the point of benefit exhaustion. They develop a method that permits the parameter estimates to vary at these points. This paper adapts some aspects of their methodology according to one of the generalizations that they propose. [Follman *et.al.*, 1990: 358-59]

In particular, the proposition of Ham and Rea that individual hazard rates increase as benefit exhaustion approaches is accepted. However, this is controlled for not by using benefit entitlement as a co-variate in the model, but rather by postulating that there are two distinct intervals during the spell, each characterized by a different functional form for the hazard rate. Generally co-variates are introduced into duration models by a proportional hazard rate specification in which some baseline hazard rate is multiplied by $\exp(\mathbf{X}\beta)$ so that, for example, the hazard rate is given as:

$$\lambda_i(\mathbf{X},t) = h(t_i)\exp(\mathbf{X}\beta) \tag{4}$$

The specification of $h(t)$ might be sufficiently flexible to permit the model to reflect developments over the course of the spell, but this model restricts the influence of the individual's characteristics, X, to be the same over the entire spell. As exhaustion of benefits approaches it is conceivable that search intensity or the reservation wage will fall, and hence that the hazard rate will increase, but there is no way in which particular individual characteristics associated with these changes of behaviour can be distinguished. In fact, the influence of personal characteristics is measured as an average of their influence across the entire duration of the spell. Thus, if there are important differences in behaviour over the two sub-periods of the spell then not only does this model mask the role of certain characteristics during the period of benefit exhaustion, it may also bias the estimates of β during the earlier period.

Let there then be two distinct intervals during the spell. During the first the individual has begun a job search and his or her benefit entitlement is sufficiently great that it does not influence behaviour. During the second interval the individual has utilized a significant fraction of his initial benefit entitlement, and the impending exhaustion of benefits becomes an influence upon behaviour. In this case the hazard function might be more accurately characterized as:

$$\lambda_{1i}(\mathbf{X},t) = h_1(t_i)\exp(\mathbf{X}\beta) \qquad t_i \leq t_{ai} \tag{5a}$$

$$\lambda_{2i}(\mathbf{X},t) = h_2(t_i)\exp(\mathbf{X}\theta) \qquad t_{ai} < t_i \tag{5b}$$

where t_{ai} represents some interval of time before benefits are exhausted. This is the formulation used here, where t_{ai} is taken to be the initial benefit entitlement of individual i less five weeks[4]. When the individual is more than four weeks away from benefit exhaustion the hazard rate is given by (5a), when he or she is within four weeks of exhaustion it is given by (5b). In this way the baseline hazard rate, *and* the influence of the co-variates, as measured by the vectors β and θ, can vary between the two intervals[5]. If the hazard is given in this piecewise manner then the density and survivor functions over the first interval are $S_1(t)$ and $\lambda_1(t)S_1(t)$, while over the second interval they are $S_1(t_a)S_2(t-t_a)$ and

$S_1(t_a)S_2(t-t_a)\lambda_2(t-t_a)$. Following Follman *et. al.* the likelihood function for this model is given as follows:

$$L(\lambda_1,\lambda_2) = \Pi_{t \le ta} S_1(t_i)\lambda_1(t_i)^{1-di}\, \Pi_{t > ta} S_1(t_a)S_2(t-t_a)\lambda_2(t-t_a)^{1-di}$$

$$= \Pi_{i=1}^{N} S_1(\tau_i)\lambda_1(\tau_i)^{1-\delta i}\, \Pi_{i=1}^{N2} S_2(\mu_i)\lambda_2(\mu_i)^{1-\delta i^*}$$

$$= L_1(\lambda_1)\, L_2(\lambda_2)$$

where $(\tau_i,\delta_i)=(t_i,d_i)$ if $t_i<t_{ai}$, $(\tau_i,\delta_i)=(t_i,1)$ if $t_i \ge t_{ai}$, and $(\mu_i,\delta_i^*)=(t_i-t_{ai},d_i)$ if $t_i>t_{ai}$, and where the total number of observations is $N=N_1+N_2$. In this way the likelihood function factors into two distinct contributions, one for each of the time intervals. This simplifies matters because the maximization may be done in two separate steps on the transformed data. The first component of the likelihood function uses information on the entire sample. Spells that last longer than t_{ai} are shortened to t_{ai} and treated as censored. All other spells are unchanged. The second component of the likelihood uses only those spells lasting longer than t_{ai}. Their length is shortened to t_i-t_{ai}.

Description of the Data and the Results

The data are drawn from one of the component files used in the administration of the Canadian Unemployment Insurance program, the so-called "Status Vector." It contains weekly information on benefit receipt and activities during an individual claim. The Canadian program supports several different types of claims. These include fishing, sickness, maternity, and regular claims as well as claims for developmental purposes such as training and job sharing. The present analysis is restricted to observations on "regular" unemployment insurance claims and dates from about mid 1971, when a substantial reform of the program was put into effect, to March, 1990. A 1 in 1000 sample of all claims was drawn to yield a sample size of 32,550.[7]

The data contains a week by week account of a claimant's activities once an unemployment insurance application has been made.[8] The duration data are derived from this information in the following manner. If an individual's application is successful he or she will be subject to a two week waiting period before unemployment insurance benefits begin to be paid. The analysis is restricted to individuals that qualified for payments, but following Portugal and Addison [1990] it is recognized that some individuals may find re-employment before the waiting period is completed or end their claim for some other reason before they actually receive any benefits. These individuals are not excluded from the sample.

It is not observed that these individuals actually found employment, only that they applied for benefits, qualified for them, and did not collect any. They are therefore regarded as having unemployment spells that are censored at two weeks in length.[9] The duration of spells begins with the week that the claim application is received, and therefore includes the waiting period. A spell is defined to continue until an individual reports finding full-time employment, in which case it is considered completed, or until the benefit entitlement is exhausted, in which case the spell is considered censored.[10]

The maximum duration of an individual's benefits is determined by the number of weeks of employment in the job used to support the claim, and by the regional and national unemployment rates. Important changes in the determination of benefit durations occurred in September, 1977, and there have also been changes in the definitions of the regions used in this determination. These are outlined by Dingledine [1981:62-67,85-95]. In any case the maximum benefit entitlement has always been 50 weeks.

Individuals may earn up to 25 per cent of their weekly amount of benefits through part-time employment during any week without penalty. However, once earnings exceed this limit benefits are reduced dollar for dollar. There is therefore a significant incentive to seek part-time employment while on claim. Corak [1990] depicts the weekly budget constraint that an individual claimant faces. Tabulations from the same data set used here show that in fact only a very small fraction of the total time on a claim is spent in receipt of full/partial benefits and earnings. [Corak, 1990: tables 1 and 2][11] What appears to happen in some cases is that part-time jobs become available for a short period, individuals accept to work in them and continue to receive benefits, and then they revert back to a period of benefit receipt without earnings.[12] They do not appear to consider this job as permanent, and do not break off their job search in a substantive way. Therefore, these intermittent employment periods are not considered distinct and are incorporated into the definition of a spell. This is also done because from the public policy point of view there is an interest in the duration of benefit payments, not simply in the duration of an unemployment spell as traditionally defined. In effect, this definition will result in the amalgamation of two unemployment spells that would otherwise have been separated by a short period of part-time work. It is, however, more accurate to describe these spells as spells of benefit receipt, rather than spells of unemployment: they measure the length of time it takes individuals to escape from benefit receipt. If a week of full-time work is reported the claimant's benefit payments will stop. In this case the spell is considered to have ended, even though the individual may eventually return to collect the benefits remaining on the claim.[13]

Table 1 offers summary statistics of the sample by gender. Spell durations average 18.5 weeks for males and 20.5 weeks for females. The first figure is double the 9.2 week figure reported in Ham and Rea [1987: table 2], but much closer to the average of the total weeks of benefits paid per claim, 20.6 weeks.[14] The Ham and Rea figure is much shorter in part because they do not appear to include the waiting period in their definition of unemployment, but mostly because they define a spell to end during the week in which the individual reports any earnings notwithstanding his benefit status. [Ham and Rea, 1987: fn.22][15]

The variable "Benefit Rate" requires comment. For those individuals earning below the maximum insurable earnings it is defined as the weekly rate of benefits divided by the weekly earnings in the job used to support the claim. For those earning above the maximum insurable earnings actual earnings are not observed, and the "Benefit Rate" is the rate of weekly benefits divided by the maximum insurable earnings.[16] This implies a measurement error in two different respects. First, from the search theoretic point of view the desired variable is the weekly rate of benefits divided by the expected wage in future employment, not the wage of previous employment. Second, and more obviously, actual observations on wages are missing for those earning above the maximum insurable earnings. The definition of the benefit rate used here is similar to the ratio of benefits to after tax earnings of previous employment that is presented as one of five alternatives by Atkinson and Micklewright [1985:109-29]. They present this variable as a measure of the adequacy of benefit payments, and as a "rule of thumb" measure of incentives. In their view the assumptions of search theory may not accurately capture the behaviourial patterns of the unemployed. The informational requirements of the model may very well exceed that available to most individuals searching for a job, and not being able to undertake the kind of present value calculations required by the model individuals may rely upon simple rules of thumb as a guide for decisions. The simplest rule of thumb would appear to be to set a reservation wage equal to the previously earned wage. For this reason Atkinson and Micklewright suggest using the ratio of benefits to after tax earnings of the past job. "Benefit Rate" is not net of taxes, but in a rough sense it may be considered to represent a "rule of thumb" replacement ratio in the sense suggested by Atkinson and Micklewright.

The variation in the benefit rate will be the result of legislative changes to the rate of weekly benefits, rather then the result of individual differences in employment earnings. There have been several changes in the rate of benefits over the sample period. The original 1971 legislation stipulated that claimants without dependents were entitled to 66 2/3 per cent of previous insurable earnings, while those with dependents were

Table 1

Summary Statistics

	MALES		FEMALES	
	mean	standard deviation	mean	standard deviation
Duration* (weeks)	18.50	16.71	20.54	17.89
Age/10	3.25	1.24	3.25	1.17
$(Age/10)^2$	12.09	9.58	11.97	8.82
Benefit Rate	0.62	0.03	0.62	0.03
Unemployment Rate	9.82	4.11	9.50	3.88
Over Maximum	0.79		0.59	
Supplementary Inc	0.03		0.04	
First Claim	0.27		0.33	
Four Week	0.18		0.16	
Dependents	0.36		0.22	
Student	0.10		0.09	
CMA	0.44		0.46	
Quarter 1	0.27		0.23	
Quarter 2	0.20		0.26	
Quarter 3	0.20		0.26	
Quarter 4	0.35		0.25	
Agr-Forest-Fish	0.30		0.19	
Mining	0.12		0.17	
Manufacturing	0.16		0.13	
Construction	0.13		0.01	
Distrib Services	0.12		0.13	
Other Serives	0.10		0.20	
Non-Market Services	0.08		0.17	
Newfoundland	0.05		0.04	
Maritime	0.09		0.09	
Quebec	0.32		0.31	
Ontario	0.29		0.32	
Manitoba-Sask	0.06		0.06	
Alberta	0.07		0.06	
B.C.	0.12		0.11	
Number Complete	15,194		8,354	
Number Censored	5,042		3,960	

* includes censored spells

entitled to 75 per cent.[17] In addition claimants with less than 1/3 of maximum insurable earnings also received 75 per cent of earnings. The higher benefit rate for those with dependents was eliminated on January 4, 1976, and the benefit rate was reduced to 60 per cent of maximum insurable earnings for all claimants in January, 1979.

In recognition of the possible measurement problems two additional control variables are defined. The indicator variable "Over Maximum" is defined to equal 0 if the claimant is below the maximum insurable earnings for the year in which the claim was initiated, and to equal 1 if the claimant is above. Seventy-nine per cent of the male sample and 59 per cent of the female sample are above the maximum. "Supplementary Income" is an indicator variable defined to equal 1 if the individual reports having any supplementary income during the claim such as severance or pension payments, or if the claim was subject to supplementary unemployment benefits offered by an employer, otherwise it is equal to 0. This variable is defined with the intention of controlling for other sources of income while on claim.

The other continuous variables in the model are the claimant's age and age^2, and the unemployment rate in the region of residence, which is included as an indicator of the state of aggregate demand. Also included in the analysis is an indicator of whether the claim was adjudicated under the Four Week rule or not. "Four Week" takes a value of 1 if it was, and 0 otherwise. It is expected that claims adjudicated under the four week rule will be shorter in length. "First Claim" is a variable with value of 1 if the claim is the first claim that the individual has ever applied for, and 0 if it is not. Ham and Rea note that lagged spell durations are a large and highly significant influence on the duration of a spell either because of unobserved heterogeneity, or because of lagged duration dependence in the sense of Heckman and Borjas [1980]. "First Claim" is included in the analysis to control for this possibility.

All of the remaining variables in the table are also 0-1 indicators. CMA is defined to equal 1 if the claim was adjudicated in a Census Metropolitan Area, roughly urban centres with a population of over 10,000, and zero otherwise. This variable is included because of the possibility that individuals living in urban centres may have more job opportunities available to them at a lower fixed cost, and hence shorter spell durations. Quarter 1 through Quarter 4 are indicators of the quarter in which the claim was initiated. The remaining variables are controls for industry of previous employment and province in which the claim was administered.

The approach to estimation assumes that the baseline hazard in (5a) and (5b) has a functional form given by the Weibull distribution, namely that $h_j = \gamma_j t^{\gamma_j - 1}$, for $j = [1,2]$. The hazard rises over time with $\gamma_j > 1$, falls over time with $\gamma_j = < 1$, and is constant with $\gamma_j = 1$. Given the piecewise character of the model it is felt that this functional form is sufficiently flexible. Indeed, given the pattern of duration dependence uncovered by Ham and Rea it is expected that the hazard rate will fall during the first interval of the individual's spell, and then to rise during the second. The choice of t_a as five weeks before the exhaustion of benefits is also motivated by their results[18]. The procedures used do not control for unobserved heterogeneity. This may potentially bias estimates of the scale parameter, and of the parameter coefficients. In order to assess the robustness of the results the model was also estimated using Cox's proportional hazard model. This is a distribution free method that is less sensitive to the influence of unobserved heterogeneity. [Cox and Oakes, 1984; Kalbfleisch and Prentice, 1980]

The results of estimating the model in the standard manner under the assumption that the baseline hazard is given by a Weibull functional form are presented in table 2. The results of the estimation procedure following Follman *et. al.*, again under the assumption of a Weibull hazard, are presented in table 3 for the male subsample, and in table 4 for the female subsample. The results of Cox's proportional hazard procedure are presented in the Appendix.

The reference case in all of these estimations is a claimant with a spell beginning during the first quarter of the year, previously employed in the manufacturing sector, resident in Ontario, with the characteristics represented by setting all of the other indicator variables to zero. The results presented in table 2 reveal significant differences between males and females. Most notably, the coefficient of "Benefit Rate" is not significantly different from zero for males, but is large and significant for females. This is an important result that suggests that the influence of changes in this parameter on labour sector behaviour operate exclusively upon females. The consequence of government attempts to reduce program costs and improve labour market efficiency by reducing the benefit rate vary between the genders. Females are more likely to find full-time unemployment sooner, but a lower benefit rate will not influence the incentives facing males to do so, it will only decrease the adequacy of the income support that they receive. While this conclusion should be tempered by the measurement problems associated with this variable it is interesting to note that the coefficient on the variable "Over Maximum" is not significantly different from zero. This implies that those claimants earning above the maximum insurable earnings have spell durations that are not significantly different than those below, and hence that

Table 2

Standard Weibull Hazard Rate Model: Male and Female Subsamples

	MALES		FEMALES	
	coefficient estimate	marginal significance level	coefficient estimate	marginal significance level
Intercept	-3.01	0.0001	-1.19	0.0133
Age/10	0.330	0.0001	-0.117	0.0724
$(Age/10)^2$	-0.0461	0.0001	0.00832	0.3296
Benefit Rate	-0.556	0.2140	-2.43	0.0010
Unemployment Rate	-0.0153	0.0001	(-0.0126)	0.0108
Over Maximum	-0.0226	0.3857	-0.0435	0.1790
Supplementary Inc	0.0600	0.2367	0.208	0.0018
First Claim	-0.00175	0.9352	-0.0352	0.2199
Four Week	0.265	0.0001	0.303	0.0010
Dependents	0.0769	0.0001	-0.153	0.0001
Student	0.0849	0.0032	-0.00929	0.8323
CMA	0.0265	0.1580	(-0.0452)	0.1041
Quarter 2	-0.0688	0.0083	0.0234	0.5040
Quarter 3	-0.164	0.0001	-0.0108	0.7581
Quarter 4	-0.0857	0.0001	-0.0280	0.4269
Agr-Forest-Fish	-0.143	0.0001	-0.157	0.0017
Mining	-0.220	0.0001	-0.116	0.0528
Construction	-0.0941	0.0032	-0.582	0.0001
Distrib Services	-0.259	0.0001	-0.299	0.0001
Other Serives	-0.314	0.0001	-0.391	0.0001
Non-Market Services	-0.291	0.0001	-0.0626	0.1637
Newfoundland	-0.0562	0.2681	-0.213	0.0073
Maritimes	-0.0805	0.0262	-0.115	0.0261
Quebec	-0.0645	0.0097	-0.135	0.0002
Manitoba-Sask	-0.206	0.0001	-0.149	0.0084
Alberta	0.0241	0.5073	-0.130	0.0186
B.C.	(0.0582)	0.0666	-0.0430	0.3586
γ	0.958	0.00626*	0.897	0.00805*
Log Likelihood	-29,729		-18,040	
Number Complete	15,194		8,354	
Number Censored	5,042		3,960	

* Indicates standard error

( ) Indicates that estimate is not robust to model specification. See Appendix 1 for estimates from Cox's Proportional Hazard model.

Table 3

Piecewise Weibull Hazard Rate Model:
Male Subsample

	PRE-EXHAUSTION		EXHAUSTION	
	coefficient estimate	marginal significance level	coefficient estimate	marginal significance level
Intercept	-2.94	0.0001	-3.91	0.0004
Age/10	0.352	0.0001	-0.108	0.5142
$(Age/10)^2$	-0.0490	0.0001	0.00926	0.6601
Benefit Rate	-0.699	0.1266	1.45	0.3739
Unemployment Rate	-0.0162	0.0001	0.00661	0.5865
Over Maximum	-0.0237	0.3744	-0.0105	0.9106
Supplementary Inc	0.0542	0.2958	0.180	0.3327
First Claim	0.00350	0.8738	-0.0904	0.2689
Four Week	0.272	0.0001	0.109	0.3058
Dependents	0.0821	0.0001	-0.0258	0.7362
Student	0.0809	0.0061	0.108	0.3127
CMA	0.0260	0.1754	0.0260	0.7127
Quarter 2	-0.0711	0.0073	0.00302	0.9781
Quarter 3	-0.189	0.0001	0.287	0.0026
Quarter 4	-0.0997	0.0001	0.250	0.0055
Agr-Forest-Fish	-0.153	0.0001	0.0886	0.4775
Mining	-0.228	0.0001	-0.0129	0.9323
Construction	-0.0947	0.0035	-0.0651	0.6331
Distrib Services	-0.262	0.0001	-0.136	0.3045
Other Serives	-0.333	0.0001	0.0423	0.7381
Non-Market Services	-0.294	0.0001	-0.169	0.2541
Newfoundland	(-0.0703)	0.1765	0.185	0.3147
Maritimes	-0.0905	0.0143	0.137	0.3075
Quebec	-0.0670	0.0084	0.0208	0.8280
Manitoba-Sask	-0.220	0.0001	0.0726	0.5979
Alberta	0.0244	0.5106	0.0174	0.9076
B.C.	(0.0601)	0.0634	0.00374	0.9763
γ	0.956	0.00642*	1.28	0.0494*
Log Likelihood	-29,413		-2,069	
Number Complete	14,607		587	
Number Censored	5,629		3,162	

* Indicates standard error

( ) Indicates that estimate is not robust to model specification. See Appendix 1 for estimates from Cox's Proportional Hazard model.

Table 4

Piecewise Weibull Hazard Rate Model: Female Subsample

	PRE-EXHAUSTION		EXHAUSTION	
	marginal coefficient estimate	significance level	marginal coefficient estimate	significance level
Intercept	-0.953	0.0545	-4.51	0.0030
Age/10	(-0.109)	0.1010	-0.233	0.3192
$(Age/10)^2$	0.00785	0.3684	0.0165	0.5971
Benefit Rate	-2.84	0.0002	3.10	0.1696
Unemployment Rate	(-0.0135)	0.0079	0.00665	0.6922
Over Maximum	-0.0426	0.1984	-0.0332	0.7652
Supplementary Inc	0.219	0.0012	-0.160	0.6048
First Claim	-0.0339	0.2490	-0.0259	0.7894
Four Week	0.321	0.0010	0.0306	0.8288
Dependents	-0.152	0.0001	0.128	0.2989
Student	-0.0320	0.4797	0.291	0.0257
CMA	-0.0365	0.1993	-0.165	0.0902
Quarter 2	0.0222	0.5339	0.0206	0.8770
Quarter 3	-0.0306	0.3959	0.297	0.0155
Quarter 4	-0.0394	0.2747	0.179	0.1513
Agr-Forest-Fish	-0.160	0.0019	-0.0564	0.7385
Mining	-0.110	0.0741	-0.126	0.5177
Construction	-0.559	0.0001	-0.970	0.0920
Distrib Services	-0.293	0.0001	-0.310	0.0802
Other Serives	-0.398	0.0001	-0.191	0.2123
Non-Market Services	-0.0524	0.2538	-0.261	0.1299
Newfoundland	-0.212	0.0093	-0.194	0.4579
Maritimes	-0.127	0.0175	0.0502	0.7655
Quebec	-0.131	0.0004	-0.172	0.1775
Manitoba-Sask	-0.169	0.0040	0.173	0.3340
Alberta	-0.130	0.0208	-0.0874	0.6730
B.C.	-0.0418	0.3833	-0.0518	0.7511
γ	0.895	0.00826*	1.26	0.0623*
Log Likelihood	-17,759		-1,340	
Number Complete	8,000		354	
Number Censored	4,314		2,626	

* Indicates standard error

( ) Indicates that estimate is not robust to model specification. See Appendix 1 for estimates from Cox's Proportional Hazard model.

the measurement problems may not be as severe as one might think. The presence of supplementary income does not influence the behaviour of males, but it does influence that of females. Females with supplementary income have shorter spells than those that do not, a result that is counter the intuition of the search model of unemployment.

Tables 3 and 4 uphold these results for the first interval of a spell, but not during the period of impending exhaustion. When parameter values are allowed to vary as the possibility of benefit exhaustion approaches the value of the benefit rate coefficient of females increases in size and significance during the first interval of the spell. However, within five weeks of exhaustion this variable is not significantly different from zero. Indeed, as exhaustion approaches the significance of most coefficients disappears. The estimate of γ does change from being less than one to greater than one, indicating that a declining hazard rate reverts to a rising hazard rate. This suggests an increase in the search intensity of individuals, but the intercept of the hazard rate also drops indicating that if an individual does come within five weeks of exhausting his or her benefits it is likely that, in spite of an increase in search intensity, he or she will not find full-time re-employment.

There are only two coefficients other than the intercept that retain their significance in the subsample of males, two of the seasonal indicators Quarter 3 and Quarter 4. In the case of females five coefficients in addition to the intercept are significant. The student status of the individual has no influence on the duration of a spell during its early stages, but as exhaustion approaches those individuals that are students are more likely to find full-time re-employment. Whether the individual is resident in a Census Metropolitan Area or not does not influence behaviour during the early part of a spell, but as exhaustion approaches the tendency is for non-CMA residents to be more likely to find re-employment. This is contrary to the expectations outlined earlier. These results might suggest that there is more of a voluntary element to the unemployment of these two groups of females. Finally, women that were employed in the Construction and Distributive Services industries are less likely to find re-employment than those that were employed in manufacturing, and this difference becomes even greater within five weeks of benefit exhaustion.

The results of the first columns of tables 3 and 4 highlight the differences between males and females for the first interval of a spell. Age influences spell duration differently between the genders. As males get older and older spell durations first become shorter and then become longer. They reach a minimum at about 36 years of age. For females the influence of age is not precisely determined. There appears to be a linear relationship between age and spell duration, but this is barely significant at the 10 per cent level of confidence, and is even less significant in the Cox model. Spell durations and regional unemployment rates are positively related for both genders, but for the case of females the relationship is not robust between the Weibull and Cox models. Aggregate demand is a significant influence of spell duration for males, but its influence on the spell durations of females is open to dispute. The presence of dependents shortens the spells of males, but lengthens those of females. Male students have shorter spells than non-students, but there is no distinction between female students and non-students. Finally, a significant seasonal pattern is evident in the spell lengths of males, but not in those of females.

Table 5 summarizes the major results in terms of the estimated average spell durations that the models of tables 3 and 4 imply for non-exhaustees. The averages are calculated by using the Weibull Survivor function. An "advantaged" and a "disadvantage" individual are defined by setting the indicator variables that prove to be significant at the 10 per cent level of confidence to the values that imply, respectively, shorter spell durations and longer durations. An "average" individual is defined by setting these characteristics at the value of the sample proportions. The continuous variables are varied according to the values given in the table or set at the extremes of these values to represent an "advantaged" and a "disadvantaged" individual when they are not being directly examined, except for the benefit rate, which is set at the sample average of 0.62 for both advantaged and disadvantaged categories, and the coefficient of the unemployment rate for the female subsample, which is set at zero.

An "average" male will experience 15.35 weeks of unemployment before finding full-time re-employment. This is essentially the same figure that Ham and Rea [1987, table 4] estimated in their preferred specification. An "average" female, on the other hand, has an unemployment spell that is about one month longer, 19.86 weeks. There is a large difference between "advantaged" and "disadvantaged" members of each gender, but "disadvantaged" males suffer spells that are actually longer than "disadvantaged" females, 39.7 weeks versus 37.96 weeks. Every 4 per cent increase in the regional unemployment rate increases the spell duration of the average male by about one week,[20] while every 5 percentage point increase in the benefit rate increases the spell duration of the average female by about 3 weeks.

Table 5

Estimated Average Spell Durations (Measured in Weeks): Various Personal and Program Characteristics

	MALES			FEMALES		
	Advant	Average	Disadv	Advant	Average	Disadv
Average Sample Characteristics						
	8.58	15.35	39.70	12.12	19.86	37.96
Benefit Rate						
0.60				11.45	18.77	35.86
0.65				13.19	21.63	41.33
0.70				15.21	24.93	47.64
0.75				17.52	28.73	54.91
Unemployment Rate						
4.0	8.58	13.97	30.64			
8.0	9.15	14.90	32.69			
12.0	9.76	15.90	34.88			
16.0	10.42	16.96	37.21			
20.0	11.12	18.10	39.70			
Age						
20	9.71	17.28	33.83			
30	8.73	15.52	30.40			
40	8.65	15.39	30.13			
50	9.45	16.82	32.93			
60	11.40	20.28	39.70			

Advant refers to an "Advantaged" claimant.

Indicator variables take on values that reduce spell duration, while continuous variables take the following values: benefit rate, 0.62; unemployment rate, 4.0; age, 36.

Disadv refers to a "Disadvantaged" claimant.

Indicator variables take on values that increase spell duration, while continuous variables take the following values: benefit rate, 0.62; unemployment rate, 20.0; age, 60.

Average refers to an "Average" claimant.

Indicator variables take on values given by the sample proportions, continuous variables take on sample means.

All calculations assume that claims are not adjudicated under the Four Week Rule, and use only coefficients from tables 3 and 4 with marginal significance levels below 10 per cent. The unemployment rate coefficient for the female calculations is set to zero.

Conclusions

This paper has used Canadian administrative data to examine the length of time that it takes UI claimants to find full-time re-employment. The analysis has been carried out by gender. The methodology used builds upon past research in this area by permitting the estimates of the hazard function to vary over the course of the unemployment spell: one set of parameter estimates being associated with a pre-exhaustion interval of the spell, and another set with the interval just before exhaustion of the benefit entitlement.

There are significant differences in the results between the genders. The "average" female unemployment insurance receipt is found to spend almost 20 weeks collecting benefits before finding a full-time job, while the "average" male spends slightly more than 15 weeks in such a state. Further, the influence of personal and program characteristics differs between the genders. The most notable finding is the result that the benefit rate has a very large and significant influence on the duration of spells of females, but no measurable impact on males. An increase in the benefit rate of 5 percentage points, from 60 to 65 for example, would increase the duration of benefit receipt of females by almost three weeks. On the other hand, the state of aggregate demand, as measured by the regional unemployment rate, is an important determinant of spell duration for males, but not for females. An increase in the unemployment rate of 4 percentage points is found to increase the duration of benefit receipt by about one week. The influence of aggregate demand on the duration of spells in the female subsample was not found to be robust to the specification of the model. These results would suggest that there is much more of a voluntary component to the spell duration of females than there is of males. A host of other differences were also found in the way personal characteristics influence spell durations between the genders.

In addition, it is found that as the exhaustion of the benefit entitlement approaches the significance of the model disappears. Males and females are much more alike in their behaviour within five weeks of benefit exhaustion. Except for the case of female students, and females living outside of census metropolitan areas, no personal or program characteristics lead to higher rates of job finding. The hazard rate is found to first decline over the course of the spell, and then to rise as exhaustion approaches. This suggests that there is some tendency for individuals to search more intensively for jobs or to become more willing to accept the job offers that they do receive. However, this influence is not great. If an individual collects benefits up to four weeks from exhaustion he or she is likely to continue collecting until exhaustion, and there is no configuration of circumstances that will improve the probability of finding a job. This finding suggests that there may be a significant involuntary component associated with benefit exhaustion that has less to do with the state of aggregate demand than with broader structural factors.

These results raise certain conundrums for the optimal design of the unemployment insurance program. A lowering in the benefit rate will likely improve the incentives of females to find full-time re-employment, but it would at the same time only serve to reduce the adequacy of income support received by males without altering their incentives. Further, while a lowering of the length of potential benefit durations will likely not influence the incentives or the income support of the broad majority of recipients, it will have an important impact upon the income support to the minority of individuals that do exhaust their benefit entitlement. There are no personal or program characteristics that appear to influence the ability of exhaustees to find full-time re-employment. Something other than a tinkering with the incentives that these individuals face is required to increase their chances of re-employment.

Appendix A

Table A-1

Cox's Proportional Hazard Rate Model: Male and Female Subsamples

	MALES		FEMALES	
	coefficient estimate	marginal significance level	coefficient estimate	marginal significance level
Age/10	0.295	0.0000	-0.0970	0.0952
$(Age/10)^2$	-0.0410	0.0000	0.00705	0.3563
Benefit Rate	-0.392	0.3605	-2.00	0.0025
Unemployment Rate	-0.0111	0.0003	-0.00706	0.1113
Over Maximum	-0.0115	0.6475	-0.0356	0.2197
Supplementary Inc	0.0455	0.3485	0.167	0.0052
First Claim	0.00849	0.6817	-0.0191	0.4592
Four Week	0.225	0.0000	0.243	0.0000
Dependents	0.0623	0.0006	-0.145	0.0000
Student	0.0689	0.0124	-0.0197	0.6166
CMA	0.0237	0.1870	-0.0349	0.1617
Quarter 2	-0.0590	0.0180	0.0107	0.7334
Quarter 3	-0.151	0.0000	-0.0139	0.6590
Quarter 4	-0.0851	0.0000	-0.0329	0.2971
Agr-Forest-Fish	-0.134	0.0000	-0.139	0.0019
Mining	-0.200	0.0000	-0.103	0.0548
Construction	-0.0948	0.0019	-0.497	0.0000
Distrib Services	-0.234	0.0000	-0.254	0.0000
Other Serives	-0.282	0.0000	-0.329	0.0000
Non-Market Services	-0.265	0.0000	-0.0603	0.1349
Newfoundland	-0.0709	0.1447	-0.194	0.0066
Maritimes	-0.0847	0.0145	-0.0993	0.0329
Quebec	-0.0596	0.0124	-0.109	0.0007
Manitoba-Sask	-0.186	0.0000	-0.118	0.0207
Alberta	0.0160	0.6462	-0.100	0.0427
B.C.	0.0425	0.1621	-0.0354	0.3996
Number Complete	15,194		8,354	
Number Censored	5,042		3,960	

Table A-2

Piecewise Cox Proportional Hazard Rate Model: Male Subsample

	PRE-EXHAUSTION		EXHAUSTION	
	coefficient estimate	marginal significance level	coefficient estimate	marginal significance level
Age/10	0.316	0.0000	-0.137	0.5172
$(Age/10)^2$	-0.0436	0.0000	0.0120	0.6569
Benefit Rate	-0.517	0.2384	1.86	0.3750
Unemployment Rate	-0.0115	0.0002	0.00832	0.5939
Over Maximum	-0.0111	0.6637	-0.0125	0.9171
Supplementary Inc	0.0394	0.4271	0.221	0.3542
First Claim	0.0145	0.4911	-0.112	0.2854
Four Week	0.230	0.0000	0.134	0.3267
Dependents	0.0669	0.0003	-0.0340	0.7292
Student	0.0638	0.0234	0.134	0.3318
CMA	0.0230	0.2103	0.0336	0.7110
Quarter 2	-0.0608	0.0165	0.00835	0.9528
Quarter 3	-0.175	0.0000	0.359	0.0032
Quarter 4	-0.0984	0.0000	0.316	0.0060
Agr-Forest-Fish	-0.143	0.0000	0.109	0.4976
Mining	-0.206	0.0000	-0.0152	0.9377
Construction	-0.0963	0.0019	-0.0813	0.6423
Distrib Services	-0.236	0.0000	-0.169	0.3181
Other Serives	-0.299	0.0000	0.0531	0.7441
Non-Market Services	-0.267	0.0000	-0.210	0.2707
Newfoundland	-0.0857	0.0847	0.229	0.3321
Maritimes	-0.0948	0.0074	0.174	0.3139
Quebec	-0.0616	0.0112	0.0250	0.8386
Manitoba-Sask	-0.198	0.0000	0.0861	0.6261
Alberta	0.0162	0.6475	0.0245	0.8988
B.C.	0.0433	0.1613	0.00483	0.9761
Number Complete	14,607		587	
Number Censored	5,629		3,162	

Table A-3

Piecewise Cox Proportional Hazard Rate Model: Female Subsample

	PRE-EXHAUSTION		EXHAUSTION	
	coefficient estimate	marginal significance level	coefficient estimate	marginal significance level
Age/10	-0.0904	0.1281	-0.289	0.3278
$(Age/10)^2$	0.00669	0.3914	0.0204	0.6037
Benefit Rate	-2.37	0.0005	3.89	0.1714
Unemployment Rate	-0.00724	0.1100	0.00825	0.6971
Over Maximum	-0.0342	0.2497	-0.0437	0.7554
Supplementary Inc	0.175	0.0037	-0.194	0.6192
First Claim	-0.0162	0.5380	-0.0355	0.7726
Four Week	0.257	0.0000	0.0356	0.8424
Dependents	-0.144	0.0000	-0.164	0.2886
Student	-0.0407	0.3153	0.355	0.0305
CMA	-0.0265	0.2976	-0.205	0.0939
Quarter 2	0.00835	0.7943	0.0281	0.8675
Quarter 3	-0.0319	0.3224	0.3688	0.0166
Quarter 4	-0.0440	0.1729	0.223	0.1579
Agr-Forest-Fish	-0.141	0.0021	-0.0714	0.7377
Mining	-0.0972	0.0785	-0.1542	0.5291
Construction	-0.474	0.0000	-1.20	0.0981
Distrib Services	-0.247	0.0000	-0.384	0.0850
Other Serives	-0.334	0.0000	0.234	0.2238
Non-Market Services	-0.0511	0.2130	-0.321	0.1398
Newfoundland	-0.194	0.0081	0.244	0.4602
Maritimes	-0.109	0.0229	0.0590	0.7810
Quebec	-0.104	0.0016	-0.214	0.1844
Manitoba-Sask	-0.133	0.0112	0.215	0.3410
Alberta	-0.0991	0.0488	-0.109	0.6776
B.C.	-0.338	0.4306	-0.0679	0.7420
Number Complete	8,000		354	
Number Censored	4,314		2,626	

Endnotes

1. The movement from hypotheses based upon individual behaviour to the consequences for the aggregate unemployment rate is not as straightforward as it seems. In particular, even if increased program generosity alters individual behaviour by, for example, making unemployment insurance recipients less willing to accept a job offer, this will not cause the aggregate unemployment rate to increase if there is a general excess supply of labour. The fact that a recipient refuses to take a job only implies that the opening is available for a non-recipient to accept. In this situation the unemployment insurance system will influence who will be unemployed, but not the overall unemployment rate. Atkinson and Micklewright have emphasized this point as have Bergmann [1990], and Beach and Kaliski [1983].

2. Some recent studies for the United States include Baldwin Grossman [1989], Katz and Meyer [1990a, 1990b], Moffitt [1985], Moffit and Nicholson [1982]. Atkinson and Micklewright survey much of the British literature focusing upon the seminal papers by Lancaster [1979], Lancaster and Nickell [1980], and Nickell [1979].

3. Atkinson and Micklewright [1985:118-22] offer a careful and clear exposition of search theory as it is applied to studies of the duration of unemployment.

4. The justification for this choice is discussed in the next section.

5. Indeed, there is nothing in this formulation to restrict the vector of co-variates, **X**, to be the same over the two intervals.

6. The data are described in Employment and Immigration Canada [1990], while the operation of the program and its institutional development up to 1980 are described by Dingledine [1981].

7. In addition to restricting the analysis to non-developmental regular claims it was required that the claim be initiated in one of the ten provinces (claims from the Yukon, Northwest Territories, and those from outside of Canada were excluded), and not contain missing or incorrectly coded information. This latter restriction required the exclusion of a small number of claims with incorrect age or gender information, and claims for which it was not possible to calculate a maximum potential benefit entitlement.

8. While the Canadian program is extremely broad in its coverage important categories of individuals are still excluded, most notably the self-employed and first time entrants into the labour force. Further, to be included in the sample the individual must have applied for unemployment insurance benefits. Individuals that experience and employment-unemployment transition, qualify for benefits, but do not apply are not part of the data set. For these two reasons the data should not be considered to be a randomly drawn sample from the entire labour force. This caveat applies to most studies that are based upon administrative data.

9. Portugal and Addison point out that many studies exclude these individuals from analysis, and that this implies that the data will be truncated from the left. They find that in their data set this procedure leads to very large overestimates of the mean duration of unemployment spells, as well as an overstatement of the influence of the benefit rate on unemployment duration by as much as 50 per cent.

10. Some spells that were initiated in 1989 and 1990 are also treated as censored because the end of the sampling period did not permit them to be followed to completion.

11. The average fraction of time on a claim spent in receipt of full benefits and earnings is less than 1 per cent, while the average fraction of time in receipt of partial benefits and earnings is about 5 per cent. The average *claim* duration is 32.5 weeks. Further, 91 per cent of claimants never report receiving full benefits and earnings, and 8 per cent report 5 or less weeks in such a state. Fifty-six per cent of claimants never report receiving partial benefits due to earnings, while 36 per cent report five or less weeks in such a state.

12. It is this type of behaviour that in part made it possible for Ham and Rea to derive 1,058 unemployment spells from observations on 282 individuals.

13. This type of behaviour is more prevalent. Fifty-two per cent of claimants report zero weeks with no benefits due to earnings, 27.4 per cent report five or less weeks in such a state, while 21 per cent report more than five weeks. Corak [1990: table 2] Individual's will exercise their option to collect the remaining benefits rather than start a new claim because they need not spend any time in a waiting period.

14. Employment and Immigration Canada [1981: table 25] also reports similar figures for the average number of weeks of benefits paid per claim. Their analysis is restricted to the years 1973 to 1979. For males they report an average that varies from a low of 15.9 weeks in 1975 to a high of 20.3 weeks in 1979. The female averages range from 17.9 weeks in 1974 to 23.7 weeks in 1979.

15. The fact that they appear to exclude any claims that do not last longer than the waiting period would suggest a left truncation of the sample, and hence a longer average spell duration.

16. The maximum insurable earnings is set yearly according to a moving average of the average annual earnings of the labour force.

17. The maximum weekly benefit payment for those with dependents could not exceed two thirds of maximum insurable earnings.

18. In particular by the pattern of duration dependence that is depicted in their figures 1 and 2. The former shows a declining hazard rate that begins to rise sharply about four weeks before the maximum potential benefits. It is drawn under the assumption that benefit entitlement does not change over the course of the spell. The latter figure depicts results that relax this assumption, and reveals a series of "spikes." The behaviour of the step function in this figure was an important influence on the choide of t_a. Over the course of spell durations 20 to 40 weeks in length this function rises steadily over a span of 4 successive weeks, then falls and rises again for the next 4 weeks, and falls and rises again. There is also a sharp increase in the hazard rate about 4 weeks before the maximum benefit entitlement.

19. The mean of the Weibull distribution is the 63.2 percentile of the distribution.

20. Once again this is about the same result that Ham and Rea report.

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