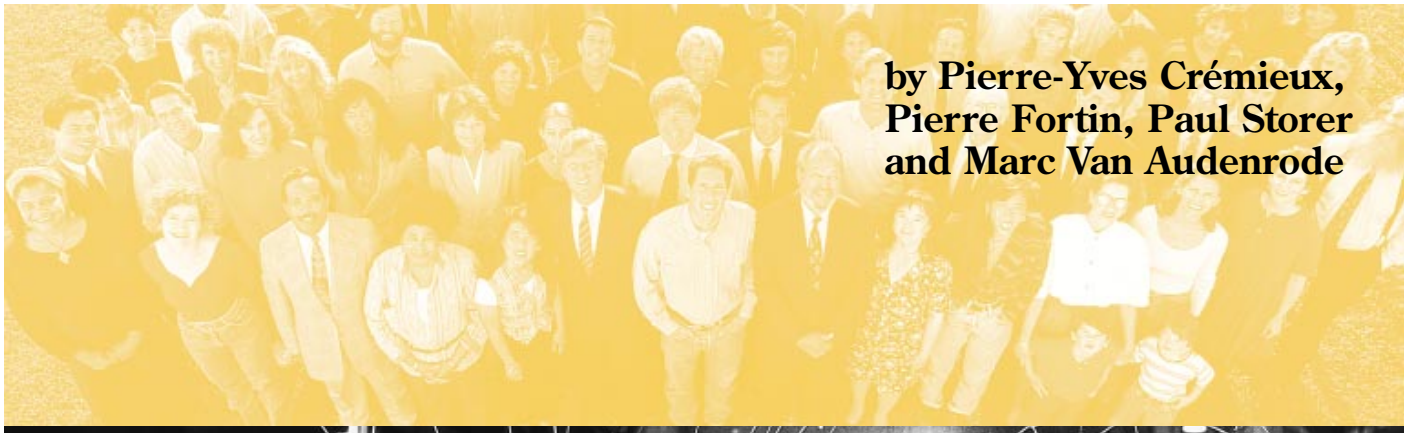
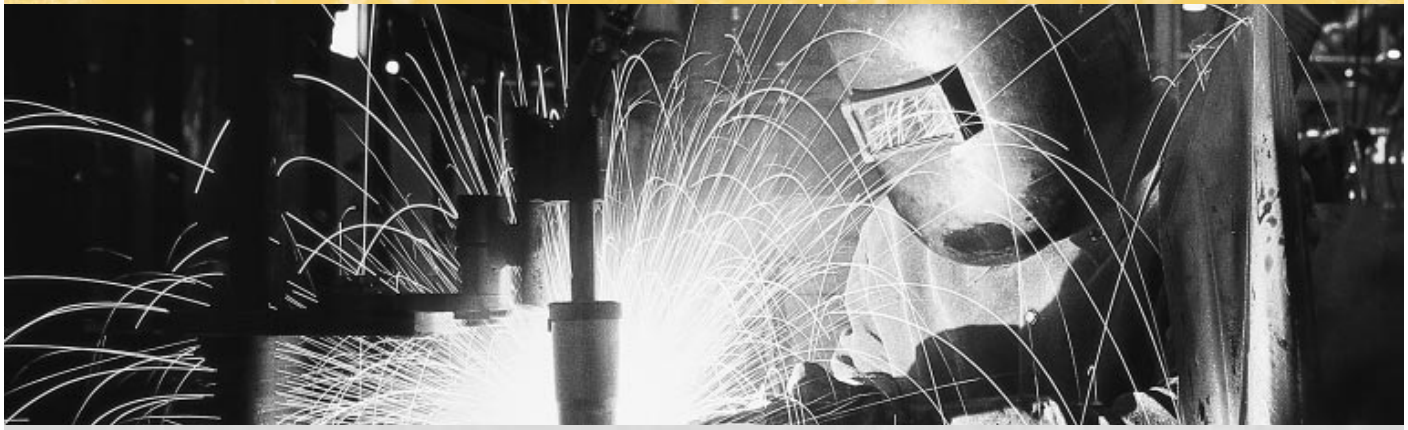
UI

The Impact of Unemployment Insurance on Wages, Search Intensity and the Probability of Re-employment



by Pierre-Yves Crémieux, Pierre Fortin, Paul Storer and Marc Van Audenrode



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UI and the Labour Market

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UI and the Labour Market

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Unemployment Insurance Evaluation Series

Human Resources Development Canada (HRDC), in its policies and programs, is committed to assisting all Canadians in their efforts to live contributing and rewarding lives and to promote a fair and safe workplace, a competitive labour market with equitable access to work, and a strong learning culture.

To ensure that public money is well spent in pursuit of this mission, HRDC rigorously evaluates the extent to which its programs are achieving their objectives. To do this, the Department systematically collects information to evaluate the continuing rationale, net impacts and effects, and alternatives for publicly-funded activities. Such knowledge provides a basis for measuring performance and the retrospective lessons learned for strategic policy and planning purposes.

As part of this program of evaluative research, the Department has developed a major series of studies contributing to an overall evaluation of UI Regular Benefits. These studies involved the best available subject-matter experts from seven Canadian universities, the private sector and Departmental evaluation staff. Although each study represented a stand alone analysis examining specific UI topics, they are all rooted in a common analytical framework. The collective wisdom provides the single most important source of evaluation research on unemployment insurance ever undertaken in Canada and constitutes a major reference.

The Unemployment Insurance Evaluation Series makes the findings of these studies available to inform public discussion on an important part of Canada's social security system.

I.H. Midgley
Director General
Evaluation Branch

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Insurance Programs

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Abstract

This report examines the effect of Unemployment Insurance and other variables on the search intensity, reservation wage, re-employment wage, and probability of re-employment of displaced workers. The results confirm in large part the results of a smaller study that we previously completed based on more limited data (Crémieux *et al.* 1994) and sheds new light on the behaviour of displaced workers. It confirms that displaced workers who are not eligible for UI suffer wage losses 7–9 percent greater than those eligible for 50 weeks of unemployment, and that UI benefits are not a major determinant of job search intensity.

This study also yielded significant new findings. We found little relationship between unemployment duration and job-search intensity. Post-displacement wages were lower among younger and less-educated workers. People with fewer assets, larger debts, or larger mortgages searched harder. Older workers, men, and workers with long tenure in their previous job also searched harder. Unionized workers and seasonal workers searched significantly less. Last but not least, the number of past UI claims had no significant impact on the job-search effort after controlling for the seasonal nature of some jobs.

Introduction

This paper reports the results of an examination of the impact of Unemployment Insurance (UI) on the productivity of job search. It is based on the Canadian Out of Employment Panel (COEP) data set (Human Resources Development Canada), which includes information on the job-search decisions and outcomes of a large, randomly selected, representative sample of people who separated from a job in Canada in 1993. With these data, it is possible to determine the linkages between economic variables, including features of the UI system, and peoples' individual choices as to how intensively they look for a new job and what salary they are prepared to accept in the new job. These linkages are very important because such individual choices are often viewed as the mechanism by which UI affects job-search outcomes and thus their "productivity."

... it is possible to determine the linkages between economic variables, including features of the UI system, and peoples' individual choices as to how intensively they look for a new job and what salary they are prepared to accept in the new job.

The productivity of any activity is measured by its output. For a factory, productivity is measured by the number and quality of goods produced. For job search, the output is the new job, and the quality of this new job can be measured by the salary. This study looks at the probability of finding a new job, which is a measure of the speed with which the "product" is made. The quality of the finished product is measured by the post-displacement wage. A low-paying job that was found quickly is thus considered to be akin to a shoddy product that was hastily fashioned.

In the analysis of the production of a good, the inputs into the production process determine its quality. The same is true for a job-search. The speed with which a job is found and the resulting wage depend, in general, on choices made regarding the search effort and the minimum acceptable wage (the reservation wage). The COEP data enable us to directly study these two important inputs into the search process. While there are other inputs (such as the recruitment activity of firms), they are not likely to be related to Unemployment Insurance.

This study is a statistical analysis of the relationship between UI, on the one hand, and job search decisions and the productivity of the search, on the other. In many ways our objectives are similar to those of Crémieux, Fortin, Storer and Audenrode (1994). However, there are many differences between the two studies, largely because the COEP data, which have only recently become available, enabled us to adopt a more detailed and comprehensive methodology.

With data where the reservation wage and search intensity are not included, the total effect of UI on the quality of search outcomes can be measured, but it is not possible to attribute the combined effect of the action of UI to any particular search input. The fact that the reservation wage and search intensity are included in the data set enabled us to identify the mechanism by which UI affects search outcomes and to separate UI effects working through various channels.

The structure of this report is as follows. Section 1 provides an overview of the theoretical framework used in the study. The COEP data used in this study are described in detail in Section 2. Sections 3 and 4 investigate the individual's choice with respect to search effort and reservation wages, respectively. These results are

then applied to Sections 5 and 6 of the report which examine in turn the probability of finding a job and the wage earned on the new job. The effect of past UI history can be examined with the COEP data and is discussed in Section 7. The paper concludes with Sections 8 and 9 discussing the lessons learned in this study for economic policy and a series of general conclusions which are designed to synthesize the various results presented.

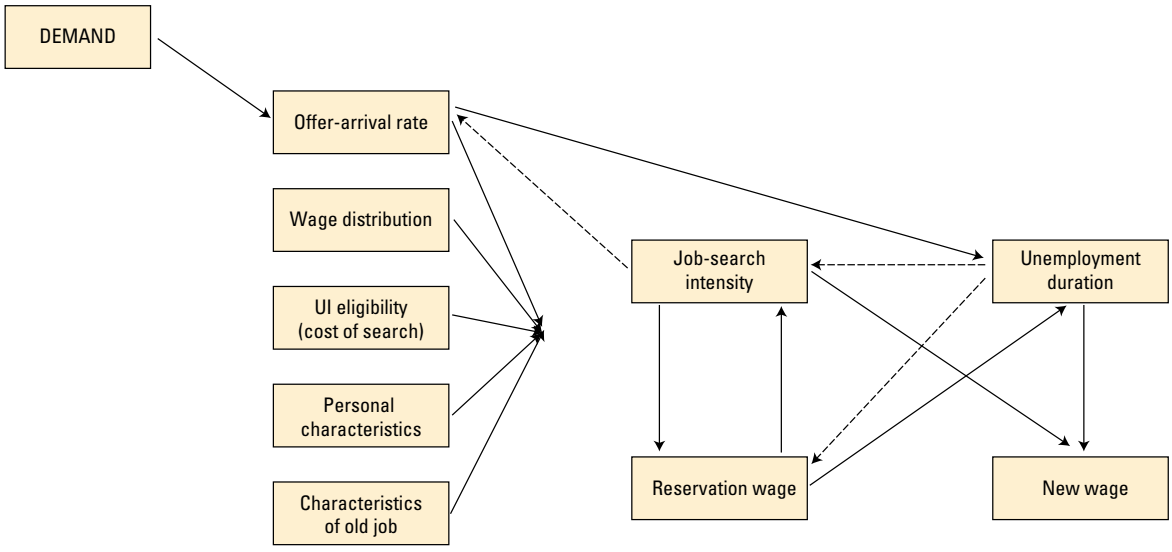
1. Theoretical Framework

Job search theory is the backbone of our analysis, as it was in Crémieux *et al.* (1994). In that study, we observed that "job search models assume that the unemployed are involved in a productive activity rather than passively awaiting the arrival of a job. Without such a perception of unemployment, programs targeted at the unemployed would play little role in facilitating labour market transitions. This model is explicitly stochastic since it assumes that there is a distribution of potential wage offers for each worker. In the absence of this assumption, wage changes would not respond to labour market programs. Finally, there exists an established methodology of duration analysis within the search approach and this provides a point of departure for the current study."

Job search theory is the backbone of our analysis ... "job search models assume that the unemployed are involved in a productive activity rather than passively awaiting the arrival of a job."

Crémieux *et al.* (1994) introduced a formal model of job search derived from Devine and Kiefer (1991). Here, we would like to offer a more intuitive overview of the job search process (Figure 1). For technical details, refer to the Appendix. We assume that workers determine their job-search intensity s_i and their reservation wage r_i, (the inputs to the search process) based on the offer-arrival rate (determined in part by demand conditions), the distribution (range) of available wages, their UI eligibility, personal characteristics, and characteristics of the previous job. In turn, s_i and r_i determine the duration of the unemployment spell and the post-displacement wage, which are the outputs of the search process.

Figure 1
Linkages in Job-Search Theory



Within this framework, the search process seems relatively simple. However, the causality is often unclear since many variables are determined jointly and/or simultaneously. Search intensity is also a determinant of the job-offer arrival rate, because the greater the search effort the greater the probability of receiving an offer. This means that there is a simultaneity between the offer-arrival rate and job-search intensity. Furthermore, the job-search intensity and the reservation wage are also linked. Workers with a higher reservation wage might search harder in order to find a high-paying job or might not search at all if they believe that the offer-arrival rate of jobs with wages above their reservation wage will be zero. Conversely, job-search intensity will affect the reservation wage since it will change the offer arrival rate. Hence, workers who search more intensely will have a higher offer-arrival rate and will increase their reservation wage.

Finally, job-search intensity and the reservation wage affect the outcomes of the job-search process — the duration of unemployment and the wage in the new job. Again, the causal link may point in two directions, since the duration of unemployment will affect both the search intensity and the reservation wage if learning or discouragement effects lead to the revision of individual decisions. The duration of unemployment will also affect the new wage as employers interpret the signal sent by varying lengths of joblessness spells, and will be affected by demand conditions beyond the individual's control through the offer-arrival rate.

Quite clearly, the job-search process involves many variables, some of which are determined simultaneously. This makes analyzing search behaviour rather difficult. However, such an analysis is crucial to the design of an effective Unemployment Insurance program. Receiving UI tends to lower the cost of the job search to the individual, thereby increasing the reservation wage, which in turn affects job-search intensity. However, this might also have a direct, negative effect, as UI acts as a leisure subsidy. This in turn affects unemployment duration and the reservation wage.

Evaluating the effect of UI on job-search intensity is complicated by the effect of unemployment duration on search intensity, which is unrelated to the presence of Unemployment Insurance. Because of these complications, the overall effect of UI is unclear from a theoretical viewpoint, and only applied analysis of data can reveal how it affects the behaviour of the unemployed. Since UI increases the reservation wage, it should increase the unemployment duration and the post-displacement wage because it enables the unemployed to wait for the best possible job rather than take the first position that comes along. However, because UI has a potentially negative effect on search intensity, it might lengthen the duration of unemployment without affecting the reservation wage, thus leaving the post-displacement wage unchanged or even lowering it.

One of the main goals of this study is to isolate the effect of UI on the reservation wage, on job-search intensity, and on the post-displacement wage. This will require two-stage statistical regression techniques in order to purge the estimations of the simultaneities described above. (These econometric techniques are described in greater detail in the Appendix.)

2. The COEP Data Set

The COEP data have corrected some major concerns of Crémieux *et al.* (1994), who used the National Employment Services (NES) data set. These concerns are threefold. First, the robustness of the results to a different, more random, sampling scheme could not be evaluated. The NES data set was built using a random sample of Canadian Employment Centre visitors. While some information is available on unemployed workers using CEC as a search method, nothing is known on the particular profile of CEC visitors and no correction for sample-selection bias could be implemented. Second, the NES data were collected during a period of sustained growth, so the study did not provide any insight into the applicability of the results to recessionary periods. Finally, the match between respondents and administrative data was far from perfect. In many cases, the exact UI status of the respondents was unknown and had to be imputed based on partial information on their past work history. This led to underestimation of UI eligibility in the case of cyclers and people who were renewing old claims.

In the COEP data, respondents were selected from two random samples of workers whose employers had filed a Record of Employment (ROE) during the first and second quarters of 1993. Second, the period of the study corresponded with a very different period in the business cycle — one of slow growth following a recession. Finally, a much better match with the respondents' administrative histories was possible.

Data Construction

The data set used in this study consists of COEP respondents who separated from their jobs during the first six months of 1993. They were interviewed three times — at six, nine, and twelve months after separation. They were asked questions regarding socio-economic characteristics, their labour market status, their job search activity, and the characteristics of their new job, if they had found one.

Of the 12,433 COEP respondents we selected those aged 20–65 years who had lost a job as a result of their employer's decision. The reasons for losing their jobs included dismissal, collective layoff, individual layoff, the end of a contract, and the end of a seasonal job. As we are focusing on permanent separations, we excluded workers who returned to their previous employer after their spell of unemployment. This left us with a sample of 5,577 spells of unemployment. However, due to many missing observations in variables (particularly on wages and dates), the analysis was often conducted with substantially fewer observations. Our criteria of who to include in the sample reflects the idea that involuntary job losers are the primary target group of the Unemployment Insurance system.

Although the COEP data would have enabled us to identify pre-Bill C-113 and post-Bill C-113 cohorts, we simply combined them. At first glance, this could appear to be problematic, for two reasons. First, that legislation lowered the benefit replacement rate for Unemployment Insurance from 60 percent to 57 percent. Second, it disqualified people from receiving benefits who quit their job voluntarily.

The change in the benefit replacement rate might make UI less attractive and therefore, at the margin, affect search strategies less. Our attempts to model this

by including the benefit replacement rate or dummy variables for the periods before and after the change did not produce significant results. We thus found no reason not to treat the two groups as identical since our focus was on the effect of UI as measured by the length of the benefit eligibility period.

The disqualification of voluntary quitters would seem at first glance not to affect our results since we only included people whose separation was involuntary. There could be a subtle effect, however, if voluntary quits were somehow relabelled as layoffs after Bill C-113. This could mean that the composition of our sample changed between the two periods. Kuhn and Sweetman (1994) suggested that there has been some relabelling, but they also had mixed results when they tried to identify the mechanism by which it occurred. This suggests that there is little that we can do to correct for this effect.

The COEP Data

There are five categories of information in the COEP data set:

(1) Respondents' personal characteristics (age, sex, education, wages, etc.);

(2) Non-policy labour market characteristics pertinent for each individual (region, industry, union status, etc.);

(3) Policy-related features of the search environment (mainly UI benefits available and the respondent's unemployment history from the status vector file);

(4) Post-separation job-search strategies (the reservation wage and search intensity); and,

(5) Job-search outcomes (the new wage, unemployment duration, union status on the new job, etc.).

The near perfect match between the survey respondents and their status vector along with more precise information on UI eligibility and reservation wages are the main differences between this data set and the NES dataset. It opens a number of important new possibilities. Furthermore, many of the variables are much better measured than they were in the NES dataset. This part of the report will briefly summarize and describe the information available for each of these five broad categories.

Personal Characteristics of Respondents

The people in the sample were generally poorly educated — close to 10 percent only completed elementary school, 63 percent completed high school, and 13 percent completed college. Only 3 percent completed a bachelor's degree (Table 1). Fifty-six percent of the respondents were men, 60 percent were married, and 62 percent were the heads of their households. Close to 16 percent were members of a visible minority. The surveyed sample is quite representative of the provincial distribution of the population. Thirty-six percent lived in Ontario, 25 percent in Québec, 12 percent in the Atlantic provinces, 16 percent in the Prairie provinces, and 11 percent in British Columbia. Only 14 people (out of 5,577) lived in the territories. While the NES sample was quite young, the COEP sample had an average age of 37 and only 62 percent of the sample were aged under 44.

Table 1
Socio-Economic Characteristics of the Respondents

Age	37
Male	0.561
Married	0.600
Minority	0.159
Disabled	0.012
Tenure in lost job (weeks)	77.900
Wage in lost job ($/hour)	11.630
Unemployment duration (weeks)	24.520
Expected to be recalled	0.252
Had a firm recall date	0.057
Dismissed	0.084
Individual lay-off	0.432
Collective lay-off	0.210
Seasonal job	0.236
End of contract	0.038
Found a new job	0.702
Wage in new job ($/hour)	11.830
Newfoundland	0.023
Prince Edward Island	0.007
Nova Scotia	0.030
New Brunswick	0.029
Quebec	0.256
Ontario	0.373
Manitoba	0.027
Saskatchewan	0.024
Alberta	0.110
British Columbia	0.119
Northwest Territories	0.001
Yukon	0.001
Elementary	0.052
Some high school	0.221
High school	0.340
Trade certificate	0.069
Some college	0.088
College	0.095
Some university	0.041
B.A.	0.061
Professional degree	0.014
Higher university degree	0.019

The COEP data also include information about assets and debts. The assets of the sample ranged from a high of $500,000 to a low of zero. The average (including the zero values) was $4,201. The mean monthly mortgage expenditure was $498. This information is very useful because peoples' assets and liabilities strongly influence people's ability to finance a job search. It is also an indication of what monthly incomes people need. On the other hand, these variables are unlikely to be related to offer arrival rates. This makes it easier to identify reservation wage effects in the data.

The respondents had an average tenure of 78 weeks (1.5 years) at the previous job, but there is considerable variation. The average unemployment spell (measured from the date of the separation to either the date a new job started or the date of censoring)was 25 weeks. After excluding workers who returned to their previous employer, 25 percent of the remainder expected to return, and 5 percent even believed that they had a firm date for their return. These expectations were not fulfilled. Lastly, more than 70 percent of the sample found a new job before the end of the survey or before they were no longer part of the sample.

Labour Market Conditions

Unlike the NES sample, which was selected during a period of rapid growth (1987–88), the COEP survey was conducted during a period of very slow growth immediately following a recession (1993). We would therefore expect the job offer-arrival rates and the wage distributions to be quite different. The COEP data include very detailed information on the area of residence, which permits the calculation of regional unemployment rates. Industry and occupation variables are also included and are used along with the regional unemployment rates to control for variations in wage-offer distributions and base offer-arrival rates between regions.

Policy-Related Features of the Search Environment

The COEP survey includes some detailed information on UI status and UI benefits. Respondents were asked whether they applied for UI and whether they received it. Unfortunately, little information was included on the number of weeks of benefit eligibility, and it is UI eligibility rather than UI claims that should be the focus of our analysis. Search intensity and a willingness to wait for a suitable job will depend on the remaining weeks of eligibility rather than the actual collection of benefits. Whereas Crémieux *et al.* (1994) could only match roughly 50 percent of the sampled individuals with the Benefit and Overpayment file at HRDC, using the COEP data we were able to match nearly 90 percent of the cases (all but roughly 500 observations.) We therefore used the March 1994 update of the status vector file to assess eligibility for UI benefits.

Of the 5,066 observations that could be matched with a status vector record, 384 claims were renewals of old claims. There were 511 who could not be matched, presumably because they did not claim benefits. This figure is slightly lower than the self-reported figure of 695 who said they had not and would not claim benefits.

We computed the potential eligibility of workers filing a new claim at the start of their unemployment spell by applying the legal formula to the number of insurable weeks reported in the corresponding status vector record. The link between individuals and Canada Employment Centre regions was made to match individuals

with regional unemployment rates. These unemployment rates were combined with the number of insurable weeks to calculate the number of weeks of eligibility for UI benefits. For workers who did not file a claim (or for whom no status vector record could be matched with certainty with that unemployment spell), the unemployed's total potential UI eligibility was computed by applying the same formula to the respondent's number of insurable weeks, as estimated from the information included in the record of employment. Essentially, the eligibility of the respondent was determined based on the number of insurable weeks prior to the job separation and the unemployment rate in the region in which the respondent lived (which affected the number of insurable weeks necessary to qualify for Unemployment Insurance).

Eligible respondents received 60 percent of their previous earnings (subject to a ceiling equal to 60 percent of the maximum insurable earnings). The duration of benefits was determined by applying the Employment and Immigration Canada table which gave benefit weeks as a function of insurable weeks and the local unemployment rate.[1] Based on the status vector file when it was available and the algorithm when it was not, we constructed two Unemployment Insurance variables. One measures the maximum possible duration of benefits, and the other the benefit replacement rate for those who actually received benefits, which is the proportion of the pre-displacement wage received in benefits. We distinguished among three types of UI users: those who never claimed, those who filed a new claim when they lost their job, and those who renewed an existing claim. We report some descriptive statistics on benefit rates and weeks of eligibility in Table 2.

Table 2
UI Characteristics of the Respondents

Percent of unemployed eligible for UI	0.866
Average eligibility (weeks)	38.060
Percent claiming	0.908
Percent renewing an old claim	0.248
Lifetime number of claims filed	5.230
Lifetime number of claims with payments	4.508
Percent with more than one claim	0.858
Total lifetime benefits paid	$24,850.40
Total lifetime weeks paid	111.950
Average number of weeks paid per spell	21.400
Average benefits paid per spell	$4,750.32

Finally, a complete historical status vector file was made available to us. This file includes all the respondents' status vector records. From it we computed the total number of claims filed by the respondent, the total number of claims for which payments were made, the number of weeks for which payments were paid, and the total amount and number of payments made to the respondent. For those who

1 People participating in certain training programs can extend their benefits, but the BNOP information necessary to identify these people was not available.

filed more than one claim, we computed the frequency of their claims. These historical data are used in this study to analyze the effect of past UI experience on the current behaviour of the unemployed.

"Choice" Variables: The Reservation Wage and Job-Search Intensity

In contrast with the NES data, the COEP survey asked a specific question about the reservation wage, not only at the beginning of the job search, but also during the other interviews at roughly seven, ten, and fifteen months after the job separation. This enables us to answer many more detailed questions regarding the search behaviour of the unemployed. In particular, we are able to observe changes in the reservation wage as the unemployment duration increased. The correlation between the lost wage and the reservation wage is quite high (0.54).

COEP also includes a great deal of data on the search behaviour of the unemployed. However, it is quite different from that in the NES data. In particular, COEP enables us to observe the actual number of hours spent searching as well as the total amount of money spent per week on the search. Respondents were asked to evaluate the number of hours per week they typically spent searching for a job while unemployed as well as the average monetary cost of the search over the same period. The question was repeated in the second and third interviews (three and six months later). While the information on the job-search methods is less precise in COEP than it is in the NES survey, the information on the time spent searching and the amount spent enables us to directly measure search intensity rather than using a constructed measure based on weights assigned to various search methods as was necessary with the NES dataset. While questions on the type of search method used were also asked, the questions are much less detailed than in the NES survey. Respondents were asked which type of search was the most useful but no question was asked about the number of employer contacts they realized as a result of each search method. In the initial interview, respondents were asked how many times they used each search method, but the question was not repeated in the second and third rounds of interviews.

Outcomes of the Job-Search Process

There are two main measures of the productivity of a job search. First, a more productive search can be measured by a relatively shorter unemployment spell. The COEP respondents lost their jobs, as shown in their Record of Employment (ROE), between January and March 1993 (for the first cohort) or between April and June 1993 (for the second cohort). Respondents were asked specifically about each job they held between the date of the ROE and the date of the interview. They were asked to identify as precisely as possible the start and end date of the first job immediately following the date of the ROE. In the second and third interviews, they were asked about the first period of unemployment (if there was one) immediately following the previous interview. So for each individual there are least one and at most three periods of unemployment with known lengths. The usual caveat applies for those who had not found a job at the time of the final interview. The use of a Cox proportional-hazard model corrects for any bias due to the right-side truncation of the sample. In the first interview, respondents were only asked

about the unemployment spell that started between January and March 1993. In subsequent interviews, they were only asked about the first unemployment spell following the previous interview. This introduces a bias against short spells, since an individual who experienced more than one spell between two interviews only appears once. This was also a problem in the NES dataset. However, while in the latter there was a gap of 12 months between the fourth and fifth interviews, which allowed plenty of time for multiple spells, the COEP interviews were six, nine, and twelve months after the separation. This minimizes the probability of multiple unemployment spells within any interval.

Second, search productivity can be measured by the difference between the pre-displacement and the post-displacement wage. One would hope that the more productive searches would increase the post-displacement wage, given the level of the pre-displacement wage. Both the NES and the COEP datasets include detailed information on the last wage before displacement and the post-displacement wages of those who found jobs. However, this information is only complete for a subsample of respondents who found a job *before the final interview*. Those who did not find a job before the end of the survey or dropped out of the sample are recorded as having a truncated spell, and the only information about them is that they were unemployed for at least a certain number of months. As in the previous analysis, we focused here on the changes in the hourly rate of pay rather than changes in the number of hours worked. This is partly because a relatively small number of people changed the number of hours they worked significantly (whether from full time to part time or vice versa). Furthermore, since we have no information on peoples' preferences regarding the number of hours worked, we would not be able to interpret a change in the number of hours worked. To a respondent who prefers part-time employment, a job search that results in full-time employment might be considered less productive, while to one who prefers full-time employment, finding full-time employment might be exactly the most productive outcome.

3. UI and Search Intensity

The COEP dataset includes direct information on job-search effort. Respondents are specifically asked how many hours they spent searching in a typical week at some point during their unemployment spell.[2] We conducted two analyses of the impact of UI on search effort. First, we examined the level of effort at the beginning of the spell, before the respondent might have changed it as a result of the duration of unemployment or difficulties encountered. Then we examined the level of effort at various points during the unemployment spell. This analysis is based on questions asked at the various interviews of currently unemployed workers regarding their search effort just before the interview.

Table 3 presents an analysis of the determinants of the number of hours per week spent searching at the beginning of the unemployment spell. Most of these results are as we expected. People with more assets search less. Older workers, men, those with long tenure in their previous job, and those with high debts or mortgage payments search more. Workers who had previously held a unionized job search significantly less. Finally, workers who lost a seasonal or temporary job search much less.

The length of the period of eligibility for UI benefits did not have a significant effect on search intensity. However, workers who renewed an existing claim and those who had filed many claims in the past tended to search fewer hours than otherwise identical people. While both these effects are statistically insignificant, they were strongly significant when the variable that controls for the seasonal or temporary nature of the lost job was dropped. One possible interpretation of this is that workers who have filed numerous claims in the past tend to have a low level of job-search intensity because they are seasonal workers who do not search during the off-season. It is, however, impossible to separate seasonal workers from those engaged in other temporary work. This latter category could well include people who choose short-duration jobs in order to qualify for benefits.

At issue here is the exogeneity of the seasonal/temporary jobs category to the nature of the UI system. On the one hand, the very existence of many seasonal jobs may be due to regional extended benefits, which permit employers to keep workers who are only employed for a short period of time each year. In such a situation it would be wrong to blame workers for a low level of search intensity, since they can do no more than wait to be recalled after the end of the inactive period. Rather, it could be that firms are exploiting the UI system and workers are passively responding to the choices permitted by firms. It is also possible that workers and firms actively collude to exploit the UI system. For temporary workers it is possible that individual-level (rather than industry-level) exploitation of the UI system is taking place.

2 In the NES study, search effort had to be estimated using an index built from responses on the type of search.

Table 3
Determinants of Job-Search Intensity at the Beginning of the Unemployment Spell (Dependent Variable: Log of Weekly Hours of Search)

Age	0.0251	(0.0092)
Age squared	-0.0003	(0.0001)
Male	0.2070	(0.0280)
Married	-0.0820	(0.0290)
Minority	0.0281	(0.0370)
Disabled	0.2148	(0.1229)
Tenure lost job	0.0119	(0.0086)
Tenure lost job squared	-0.0003	(0.0003)
Old job unionized	-0.0987	(0.0338)
UI Eligibility (reference: 50 weeks)		
Ineligible for UI	0.0045	(0.0473)
Eligible for less than 30 weeks	-0.0421	(0.0601)
Eligible for 30–39 weeks	0.0159	(0.0440)
Eligible for 40–49 weeks	-0.0505	(0.0341)
Log (total house payments)	0.0239	(0.0050)
Log (total assets)	-0.0097	(0.0034)
Car loan	-0.0156	(0.0276)
Other debts	0.0781	(0.0267)
Expected recall	-0.0417	(0.0367)
Had firm recall date	-0.0466	(0.0620)
Had seasonal job	-0.1621	(0.0337)
Log wage in lost job	-0.0530	(0.0311)
Regional unemployment rate	-0.0055	(0.0053)
Renewal of old claim	-0.0543	(0.0381)
Total number of claims previously filed	-0.0064	(0.0046)
Number of observations	3,599	
Adjusted R-squared	0.0783	

Notes:
Eleven dummy variables for province of lost job and nine for school are included but are not shown. Standard errors are in parentheses.
To avoid excluding observations where the respondent did not search, the dependent variable is actually log (weekly hours of search + 1).

The analysis of search intensity is continued in Table 4, which presents the results of an analysis of the determinants of the number of hours per week spent searching at different points in the unemployment spell. Here, rather than one observation per spell, there is one observation per interview covered in the spell. In the first column unemployment duration is entered directly, without taking into consideration the possibility of simultaneity between job-search intensity and unemployment duration. In the second column unemployment duration has been replaced

by an instrumental variable in order to purge it of any possible simultaneity effects.[3] Using these two specifications enables us to test the robustness of the two approaches.

Table 4
Determinants of Job-Search Intensity During the Unemployment Spell (Dependent Variable: Log of Weekly Hours of Search)

Age	0.0251	(0.0092)
Age squared	-0.0003	(0.0001)
Male	0.2070	(0.0280)
Married	-0.0820	(0.0290)
Minority	0.0281	(0.0370)
Disabled	0.2148	(0.1229)
Tenure lost job	0.0119	(0.0086)
Tenure lost job squared	-0.0003	(0.0003)
Old job unionized	-0.0987	(0.0338)
UI Eligibility (reference: 50 weeks)		
Ineligible for UI	0.0045	(0.0473)
Eligible for less than 30 weeks	-0.0421	(0.0601)
Eligible for 30–39 weeks	0.0159	(0.0440)
Eligible for 40–49 weeks	-0.0505	(0.0341)
Log (total house payments)	0.0239	(0.0050)
Log (total assets)	-0.0097	(0.0034)
Car loan	-0.0156	(0.0276)
Other debts	0.0781	(0.0267)
Expected recall	-0.0417	(0.0367)
Had firm recall date	-0.0466	(0.0620)
Had seasonal job	-0.1621	(0.0337)
Log wage in lost job	-0.0530	(0.0311)
Regional unemployment rate	-0.0055	(0.0053)
Renewal of old claim	-0.0543	(0.0381)
Total number of claims previously filed	-0.0064	(0.0046)
Number of observations	3,599	
Adjusted R-squared	0.0783	

Notes:
Eleven dummy variables for province of lost job and nine for school are included but are not shown. Standard errors are in parentheses.
To avoid excluding observations where the respondent did not search, the dependent variable is actually log (weekly hours of search + 1).

3 To do this, some variables had to be excluded from the job-search intensity equation but included in the unemployment-duration equation. In this case, tenure on the old job and the union status in the old job perform this function. The significant variables in this first stage equation for unemployment duration were: gender; assets and liabilities; past UI history and the seasonal nature of the job; age; tenure, union status, and wage in the old job; the regional unemployment rate; UI eligibility; education; province; and occupation in the job lost.

Broadly speaking, the results that show that job-search intensity varies with unemployment duration are consistent with those based on job-search intensity at the beginning of the unemployment spell. The effects of UI eligibility are often insignificant, and when they are significant they are not necessarily of the correct sign. While there is evidence that people who are eligible for 40–49 weeks of UI benefits search less intensively than all others, they also search less intensively than those with 50 weeks of benefits. These time-varying job-search intensity regressions also confirm the result that UI history variables do not have a significant effect on job search intensity once the seasonal/temporary nature of a job is introduced into the equation. Interestingly enough, even the effect of seasonality becomes small and barely significant at the 5 percent level when corrected for simultaneity. This result must be treated with some caution because it may reflect the fact that we excluded some variables from the equations to eliminate simultaneity biases.

One advantage of the time-varying regressions is that they enable us to examine the shape of the relationship between unemployment duration and job-search intensity. It is generally assumed that the latter falls from its initial level but rises shortly before the expiry of UI benefits. In fact, in the extreme case, it is possible that people receiving UI benefits do not even begin to search for a job until shortly before the expiry of their benefits. In both of the regressions in Table 4, job-search intensity initially increases and then decreases. The difference between the two specifications is at the point at which intensity falls. Without the correction for simultaneity, there is evidence that it begins to fall after 9.8 weeks of unemployment, while with the correction for simultaneity it begins to fall after 34.9 weeks.

A graphical analysis of this is shown in Figures 2a and 2b. Figure 2a shows average hours of searching per week as a function of elapsed duration. The graph suggests that job-search intensity follows a gentle inverted-U pattern, with a peak at roughly 25 weeks. This gives greater support to the simultaneity-corrected results and suggests that the uncorrected results may be misleading because of simultaneous interactions between job-search intensity and unemployment duration. In Figure 2b one can see the shape of the fitted curve for the effect of unemployment duration on job-search intensity. The graph shows that the contribution to variation in job-search intensity is not large. The total variation in job-search intensity attributable to elapsed unemployment duration is two weeks. Furthermore, there is very little decline in job-search intensity between 34 and 68 weeks of elapsed unemployment duration.

These results suggest little evidence that unemployed people change the intensity of their job search immediately before their UI benefits expire. This is inconsistent with the notion that people eligible for UI search little before the end of their UI benefit period. This is somewhat different from Crémieux *et al.* (1994), who found that search intensity fell off quite dramatically after 18 months of unemployment. To a large extent, this is purely mechanical because in the COEP sample the longest unemployment duration is 68 weeks. It is thus very difficult to identify in the COEP data effects that only occur after 18 months. In the current study, the bulk of the observations are spells that lasted between three and nine months. The least squares regression techniques typically used in econometric analysis fit a

Figure 2a
Average Job Search Intensity by Unemployment Duration

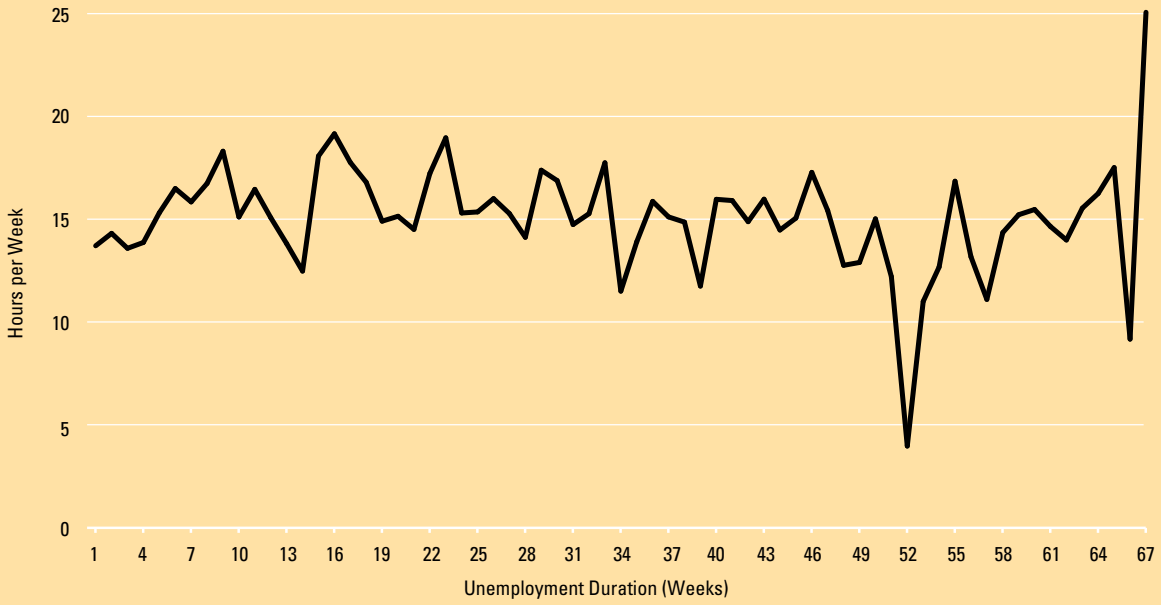
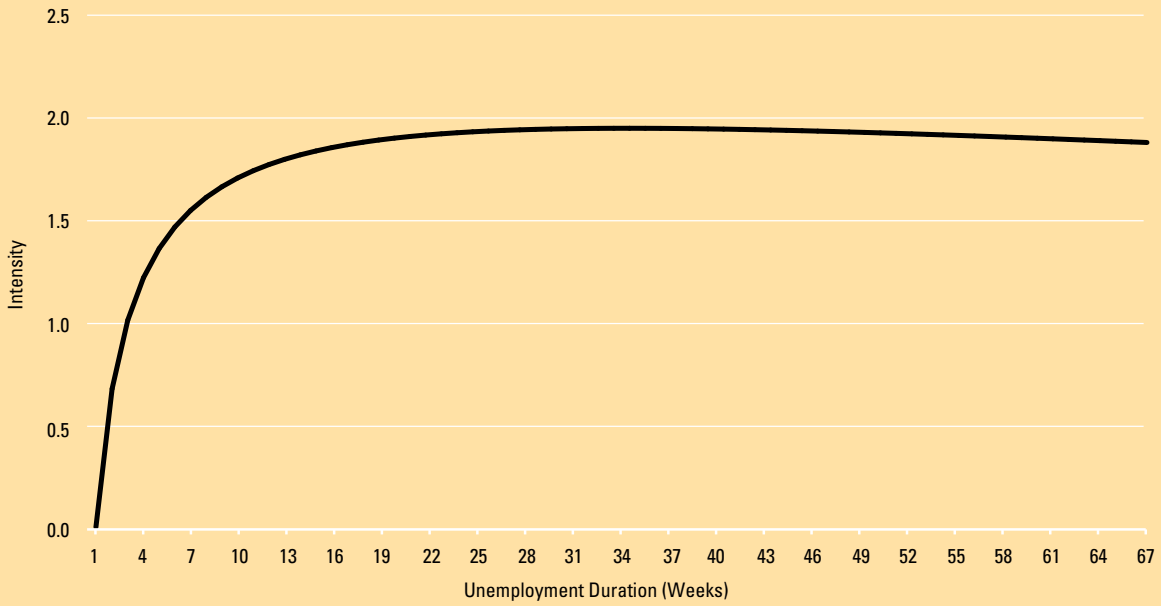


Figure 2b
Fitted Job Search Intensity by Unemployment Duration



relationship that minimizes errors in the regions with the most observations. This fitted relationship can, in theory, be extended to regions far removed from the three-to-nine-month range but such extrapolation can be dangerous. A change in the shape of the relationship for spells much longer than nine months may not be detected because regression methods are designed to pay the most attention to the shape of the relationship where there are many data points.

The final factor that might explain the differences between our results and those of Crémieux *et al.* (1994) is that the latter used an index of job-search effort that could vary with the search method. Accordingly, if people devoted a constant number of hours to searching but changed their search method over time the impression of a decreasing search effort could nonetheless be created.

Another interpretation of the results of the current paper is that they reflect economic behaviour rather than features of the data. Since the recessions of 1982 and the late 1980s the increase in long-term unemployment may have rendered long unemployment spells more normal, so that the unemployed were not so easily discouraged during the 1993 expansionary period. This interpretation cannot, however, be corroborated by hard facts.

4. UI and the Reservation Wage

It is always very difficult to separate the effects of the reservation wage, the offer-arrival rate, and job-search intensity on job-search outcomes because these variables are all affected by the same factors. Unemployment duration, the probability of re-employment, and the reservation wage are simultaneously determined, and the absence of good instruments in most data sets makes it impossible to estimate the effect of these variables exclusive of the others.

One of the key features of the COEP dataset is that it has the potential of providing good instruments to identify unemployed workers' reservation wages. This advantage stems from the wealth of individual information concerning relevant variables such as the debts and assets of unemployed workers found in the COEP data. These quantities are very likely to affect the reservation wage of the unemployed without directly affecting offer arrival rates. In this section, we provide unique results on the relationship between assets, liabilities, Unemployment Insurance, and the unemployed's choice of a lowest acceptable wage.

As is the case with job-search intensity, because the reservation wage is likely to evolve over a spell of unemployment, two separate analyses of reservation wages are presented. This structure parallels that used above for job-search intensity. The first analysis focuses on the reservation wage at the beginning of the spell, while the second studies its dynamic evolution over the course of the unemployment spell.

The Reservation Wage at the Beginning of an Unemployment Spell

Table 5 presents the results of a least-squares analysis of the reservation wage. The reservation wage is the lowest wage respondents would accept at various points in the unemployment spell. A number of socio-economic factors have a statistically significant effect on the reservation wage. Perhaps the strongest is the wage earned in the lost job. Interestingly, while the latter has a strong positive coefficient, it is significantly lower than one. This indicates that workers do not mechanically set their wage demand at their old wage.

Several other variables have an important effect on the reservation wage. Older people, men, and people whose previous job was unionized all tend to have higher reservation wages, even after we controlled for the level of the lost wage, which already includes many of these factors. Any wage premium accruing to union status was already reflected in the old wage, and it is interesting that there is a further, direct effect of union status. This may mean that some of the variables that are significant, even though the old wage is included, are capturing expectations regarding the duration of unemployment. Minority status also has a negative effect on the reservation wage, even after controlling for the wage in the lost job.

Table 5
Determinants of Reservation Wage at the Beginning of the Unemployment Spell (Dependent Variable: Log of Reservation Wage)

Age	0.0142	(0.0045)
Age squared	-0.0001	(0.0001)
Male	0.1080	(0.0160)
Married	-0.0099	(0.0150)
Minority	-0.0498	(0.0190)
Disabled	0.0348	(0.0608)
Tenure in lost job	0.0033	(0.0022)
Interview in English	0.0194	(0.0302)
Old job unionized	0.0897	(0.0172)
UI eligibility (reference : 50 weeks)		
Ineligible for UI	-0.0894	(0.0238)
Eligible for less than 30 weeks	-0.0710	(0.0301)
Eligible for 30–39 weeks	-0.0447	(0.0218)
Eligible for 40–49 weeks	-0.0093	(0.0175)
Log (total house payments)	0.0036	(0.0025)
Log (total assets)	0.0051	(0.0017)
Car loan	0.0184	(0.0142)
Other debts	0.0066	(0.0137)
Log wage job lost	0.3963	(0.0162)
Regional unemployment rate	-0.0011	(0.0026)
Renewal of old claim	0.0611	(0.0185)
Number of observations	3,814	
Adjusted R-squared	0.3518	

Notes:
Eleven dummy variables for province of lost job and nine for education are included but are not shown.
Standard errors are in parentheses.

Other variables are not directly reflected in the old wage except as far as they affected the wage outcome of a previous job search. These include the respondent's assets and liabilities. These variables are generally not even observable by a previous employer and are therefore unlikely to have been incorporated into the old wage. Total assets have a significant positive effect on the reservation wage, which is to be expected since the existence of assets can help finance a period of productive job search. The effects of various types of indebtedness, while not quite significant, are positive in this equation. People with high fixed financial obligations must earn a salary that allows them to meet them. One might think that such people would accept almost any job in order to avoid defaulting on their payments. However, this is not the strategy adopted, probably because the effect is the same whether one defaults a little bit or completely on house or car payments.

Receiving UI does raise the reservation wage, as economic theory suggests. The magnitude of this effect is in the order of 8 to 9 percent higher for people with 50 weeks of benefits compared with those without benefits. Workers who are renewing an existing claim also have significantly higher reservation wages. This

might be because a large number of them are seasonal workers. For people in this situation there is no advantage to lowering their reservation wage. The date of the arrival of the next job is likely to be independent of the salary it brings. Such people can be viewed as standing in a job queue rather than engaging in a job search. Interestingly, the effect on the reservation wage of those not renewing an existing claim compared with those who are renewing a claim is not statistically significant, although the point estimate of the effect is slightly lower for those renewing a claim.

The Dynamics of the Reservation Wage

UI is allowed to have an effect upon both the initial level of the reservation wage and the rate at which the reservation wage is updated over time. Most of the results described earlier in this section for variables that are constant over time (assets, the wage in the old job, etc.) do not change when we adopt a dynamic framework. The UI effects on the initial levels of the reservation wage are still of the expected sign but are somewhat less significant than they were in the static regressions.

Table 6
Determinants of Reservation Wage During the Unemployment Spell
(Dependent Variable: Log Reservation Wage During the Reference Period)

	OLS[1]	2SLS[2]	2SLS[2]	2SLS[3]
UI Eligibility (Reference: 50 Weeks)				
Ineligible for UI	-0.0472		-0.0488	-0.0596
	(0.0273)		(0.0274)	(0.0336)
Eligible for less than 30 weeks	-0.0609		-0.0636	-0.1038
	(0.0421)		(0.0398)	(0.0541)
Eligible for 30–39 weeks	-0.0384		-0.0599	-0.0594
	(0.0232)		(0.0243)	(0.0263)
Eligible for 40–49 weeks	-0.0073		-0.0084	-0.0135
	(0.0173)		(0.0173)	(0.0166)
Log (total house payments)	0.0050	0.0071	0.0064	0.0060
	(0.0026)	(0.0028)	(0.0028)	(0.0027)
Log (total assets)	0.0033	0.0059	0.0052	0.0018
	(0.0019)	(0.0022)	(0.0022)	(0.0024)
Car loan	-0.0021	-0.0235	-0.0313	-0.0221
	(0.0154)	(0.0163)	(0.0165)	(0.0207)
Other debts	0.0235	0.0221	0.0217	0.0249
	(0.0142)	(0.0144)	(0.0144)	(0.0143)
Log wage lost job	0.3185	0.4609	0.4542	0.3050
	(0.0172)	(0.0231)	(0.0236)	(0.0263)
Renewal of old claim	0.0319			
	(0.0213)			
Log (unemployment duration)	0.0162	-0.0267	-0.0715	-0.1936
	(0.0131)	(0.0348)	(0.0384)	(0.1300)
Number of observations	2,669	2,669	2,669	2,669
Adjusted R-squared	0.3685	0.2815	0.2839	0.3681

Notes:
Controls for age, age squared, sex marital status, tenure, union status, minority, disabled, regional unemployment rate, and eleven dummy variables for province of lost job and nine for education are included but are not shown.
All variables included are shown.
Hours on the job lost and renewal of the claim excluded to identify the equation.
Standard errors are in parentheses.

There could be a two-way causation between the reservation wage and unemployment duration. While it is true that longer spells of unemployment might lead people to revise their wage demands downward, it is also true that higher reservation wages will, other things equal, lead to longer spells of unemployment. This is the most likely explanation for the positive (but insignificant) coefficient on unemployment duration shown in the first column of Table 6. Here we report the results of calculations where we made no adjustment for simultaneity. In the other three columns we report the results of various steps we took to correct for simultaneity. In all three calculations elapsed duration had a negative effect on the reservation wage, although this was only significant in one case. All in all, these results suggest that there is some downward revision of the reservation wage over the course of an unemployment spell, but this effect is weak.

Receiving UI changes the speed at which the reservation wage is revised downward, rather than simply increasing it by a constant amount throughout the spell. Indeed, since otherwise identical people with and without UI benefits should have the same reservation wages once their benefits are exhausted, the coefficient on the duration of unemployment must be allowed to vary according to an individual's UI eligibility.

In Table 7, we present the results of calculations in which we allow precisely such an interaction between the unemployment eligibility variables and the elapsed duration of unemployment. There are no clear, unambiguous patterns to these results. The results of this calculation are more evident in Figure 3, which shows the estimated relationship between unemployment duration and the reservation wage based upon the regression coefficients. It reveals that people with 50 initial benefit weeks and those with 30–39 initial benefit weeks have roughly the same reservation wage at the point when their benefits are exhausted. It should be noted that the absolute level of the reservation wage in this graph is not meaningful since the graph only shows the contribution of the coefficients for employment duration and does not account for the contribution of other explanatory variables.

Figure 3
Fitted Reservation Wage by Unemployment Duration

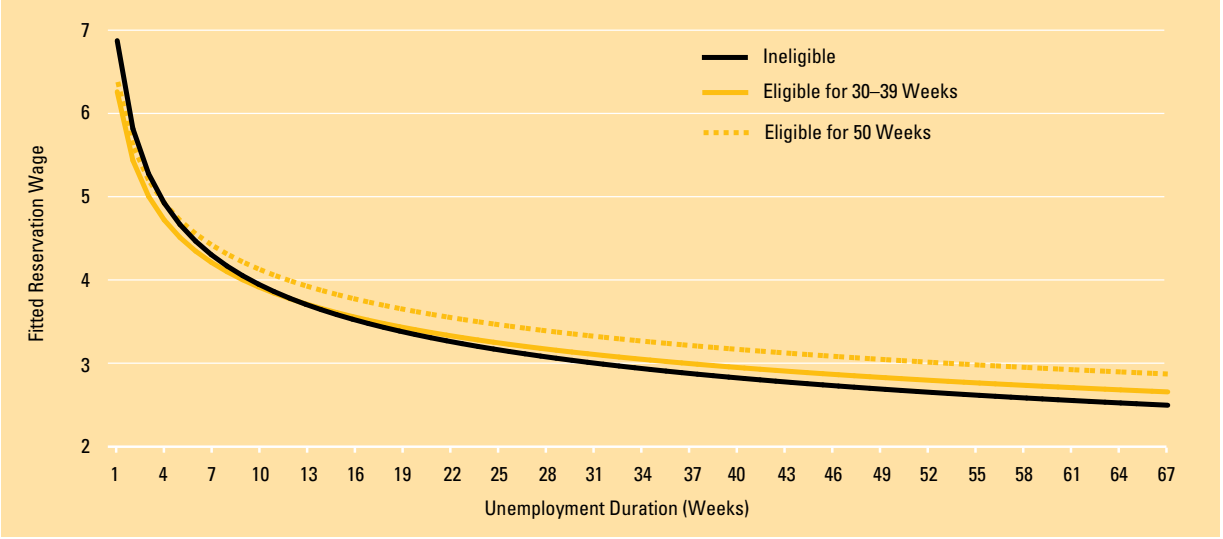


Table 7
Determinants of the Reservation Wage During the Unemployment Spell and the Interaction of Unemployment Duration and UI Status (Dependent Variable: Log Reservation Wage During the Reference Period)

	2SLS[1]	2SLS[2]	2SLS[3]
UI Eligibility			
Ineligible for UI* log (unemployment duration)	-0.0882 (0.0409)	-0.2422 (0.1583)	-0.0488 (0.0274)
Eligible for less than 30 weeks* log (unemployment duration)	-0.0937 (0.0441)	-0.0670 (0.1803)	-0.0636 (0.0398)
Eligible for 30–39 weeks* log (unemployment duration)	-0.0921 (0.0404)	-0.2051 (0.1449)	-0.0599 (0.0243)
Eligible for 40–49 weeks* log (unemployment duration)	-0.0713 (0.0385)	-0.1360 (0.1421)	-0.0084 (0.0173)
Eligible for 50 weeks* log (unemployment duration)	-0.0681 (0.0373)	-0.1915 (0.1337)	-0.0084 (0.0173)
Log (total house payments)	0.0064 (0.0028)	0.0060 (0.0027)	0.0064 (0.0028)
Log (total assets)	0.0052 (0.0022)	0.0019 (0.0024)	0.0052 (0.0022)
Car loan	-0.0320 (0.0165)	-0.0207 (0.0206)	-0.0313 (0.0165)
Other debts	0.0217 (0.0144)	0.0246 (0.0143)	0.0217 (0.0144)
Log wage lost job	0.4534 (0.0236)	0.3058 (0.0231)	0.4542 (0.0236)
Number of observations	2,669	2,669	2,669
Adjusted R-squared	0.2842	0.3685	0.2839

Notes:
All variables included are shown.
Hours on the lost job and renewal of the claim are excluded to identify the equation.
Standard errors are in parentheses.

5. UI and the Probability of Re-employment

People who are ineligible for UI have a re-employment probability 38 percent higher than those with 50 weeks of benefits.

The reservation wage, the intensity of the job search, and the offer-arrival rate together determine the probability of re-employment. The offer-arrival rate is determined by recruitment activity on the part of firms. Firms' demand for labour will lead to a higher or lower probability of receiving a job offer for any given level of job-search intensity on the part of a worker. Unfortunately, there is no measure of the offer arrival rate. However, this parameter is unlikely to be affected by features of the UI system. Thus, this lack of information should not bias the UI variable coefficients. But it is possible that other coefficients are biased by this arrival rate effect.

To study the impact of UI on the probability of re-employment, we estimate a Cox partial-likelihood model with several time-varying covariates. In Cox's partial-likelihood specification of the proportional hazard model there is a flexible "baseline hazard," which allows us to disregard most of the potential biases in the coefficients that could be caused by unobserved heterogeneity among workers. Effectively, unobserved heterogeneity is swept into the shape of the baseline hazard, leaving coefficient estimates unaffected. With this model specification, coefficients are interpreted as percentage changes in the re-employment probability for a unit change in a given independent variable.

Table 8 presents the results of the estimation of several specifications for the re-employment probability equation. In all but the first column, time-varying explanatory variables are entered to capture the dynamic path of search intensity and the reservation wage. In the first column, re-employment probabilities vary with levels of UI eligibility only. In this case, standard disincentive effects of UI are encountered. People who are ineligible for UI have a re-employment probability 38 percent higher than those with 50 weeks of benefits. For those who are eligible but entitled to less than 30 weeks this effect is even stronger — their re-employment probabilities are 63 percent higher than those of people with 50 weeks of benefits. Of course, these results do not indicate by which channels UI affects re-employment probabilities, but simply the raw associations found in the data. In the other two columns, UI effects due to its impact on reservation wages are distinguished from those due to its impact on job-search intensity.

In columns 2 and 3 of Table 8 we include the predicted values of the search intensity and reservation wages as described in Sections 4 and 5 above. Since these measures vary for each interview, we include one observation per interview, and treat the fitted values as time-varying covariates. Job-search intensity and reservation wages, when introduced alone in the estimation, have the opposite effect to that predicted by search models with a constant offer arrival rate: higher reservation wages increase re-employment probabilities, while more hours of job search tend to lower them. This points toward a relationship between an omitted common cause of reservation wages, job-search intensity, and re-employment probabilities. It confirms Devine and Kiefer's result (1993) that demand-side fluctuations in offer-arrival rates tend to raise re-employment probabilities, raise reservation wages, and lower job-search intensities. If people believe that they are likely to

find a new job quickly, they will likely devote relatively less effort to searching and set a relatively high reservation wage. Despite these choices, if the initial information regarding job prospects was good, they will nevertheless find a job quickly.

Table 8
Determinants of the Probability of Re-employment
(Cox Partial Likelihood Estimate of Transition Hazard to Employment)

Age			0.0348
			(0.0146)
Age squared			-0.0007
			(0.0002)
Male			0.1941
			(0.0714)
Minority			-0.2169
			(0.0583)
Disabled			-0.0821
			(0.1869)
Tenure in lost job			-0.0537
			(0.0080)
Old job seasonal			0.1272
			(0.0549)
Old job unionized			0.0506
			(0.0553)
UI eligibility (ref: 50 weeks)			
Ineligible for UI	0.3775		0.0731
	(0.0613)		(0.0713)
Eligible for less than 30 weeks	0.6285		0.2618
	(0.0780)		(0.0899)
Eligible for 30–39 weeks	0.2453		0.0861
	(0.0599)		(0.0649)
Eligible for 40–49 weeks	0.0787		-0.0707
	(0.0496)		(0.0534)
Fitted log reservation wage		0.4981	0.9816
		(0.0705)	(0.2603)
Fitted job-search intensity		-0.1857	-0.5696
		(0.0802)	(0.1566)
Log wage job lost			-0.2419
			(0.0955)
Regional unemployment rate			-0.0139
			(0.0086)
Received notice			-0.0551
			(0.0445)
Had return date			0.1840
			(0.0859)
Expected to be recalled			0.0443
			(0.0502)
Number of observations	6,070	6,070	6,070
2 x log likelihood	86.29	50.68	547.93

Notes:
Eleven dummy variables for province of lost job and nine for education are included but are not shown.
Standard errors are in parentheses.

If this type of heterogeneity among the unemployed were present in our sample, it would produce exactly the type of coefficients for the reservation wage and search intensity that we find here. The results for the reservation wage and job-search intensity are thus not a problem with our search framework but rather an indication that a full job-search model with demand- and supply-side influences is needed to explain re-employment probabilities. Given that the COEP data do not include such demand-side variables, the only way to test for their importance is to examine the signs of the supply-side variables that have been included.

This interpretation of the results is correct to the extent that the variables included as explanatory factors in the reservation wage and job-search intensity equations capture this information regarding the search prospects of workers. If such variations dominate variations in reservation wage and job-search intensity, then these variables simply reflect the optimal responses of the unemployed, given their perceived re-employment prospects. These prospects are absent from the equations, so the reservation wage and job-search intensity variables play a proxy role and their coefficients are thus subject to omitted-variable bias.

In the third column of Table 8, the reservation wage, job-search intensity, UI eligibility, and observable socio-economic variables are shown. In this specification re-employment probability is significantly affected by a number of variables. It rises for men, for people who have lost a seasonal job, and for those with a date by which they will return to their lost job. Personal characteristics that tend to lower the re-employment probability include minority status and tenure and wage in the lost job. Education (not shown) tends to raise it while age initially raises it but begins to have a negative effect after 24 years of age. Most of these effects are rather standard and are typically attributed either to discrimination or to the preference of employers for younger employees for whom the return on an investment in training is greater over a prolonged period.

The reservation wage and job-search intensity maintain the same signs as before. The magnitudes of both effects, however, increase in absolute value. This reflects the inclusion of variables such as the wage in the previous job, which are determinants of these two variables. The old wage has a strong positive effect through the reservation wage, which tends to raise the re-employment probability but also has a direct negative effect that lowers the re-employment probability. In column 2, the reservation wage captured both the effect of the reservation wage related to perceptions of the re-employment probability and of workers' attempts to retain their previous wage level. Once the old wage is introduced directly, this variable captures this latter effect and the reservation wage captures the re-employment perception effect more fully and so it receives a more positive coefficient. Variables that affect reservation wages and job-search intensity that are not also in the re-employment probability equation are primarily asset and debt variables. They were excluded because there is little reason to think that they affect re-employment except through the reservation wage or job-search intensity.

UI disincentive effects are notably lower in the third column of Table 8. With other explanatory variables included, these variables become insignificant, for the most part. With the exception of the special group of people who are eligible for less than 30 weeks of benefits, UI has no significant effect on unemployment

duration.[4] This result is somewhat predictable, since the fitted reservation wage variable, and to a lesser extent the search intensity variable, also have UI components. On the other hand, the signs of these two variables do not seem to be consistent with UI disincentives acting through the reservation wage or job-search intensity. Furthermore, an intermediate regression (not shown) reveals that it is not the reservation wage and search intensity variables that rob the UI variables of their explanatory power but rather the socio-demographic variables (age, sex, seasonal nature of the job, return date, old wage, etc.). This effect partly passes through the seasonal variables and may be evidence of a strong equivalence between traditional UI disincentive effects and seasonal nature of the job. Other demographic variables also contribute to the insignificance of the UI variables.

To test of the robustness of these results, we ran the estimation using only one observation per spell and using the actual reservation wage and job-search intensity at the beginning of the unemployment spell. As these variables are measured without information about the success or failure of the job spell, there is no need to correct for possible reverse feedback effects from elapsed duration (Table 9). These results reveal some interesting differences. Age now has a positive effect for most of the sample. The wage on the job lost, although not quite significant at the 5 percent level, is now positive rather than negative. The other effects remain qualitatively the same, although the magnitude of the reservation wage and job-search intensity effects fall rather substantially. This is perhaps surprising given that these are actual variables rather than predicted values from estimated equations. On the other hand, the dynamics of these variables are not used in Table 9. UI disincentive effects are weak, as they are in the last column of Table 8, but this finding can be explained by some of the socio-demographic variables in the equation.

Our first conclusion is that while we were somewhat successful in modelling reservation wages and search intensities, we still lack data on what may be the most important factor determining these variables — people's perception of their re-employment prospect. This factor, which we can only indirectly infer, affects the intensity of the job search and the reservation wage as well as re-employment probability. This is important, given the growing consensus that demand-side influences are the most important determinants of re-employment probability. As Devine and Kiefer (1993) state: "one recurring impression from studies on both the demand and supply sides of the labour market is that variation in offers across individuals is more important in explaining unemployment durations than variation in reservation wages." Our results lead us to concur with their impression.

The second conclusion concerns the disincentive effect of UI. As we have seen, when all the covariates are introduced in the regression, UI has only a borderline effect on unemployment duration. This happens despite the fact that it shows huge disincentive effects when no other controls are introduced. This contradicts most of the literature, and it might simply be due to the unusual richness of the data set. Unlike other data sets, the data used here include information on socio-

4 This result remains even when the fitted reservation wage and search intensity are dropped from the regression.

economic characteristics of workers and on their previous jobs. The inclusion of characteristics of the previous job, which control for labour market attachment, might explain why we found no disincentive effect: high labour market attachment is likely to be correlated with long unemployment spells. For someone who expects to be in a job for 10–20 years, finding a new job is certainly more serious than it is for someone who plans to remain in it for only 10 days. In Canada, labour market attachment is also correlated with high benefits.

Table 9
Determinants of the Probability of Re-employment without Time-Varying Regressors (Cox partial likelihood estimate of transition hazard to employment)

Age	0.0558	(0.0137)
Age squared	-0.0003	(0.0002)
Man	0.2417	(0.0491)
Minority	-0.2500	(0.0605)
Disabled	-0.0426	(0.2001)
Tenure in lost job	-0.0396	(0.0088)
Old job seasonal	0.1379	(0.0512)
Old job unionized	-0.0261	(0.0525)
UI eligibility (reference: 50 weeks)		
Ineligible for UI	0.0823	(0.0719)
Eligible for less than 30 weeks	0.4012	(0.0871)
Eligible for 30–39 weeks	0.0938	(0.0671)
Eligible for 40–49 weeks	-0.0367	(0.0543)
Log reservation wage	0.0817	(0.0495)
Search intensity	-0.0567	(0.0270)
Log wage job lost	0.0971	(0.0537)
Regional unemployment rate	-0.0249	(0.0085)
Received notice	-0.00636	(0.0461)
Had return date	0.0448	(0.0947)
Expected to be recalled	0.0343	(0.0519)
Number of observations	3,094	
2 x log likelihood	363.65	

Notes:
Eleven dummy variables for province of lost job and nine for education are included but are not shown.
Standard errors are in parentheses.

6. UI and the Post-Displacement Wage

Ineligible workers and those eligible for less than 30 weeks suffer wage losses 5–8 percent larger than those eligible for 50 weeks.

What determines the wage earned in the first job obtained after a period of unemployment? The effect of UI and other variables on the post-displacement wage is shown in Table 10. These are the results of a regression on the post-displacement wage that corrects for both simultaneity effects and the potential bias caused by the exclusion of people who did not find a new job. Several results are worth noting. The new wage (even after controlling for the old wage) is strongly related to the worker's education level. Less-educated people's salary levels go down more. They decrease 16 percent and 11 percent more among workers with only elementary school education and those with some high school, respectively, compared with workers who have a university degree. Second, wages decrease less with age until the age of 50, when they become an increasing function of age. To our knowledge this is the first time this result has emerged in research on displaced workers. It implies, for the first time, that the last recession hurt younger workers more than older workers.

The reservation wage variable is added directly to this equation because there is no risk of simultaneity. However, job-search intensity must be corrected for simultaneity since it is only reported after the job search has begun. Higher reservation wages tend to increase the post-displacement wage by roughly 25 percent, although there is significant variance around this figure. Job-search intensity does not affect the new wage. This is perhaps not surprising, given the lack of variation in our fitted job-search intensity measure.

The correction for sample-selection bias, the measure of unemployment duration, and the regional unemployment rate do not significantly affect the new wage. Workers who are not eligible for UI or those eligible for less than 30 weeks lose approximately 6 percent more than those who are eligible for 50 weeks. When we estimate UI's effect on new wages under various specifications, they all lead to the very consistent and robust result that ineligible workers and those eligible for less than 30 weeks suffer wage losses 5–8 percent larger than those eligible for 50 weeks (Table 11). These results are consistent with, and very close to, those of Crémieux *et al.* (1994).

Table 10
Two stage Least Square Estimation of Post-Displacement Wage (Dependent Variable: Log of Hourly New Wage)

Age	0.016	(0.007)
Age squared	-0.001	(0.001)
Male	0.029	(0.033)
Married	0.034	(0.019)
Minority	0.006	(0.030)
Disabled	0.048	(0.113)
Tenure in lost job	-0.006	(0.004)
Log wage in lost job	0.254	(0.037)
Log unemployment duration	-0.025	(0.098)
Log hours worked in new job	0.060	(0.100)
New job unionized	0.127	(0.022)
Interview in English	-0.024	(0.029)
UI eligibility (reference: 50 weeks)		
Ineligible for UI	-0.072	(0.031)
Eligible for less than 30 weeks	-0.081	(0.037)
Eligible for 30–39 weeks	-0.005	(0.029)
Eligible for 40–49 weeks	0.003	(0.021)
Province (reference: Yukon or missing)		
Newfoundland	-0.161	(0.104)
Prince Edward Island	0.027	(0.081)
Nova Scotia	-0.143	(0.081)
New Brunswick	-0.058	(0.079)
Quebec	-0.028	(0.077)
Ontario	-0.115	(0.088)
Manitoba	-0.007	(0.087)
Saskatchewan	-0.047	(0.079)
Alberta	-0.004	(0.081)
British Columbia	0.275	(0.145)
Northwest Territories	0.017	(0.086)
Education (reference: trade certification)		
Elementary	0.020	(0.150)
Some high school	-0.186	(0.048)
High school	-0.123	(0.036)
Some college	-0.097	(0.030)
College	-0.019	(0.039)
Some university	-0.039	(0.038)
B.A.	-0.071	(0.052)
Professional degree	0.034	(0.047)
Higher university degree	-0.024	(0.084)
Regional unemployment rate	0.003	(0.004)
Log reservation wage	0.280	(0.036)
Fitted search intensity	-0.039	(0.075)
Lambda (correction for selection bias)	0.083	(0.356)
Number of observations	2,201	
Adjusted R-squared	0.434	

Table 11
Effects of Unemployment Insurance on Wages Obtained after the Loss of a Job (Differences in the New Wage Measured as Proportion, of the Old Wage Reference: Unemployed Workers Eligible for 50 weeks of UI)

Eligibility (Weeks)	Reduced Form Model	OLS	OLS with Correction for Selection Bias	IV Estimation
0	-0.0768 (-2.692)	-0.0578 (-2.203)	-0.0591 (-2.216)	-0.0723 (-2.357)
1–29	-0.0512 (-1.519)	-0.0483 (-1.558)	-0.0495 (-1.580)	-0.0813 (2.184)
30–39	-0.0276 (-0.997)	-0.0099 (-0.410)	-0.0114 (-0.462)	0.0054 (0.186)
40–49	0.0050 (0.238)	-0.0006 (0.031)	0.0002 (0.011)	0.0030 (0.141)
50	0	0	0	0

Notes:
T-statistics are in parentheses.
2,907 observations of job losers, aged between 20 and 65, who did not go back to their previous employer and found a job by the end of the survey.
Regressions include controls for sex, marital status, lost wage, tenure in the lost job, union status, hours worked, unemployment duration, language, minority, disabled, regional unemployment rate, age, province, occupation, education and reservation wage at the time of the lost job.
In the IV estimation, unemployment duration, reservation wage and hours worked are instrumented using, in addition to these variables, status of head of household, province and occupation at the lost job, and information on the respondent's assets and liabilities. Those variables are also used in the reduced form of the model.

7. UI History and Unemployment

... some workers are unemployed often but for relatively short periods while others are seldom unemployed but stay unemployed for longer periods.

An interesting question, from a policy point of view, is whether previous unemployment spells and use of the UI system generally affect the current spell. First, does having claimed UI benefits in the past increase the likelihood that a person will claim again? This issue cannot be addressed here because the COEP data only include people who have separated from a job, and to address this question it would be necessary to evaluate whether the probability of experiencing a separation is affected by past UI use.

Two other hypotheses that can be examined using the COEP data are:

(1) Do people who collect UI more often tend to claim for longer periods? and,

(2) Do people tend to claim for progressively longer and longer periods with each successive claim?

In order to examine these hypotheses, we carried out a regression similar to those presented in Table 10 but with more information on the respondent's UI history (Table 12). As expected, these historical variables have a strong impact on the probability of re-employment. People whose average claim was longer and those whose average benefits per claim were higher tended to have lower re-employment hazards. On the other hand, the benefits per claim effect may simply reflect omitted individual-level variables that tend to lower job finding rates and thus raise the average number of weeks for all unemployment spells. The number of previous claims, the seasonal nature of the lost job, and the fact that a claim was renewed all tend to raise the probability of re-employment. This could be due to the association of these characteristics with frequent short spells of unemployment.

Table 12
UI History and Determinants of the Probability of Re-employment
(Cox Partial Likelihood Estimate of Transition Hazard to Employment)

Lost job seasonal	0.1384	(0.0559)
Renewal of old claim	0.1026	(0.0569)
Number of previous claims	0.0412	(0.0071)
Average weeks per claim	-0.4722	(0.0752)
Average benefits per claim	-0.1415	(0.0633)
Number of observations	5,922	
2 x log likelihood	916.03	

Notes:
The same specification is used as in Table 10, column 3. History variables are added.
Standard errors are in parentheses.

These results point to a dichotomy in Canadian unemployment — some workers are unemployed often but for relatively short periods while others are seldom unemployed but stay unemployed for longer periods. There are several characteristics that suggest that someone who is a seasonal, repeat user of UI will also have a short current spell. They include a seasonal lost job, a claim that renews an old claim, and a high number of prior claims. On the other hand, indicators of long

previous spells of unemployment point to a longer current spell. These include a high dollar amount of benefits received and a high number of weeks of benefits paid per spell.

These results indicate both the dual nature of unemployment — short and frequent or long and rare spells — and the importance of workers' UI histories on their current experience. We get further confirmation when we look directly at workers' UI histories in Table 13. In the first column are regressions of the number of weeks of benefits paid during the latest spell of unemployment on the number of times a claim was filed and the number of weeks paid on previous claims. The results clearly indicate a small, but significant, negative effect of the number of previous claims on the duration of the current ones, and a small, positive effect of the duration of the previous claims. Those with numerous past spells have, on average, shorter spells, and those who have had long past spells will have longer spells.

Table 13
UI History and Unemployment Duration
(Dependant Variable: Number of Weeks Paid During Latest UI Claim)

	Level	Deviation from the Mean
Number of claims filled	-0.8678 (0.0603)	-0.6196 (0.0489)
Weeks paid during previous claim	0.0941 (0.0134)	-0.0322 (0.0128)
Weeks paid two claims before	0.0598 (0.0133)	-0.3618 (0.0128)
Weeks paid three claims before	0.0418 (0.0133)	-0.3866 (0.0128)
Number of observations	6,900	6,900
Adj. R-squared	0.0399	0.2243

Notes:
These regressions only use people with four or more unemployment spells.
Standard errors are in parentheses.

This is not sufficient evidence to point to UI addiction. The positive autocorrelation of the duration of unemployment spells, measured by the number of weeks of benefits, could simply be caused by persistent characteristics of the worker. This would therefore not reflect the fact that spells of unemployment are becoming longer and longer as the unemployed person acquires a taste for UI benefits. In order to control for this possibility, a measure of individual fixed effects was introduced into the regression. The length of the average spell *per individual* was subtracted from the duration of current and past spells to remove any individual effects on the length of all spells.

The results of these corrected regressions are shown in the second column of Table 13. The number of previous spells still has a negative effect on the number of weeks of UI paid in the current spell, even after correcting for individual effects. This reflects the fact that people claiming more frequently will probably pass more frequently from unemployment to employment, and the reverse applies to people who claim less frequently. On the other hand, when the data is purged of individual effects the results indicate that the number of weeks of benefits in previous spells has a negative effect on the number of weeks of benefits in a current spell. Without correcting for individual effects, these past unemployment

durations tended to raise the current duration. This is evidence disproving the view that the unemployed have an insatiable appetite for benefits which is only fed by each spell.

Our findings regarding UI history and the behaviour of the unemployed differ from those of Lemieux and MacLeod (1995) and Corak and Pyper (1995) for two principal reasons. First, we try to explain the number of weeks for the current claim as a function of past history, while Lemieux and MacLeod look at the determinants of the probability of claiming. Second, we attempt to control for the *nature* of previous jobs (e.g., Were they seasonal? Did they reflect a precarious situation?), while Lemieux and MacLeod do not look at this question because of the limitations of their data. Where we do not include controls for individual characteristics, our results are highly consistent with those of Lemieux and MacLeod. In both cases, UI use, measured by the probability of use or by the length of use, is positively related to past UI exposure.

In the current study we have attempted to respond to the criticism that this result may simply reflect the fact that unobserved heterogeneity among individuals creates a false impression of UI addiction. To give this a more theoretical structure, imagine that the duration of the t^{th} spell of insured unemployment for individual i is determined by the following relationship:

$$d_{i,t} = \alpha d_{i,t-1} + ß x_i + \varepsilon_{i,t}$$

Here the duration of the t^{th} spell of insured unemployment depends upon an individual-specific component x_i and an effect due to the length of the previous UI spell $d_{i,t-1}$. Under the hypothesis of addiction, $\alpha > 0$, since individuals develop a taste for UI. This situation was studied by Heckman and Borjas (1980), who argue that: "Improper treatment of unmeasured variables gives rise to a conditional relationship between future and past unemployment due solely to uncontrolled heterogeneity." Although they studied unemployment rather than the receipt of UI benefits, their argument applies here.

Omitting the heterogeneity term x_i generates an upward bias when we estimate α. This is because positive autocorrelation of the individual effect x_i implies that the correlation of x_i with $d_{i,t-1}$ is of the same sign as $ß$. (For simplicity, x_i is not time-varying here, but if it were it would almost certainly display positive autocorrelation.) In this case, the bias in the estimate of the coefficient α is determined by:

$$bias = ß(d'_{i,t-1}\, d_{i,t-1})d'_{i,t-1}x_i$$

and,

$$sign[bias] = (sign[ß])^2 > 0.$$

In other words, if the individual-specific term is not important (i.e., $ß = 0$), a cross-section regression of $d_{i,t}$ on $d_{i,t-1}$ should give a positive coefficient if there is an addiction effect. If there is reversion toward a mean spell length, there should be negative coefficients, because long spells will be offset by short future spells. This one-lag analysis is readily extendable to the case of multiple lags of $d_{i,t}$ as used in this report. If the individual-specific term x_i does have a significant effect, then $ß > 0$ and the simple regression analysis described above is invalid due to the existence of a bias. This is because the individual-specific components of the

durations $d_{i,t}$ can create a positive relationship, even when there is actually a negative true coefficient α. By removing the average spell length for an individual, we purge our unemployment durations of the fixed x_i effects and prevent this from happening.

While our method is perhaps not perfect, it is both clear and effective, and in any case it is the best we can do given the focus of our study. The reversal of the sign of the coefficient α that is uncovered when our correction is applied strongly suggests that individual effects give the appearance of addiction in the COEP data, much as Heckman and Borjas suggested.

8. Policy Implications

Our results have several interesting implications for public policy. In particular, they challenge the conventional wisdom regarding the effect of UI benefits upon the behaviour of searching workers. We found far less evidence of negative effects of UI than other studies have generally found.

Our results challenge the conventional wisdom regarding the effect of UI benefits upon the behaviour of searching workers.

The Intensity of Job Search

Like Crémieux *et al.* (1994), we found little evidence that people receiving UI benefits differ from those not receiving them with regard to the intensity of their job search. This is qualified by the observation that people with seasonal jobs do search less intensively. To the extent that the existence of seasonal jobs is partly a result of the nature of the UI system, this may imply that the UI system does, perhaps indirectly, reduce the job-search effort of people receiving UI benefits.

Taken at face value, the slow decline in intensity that we found and the lack of a strong UI effect on search effort suggest that individuals do not systematically alter their search effort in response to the UI system. What UI effects do exist are attributable to the promotion through the UI system of seasonal and temporary jobs.

UI and the Reservation Wage

We showed that the length of UI benefits available had a positive, although small, effect on the reservation wage. Interestingly, the effect of UI on the reservation wage is quantitatively similar to its effect on the new wage. This suggests that the positive effect of UI on wages may work precisely through the reservation wage. UI may allow workers to reject jobs that are of low value to them. In this sense there is evidence that UI is acting as social insurance — exactly the purpose for which it was designed — by smoothing the transition from one good job to another. UI does not seem to create exaggerated wage demands, because the reservation wage effects are similar to those found for new wages. In this sense there is evidence that the existence of UI has a very favourable effect.

UI and the Probability of Finding a New Job

We found that UI has little significant effect on re-employment probabilities once other explanatory variables are included in the equation. This is a rather startling result and is a major departure from past studies. Caution is necessary, however, because variables that affect UI use, such as employment in a seasonal/temporary job and the renewal of an existing claim, are included in our analysis. Typically, the data for such variables are not available to researchers. This result regarding the significance of UI eligibility periods in past studies may, to some extent, indicate the linkages between the nature of certain jobs and the UI system. It may not be a question of individuals responding to the UI system. Individuals may simply be responding to an industrial structure that is fostered by the existence and nature of the UI system in Canada.

Unemployment Insurance Policy and Post-Displacement Wages

This study confirms the results of Crémieux *et al.* (1994), who used the NES data-set. Both studies obtained roughly the same result — the wages of people with 30 or more weeks of UI benefits were 7–9 percent higher than those of people who had no benefits whatsoever. This shows that the UI subsidy to job search is effective at both the individual and the societal levels.

Given that the effect of UI on the new wage found here is essentially the same as that found by Crémieux *et al.* (1994), it is useful to recall their conclusions. They converted the 7–9 percent wage boost from UI into an annual salary increase of $1,280.00 per year for someone who previously earned an hourly salary of $8.00. This could be set against the maximum benefits (for a full 50 weeks) of $8,800. Under this scenario, a pay back period of nine years at an interest rate of 6 percent would suffice to make receiving UI interesting from an individual's perspective.

In other words, a private company could make a profit providing Unemployment Insurance benefits and requiring that workers pay back a portion of their wage when they found a job, over a certain period of time. The Minister of Finance recently announced that the government would stop providing services that can be provided by the private sector. While this cost-benefit analysis implies that in a world without private information the private sector could provide UI, there are compelling reasons for the government continuing to provide UI publicly in order to avoid moral hazard and adverse selection problems.

An advantage of the COEP data is that they include information on work histories. We found that the vast majority of the individuals in this study (86 percent) had received UI benefits in the past. Moreover, the average number of claims where benefits were paid is 4.5. Since many people in the sample used UI repeatedly and are therefore probably sophisticated, our test of UI productivity (measured by the length of the unemployment spell and the post-displacement wage) is very strong. Despite this, we found that UI raises the post-displacement wage and does not lower job-search intensity except for that of people in seasonal/temporary jobs.

9. Conclusion

This study used the Canadian Out of Employment Panel (COEP) data, a data set of unprecedented richness that contains both a wealth of information about individual characteristics and direct measures of unemployed peoples' reservation wages and job-search intensity. It also include detailed information on the work histories of unemployed people over several years. The quality and scope of the COEP data set enabled us to investigate the links between Unemployment Insurance and economic behaviour more thoroughly than ever before. The randomness of the COEP sample also means that it is unusually representative.

Our analysis of search intensity shows that UI had no direct effect on search intensity, although it may have had an indirect effect by subsidizing seasonal industries. The seasonal nature of the lost job is one of the main determinants of job-search intensity. Without Unemployment Insurance funded through the general Unemployment Insurance pool, costs in seasonal industries would increase as a result of higher UI contributions to a separate pool or increased wages to compensate workers for the absence of revenues during the off-season. The industry would shrink, and the number of workers employed in seasonal industries and on UI during the off-season would decline.

High mortgage and other debt along with long tenure in the lost job and greater age all lead to more intense job-searching. Finally, job-search intensity did not fall appreciably with unemployment duration within the 68-week time-frame used in the COEP study.

The reservation wage did react positively to UI. The dynamic analysis also showed that it tended to fall, although not drastically, with unemployment duration.

The re-employment probability of workers is affected less by UI than has been suggested by previous studies. This partly reflects the fact that we controlled for the seasonal/temporary nature of jobs, UI history, and individual characteristics. It could be that studies that found that UI delayed greatly the return to work were in fact assigning to UI an effect that was due to other characteristics of unemployment not controlled for because of a lack of data. The effects of the reservation wage and search intensity on the probability of re-employment are opposite to those suggested by search theory that suggests that offer arrival rates are fixed. If offer arrival rates were fixed, higher reservation wages and lower search intensity would lead to a lower probability of re-employment. The exact opposite result is found here, and this finding is extremely robust to specification changes. As suggested by the growing literature on search models with variable offer arrival rates, this probably reflects the impact of offer-arrival rates and demand-side influences. Some workers will have high offer-arrival rates and know it (they don't search much and have a high reservation wage but still land a good job) while others will have a low offer-arrival rate, which a frantic search and low reservation wage will not compensate for. This implies that demand factors, which have not been studied much within the context of the job search, are a crucial missing link in our understanding of job-search dynamics.

New wages respond positively to the reservation wage but vary little with search intensity. An examination of the effect of UI history on current UI use shows that evidence of UI addiction largely disappears once individual factors are controlled for. In particular, the seasonal nature of the lost job is a very strong determinant of future use of UI, given past use.

We have identified two areas for future research. First, the use of UI by seasonal firms should be examined, with a focus on the possibility of colluding behaviour of firms and workers to best extract money from the UI system. Our results indicate that the effect of UI on the behaviour of the unemployed may be indirect, through a change in the industrial structure, rather than direct, through individual optimization of UI use. Second, we need a better measure of unemployed workers' own perceptions of their probable offer-arrival rates to determine the extent to which they, rather than UI variables, drive their search activity and reservation wages.

Appendix: Econometric Techniques

Detailed Economic Framework

The economic framework adopted in this study is essentially from Devine and Kiefer (1991). The second chapter of this book outlines the essential elements of the economic environment, which are roughly the following:

(1) The model takes place in discrete time. After τ periods of searching, there is a probability $\delta_{i,\tau} = d(e_{i,\tau}, a_{i,\tau})$ that a job offer will be received by person i. This probability will be a function of the search effort of an individual $e_{i,\tau}$ and of a combination of the efficiency of the matching process and the incentive for employers to search, which are captured by a base arrival rate $a_{i,\tau}$. This probability could be time-varying if employers are reluctant to hire the long-term unemployed or if search intensity varies with the length of a period of job search, for example. The cost of searching to an unemployed person is represented by a function $c(e_{i,\tau})$.

(2) The wage offer distribution is captured by a probability-density function $f_{i,\tau}(w)$ specific to each individual. This wage-offer function may itself vary with the length of the search, perhaps due to the depreciation of human capital or the stigmatization of unemployed workers.

(3) Once a job offer is received it may be rejected. This will happen if the wage offered is less than the reservation wage $w^r_{i,\tau}$ of the searcher. The reservation- wage decision is a function of the perceived wage distribution and the value of staying unemployed.

(4) Unemployment insurance is of limited duration and is a non-decreasing function of the pre-unemployment wage. Searchers may also have other income that can be used to finance a period of job search. It is assumed that an individual i receives total period income of $b_{i,\tau}$ after searching for τ periods.

(5) People are assumed to maximize the discounted expected value of the lifetime income stream and to use the interest rate r when discounting future income streams.

(6) The personal characteristics $e_{i,\tau}$, $a_{i,\tau}$, $f_{i,\tau}(w)$, $w^r_{i,\tau}$ and $b_{i,\tau}$ may or may not be entirely explained by a vector of observable characteristics X_i.

Given this model, unemployed agents choose a job-search intensity and reservation wage that vary with $f_{i,\tau}(w)$, $b_{i,\tau}$, and the base offer arrival rate $a_{i,\tau}$. As Devine and Kiefer show, in the stationary case where $a_{i,\tau}$, $f_{i,\tau}(w)$, $b_{i,\tau}$ and job-search intensity are constant over time, the reservation wage is implicitly given by the equation:

$$w^r_i = b - c(e_i) + \frac{\delta_i}{r}\int_{w^r_i}^{\infty} (w - w^r_i) f_i(w)\, dw \qquad \textbf{(1)}$$

Job-search intensity will be determined by a simple first-order condition that equates the marginal benefit of searching to its marginal cost:

$$c'(e_i) = \frac{\delta_i(e_i, a_i)}{r} \int_{w^r_i}^{\infty} (w - w^r_i) f_i(w)\, dw \qquad \textbf{(2)}$$

In the general case, however, the reservation wage can vary over time due to changes in any of $a_{i,\tau}$, $f_{i,\tau}(w)$, or $b_{i,\tau}$. Non-work income could vary over time as benefits expire or as savings are exhausted. Job-offer arrival probabilities might fall with τ if employers interpret longer spells of joblessness as a bad signal. Wage offer distributions could drift to the left over time if workers' skills depreciated during the period of joblessness or, again, if employers considered the longer-term unemployed to be less qualified and thus worthy of lower wages. In this general case, the solution for the reservation wage and search effort becomes much more complicated because it is based on an expected-value calculation with the values of the sum changing in each period.

In any case, for completed unemployment spells, the distribution of the post-unemployment wage is described by the conditional *pdf*:

$$f_{i,\tau}(w \mid w \geq w^r_{i,\tau}) \qquad \textbf{(3)}$$

The distribution of waiting times until a job is found and accepted is obtained by noting that in each period the probability of leaving unemployment is:

$$\delta_{i,\tau}(e_i, a_i) \int_{w^r_{i,\tau}}^{\infty} f_{i,\tau}(w)\, dw \qquad \textbf{(4)}$$

In this environment, it is clear that changes in wages, search intensity, and unemployment duration are closely inter-related. We have already shown how the reservation wage, and the new wage, and job-search intensity can vary as a result of unemployment duration. *Ceteris paribus*, a higher reservation wage will lead to a higher expected new wage because the conditional *pdf* for the new wage is translated to the right if $w^r_{i,\tau}$ rises. As a result, the expected duration of unemployment also increases because the probability of leaving unemployment in each period falls. A similar effect appears, obviously, when the job-search intensity varies.

This simultaneity makes it difficult to analyze the impact of Unemployment Insurance on unemployment duration. We need quantitative evaluation of this effect because Unemployment Insurance generally provides a subsidy to the job-search which raises b_i, in equation **(1)**, and thus also the reservation wage which in turn changes the job-search intensity decision. The effect of this job-search subsidy could be to encourage patience on the part of the unemployed and enable them to wait for the arrival of the best job offer. By the same token, they are not obliged to take the first, possibly ill-suited job offered. Subsidizing the job-search could also reduce its intensity. To correctly quantify the effects of UI on unemployment duration, we have to isolate the true relationship between UI benefits and reservation wages, on the one hand, and UI benefits and job-search intensity, on the other. Then, using the appropriate two-stage techniques, the true relationship between UI, re-employment wages, job-search effort, and unemployment duration can be estimated.

Job-Search Intensity

For this section we used regression analysis of the determinants of hours spent searching. To examine job-search intensity at the beginning of the search period we used, a simple ordinary least squares (OLS) approach, since the explanatory variables could all be assumed to be exogenous. To examine its determinants during the unemployment spell, we made some correction for the possibility of simultaneity between it and unemployment duration (an important explanatory variable). In this case, we also used an equation with unemployment duration instrumented. In the equation with instrumented duration, we dropped tenure in the old job and union status on the old job in order to achieve identification. It is reasonable to think that these two variables have no impact on job-search intensity but do have an impact on unemployment duration through other means.

The Reservation Wage

The methodology is essentially the same as that for job search intensity — an initial analysis using ordinary least squares and an instrumental variables analysis of the evolution of reservation wages over time.

Re-Employment Probability

We estimated the relationship between the duration of joblessness and the wage change by examining the conditional probabilities of passing between unemployment and employment at a given instant. When examining the influence of variables on the duration of unemployment, it is frequently assumed that these instantaneous probabilities of leaving unemployment after searching for τ periods, the so-called re-employment hazard rates $\lambda(\tau,Z_{i,\tau})$, are determined by an equation such as:

$$\lambda(\tau,Z_{i,\tau}) = \lambda_0(\tau)exp(Z_{i,\tau}ß).$$

Here $Z_{i,\tau}$ is a vector of possibly time-varying covariates and $\lambda_0(\tau)$ is the baseline hazard. The $Z_{i,\tau}$ vector includes all of the X_i vector as well as the fitted reservation wage, fitted job-search intensity and program participation variables. The baseline hazard is obtained when all of the $Z_{i,\tau}$ variables are zero.[5] The baseline hazard can be viewed as a scaling factor that increases or decreases the probability of leaving unemployment for a given value of the covariates. This baseline hazard may vary with the time spent searching if there is a pattern of temporal dependence of hazard rates that is common to all individuals.

The advantage of this proportional hazard model of unemployment duration, relative to other models such as the "accelerated failure" model, is that it is possible to obtain non-parametric estimates of the baseline hazard. This is done with the Cox partial likelihood method in which a likelihood function independent of the baseline hazard can be obtained. This permits estimation of the ß parameters, which can then be used to estimate the baseline hazard itself.

The unit of observation is once again the unemployment spell. There is one observation per spell. However, as job-search intensity is measured at each of the surveys, more detailed information on search behaviour during the spell is available.

5 The regressors are usually defined as deviations from sample means so that the baseline hazard is the hazard for the "average" individual in the sample.

A fitted value for job-search intensity is computed for each survey crossed by the spell. This fitted value is treated as a time-varying covariate in the Cox regression.

To estimate this model, the econometric software package STATA is ideal. It has a routine COX that applies the Cox partial likelihood method to estimate the proportional hazards model. This routine allows the possibility of time-varying regressors of the type that we used in this study.

The Re-employment Wage

We measured the magnitude of UI benefits' effect on wages based on categorical variables for weeks of Unemployment Insurance benefits available.[6] The categories adopted were the following: i) not eligible for benefits, ii) eligible for less than 30 weeks of benefits, iii) eligible for 30–39 weeks of benefits, iv) eligible for 40–49 weeks of benefits, and v) eligible for 50 weeks of benefits. Using these categories is preferable to using the number of weeks of benefits itself, because the latter does not impose a constant increasing relationship between the number of weeks of benefits and the new wage. In fact, such a relationship is not borne out by the data. Rather, the new wage seems to be a "step" function of the number of weeks of benefits.

Murphy and Welch (1990) have shown that interpreting the coefficients of a high-power polynomial approximation is difficult, particularly when the observations are not evenly spread over the independent variable's possible range of values. This is exactly the situation here. A highly non-linear relationship is likely to exist between the dependent variable and the duration of eligibility for UI benefits, and there are very few observations at each level of eligibility.

Despite the simultaneity of the unemployment duration and the re-employment wage, researchers have tried to use ordinary least squares estimation of linear models to examine the effect of unemployment duration upon re-employment wages. In particular, Classen (1977) and Kahn (1978) have applied this approach to look at the relationship between unemployment insurance and job search outcomes in the United States. Recently, Addison and Portugal (1989) used ordinary-least-squares analysis and concluded that longer spells of unemployment duration lowered post-displacement wages. Addison and Portugal considered the wages earned by worker i in jobs j and $j-1$ to be

$$lnW_{i,j-1} = \alpha_0 + \alpha_1 X^I_i + \alpha_2 X^{IE}_{i,j-1} + u_{i,j-1} \quad \textbf{(5)}$$

and,

$$lnW_{i,j} = ß_0 + ß_1 X^I_i + ß_2 X^{IE}_{i,j} + ß_3 ln(dur_{i,j}) + u_{i,j} \quad \textbf{(6)}$$

Here the vector of observable characteristics for individual i, X_i, is partitioned into X^I_i,which is a vector of characteristics specific to individual i and $X^{IE}_{i,j}$, which is a vector of characteristics specific to individual i and job j. Also, $ln(dur_{i,j})$ is

6 The detailed description of the method used to determine the number of weeks of benefits to which a person was entitled is provided in the data section of this report.

the unemployment duration for individual *i* between jobs *j-1* and *j*. Standard human-capital theory predicts that variables such as age, education, tenure in the old job, and industry should enter these equations.

One of the innovative aspects of the present study is that it analyzes data on the reservation wage and search intensity of the unemployed workers. These variables also enter the new wage equation and are included directly.

The presence of the duration of unemployment in the new wage equation could be explained by various theories. Hysteresis theories of unemployment such as that of Blanchard and Summers (1986) often hinge on an alleged negative relationship between the probability of receiving a job offer and the length of a period of unemployment. Empirical support for this proposition is found in Jackman and Layard (1991) for Britain. In this framework, scarring or stigma effects may reduce the offer-arrival probability of the long-term unemployed. People who are thus stigmatized would have lower offer-arrival rates, would revise their reservation wages downward, and would be likely to accept a lower new wage. A period of unemployment may have more tangible effects on an unemployed person's prospects if his/her job skills depreciate during a period of idleness, as in the model of Pissarides (1992). In this case, the distribution of wage offers may shift over time, lowering the reservation wage and thus the conditional and unconditional expected re-employment wage.

Addison and Portugal's result is that $ß_3$ is negative. At the same time, their two-stage-least-squares and instrumental-variables results suggest that this is because of a relationship between the unemployment duration variable and other variables that have a common impact upon the wage change and unemployment duration. Hence it is not possible to point to a pure effect by unemployment duration on the wage due to human capital depreciation, insider/outsider effects, "scarring", or other such channels that might translate the wage offer distribution to the left over time. This suggests that some sort of two-stage correction is needed to measure the relationship between unemployment duration and wage changes.

Finally, truncated jobless spells cannot be used, since data on the new wage are not available. As a consequence, the rejection rule for truncated observations is non-random, since the long-term unemployed are more likely to be removed from the sample. We corrected for this type of truncation in the spirit of Heckman's "lambda" approach.

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List of UI Evaluation Technical Reports

Unemployment Insurance Evaluation

In the spring of 1993, a major evaluation of UI Regular Benefits was initiated. This evaluation consists of a number of separate studies, conducted by academics, departmental evaluators, and outside agencies such as Statistics Canada. Many of these studies are now completed and the department is in the process of preparing a comprehensive evaluation report.

Listed below are the full technical reports. Briefs of the full reports are also available separately. Copies can be obtained from:

Human Resources Development Canada
Enquiries Centre
140 Promenade du Portage
Phase IV, Level 0
Hull, Quebec K1A 0J9 Fax: (819) 953-7260

UI Impacts on Employer Behaviour

- **Unemployment Insurance, Temporary Layoffs and Recall Expectations**
  M. Corak, Business and Labour Market Analysis Division, Statistics Canada, 1995. *(Evaluation Brief #8)*
- **Firms, Industries, and Cross-Subsidies: Patterns in the Distribution of UI Benefits and Taxes**
  M. Corak and W. Pyper, Business and Labour Market Analysis Division, Statistics Canada, 1995. *(Evaluation Brief #16)*
- **Employer Responses to UI Experience Rating: Evidence from Canadian and American Establishments**
  G. Betcherman and N. Leckie, Ekos Research Associates, 1995. *(Evaluation Brief #21)*

UI Impacts on Worker Behaviour

- **Qualifying for Unemployment Insurance: An Empirical Analysis of Canada**
  D. Green and C. Riddell, Economics Department, University of British Columbia, 1995. *(Evaluation Brief #1)*
- **Unemployment Insurance and Employment Durations: Seasonal and Non-Seasonal Jobs**
  D. Green and T. Sargent, Economics Department, University of British Columbia, 1995. *(Evaluation Brief #19)*
- **Employment Patterns and Unemployment Insurance**
  L. Christofides and C. McKenna, Economics Department, University of Guelph, 1995. *(Evaluation Brief #7)*

- **State Dependence and Unemployment Insurance**
  T. Lemieux and B. MacLeod, Centre de Recherche et Développement en Economique, Université de Montréal, 1995. *(Evaluation Brief #4)*
- **Unemployment Insurance Regional Extended Benefits and Employment Duration**
  C. Riddell and D. Green, Economics Department, University of British Columbia, 1995. *(To be released when available)*
- **Seasonal Employment and the Repeat Use of Unemployment Insurance**
  L. Wesa, Insurance Programs Directorate, HRDC, 1995. *(Evaluation Brief #24)*

UI Macroeconomic Stabilization

- **The UI System as an Automatic Stabiliser in Canada**
  P. Dungan and S. Murphy, Policy and Economic Analysis Program, University of Toronto, 1995. *(Evaluation Brief #5)*
- **Canada's Unemployment Insurance Program as an Economic Stabiliser**
  E. Stokes, WEFA Canada, 1995. *(Evaluation Brief #6)*

UI and the Labour Market

- **Unemployment Insurance and Labour Market Transitions**
  S. Jones, Economics Department, McMaster University, 1995. *(Evaluation Brief #22)*
- **Unemployment Insurance and Job Search Productivity**
  P.-Y. Crémieux, P. Fortin, P. Storer and M. Van Audenrode, Département des Sciences économiques, Université du Québec à Montrèal, 1995. *(Evaluation Brief #3)*
- **Effects of Benefit Rate Reduction and Changes in Entitlement (Bill C-113) on Unemployment, Job Search Behaviour and New Job Quality**
  S. Jones, Economics Department, McMaster University, 1995. *(Evaluation Brief #20)*
- **Jobs Excluded from the Unemployment Insurance System in Canada: An Empirical Investigation**
  Z. Lin, Insurance Programs Directorate, HRDC, 1995. *(Evaluation Brief #15)*
- **Effects of Bill C-113 on UI Take-up Rates**
  P. Kuhn, Economics Department, McMaster University, 1995. *(Evaluation Brief #17)*
- **Implications of Extending Unemployment Insurance Coverage to Self-Employment and Short Hours Work Week: A Micro-Simulation Approach**
  L. Osberg, S. Phipps and S. Erksoy, Economics Department, Dalhousie University, 1995. *(Evaluation Brief #25)*

- **The Impact of Unemployment Insurance on Wages, Search Intensity and the Probability of Re-employment**
  P.-Y. Crémieux, P. Fortin, P. Storer and M. Van Audenrode, Département des Sciences économiques, Université du Québec à Montrèal, 1995. *(Evaluation Brief #27)*

UI and Social Assistance

- **The Interaction of Unemployment Insurance and Social Assistance**
  G. Barrett, D. Doiron, D. Green and C. Riddell, Economics Department, University of British Columbia, 1995. *(Evaluation Brief #18)*
- **Job Separations and the Passage to Unemployment and Welfare Benefits**
  G. Wong, Insurance Programs Directorate, HRDC, 1995. *(Evaluation Brief #9)*
- **Interprovincial Labour Mobility in Canada: The Role of Unemployment Insurance and Social Assistance**
  Z. Lin, Insurance Programs Directorate, HRDC, 1995. *(Evaluation Brief #26)*

UI, Income Distribution and Living Standards

- **The Distributional Implications of Unemployment Insurance: A Micro-Simulation Analysis**
  S. Erksoy, L. Osberg and S. Phipps, Economics Department, Dalhousie University, 1995. *(Evaluation Brief #2)*
- **Income and Living Standards During Unemployment**
  M. Browning, Economics Department, McMaster University, 1995. *(Evaluation Brief #14)*
- **Income Distributional Implications of Unemployment Insurance and Social Assistance in the 1990s: A Micro-Simulation Approach**
  L. Osberg and S. Phipps, Economics Department, Dalhousie University, 1995. *(Evaluation Brief #28)*
- **Studies of the Interaction of UI and Welfare using the COEP Dataset**
  M. Browning, P. Kuhn and S. Jones, Economics Department, McMaster University, 1995.

Final Report

- **Evaluation of Canada's Unemployment Insurance System: Final Report**
  G. Wong, Insurance Programs Directorate, HRDC, 1995.