In and Out of Unemployment Insurance in Canada: a Dynamic Approach

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Abstract

This paper analyses the level of unemployment insurance beneficiaries in Canada over the period 1976-1990 and identifies some reasons why it showed downward rigidity in recent years. An aggregate unemployment flow model with simultaneous determination of wages is estimated and used for simulations. It is shown that both incidence and exit rate exhibit persistence. Also the composition of the beneficiaries has changed over the decade: in 1983, close to half of the level could be explained by aggregate demand deficiency and high energy prices. In 1991, half the level is explained by deficient aggregate demand and mismatch as unskilled unemployed are having increasing difficulties exiting unemployment.

JEL Classification: J64, J65.
Keywords: Unemployment, Labour Flows, Unemployment Insurance.

Abstrakt

Článek analyzuje počet příjemců dávek pojištění v nezaměstnanosti v Kanadě v období let 1976-1990 a zjišťuje důvody pro sestupnou rigiditu, která se objevila v posledních letech. Pro testování a simulace je použit vývojový model agregátní nezaměstnanosti se simultánním stanovením mezd. Je ukázáno, že výskyt a výstupní rychlost vykazují perzistenci. Složení příjemců dávek se v průběhu desetiletí rovněž změnilo: téměř polovina počtu příjemců dávek v roce 1983 by mohla být vysvětlena nedostatečnou agregátní poptávkou a vysokými cenami energií. V roce 1991 se polovina počtu příjemců vysvětluje nedostatečnou agregátní poptávkou a také tím, že nekvalifikovaní nezaměstnaní mají větší potíže s nalezením zaměstnání.

Klasifikace JEL: J64, J65.
Klíčová slova: nezaměstnanost, toky pracovních sil, pojištění pro případ nezaměstnanosti.

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1. INTRODUCTION

Studies of Canadian unemployment traditionally look at the United States as the reference country. Recently such studies have concentrated on explaining the rising divergence between the two unemployment rates (see for examples, Ashenfelter and Card 1986; McCallum 1987; Keil and Symons, 1990; Card and Riddell 1993). In particular, Canadian unemployment in the 1980s did not exhibit the same downward flexibility as its American counterpart (see Figure 1). To our knowledge, very few studies approach Canadian unemployment from a European perspective although persistently a high level of unemployment have characterised European labour markets since the early eighties.[1] Moreover, there are similarities in the behaviour of Canada's, West Germany's and the UK's unemployment rates. In all three countries, unemployment increased in two distinct stages, in the early seventies and in the early eighties and remained at a higher level after each increase (see Figure 1).

In this paper, we evaluate the causes of unemployment in Canada with a flow model of unemployment commonly tested in empirical studies of European unemployment. The model is modified to take into account some features of the Canadian labour market and to allow for the simultaneous determination of wages with feedback from excess supply.

The approach used in this paper departs from other studies of Canadian unemployment mentioned above in at least two major ways. First, the analysis concentrates on the flow of workers in and out of unemployment rather than on the net result, the level of unemployment. Secondly, it focuses on the sub-set of the labour force covered by the unemployment insurance (UI) scheme.

The analysis of labour market flows offers the opportunity to develop more disaggregated macro analyses and it has benefitted from increasing attention since the pioneer article by Nickell (1982) (see for examples, for the United States, Blanchard and Diamond 1992, 1990; Davis and Haltiwanger 1990; for European countries, Burda and Wyplosz 1990; Gross 1993a, 1993b; Pissarides 1985, 1986; Junankar and Price 1984; for Canada, Jones 1993). When applied to study unemployment, the flow approach offers several appealing features compared to the stock analysis. First, through a more precise identification of the supply- and demand-factors, it is possible to distinguish between the behaviour of agents in declining sectors (or periods) and in expanding sectors (or periods). In particular, the job allocation process can be better identified, and so can the sources of

[1] Fortin (1989) and Milbourne, Purvis and Scoones (1991) make some comments about potential similarities with Europe.

persistence or hysteresis. Secondly, the flows are variable and large compared to the stock and the unemployment level may fail to reflect the true underlying changes on the labour market. Thus it is essential to identify separately how the entry rate (incidence) and the exit rate have evolved through time.

The second major characteristic of this paper is that it concentrates on the unemployed who collect UI benefits. For policy purpose it is important to uncover the interaction between supply, demand and unemployment benefits. More precisely, to identify the reasons why people end up on unemployment insurance, it is informative to design more targeted policies. The advantages and shortcomings related to the use of this data set are developed in Section 2.

The findings of this paper show that the composition of Canadian unemployment in the eighties changed. In particular, high energy costs have had a strong adverse effect on unemployment in the early eighties. This effect has been reversed with the sharp drop in energy prices in the second part of the eighties. Also, since 1985, the growing gap between the characteristics required by potential employers and those offered by the unemployed has slowed down hiring from the unemployment pool and bid up wages. This phenomenon is a well-known feature of unemployment in the UK (Layard and Bean 1989) and to some extent of the German unemployment (Gross 1993a). This paper also identifies some persistence in the aggregate entry and exit rates. This feature, coupled with the growing skill gap, may be at the source of the downward rigidity observed in Canadian unemployment in the late eighties.

The remainder of the paper is organized as follows: the data set is described in Section 2. In Section 3, the background model and the results of the estimations are presented. In Section 4, simulations are run to identify the causes of unemployment and, finally, conclusions are drawn about the nature of unemployment in Canada since 1976.

2. The Data

The aggregate flow data used in this study are from the unemployment insurance records. The use of administrative data is not very common in studies of the aggregate Canadian labour market. However, in recent years, more attention has been given to that source of information (see for examples, Corak 1992 and Corak and Jones 1993). One of the reasons is that, since the reform of the Unemployment Act in 1971 and since changes in the measurement of the number of beneficiaries in 1975, registration data have become a much more comprehensive measure of unemployment. In effect, since 1976, more than 90%

of the labour force is eligible for the benefits (see Green and Riddell, 1992). Also, on average, between 1976 and 1990, the simple correlation coefficient between the unemployment rate computed from survey information and the beneficiary rate is 0.909 (see Figure 3 and Lévesque 1987). However, there are definitional differences between the administrative and the survey measures of unemployment. First, due to the maximum imposed on the collection period for unemployment benefits, the long-term unemployed (i.e more than one year) are not part of the administrative sample. Secondly, if some people get discouraged after searching for a few months, they are still considered as unemployed if they are eligible for the benefits. Finally, young people and re-entrants tend to be under-represented in administrative data since they may not be eligible for the benefits. Thus, the results of this study should be viewed as an explanation for the causes of unemployment subject to the availability of unemployment benefits. However, for simplicity, in the remaining sections we will use "unemployed" and "beneficiaries of unemployment insurance" as substitutes.

The inflow (I_t) is the number of claims allowed during the period. The stock is the number of beneficiaries from unemployment benefits (U_t) at the beginning of the period.[2] One of the limitations of this dataset is that outflow observations are not readily observable. Consequently, the outflow (O_t) is computed as the residual from the definition of unemployment ($O_t=U_{t+1}-U_t-I_t$). Both flows and the stock are pictured in Figure 2.

The main characteristics of the flow and stock series are given in Table 1. Between 1976 and 1990, on average, close to 3 million people are accepted as claimants to unemployment benefits every year and the average number of beneficiaries is less than one million. Hence, flows can be very large compared to the stock. Their variability through time is clear from Figure 2. In 1979, both flows experienced a step-like decline by more than 70,000 units (12%). From 1981 to 1982, the increase was 50% and in 1983, both flows declined by 14%. Since then, they have remained relatively constant at a higher level than in the seventies.

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[2] Strictly speaking, the level of beneficiaries is measured for the reference week of the Labour Force survey, including the 15th of each month. Recorded data include beneficiaries of sickness, maternity, parental, adoption leave and worksharing benefits. Only the regular benefits and the fishing and training benefits are included in our data.

Allowed claims are classified under two categories: new claims and renewal. This distinction is purely administrative and both categories represent new claims. The renewal claims are not available according to types of benefits thus all of them are included in the data. On average, renewals represent, 18% of claims allowed. (Statistics Canada).

When unemployment experiences significant variations a natural question is: Who is the culprit? Is it the inflow, through changes in the incidence or is it the outflow, through changes in the duration? High unemployment in the US is characterized by high incidence. In Europe, the incidence is low and the duration is high (see Layard, Nickell and Jackman 1991, p. 222-24). Figure 4, shows what would have happened to the level of beneficiaries, had the duration or the incidence been stable at their early sample value.[3] Neither flow is solely responsible for unemployment variations over the whole sample. On the one hand, incidence has been quite volatile throughout the sample: relatively high in 1982-87 and low in 1979-82 and 1987-90. On the other hand, between 1986 and 1990, a slowdown in the outflow rate is responsible for an increase in unemployment of approximately 20% on average. Thus, in the late eighties, increased duration has maintained unemployment at a higher level.[4]

In the next section the flow model is defined and estimated in order to get some insight into the reasons why this happened.

3. Theoretical Background and Estimations

The model consists of two flow equations and a wage equation. The wage equation is explicitly introduced to allow for feedback from excess labour supply to the determination of wages.[5]

Since the purpose of this paper is not to test a given model of unemployment, only a sketch of the theoretical setting is provided (see Nickell 1982, 1990 and Pissarides 1985 for more details). Abstracting for the time being from particular institutional features, workers can become eligible for unemployment benefits for

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[3] Dynamic simulations have been computed such that,

$$U_{t+1} = U_t[1-(O/U)_t] + (I/N)_t N_t$$

where (I/N) is the incidence or inflow rate and (O/U), the outflow rate. The rates are held alternatively constant at their average 1976-value (I/N=0.0652, O/U=0.8985).

[4] The outflow rate takes the lowest value of the sample in 1983 with 0.651 and reaches a high of 0.742 in 1988 before starting to decline again.

[5] In most empirical studies of the flows, the real wage is simply instrumented as real wages do not adjust according to the market-clearing model in several European economies (see for example Branson and Rotemberg 1980). Simultaneous equation models have been developed mostly within the stock framework (see for example Bean, Layard and Nickell 1986).

three reasons: First, because they have been laid off from their job (L). Secondly, because they have quit their job and the beginning of the new job does not coincide with the termination of the old one (Q). Finally, there are new entrants in the labour force who are looking for a job (E). People lose their eligibility for unemployment benefits when they find a job (H) or when they reach the end of the collecting period (R). The inflow and the outflow are thus defined as,

$$I \equiv L + Q + E, \quad O \equiv H + R. \qquad \textbf{(1)}$$

Using an aggregate search model as in Nickell (1982) it is assumed that the flows of workers and jobs are generated by random shocks hitting firms in every period. In equilibrium, shocks are taken as permanent by all agents and are distributed randomly around a zero-mean and constant variance. When hit by a positive shock, a firm starts searching for suitable workers. When hit by a negative shock, it lays off workers. Unemployed workers in every period search for a suitable job. Wages are set at the beginning of the period (through negotiation, for example) and agents take them as given for the coming period. Furthermore, it is assumed that layoffs and quits are proportionate to employment. Hiring from unemployment is the product of the number of contacts made by the unemployed (cU), the proportion which receives an offer (f) and the proportion which accepts the offer (p). The two flow definitions in (1) can thus be rewritten,

$$I = k \cdot N + q \cdot N + e \cdot LF = k[X] \cdot N + q[Z] \cdot N + e[T] \cdot LF,$$
$$O = c \cdot U \cdot p \cdot f + r \cdot LF = c \cdot U \cdot p[Y] \cdot f[S] + r[T] \cdot LF.$$

where the rates, k,q,p,f,e,r are each a function of a vector of exogenous variables (X,Z,Y,S,T).

In the hiring function, the contact rate by the unemployed (c) is assumed to be constant in equilibrium. The job offer rate (f) and the layoff rate (k) depend on the cost of labour (i.e. real wage relative to productivity, LABC), supply shocks (SSHOCK), and the cost of idle capital when opening a vacancy or laying off a worker (CK). The quit rate (q) depends on the future job prospect and the distribution of wages as represented by f, the job-offer rate to the unemployed, and on their acceptance rate (p). The acceptance rate by the unemployed (p) depends on the cost of searching while unemployed, or the characteristics of the UI scheme (UI) and the state of the labour market (f,c).

The rates of new entry (e) and exit (r) depend on the labour force composition (LFCOMP) and on the features of the unemployment scheme (UI).

In equilibrium, the shocks generating the labour flows are distributed with a constant variance. Structural shifts (STRUCT), à la Lilien (1982), are introduced through mean-preserving shifts in the distribution of shocks. As some firms are hit by larger positive and others by larger negative shocks both, the layoff rate (k) and the job offer rate (f) increase. As the two flows increase no persistent effect is expected on the level of unemployment. However, this holds only if hiring firms are looking for the type of workers freed by declining firms. In a world with technical changes and with widely different sectors, it is unlikely that workers are perfect substitutes. Then mismatch will occur (MMATCH) as growing firms cannot find among the unemployed the type of workers they are looking for. The outflow from unemployment may not respond as fast as the inflow to shifts in the distribution of shocks and unemployment may increase temporarily until adjustment takes place.

Many models compete to define aggregate wage functions however, it is not the purpose of this study to test any one of them in particular. The chosen wage-equation is consistent with the earlier assumption that wages are set by some form of bargaining at the beginning of the period and agents take them as given for the period (see Nickell 1990). It also allows for a feedback from excess supply to wage setting. It is defined as,

$$RWAGE = [U, \Delta U, PTY, V],$$

where RWAGE is the real wage, U is the level of unemployment and PTY is productivity. The variable ΔU takes into account any insider-outsider effect: If there is such an effect, the coefficient on the first difference in unemployment is expected to be positive and there is a larger sensitivity of wages to unemployment in the short-run than in the long-run. This is a very simple way to account for the insider-outsider effect. However, since we use administrative data, nobody is unemployed for more than one year and any impact from the long-term unemployed is expected to be weak. V is a vector which contains other factors affecting the equilibrium wage, namely, supply-shocks (SSHOCK), the characteristics of the supply of labour (LFCOMP), the opportunity cost of being unemployed (UI), the cost of idle capital (CK). Mismatch (MMATCH) is expected to affect real wages positively. An increasing gap between the characteristics of the jobs and those of the unemployed, may induce firms to bid for already employed workers and new entrants.

The three-equation model can thus be written as follows,

$$
\begin{aligned}
I/N &= k[LABC, SSHOCK, STRUCT, CK] + q[\bar{c}, UI, f] \\
&\quad + e[LFCOMP, UI]\cdot(LF/N), \\
O/U &= \bar{c}\cdot p[UI, f]\cdot f[LABC, SSHOCK, STRUCT, MMATCH, CK] \\
&\quad + r[LFCOMP, UI]\cdot(LF/N), \\
RWAGE &= w[U, \Delta U, PTY, SSHOCK, MMATCH, CK, UI, LFCOMP].
\end{aligned}
\tag{2}
$$

where LABC is the RWAGE/PTY ratio. The results of the comparative statics for the equilibrium model can be summarized into the following sign matrix:

$$
\begin{array}{l}
\\
UI \\ CK \\ RWAGE \\ SSHOCK \\ STRUCT \\ MMATCH \\ LFCOMP \\ U \\ PTY
\end{array}
\begin{array}{c}
\begin{array}{cccccc} w & k & p & f & q & r(e) \end{array} \\
\left\{
\begin{array}{cccccc}
+ & na & + & na & + & -(+) \\
- & - & - & + & + & na \\
na & + & + & - & - & na \\
- & + & + & - & - & na \\
na & + & - & + & + & na \\
- & na & + & - & - & na \\
? & na & na & na & na & ? \\
- & na & na & na & na & na \\
+ & - & na & + & na & na
\end{array}
\right\}
\end{array}
$$

Finally, the model should allow for out-of-equilibrium situations when aggregate demand is not constant. In the wage equation, errors in inflation expectations are introduced (UEINFL) and aggregate demand variations are accounted for by unemployment (U). A business cycle measure (AD) is introduced in each flow equation. Thus, the reduced forms for (2) can be written as,

$$
\begin{aligned}
I/N &= A[\underset{-}{AD}, \underset{+/-}{LABC}, \underset{+/-}{SSHOCK}, \underset{+}{STRUCT}, \underset{+/-}{CK}, \underset{+}{UI}, \underset{+}{LFCOMP}], \\
O/U &= B[\underset{+}{AD}, \underset{-}{LABC}, \underset{-}{SSHOCK}, \underset{-}{STRUCT}, \underset{-}{MMATCH}, \underset{+}{CK}, \underset{-}{UI}, \underset{-}{LFCOMP}], \\
LABC &= W[\underset{-}{UEINFL}, \underset{-}{U}, \underset{+}{NPROD}, \underset{+/-}{SSHOCK}, \underset{+}{MMATCH}, \underset{+/-}{CK}, \underset{+}{UI}, \underset{-}{LFCOMP}].
\end{aligned}
\tag{3}
$$

The next Section deals with the empirical specification of the model and with the estimation results.

4. EMPIRICAL IMPLEMENTATION

The three equations in (3) are specified in log-linear dynamic form such that,

$$Y_t = a_0 + \sum_{i=1}^{4} a_i Y_{t-i} + \sum_{j=1}^{n} \sum_{i=0}^{4} b_{j,i} X_{j,t-i} + u_t \ .$$

The introduction of the auto-regressive terms follows from the results of a Durbin-Watson test for stationarity run on each dependent variable. They indicate that the presence of unit-root is likely in the wage series and unlikely (but not with certainty) in the flow series.[6] Using the "general-to-specific" approach, initially four lags are introduced to take into account any yearly effect in the auto-regressive as well as in the distributed-lag portion (see Davidson, Hendry, Srba and Yeo 1978). The specification is tested down on the basis of a t-value t<1.3. The equations are estimated by Three Stage Least Squares on seasonally unadjusted series with seasonal dummies. The final results for the three equations are presented in Table 2. Most of the coefficients are not significantly different from those obtained by OLS estimations.

The empirical variables are defined in details in the Appendix and only a brief description is given here. Special attention has been devoted to measuring structural shifts and these variables are described more fully in the text. As seen in Section 3, the basic theoretical argument behind Lilien's (1982) dispersion measure is particularly important in a flow model. However, it is now clear that Lilien's (1982) measure as used in Samson (1985) for Canada is flawed (see Abraham and Katz 1986).[7] Thus, using a dynamic setting, the dispersion index has been corrected for cyclical effects. The procedure is as follows: First, employment in each sub-category has been purged from aggregate demand variations, such that,

[6] The Durbin-Watson test is computed as

$$DW(x)=\sum(x_t-x_{t-1})^2/\sum(x_t-\bar{x})^2.$$

DW is very small when x_t is a random walk and close to 2 when x_t is white noise (Hendry 1989, p.38). The results for the two flow rates are, DW(I/N)=1.315 and DW(O/U)=1.299 and for the wage, DW(PWAGE)=0.256. We chose not to run more sophisticated unit-root tests, such as the Augmented-Dickey-Fuller test, because of their low degree of reliability in small samples (Campbell and Perron 1991).

[7] Several attempts have been made, using Canadian data, to improve the quality of structural shift measures (see for examples, Neelin 1987; Charette and Kaufmann 1987).

$$N_{i,t} = a_0 + \sum_{j=1}^{6} a_j N_{i,t-j} + \sum_{k=1}^{6} b_k AD_{t-k} + \epsilon_t,$$

where $N_{i,t}$ is the log of the employment level in the i^{th} category at time t and AD is the detrended RGDP. Then the 'purged' employment level is computed from the following dynamic simulation:

$$\hat{N}_{i,t} = a_0 + \sum a_j \hat{N}_{i,t-j} + \hat{\epsilon}_t. \quad \textbf{(3)}$$

This procedure allows for stochastic trends and therefore avoids the arbitrary imposition of a deterministic trend. It also corrects for any persistence in aggregate demand shocks. The resulting estimated employment levels from (3) are then used to compute Lilien's dispersion index.[8] Two kinds of structural changes have been measured: industrial shifts within manufacturing (ISHIFT) and sectoral shifts (SSHIFT) across the economy.

When structural shifts are accompanied by technological changes, hiring firms may be looking for workers with characteristics different from those offered by laid off workers. Thus firms may compete for employed workers rather than hire from the unemployment pool. Larger inflow and smaller outflow increase unemployment temporarily as mismatch between labour demanded and supplied by the unemployed occurs. The discrepancy between the characteristics of labour demanded and supplied by the unemployed is approximated by the ratio of the proportion of people with no more than a high school degree in unemployment and in employment (MATCH). A larger ratio reflects an increase in mismatch. Note that this measure does identify whether there is general skill mismatch in the economy (i.e. simultaneous high unemployment and unfilled vacancies) as vacancy data for skill categories are not available.[9]

The remaining variables appearing in Table 2 are defined as follows: Aggregate demand is measured by detrended real GDP (AD) and the real exchange rate

[8] The index is defined in the following way,

$$\sigma_t = \left[\sum_{i=1}^{k} s_{i,t} (\Delta \log \hat{N}_{i,t} - \Delta Log \hat{N}_t)^2 \right]^{1/2}$$

where s_i is the share of category i in total employment.

[9] The alternative measure for vacancies is the help-wanted index. However, it is only available for broadly defined regions. The series on vacancies per occupations was discontinued in 1978.

(REXRATE). The labour cost variable is the ratio of the real wage and output per employee (PWAGE). The real price of energy (ENERGY) captures supply-side shocks. The participation rate of women (WOMP) is used as a measure for changes in the labour force composition. The share of young people and the share of women in the labour force were also tested but without success.

The wage equation is estimated under the restriction that in the long run the elasticity of the real wage with respect to productivity is equal to 1. Expectation errors about inflation are measured by the first difference in the 12-month inflation rate (UEINFL).[10] The opportunity cost of idle capital (ERIR) is the ex-ante real return on government bonds where expected inflation is actual inflation minus unexpected (UEINFL). The unionization rate was also considered. However, it shows little variation over the sample, remaining around 37% (Labour Canada).

The results of several tests at the bottom of Table 2 indicate that the final specifications are robust. Within sample forecasts have been computed over the last eight quarters (1989.1-1990.4). The average forecast errors are insignificant and the test for parameter constancy show the coefficients are stable. The results of the Breush-Pagan test indicates that the covariance matrix of the residuals is diagonal. Also, normality tests confirm that the fitted and simulated residuals are well-behaved. When two lags appeared with opposite signs and non-significantly different coefficients, the variable was introduced in difference.

The dynamic structure of the final specifications, in Table 2, exhibits some interesting characteristics. First, as the lag structure of the two flow equations shows, the inflow rate reacts faster than the outflow rate to most shocks (business cycle, supply-side and, structural shifts).

Second, all three equations show some persistence as a lagged dependent variable appears in each specification. The wage-productivity series is non-stationary in level as the coefficient on the lagged dependent variable is not statistically different from one. As a consequence, the results should be interpreted for changes in the growth rate of the real wage.

In both flow equations the coefficient on the lagged dependent variable is clearly different from one, ruling out non-stationarity. Furthermore, in the outflow rate, persistence occurs through the four-quarter lag. Various experiments showed that

[10] This measure is borrowed from Dimsdale, Nickell and Horsewood (1989) and is a very simple way of formulating expectations. If $\Delta p=\Delta p_{-1}+\varepsilon$, then $p-p^e=\Delta^2 p$. (see footnote 13, p.286).

it is unlikely to represent a seasonal effect.[11] At this point, it must be noted that none of the equations includes a UI-related variable. Attempts have been made to introduce a replacement ratio but it was never significant. Recent studies of Canadian aggregate unemployment have concluded that the UI provisions introduced in 1977 which make the qualifying and collecting periods dependent on regional unemployment, have led to persistence in the level of unemployment (see Milbourne, Purvis and Scoones 1991, and Coe, 1990). Given the unavailability of data prior 1976, it is unfortunately not possible to compute a Chow-test for the degree of persistence before and after the changes to the UI rules. However, to get some insight into the reason for persistence in the flow rates, an F-test against an unrestricted specification including an eligibility variable with four lags has been run. The results indicate that their contribution is insignificant. Furthermore, when the variable is substituted for the auto-regressive terms in the final specifications for the flow rates the coefficients are significant with the other results surprisingly stable.[12] Thus it appears that persistence may have been introduced not only in the stock of unemployment but in both incidence and duration.

Looking at the estimated coefficient on the exogenous factors, most exhibit the expected sign. Aggregate demand enters both flow equations; the real exchange rate and the wage-productivity ratio enter significantly only the inflow rate. Thus, layoffs rather than hiring tend to respond to changes in the competitiveness of Canadian products and in the real labour costs. Structural shifts affect the inflow rate positively but slow down the outflow in spite of the control for mismatch. This could be interpreted as growing firms not even trying to hire the unemployed in period of structural changes. One reason could be that they use unemployment as a signal for inadequacy of skill level. The rate of change in the participation rate of women enters positively both flows. The positive sign in the inflow equation is expected as a growing labour force leads to a larger number of new

[11] Time varying seasonal dummies and a time trend were alternatively added to the original specification. None were significant. Recursive estimations, starting in 1985, show that the constant, which acts as the fourth quarter value, as well as the coefficient on the four-lag dependent variable were stable.

[12] The eligibility measure was given to me by Pierre Fortin from UQUAM. It is a weighted index of the ratio of the maximum length of collection for a person with the minimum period of work over that the minimum period for the regions defined by the Unemployment Act (see Fortin 1984). The results of the F-tests are the following, F(I/N)= 2.55 and F(O/U)=1.21 for a critical value at 5% of approximately F=2.60. It must be noted that, given the definition of the eligibility variable, multi-collinearity is expected. The results of the estimations with the eligibility variable are available on request from the author.

entrants ending in unemployment. The positive sign in the outflow rate suggests that as the women participation rate rises, the rate of exit increases. Unfortunately, this model does not allow for the distinction between people who lose entitlement to the benefits because they have found a job or because they have reached the end of the collecting period.

Turning to the real wage equation the results indicate that the one-to-one relationship between real wage and productivity, imposed in the long-run, also holds in the short-run. As expected, an underestimation of future inflation affects the real wage adversely. Structural shifts do not affect the product wage behaviour but a higher degree of mismatch between the skill demanded and those offered by the unemployed put pressures on the wage. As the unemployed offer relatively lower levels of education, employers bid to attract the already employed workers which are considered more suitable. Thus, the growing education-gap between unemployed and employed individuals contributes to unemployment in two ways: indirectly, by raising the cost of labour and then generating layoffs and, directly by slowing down the outflow. No insider-outsider effect could be detected as only the pre-determined level of unemployment (6-month lag effect) enters the wage equation significantly. However, administrative data do not include people unemployed for more than one year. Therefore the long-term unemployed are likely to be underestimated, weakening any potential effect.

Finally, the real interest rate enters the wage-equation twice and the result of the dynamics favours a small positive effect. This result questions the *a priori* that the real interest rate represents the opportunity cost of capital. However, as the variable enters only the wage equation, it can be interpreted as an efficiency-wage effect: When the real interest rate increases, the present value of jobs for workers decreases and, the incentive to shirk or quit rises. Firms may want to raise the wage to restore the efficiency-wage level. Thus, at this highly aggregated level, it appears that efficiency-wage rather than insider-outsider factors affect the wage determination process. However, a more careful modelling of the wage-equation is required to draw definite conclusions about the respective relevance of the two competing hypotheses.

To summarize, the estimation results show that the entry and exit rates exhibit some degree of persistence. Structural change affect both flow equations adversely. Moreover, mismatch is significant in increasing duration of unemployment and in putting pressure on the rate of growth of wages. Real wages appear to be determined by a mix of efficiency-wage and market-clearing factors.

In the next section the estimated equations are used to get some insight into the causes for unemployment in Canada.

5. SIMULATIONS

In order to identify the responsibility of each factor in explaining Canadian unemployment, dynamic simulations have been run for the beneficiary level, such that,

$$U^s_{t+1} = U^s_t[1-B^s_t] + A^s_t(W^s_{t-2})N^s_t,$$

where s stands for simulated and,

$$B^s_t = [O/U]^s_t \ , \quad A^s_t = [I/N]^s_t \ , \quad W^s_{t-2} = LABC^s_{t-2} \ , \quad N^s_t = LF_t - U^s_t.$$

with LF the labour force. Initially, the estimated coefficients have been used to assess the performance of the flow model in fitting actual level data. Figure 5 shows that the fully recursive three-equation flow model captures quite well the variations in the actual level of beneficiaries. Thus, simulations are run to evaluate the responsibility of each factor in explaining unemployment.

Each simulation can be considered as an answer to the question: "What would have been the level of beneficiaries from UI benefits, had the particular variable not deviated from its benchmark-value, in 1976?"[13] The results for the share of responsibility for individual variables between 1977 and 1990 are presented in Table 3. The results for 1991, an out-of-sample year, are given in Table 4. The levels of unemployment that would have prevailed under some of the hypotheses are depicted in Figure 6.

Aggregate demand (Tables 3 and 4, Col. 1) is responsible for some of the variations in the level of unemployment throughout the sample. In 1983, low aggregate demand was responsible for almost 12.2% of the registered unemployed. In 1991, aggregate demand deficiency had a deeper effect than in the previous recession since it was responsible for 14.15% of registered unemployed. In 1981 and 1986, unemployment would have been higher by 7.15%

[13] Most variables are maintained at their 1976-average values. There is no particular reason for choosing 1976 except that it is the initial year of the sample. However, in 1976 the unemployment rate was relatively low (7.1%) and similar to that of the US (7.0%). Aggregate demand is kept neutral (no deviation from trend output, no expectation error and real exchange rate constant at 1980-82 average); structural shift variables are kept at the average sample-value. The real interest rate is constant at the 1980-1982 average (2.85%) as it was negative in the late seventies.

and 10.40% respectively without the expansion in aggregate demand. As a result, the evolution of unemployment without aggregate demand variations would have been somewhat smoother however, large fluctuations remain to be explained.

During the first part of the eighties, the major adverse effect on unemployment came from energy prices. In Tables 3 and 4, Column 4, the adverse impact of the second oil shock is reflected in the large increase, from almost 8% to 22%, in the energy share between 1980 and 1983. However, by 1988, the drop in energy prices had drastically reversed the impact as only 4.25% of unemployment could be explained by the energy price. From 1989 onward, unemployment would have been higher had the energy price not dropped. Similar timing has been found for France (Gross 1993b). However, Canadian unemployment responded more sharply to the variations in energy prices.

The effect of structural shifts and mismatch is given in Table 4, columns 2 and 3 and the combined effect is pictured in Figure 6. No significant adverse effect can be identified before the early eighties. Starting in 1982, unemployment would have been lower without structural changes. Since then, the share has been rising continuously. When considering the individual effect of mismatch and structural changes, (Table 4, Col. 2 and 3 respectively) it is clear that the responsibility lies mostly with mismatch. Sectoral and industrial shifts, on the one hand, have a relatively small effect on unemployment moreover it is often beneficial. This clearly indicates that, when Lilien's measure is corrected for aggregate demand effects, its ability to explain unemployment becomes minimal. Mismatch, on the other hand, has a negligible effect until the mid-eighties. However, between 1985 and 1990, its share of responsibility in explaining unemployment has risen from 7.05% to 19.55%. Hiring did slow down because of the relatively low level of education among the unemployed.

Additional growing pressures have been put on the wage product since 1988 through the real interest rate (Tables 3 and 4, column 5 and Figure 6). The impact in terms of share of unemployment which can be explained by the 'efficiency-wage' argument remains modest but is growing (from 0% in 1988 to 3.30% in 1991). Finally, the labour force variable has a very small effect on the level of beneficiaries throughout the sample. The larger inflow is compensated by the larger outflow as the rate of growth of women participation rate increases (Tables 3 and 4, Column 6).

To summarize, Canadian unemployment has been persistently high in the second portion of the eighties mostly because of an inadequacy between the characteristics required by employers and those offered by the unemployed. Thus, even though in the wage equation, there is a market-clearing process at work, individual wages across various categories of skills may react with different degrees of flexibility. Our real wage measure is based on manufacturing wages which may overstate the downward flexibility of the real wage in other sectors. The strong effect of the mismatch variable in the simulations could indicate a lack of responsiveness of real wages for unskilled labour (or a minimum-wage effect), leading to a shortage of jobs for that specific category of unemployed. Alternatively, it could be the consequence of employers changing requirements.

6. CONCLUSION

Using an unemployment flow model with simultaneous wage determination, this paper has studied the behaviour of the level of beneficiaries of unemployment insurance in Canada between 1976 and 1990. In using a model similar to those tested on European economies and amended for the specific characteristics of the Canadian economy, the paper is a contribution to the debate on the reasons for the growing divergence between Canadian and American unemployment levels. The findings support the hypothesis that Canadian unemployment has started to exhibit one of the features of European unemployment: A deterioration in the market's ability to match the unemployed with jobs. Consequently, the composition of Canadian unemployment has changed. In 1983, close to half the level of UI-beneficiaries could be explained by aggregate demand deficiency and supply-side shocks (i.e. the rise in energy prices). In 1991, half the level of unemployment can be explained by aggregate demand deficiency and mismatch. Also, when controlled for aggregate demand effects, structural shifts across manufacturing industries or broad sectors do not affect unemployment in a significant way. Real wages do respond to excess supply but are also affected positively by real interest rates which were high in the late eighties. Finally, exogenous shocks have persistent effects on the inflow and outflow rates.

According to our results, the Canadian labour market has started to show a rising degree of mismatch which, combined with the persistence factor explains the higher than usual level of unemployment at the end of the eighties. It could also develop into a more acute long-term unemployed problem. It is thus important to identify the reasons for the growing difficulties less-educated unemployed encounter in finding jobs. In particular our study could not identify whether the mismatch arises from a lack of wage adjustment for some sub-groups of people (i.e. minimum-wage effect) or whether it comes from a shift in the characteristics demanded by potential employers (i.e. skill effect).

TABLE 1
SUMMARY STATISTICS 76:1-90:4

	Mean	S.Dev.	Max.	Min.
INFLOW	651,081	141,961	1,021,397	393,054
OUTFLOW	642,216	137,204	907,726	419,064
BENEFICIARIES	861,333	237,280	1,413,477	442,780
WORKERS COVERED BY UIC	10,871,750	1,050,821	12,748,000	8,924,000
EMPLOYED COVERED BY UIC	10,010,417	982,193	11,886,990	8,213,624

TABLE 2
RESULTS OF THE ESTIMATIONS FOR THE WAGE AND FLOW EQUATIONS: 1976:1-1990:4

$(I/N)_t$		$(O/U)_t$		$RWAGE_t^b$	
C	-6.458** (1.09)	C	0.526** (0.16)	C	0.105** (0.13)
I/N_{t-1}	0.451** (0.08)	O/U_{t-4}	0.265** (0.05)	$RWAGE_{t-1}$	1.035** (0.02)
AD_t-AD_{t-2}	-2.230** (0.44)	AD_{t-2}	1.724** (0.2)	$UNEMP_{t-2}$	-0.021** (.007)
$REXRATE_t$	0.594** (0.16)	$ENERGY_{t-4}$	-0.121** (0.03)	$UEINFL_{t-2}$	-0.444** (0.19)
$PWAGE^a_{t-2}$	0.201** (0.07)	$SSHIFT_{t-4}$	-2.776** (0.74)	$MATCH_{t-1}$	0.182** (0.05)
$ENERGY_{t-2}$	0.281** (0.07)	$MATCH_{t-4}$	-1.256** (0.19)	$ERIR_t$	-0.008** (.002)
$ISHIFT_{t-2}$	2.760** (0.93)	$\Delta WOMP_{t-1}$	0.091** (0.01)	$ERIR_{t-1}$	0.011** (.001)
$ISHIFT_{t-3}$	3.449** (1.02)				
$\Delta WOMP_{t-1}$	0.087** (0.02)				

STATISTICS			
Eq. S.E.	0.050	0.032	0.008
Corr.act. predic.	0.973	0.977	0.998
N	56	56	56
$CHI^2(2)$ normality fit.res.	0.034	0.078	0.587
Mean forec. error	0.01003 (0.049)	-0.00952 (0.046)	0.00294 (.009)

[a] PWAGE=RWAGE/PTY.
[b] Long-term elasticity with respect to PTY constrained to 1.
Test for parameter constancy over 1989.1-1990.4: Cumulative $CHI^2(24)/24$= 1.056.
LM test for diagonal Covariance Matrix (Breush-Pagan test) $CHI^2(3)$=8.96 (Critical CHI^2 at 97.5%=9.35).
L.R. test of over-identifying restrictions: $CHI^2(42)$ = 57.12 Critical value at 95%=56.9).
** significant at 1 %, S.E. in parentheses.

TABLE 3
SHARES OF THE LEVEL OF BENEFICIARIES OF UI
DUE TO SOME SPECIFIC FACTORS[a/]

Year	1 AD	2 MATCH	3 STRUC SHIFT	4 ENERGY	5 ERIR	6 WOMP
1976	-	-	-	-	-	-
1977	10.10	- 0.30	1.85	0.35	0.00	- 2.35
1978	5.90	0.75	- 3.40	3.65	0.05	3.05
1979	- 2.75	0.10	- 7.25	6.80	- 0.45	3.40
1980	- 3.45	- 0.60	- 7.10	7.80	- 1.75	2.60
1981	- 7.15	1.40	- 4.85	13.10	- 2.80	1.25
1982	6.25	3.05	2.20	19.60	- 2.95	0.80
1983	12.20	5.10	5.60	21.90	- 2.90	0.25
1984	3.35	6.05	7.55	24.55	- 4.00	0.85
1985	- 4.95	7.05	12.60	24.15	- 4.45	2.60
1986	-10.40	10.65	3.00	24.75	-2.85	1.20
1987	- 4.35	13.85	- 0.25	12.60	- 0.95	- 0.55
1988	- 5.55	17.55	0.55	4.25	0.00	0.95
1989	3.20	18.55	- 2.65	- 3.85	1.00	0.25
1990	9.65	19.55	- 2.80	- 7.65	2.40	0.00

[a/] Computed as $[(U^{ref}-U^{sim})/U^{ref}]*100$. A negative sign indicates that, if the variable had not changed, unemployment would have been higher. Thus variations in the selected variable have contributed to lowering unemployment. U^{ref} is total estimated level for Col. 1 and, Col. 1 for all the other cases.

TABLE 4
OUT-OF-SAMPLE SIMULATIONS

	AD	MATCH	STRUC. SHIFT	ENERGY	ERIR	WOMP
1991	14.15	23.40	-1.40	-4.80	3.30	-0.85

APPENDIX: Definitions of the variables

AD: logarithm of the ratio of actual minus trend real gross domestic product computed over the period 1973:1-1991:4 (CANSIM D20463).

ERIR: ex-ante real return on government bonds of more than 10 years. Nominal interest rate minus 12-month expected inflation rate on a quarterly basis based on UEINFL (CANSIM B14013, P484000).

ENERGY: producer price for energy products over total producer price index (CANSIM D694001).

I/N: inflow rate or incidence. Sum of all claims allowed over the quarter as a proportion of the number of employed persons covered by the unemployment insurance scheme at the beginning of the quarter (Statistics Canada [b]).

ISHIFT: structural shift measure computed 20 two-digit manufacturing industries (i.e. Food and Beverages, Tobacco, Rubber, Leather, Textile, Knitting mills, Clothing, Wood, Furniture and fixtures, Paper, Printing and publishing, Primary metal, Metal fabricating, Machinery except electrical, Transportation equipment, Electrical products, Non-metallic mineral products, Petroleum and coal, Chemicals and chemical products, Miscellaneous) (CANSIM).

MATCH: ratio of the proportion of the unemployed with a high school degree or less over the proportion of the employed with a high school degree or less (Statistics Canada [a]).

O/U: outflow rate. Outflow over the quarter as a proportion of the number of beneficiaries. The outflow is computed from the inflow (I_t) and the number of beneficiaries (U_t) as,

$$U_{t+1} = U_t + I_t - O_t$$
$$O_t = U_t - U_{t+1} + I_t$$

where the stock is measured at the beginning of the quarter (Statistics Canada [b]).

PROD: real gross domestic product per employed worker in manufacturing (OECD, CANSIM L27).

PWAGE: hourly wage in manufacturing industries deflated by the producer price index for manufacturing industries over PROD (OECD, CANSIM L27, D694001).

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