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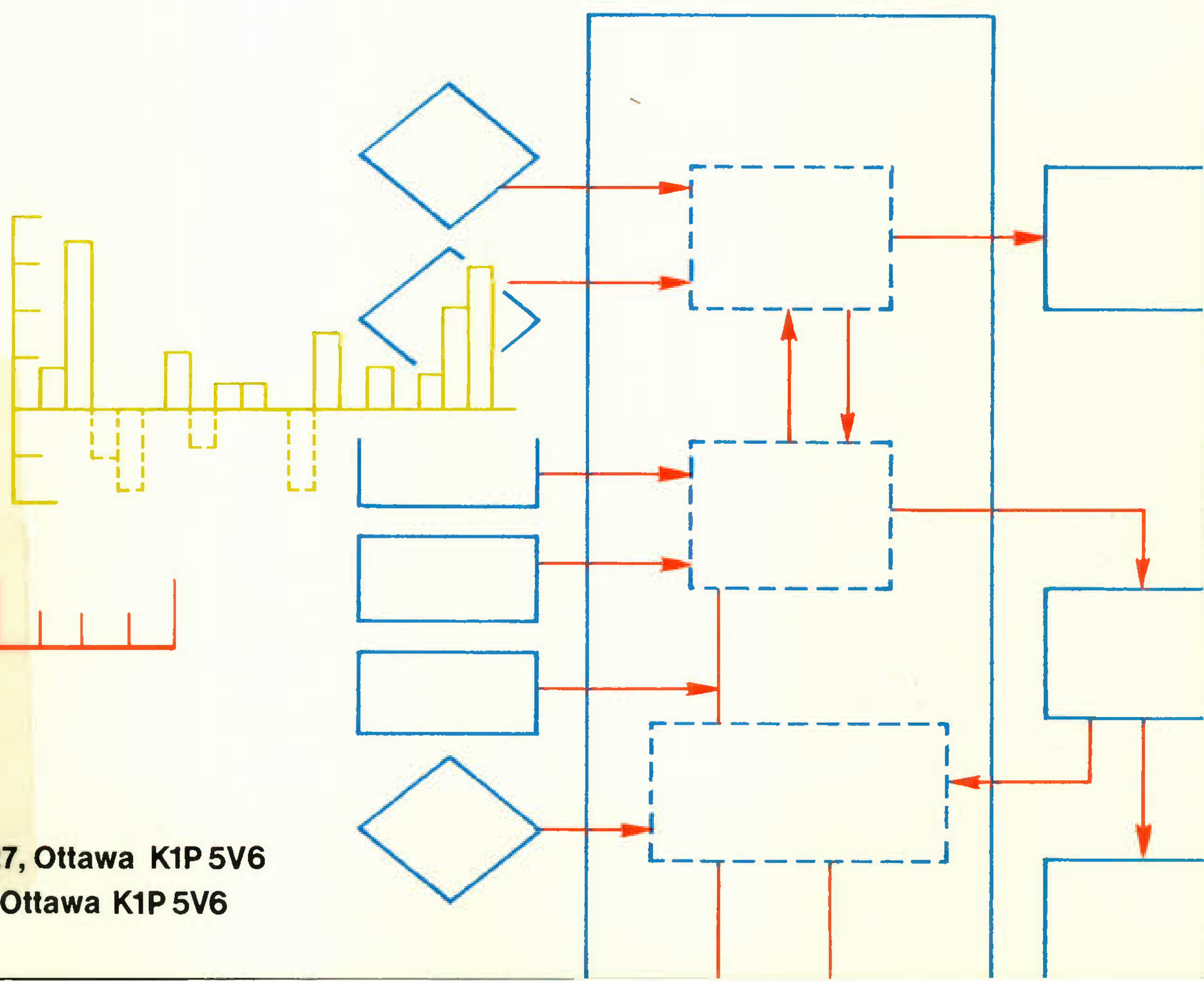

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DISCUSSION PAPER NO. 31

Unemployment Insurance and Labour Force Participation, With Application to Canada, and the Maritimes

by N. Swan

April 1975

SUMMARY

Unemployment insurance has become increasingly generous and its coverage extended in recent years. The purpose of this Discussion Paper is to analyse how one might measure the effects these developments have had on labour supply, and to apply the analysis to data for Canada and the Maritime Provinces.

A theoretical section begins the paper, and develops a 14-equation model of labour force participation. The model has two characteristics which are necessary for the purpose of the paper, and which distinguish it from previous explanations of labour supply. First, it includes separate variables for the true and the measured values of the labour force, and also of the unemployed. Separate variables are necessary because misstatement of one's true labour force status is an almost inevitable corollary of the very effects we seek to measure. Second, it includes exogenous variables designed to capture the effects of the changing generosity of the unemployment insurance system.

The model is solved to yield two equations containing only observable variables, and which together can be used to draw inferences about the effect of unemployment insurance on true, as opposed to measured, labour force participation.

The empirical section explains the precise specification of the variables used in the regressions and gives results for Canada and for each of the Maritime Provinces. The meaning of the results for true participation depends on what value one assigns to a particular unknown constant, but for reasonable values

of this constant the effects of unemployment insurance seem to have been strong ones. Perhaps surprisingly, the increasing generosity of the unemployment insurance system appears to have increased participation in Canada, and in two of the three Maritime Provinces.

A final section gives an ancillary check on the theory by testing with Canadian data, in a crude fashion, some of the other predictions which can be drawn from it.

RÉSUMÉ

Depuis quelques années les prestations d'assurance-chômage sont devenues de plus en plus généreuses et leur distribution plus large. L'objet du présent document est de voir comment on pourrait mesurer les effets que ces changements ont eu sur l'offre de travail, et appliquer l'analyse pertinente aux données relatives au Canada et aux provinces Maritimes.

Le texte commence par une section théorique qui présente un modèle de 14 équations représentant la participation à la population active. Le modèle comporte deux caractéristiques qui le distinguent des explications précédentes de l'offre de travail. Premièrement, il comprend des variables distinctes représentant les valeurs vraies et mesurées de la population active et du chômage. Ces distinctions entre les variables sont nécessaires, car un mauvais énoncé du véritable statut de quelqu'un sur le marché du travail est presque une conséquence inévitable des effets-mêmes que nous cherchons à mesurer. Deuxièmement, le modèle comporte des variables exogènes conçues pour "capter" les effets de la générosité accrue du régime d'assurance-chômage.

Le modèle est résolu de façon à donner deux équations renfermant seulement des variables observables, et qui, ensemble, peuvent servir à tirer des conclusions au sujet de l'effet de l'assurance-chômage sur la participation réelle des gens à la population active, par opposition à celle qui est mesurée.

Dans la section empirique, l'auteur précise la spécification des variables employées dans les régressions et donne des résultats tant pour le Canada que pour chacune des provinces Maritimes. La signification de ces résultats, par rapport à une participation véritable à la population active, dépend de la valeur qu'on attribue à une certaine constante inconnue; mais pour des valeurs raisonnables de cette constante, les répercussions de l'assurance-chômage semblent avoir été fortes. Chose peut-être étonnante, la générosité croissante du régime d'assurance-chômage semble avoir accru les taux d'activité au Canada, ainsi que dans deux des trois provinces Maritimes.

Dans une dernière section, l'auteur fait, en guise d'appoint, une vérification de sa théorie en testant grossièrement, au moyen de données canadiennes, certaines des autres prédictions qu'elle peut permettre.

Introduction

Unemployment insurance has become increasingly generous and its coverage expanded in recent years. In this Discussion Paper we examine what effects, if any, this has had on labour force participation. Some empirical results are presented for the Maritime Provinces, and for Canada as a whole.

Theory

Two kinds of effect are possible as UIC (Unemployment Insurance Commission) benefits and conditions become more generous. One is that workers in the labour force will choose more leisure.[1/] The other is that people outside the labour force will enter it for at least long enough to qualify for benefits. The first effect reduces the labour supply and the second increases it. Both effects increase the number of beneficiaries under the UIC scheme. If some or all of the extra beneficiaries, all of whom while receiving benefits are actually taking leisure, inform the Labour Force Survey interviewers that they are looking for work, the measured amount of unemployment will exceed the true amount. Some misstatement of one's true labour force status seems likely, because benefits could be cut off if one told the truth and it got back to the UIC authorities.

We begin by supposing that the working-age population can be conceptually separated into three groups. For members of the first group participation or nonparticipation in the labour force is not affected by how generous the UIC benefits are. Members of this group may be outside the labour force, employed,

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[1/] They could have tastes that mean they would not, but this seems unlikely.

or unemployed. If unemployed, they are genuinely seeking work. We denote the size of the part of this group in the labour force by L_1, the number of employed in it by E_1 and the number of unemployed by U_T (subscript "T" for "true"). For this group we have:

(1) $$L_1 = E_1 + U_T$$

The second group consists of those who choose to work <u>less</u> frequently, and take more leisure, as the UIC system becomes more generous. We denote the size of this group by L_2. At any point in time some members of this group will be employed (E_2), others will not be. It is assumed that, whether or not the last termination of employment by those not currently employed was voluntary, the state of nonemployment in this group is voluntary, in the sense that work is not really wanted. The nonemployed will then either imply falsely to the Labour Force Survey that they are unemployed, or will say that they are out of the labour force. We call the group with misrecorded status U_{2L} and the rest U_{2T}. We then have:

(2) $$L_2 = E_2 + U_{2L} + U_{2T}$$

The third group consists of those who choose to work <u>more</u> frequently, and take less leisure or work less at home, as the UIC scheme becomes more generous, such as the housewife who enters the labour force because UIC payments can be later obtained after leaving work. We denote the size of this group by L_3, and the number who happen to be employed at a point in time by E_3. The nonemployed will include, as with group 2, those whose status is misrecorded and others, denoted respectively by U_{3L} and U_{3T}. Thus:

(3) $$L_3 = E_3 + U_{3L} + U_{3T}$$

Of the variables so far defined none is presently measured by Statistics Canada. What we observe is the total who say to the Labour Force Survey that they are seeking work, the total number who are drawing unemployment benefit, and the total who are employed. We call these numbers $U_{M(easured)}$, B(eneficiaries) and $E_{M(easured)}$. These numbers are related to the previous ones as follows:

(4) $$E_M = E_1 + E_2 + E_3$$

(5) $$U_M = U_T + U_{2L} + U_{3L}$$

(6) $$B = U_T(1 - p) + U_{2L} + U_{2T} + U_{3L} + U_{3T},$$ in which

"p" is the proportion of the truly unemployed who are not drawing benefits under unemployment insurance.

Behavioural Relationships

Denote a vector of non-UIC variables that affect participation by "X", and a vector of variables representing the generosity of the UIC scheme by "Y". We shall suppose that total participation by groups 1 and 2 combined is affected only by X, but that the proportion of groups 1 and 2 combined which is accounted for by group 2 is a positive function of Y, as well as perhaps being influenced by X. Denoting the working-age population by "P" this gives:

(7) $$L_1 + L_2 = Pf(X)$$

(8) $$L_2 = (L_1 + L_2)g(X, Y), \text{ with}$$

g_Y positive.

The proportion of L_2 who are not employed at any point in time depends on how much leisure is taken on average. If, for example, everyone in group 2 took 5 weeks leisure out of 50 weeks each year, then on average over time one-tenth of the group would be nonemployed. Then we would have $(U_{2L} + U_{2T})/L_2 = 0.1$. More generally we shall have $(U_{2L} + U_{2T})/L_2 = h$, and "h" will be a function of both X and Y. This gives:

(9) $$U_{2L} + U_{2T} = L_2h(X, Y), \text{ with}$$

h_Y positive.

Reasoning analogously for group 3, we obtain:

(10) $$L_3 = Pj(X, Y), \text{ with}$$

j_Y positive, and

(11) $$U_{3L} + U_{3T} = L_3m(X, Y), \text{ with}$$

m_Y positive.

A variable of great interest is the true labour force -- the total number either employed or genuinely seeking work. If we call it L_T we have:

(12) $$L_T = L_1 + E_2 + E_3$$

Next, suppose that the fractions with misrecorded status in both groups 2 and 3 are the same. If we call this common fraction "k" we obtain:

(13) $$U_{2L} = k(U_{2L} + U_{2T})$$

(14) $$U_{3L} = k(U_{3L} + U_{3T})$$

For the time being we leave open the question of whether k will be greater as the generosity of the scheme changes, i.e., whether k is a function of Y.

Questions of Interest

The primary question that we wish to answer is how much true labour force participation is affected by the generosity of the UIC system, i.e., what is the size of:

$$\frac{\partial(L_T/P)}{\partial Y} \; ?$$

To make progress we need to eliminate several variables from equations (1) to (14).

Reduction of Equations (1) to (14)

In simplifying equations (1) to (14) we adopt two conventions. First, units of measurement are chosen in such a way that in those units the size of the working-age population is 1.0. All labour force related variables may then be treated indifferently as absolute values or as rates (relative to the working-age population). Second, functions and parameters are written in lower case letters, and for functions the arguments are omitted, e.g., j(X, Y) is written as j.

With these conventions, and some algebra[1/] we can reduce equations (1) to (14) to: -

(15) $$E_M = a - b - U_T$$ (a, b are defined after equation (18).)

(16) $$U_M = U_T + kb$$

(17) $$B = U_T(1 - p) + b$$

[1/] Equations (7), (8) and (10) allow us to substitute in the remaining equations for L_1, L_2 and L_3. Similarly, equations (1), (2) and (3) then permit elimination of E_1, E_2 and E_3. Carrying out these steps, and adopting the convention that P = 1, and j(X, Y) = j, etc., we obtain:-

(4)' $$E_M = f - U_T - U_{2L} - U_{2T} + j - U_{3L} - U_{3T}$$

(9)' $$U_{2L} + U_{2T} = fgh$$

(11)' $$U_{3L} + U_{3T} = jm$$

(12)' $$L_T = f - U_{2L} - U_{2T} + j - U_{3L} - U_{3T}$$

Equations (5), (6), (13) and (14) are unchanged.

From (13) and (14) with (9)' and (11)' we obtain:-

$$U_{2L} = kfgh$$

$$U_{3L} = kjm$$

Substituting these two results into (5); and (9)' and (10)' into (4)', (6) and (12)' we obtain:-

(4)" $$E_M = f + j - fgh - jm - U_T$$

(5)" $$U_M = U_T + kfgh + kjm$$

(6)' $$B = U_T(1 - p) + fgh + jm$$

(12)" $$L_T = f + j - fgh - jm$$

Writing f + j = a, fgh + jm = b, these last four equations become, respectively, equations (15), (16), (17) and (18) in the main text.

(18) $$L_T = a - b$$

where $a = f + j$, and $b = fgh + jm$.

We would like to estimate values for

$$\frac{\partial L_T}{\partial Y} = \frac{\partial a}{\partial Y} - \frac{\partial b}{\partial Y}$$

With this in mind we add (15) and (16) to obtain

(19) $$U_M + E_M = a - (1 - k)b$$

and we subtract (16) from the sum of (17) and (19) to get

(20) $$B + E_M + pU_T = a$$

Equations (19) and (20) are our basic model. The left-hand side of (19) is the observed participation rate.

The term pU_T in (20) is not currently estimated, but could be. It represents the number of the truly unemployed who are not drawing benefit. Since someone not drawing benefit has no motive to misrepresent his labour force status the value of pU_T could readily be measured as the total number of unemployed people who are not drawing UIC benefits.

Since data on pU_T are presently lacking we had to assume that it would be related in a known manner to variables we could observe. The specific assumption we made was that it would be related to the proportion of the working-age population covered under the UIC scheme, Z, declining as this rose, and that it would be related positively to measured unemployment. The form of the relationship to these two variables was taken as

$$pU_T = (1 - qZ - (1 - q)Z^2)U_M, \; 1 \leq q \leq 2, \text{ with}$$

q constant. The essential property of this relationship is that it assumes that coverage of the unemployed has always been higher than coverage of the working-age population as a whole. Variations in the constant q permit varying assumptions about how much higher. The value of q which gave the best fit for equation (20) was the one used. Seasonality in pU_T was allowed for by the presence of seasonal dummies in the function a.

Estimation of (19) and (20) then gives estimates of

$$\frac{\partial}{\partial Y}(a - (1 - k)b) = \theta_1, \text{ say,}$$

and of

$$\frac{\partial a}{\partial Y} = \theta_2, \text{ say.}$$

Now

$$\frac{\partial L_T}{\partial Y} = \frac{\partial a}{\partial Y} - \frac{\partial b}{\partial Y}$$
$$= \frac{\theta_1 - k\theta_2}{1 - k} - \frac{b}{1 - k}\frac{\partial k}{\partial Y}$$

If k is a constant only the first term is relevant, and given a guess at k's value $\partial L_T/\partial Y$ can be estimated. If k is an increasing function of Y then $(\theta_1 - k\theta_2)/(1 - k)$ will be upward biased as an estimate of the impact of Y on participation.

We note that θ_1 from (19) is upward biased as an estimate of $\partial L_T/\partial Y$, unless k = 0 which means that everyone's labour force status is correctly recorded, but that even if the value of k were known the extent of the bias could not be estimated without the estimate of the derivative with respect to "a", given by equation (20). Both (19) and (20) are therefore needed for any guess at the impact of UIC benefits on true participation.

Specification of the Functions "a" and "b"

We have

$$a = f(X) + j(X, Y)$$

and

$$b = f(X)g(X, Y)h(X, Y) + j(X, Y)m(X, Y).$$

The right-hand sides of both (19) and (20) are, therefore, complicated functions of the vectors X and Y. They were approximated by linear functions. In X we included a number of variables to represent a number of factors known to affect labour force participation; X may be thought of as the vector of "control" variables. Y is the vector of UIC variables.

Empirical Work

Equations (19) and (20) were fitted to data for the Maritime Provinces and for Canada.

Specification of Variables

(i) Dependent Variables

In equation (19) the dependent variable was the measured participation rate. At the provincial level in the Maritimes this is not available separately by sex, so the total rate was used. The data were quarterly and unadjusted, from 1953 I to 1973 II inclusive. In fact all variables were quarterly over this period, and unadjusted for seasonality unless otherwise noted. The source was CANSIM, which in turn is based on the Labour Force Survey.

In equation (20) data on beneficiaries (B) was obtained from Statistics Canada Monthly Publication, Statistical Report on the Operation of the Unemployment Insurance Act, Cat. No. 73-001. Employment (E) was obtained from the Labour Force Survey via CANSIM. The variable pU_T was obtained as described above, using data on coverage from the same source as for B, and values of p of 1.8 for Prince Edward Island, 1.0 for Nova Scotia, 1.0 for New Brunswick, and 1.8 for Canada. The sum of B, E, and pU_T was divided by the working-age population, obtained from the Labour Force Survey via CANSIM.

(ii) Independent Variables in the X Vector

The choice of independent variables other than those related to unemployment insurance was based on the same principles as those outlined in Swan,[1/] in which detailed reasons for the choices are given, and in which their relationship to the work of others in the field, for both Canada and the United States, is explained.

To capture the effect of family responsibilities on the female component of total participation the average of the birth rate in the current and subsequent quarter was used.

[1/] N. Swan, "The Response of Labour Supply to Demand in Canadian Regions", Canadian Journal of Economics, VII, No. 3, August 1974.

At the provincial level birth rates, rather than the more natural choice of the stock of children, was the best that could be done in the light of data constraints. The birth rate was measured per 1,000 of population.

To get at the effect of short-run wage changes the deviation of the logarithm of the wage from a regression estimate of it was used. This regression estimate had time and seasonal dummies as the independent variables, so that the wage variable can be interpreted as a deseasonalized detrended wage in logarithmic form. The wage itself was the sum of wages, salaries and supplements, obtained from National Accounts via CANSIM, divided by employment, from the Labour Force Survey via CANSIM.

The net result of additional and discouraged-worker effects was allowed for by including the Canadian unemployment rate, deseasonalized and detrended in the same way as the wage variable, but not in logarithmic form.

Seasonal factors and trend factors not captured in other variables were allowed for by including seasonal dummies and a time trend. In Nova Scotia a further dummy had to be included over the period 62 III to 66 I to capture the influence of an unknown factor which was depressing participation at that time.

(iii) <u>Independent Variables in the Y Vector</u>

A number of variables were considered for measuring the degree of generosity of the UIC system. The features of the system that might affect participation include the dollar level of the benefits relative to current wage rates, the rate at which benefit weeks may be accumulated by working, the minimum period of work required before any benefits can be drawn, and the length of the waiting period (the time after becoming unemployed before benefits become payable).

What we wanted to do essentially was measure the degree to which the income-leisure opportunity locus was shifted outwards as the UIC legislation changed. We experimented with expressing the actual area under the locus as an explicit function of the measureable characteristics of the legislation. This method had the advantage that it implied that certain ways of combining the measures before including them as variables in the regression would lead to results superior to those obtainable by including the measures as variables in a simple linear fashion. Eventually we were led to measurements which worked well. One was the rate at which additional benefit weeks accumulate by further work beyond the minimum required to obtain any benefit at all. This variable is called THETA, in the regressions. The other was a composite variable constructed as the ratio of two measurable characteristics of the UIC system: the maximum possible weekly dollar benefit and the minimum period of work in weeks required to qualify before any benefits could be drawn. This is called MXB/MQWS, in the regressions.

Those familiar with the theory of work-leisure choices will perhaps feel that MXB/MQWS should be deflated by a variable measuring the opportunity cost of leisure, such as the average wage rate or the minimum wage. Initially this was done, with the unfortunate effect of masking a troublesome perfect collinearity between MXB/MQWS and some other measures of the generosity of the unemployment insurance system. Troublesome regressions resulted, because the determinant of the independent variables was very small. Due to the deflation of MXB/MQWS, however, the determinant was not identically zero, so that it was some time before the source of the problem was discovered. Thereafter, to facilitate detection of this problem if it arose again, MXB/MQWS was kept undeflated. A check at the end indicated that deflation in any case neither improves nor worsens the results found.

Regression Results

General Fit

The fits were close for data as noisy as participation rates[1/] in small provinces. After using Hildreth-Lu the serial correlation became insignificant; and "t" values were generally good. Table 1 shows the details of the results.

Control Variables

The birth rate variable affected participation negatively everywhere, and was significant or close to it everywhere except in Nova Scotia. A negative effect is what was expected. Deviations of the wage from its trend/seasonal value, which might be viewed as the expected or normal value,

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[1/] We shall include the variable ($B + E_m + pU_T$), referred to hereafter as "BEU", in the phrase participation rates unless the context indicates otherwise.

Table 1

REGRESSION RESULTS
(See overleaf for glossary of variable names)

Dependent Variable	UIC Variables: MAXB/MQW	THETA	Control Variables: BR+	LØGW*	UMCAN*	Constant	Time	SD1	SD2	SD3	D62III-66I	Fit Criteria: RHØ	D.W.	R^2 (1)
New Brunswick														
PR	0.55 (3.5)	1.33 (0.7)	-1.48 (-3.2)	-19.73 (-7.4)	0.29 (3.2)	59.31 (16.1)	-0.08 (-2.9)	-1.17 (-6.8)	0.63 (2.5)	2.54 (13.1)	--	0.71	2.07	0.89
BEU	0.64 (3.7)	0.19 (0.1)	-1.38 (-2.7)	-21.12 (-7.1)	0.63 (6.2)	58.93 (14.4)	-0.08 (-2.5)	1.82 (9.2)	2.81 (9.7)	2.46 (11.1)	--	0.68	1.99	0.87
Nova Scotia														
PR	0.18 (1.0)	1.08 (0.5)	-0.47 (-0.8)	-21.11 (-7.0)	0.12 (1.5)	51.39 (11.4)	-0.02 (-0.5)	-1.58 (-9.5)	-0.08 (-0.3)	1.61 (10.0)	-0.62 (-1.4)	0.90	1.94	0.87
BEU	0.32 (2.5)	-3.15 (-1.9)	0.50 (-1.0)	-18.51 (-6.9)	0.28 (3.1)	52.95 (14.4)	0.003 (0.1)	1.06 (4.9)	1.61 (5.4)	1.43 (6.5)	-1.80 (-4.4)	0.34	1.80	0.77
Prince Edward Island														
PR	0.46 (2.0)	-0.21 (-0.1)	-0.95 (-1.6)	-21.24 (-7.1)	-0.24 (-1.5)	57.87 (13.8)	-0.06 (-1.7)	-3.72 (-10.0)	0.65 (1.3)	3.35 (9.0)	--	0.55	1.97	0.84
BEU	0.59 (3.5)	3.55 (1.5)	-1.24 (-2.7)	-24.14 (-9.0)	0.18 (1.4)	57.90 (18.6)	-0.1 (-3.2)	0.25 (0.7)	3.39 (7.6)	3.74 (10.6)	--	0.31	1.98	0.78
Canada														
PR	0.13 (4.6)	2.25 (2.9)	-0.85 (-6.0)	-1.04 (-0.9)	0.16 (4.5)	61.14 (40.4)	-0.04 (-2.8)	-0.67 (-9.1)	0.86 (8.6)	1.95 (27.2)	--	0.59	1.69	0.97
BEU	0.21 (4.8)	2.50 (2.7)	-0.82 (-4.9)	0.06 (0.0)	0.22 (5.1)	60.80 (34.1)	-0.05 (-3.0)	0.67 (7.0)	1.87 (14.9)	1.94 (20.7)	--	0.48	1.88	0.94

(1) **Not corrected for degrees of freedom (40 observations). Note: "t" values shown in parentheses.**

Glossary of Variable Names

BEU : $B + E_M + pU_T$, beneficiaries plus employed plus those unemployed who are not drawing unemployment insurance benefits, all as a fraction of the working-age population (see equation (20)).

BR+ : average birth rates in current and next quarter.

D62III - 66I : dummy variable, unity from third quarter '62 to first quarter '66, zero otherwise.

LØGW* : deseasonalized and detrended Canadian unemployment rate in all regressions.

PR : $U_M + E_M$, the measured participation rate (see equation (19)).

MAXB/MQW : maximum rate of benefit under unemployment insurance, in dollars per week, divided by minimum number of weeks' contribution required to qualify for benefit.

SD1, SD2, SD3 : seasonal dummies.

THETA : the number of extra weeks of benefit acquired for one extra week's contribution beyond the minimum number of weekly contributions needed for entitlement to benefits (normally a fraction).

affected participation negatively in all the Maritime Provinces, though no effect was observed for Canada. Thus the short-run supply curve of labour appears to be negatively sloped. The unemployment variable was not significant in Prince Edward Island and Nova Scotia, but was, with a positive sign, in New Brunswick and Canada, suggesting a net additional worker effect.[1/] Time-trend effects were mildly negative; presumably the decline in the birth rate picks up most of the rise in the female part of participation, leaving the time trend to capture the secular downward drift in male participation. Seasonal dummies, as expected, had strong effects everywhere.

UIC Variables

MXB/MQWS was significant in all cases but one, the exception being the PR regression in Nova Scotia. THETA performed less well, being significant only in Canada; it was almost significant in the BEU regression in Nova Scotia, but with the wrong sign. Our general conclusion, subject to the section following, is that increasing generosity of the UIC system did affect participation in New Brunswick, Prince Edward Island and Canada as a whole, but not in Nova Scotia.

Interpretation of the Results

We note from equations (19) and (20) and the definition of a and b that

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[1/] Together with the backward bending nature of the short-run supply curve this might suggest an attempt to keep earned income stable in the short run. Unemployment leads, on balance, to more people looking for work, while temporary falls in wage rates lead to the same thing, or, possibly, to more weeks of work per person on average.

$$\frac{\partial a}{\partial Y} = f_Y + j_Y = j_Y > 0$$

$$\frac{\partial b}{\partial Y} = f \frac{\partial}{\partial Y}(gh) + \frac{\partial}{\partial Y}(jm)$$

$$= fgh_Y + fhg_Y + jm_Y + mj_Y$$

$$> 0$$

From (20)

$$\frac{\partial(BEU)}{\partial Y} = \frac{\partial a}{\partial Y}$$

From (19)

$$\frac{\partial(PR)}{\partial Y} = \frac{\partial a}{\partial Y} - (1 - k)\frac{\partial b}{\partial Y}$$

so that $$\frac{\partial(BEU)}{\partial Y} > \frac{\partial(PR)}{\partial Y} \text{ since } 0 < k < 1$$

The theory therefore predicts that when BEU is the dependent variable the coefficients of the UIC variables (those in the Y vector) will exceed those when PR is the dependent variable. The prediction is borne out for the variable MXB/MQWS in two of the three provinces and in Canada, provided that one accepts a point estimate if it is significant, but does not insist that the difference between point estimates also be significant. Using the same criterion the prediction is borne out for THETA in the Canada regression, but not elsewhere. In the remaining cases there is no instance of a significant point estimate that gives a result contradictory to that predicted. On the other hand, the very much more rigorous test, which proceeds by asking if one could reject the hypothesis of no difference between coefficients, always fails. Even so, considered as a group the observed results seem unlikely to have occurred if the theory was false.

If the theory is correct it follows that the effect of the UIC variables in the PR regressions overstates their true effect on participation. We deduced above that if the effects of Y on k could be ignored then

$$\frac{\partial L_T}{\partial Y} = \frac{\theta_1 - k\theta_2}{1 - k}$$

In this case θ_1 is the coefficient of any UIC variable in the PR regressions, and θ_2 the coefficient of the same variable in the BEU regressions. Consider, for example, the variable MXB/MQWS for Prince Edward Island. In that case $\theta_1 = 0.46$ and $\theta_2 = 0.58$ so that

$$\frac{\partial L_T}{\partial [MXB/MQWS]} = \frac{0.46 - 0.58k}{1 - k}$$

The value of this depends on k, the fraction of voluntarily unemployed people who are recorded as unemployed. For $k = 0.5$, for example, its value is 0.35. Table 2 below gives the values of $\partial PR/\partial Y$ and of the adjusted value, $\partial L_T/\partial Y$ for each of the cases where the coefficients on the variables MXB/MQWS and THETA were significant in both regressions, and for three values of k.

Table 2

PARTICIPATION RATES: APPARENT AND ADJUSTED REGRESSION COEFFICIENTS ON CERTAIN UIC VARIABLES

Regression	UIC Variable	Apparent Coefficient	Adjusted Coefficient When the Fraction of the Voluntarily Unemployed Recorded as Unemployed is:-		
			0.3	0.5	0.7
New Brunswick	MXB/MQWS	.55	.51	.46	.33
Prince Edward Island	MXB/MQWS	.46	.41	.35	.20
Canada	MXB/MQWS	.18	.17	.15	.11
Canada	THETA	2.25	2.14	2.00	1.67

The meaning of the results may be seen more clearly by estimating the impact of known changes in UIC variables on participation over the sample period. The impact may be calculated with and without adjustment. The variable MXB/MQWS increased over the sample period from 1.1 to 12.5, a change of 11.4. In New Brunswick, for example, the coefficient of this variable is 0.55 in the regression using measured participation rates, giving a rise in measured participation of 11.4 x 0.55 = 6.3 percentage points. If we assume some value for k, say 0.7,[1/] the adjusted value is 11.4 x 0.33 = 3.8 percentage points. For this value of k this would be the effect on the true participation rate, only about half the size of the measured effect, but still substantial.

In Prince Edward Island we obtain a rise in the measured participation rate of 5.2 percentage points, which

[1/] We chose a large value in order to err on the side of conservatism in assessing the increase in true participation.

becomes, for k = 0.7, a rise in the true participation rate of 2.3 percentage points.

In Canada THETA is important as well: it rose over the sample period by 0.368. The combined effects of MXB/MQWS and THETA on the measured participation rates in Canada were therefore (0.18 x 11.4) + (0.368 x 2.25) = 2.9 percentage points. Adjusted with a k of 0.7 the effect on true participation was 1.9 percentage points.

An Ancillary Check on the Results

The theory developed above implies that full-time workers and others will react differently to UIC variables, and to the extent that an appropriate division of the labour force by age and sex corresponds to a division among those who, before increasing generosity of unemployment insurance, would have worked full-time and those who would not have, the theory can be tested by regressions on individual age-sex groups. Data constraints limit what can be done here, however, for time-series data on measured participation rates by age-sex groups are not available for the individual Maritime Provinces, although they are for all of Canada. The BEU variable is not available in any age-sex breakdown at all in time-series form. Consequently we looked at the effect of UIC variables by age-sex group for measured participation in Canada as a whole. The results are shown in Table 3. Annual data were used because complete quarterly time-series data on participation rates for certain age-sex groups were not available. As a result a few rates had to be estimated in certain years and it was felt that more reliable estimates were obtained using annual rather than quarterly data. The remaining

Table 3

REGRESSION RESULTS
(See Table 1, continuation, for glossary of variable names)

Dependent Variable	UIC Variables		Control Variables					Fit Criteria	
	MAXB/MQW	THETA	BR+	LØGW*	UMCAN*	Constant	Time	D.W.	$\bar{R}^2$
Canada									
PR Male -- 14-19	0.53 (6.9)	-3.90 (-2.2)		35.65 (9.9)	-0.25 (-2.7)	50.25 (74.1)	-0.66 (-17.0)	2.48	0.99
PR Male -- 20-24	0.44 (5.9)	3.85 (2.3)		-10.68 (3.1)	0.07 (0.7)	92.84 (142.0)	-0.69 (-18.5)	1.91	0.98
PR Male -- 25-54	0.02 (1.0)	2.04 (4.7)		-3.19 (-3.6)	-0.01 (-0.6)	96.78 (578.2)	-0.09 (-9.2)	1.76	0.91
PR Male -- 55-64	-0.29 (-4.6)	5.67 (3.9)		-2.81 (-1.0)	-0.09 (1.2)	85.49 (154.9)	-0.18 (-5.8)	1.55	0.92
PR Female -- 14-19	0.48 (4.8)	6.17 (2.6)	-0.64 (-2.7)	6.18 (1.4)	0.20 (1.4)	51.04 (7.2)	-0.80 (-3.6)	2.17	0.82
PR Female -- 20-34	0.08 (1.2)	-5.33 (-3.1)	-0.35 (-2.0)	19.80 (6.4)	-0.06 (-0.6)	40.04 (7.9)	0.85 (5.2)	2.16	0.99
PR Female -- 35-64	-0.01 (-0.1)	4.26 (2.7)	-0.34 (-2.1)	-13.18 (-4.6)	0.10 (1.1)	27.81 (5.9)	0.76 (5.0)	2.02	0.99

participation rates for which complete time series did exist were also converted to an annual basis along with the explanatory variables so that all of the participation rate regressions could be run using annual data.

The results in Table 3 indicate that males 25 to 54 are influenced to a much smaller degree than males 14 to 19 or males 20 to 24, so that although prime-age males do seem to increase their participation as a result of unemployment insurance benefits[1/] they do so to a much smaller degree than teenage males or males 20 to 24. The results also suggest that males 55 to 64 tend to withdraw from the labour force because of unemployment insurance benefits. The results are reasonably but by no means perfectly consistent with our theoretical expectations, despite the comment in the footnote below.

The table also indicates that females 14 to 19 and 35 to 64 are the groups most strongly affected by the scheme and that they increase their participation. This result conforms to our theoretical expectations. Females 20 to 34 decrease their participation, however, and this result is not in line with expectation.

On balance the results of the age-sex regressions for Canada, viewed as a whole, do increase our confidence in the underlying theory, although only slightly. They certainly do not suggest rejection of our earlier results for the provincial and Canada-wide regressions.

[1/] This may be consistent with an actual decrease, given the problem of measuring true participation.

Conclusions

The effect of the recent increase in generosity and coverage of unemployment insurance has been considerably to increase measured participation rates in Canada, and in New Brunswick and in Prince Edward Island, but apparently not in Nova Scotia. Where increases occurred, the rise in each true participation rate was smaller than in the measured rate, but even when a generous allowance is made for measurement error, the true increases remain surprisingly large.