

✓ THE CAUSES OF CANADIAN UNEMPLOYMENT:

A NEW APPROACH

by

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The Causes of Canadian Unemployment:

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ABSTRACT

The main theme of the thesis is the causes of Canadian unemployment. The study is based on the premise that the unemployment rate is still a measure of relevance and therefore it is important to understand the factors explaining this phenomenon. The question of primary interest concerns the side of the economy from which these factors emanate. That is, do supply side or demand side factors dominate?

The approach used in attempting to answer this question is twofold. The first section of the study deals with the theoretical determinants of unemployment. This section analyses one demand side factor and several supply side factors. This is the usual approach taken. The "New Approach" of the title refers to the supply side factors. On the supply side consideration is given to unemployment induced by unemployment insurance compensation, by structural factors and by seasonal factors. The novelty of the approach lies in the variables used to capture these supply side concepts.

Unemployment insurance compensation is measured by a replacement ratio, but in contrast to other studies the measure used here is an expected replacement ratio. The structural measures are separated into a technological measure and two demographic measures. The former seeks to capture unemployment caused by changes in wage rates relative to the cost of capital. The latter measures explain unemployment caused by changes in the labour force and population of youths and of females aged twenty-five and above. Seasonal unemployment is measured by calculating the variance of seasonal adjustment factors.

The second section provides empirical tests of the theoretical model. Econometric techniques are used to estimate the equations for the supply of labour, the demand for labour and the unemployment rate.

The conclusions demonstrate that the variables used to explain the causes of Canadian unemployment possess the theoretically correct signs but that two are statistically insignificant: these being the expected replacement ratio and the female demographic variable. One implication of the study is that there is a need for further research regarding the causes of the increase in the female unemployment rate.

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SECTION I
INTRODUCTION

The purpose of the study is to examine the causes of Canadian unemployment. Forces affecting unemployment can be separated into supply and demand factors. The question of whether unemployment is caused by supply or demand factors is important. If unemployment is being caused by demand factors, such as reductions in consumer expenditure or increased interest rates, then action can be taken by the authorities to remedy the situation. The authorities could initiate the appropriate demand management response via fiscal and/or monetary policies. If it is supply factors, such as increased labour force participation ratios, which are causing unemployment, then this finding is of importance, as demand management responses will not be appropriate and other non demand side actions may be necessary. Therefore, it is important to know whether the causes of unemployment emanate from the supply or demand side, so that appropriate responses can be pursued. Unfortunately, there are no "pure" demand or supply factors and thus proxies have to be used.

The supply side factor proxies used in the study include previously used concepts,¹ but with a different approach to their measurement. In addition, new supply side concepts are introduced. The supply factors included are seasonal, structural, and unemployment insurance compensation induced unemployment.

The usual approach to the measurement of unemployment insurance compensation (UIC) induced unemployment is the replacement ratio (B/W).² The new approach is to use the expected replacement ratio, E(B/W). This

explicitly introduces the probability of receiving UIC payments into the analysis.

The concept of structural unemployment is approached in two ways. The first concerns technology and the second demography. For the former a relative price ratio is used. This seeks to capture changes in capital-labour ratios, and hence changes in unemployment. The demographic factors are measured by use of two variables. These are people aged between fourteen and twenty-four years, and women aged twenty-five and over, as percentages of the labour force.³

The concept of seasonal unemployment is captured through the use of a variance measure. It follows the work of David C. Smith,⁴ and appears to be the first application of such a measure in a Canadian context.

On the demand side, the traditional concept of the Gross National Product (GNP) gap is used. This attempts to measure the difference between potential and actual output in percentage terms.

The underlying theory regarding the dependent variables (labour supply, labour demand and the unemployment rate) is discussed in section 2, entitled "Theoretical Analysis of the Determinants of the Unemployment Rate." Following this "The Empirical Results" are presented in section 3. The results follow from the theory and attempt to give flesh to the bones of a priori theorising. The results are obtained through the use of regression analysis and an interpretation of the results is presented. Section 4 deals with the conclusions which are drawn from the main findings of the study.

NOTES

1. Herbert G. Grubel and Dennis R. Maki, "What is Full Employment?", Simon Fraser University, Department of Economics and Commerce Discussion Paper No. 79-1-1, 1979.
2. Herbert G. Grubel, Dennis R. Maki, and S. Sax, "Real and Insurance-Induced Unemployment in Canada," Canadian Journal of Economics, May 1975, pp. 174-191.
3. It could be claimed that these variables are not exogenous. See the section on demographically induced unemployment for a discussion of this point.
4. David C. Smith, "Seasonal Unemployment and Economic Conditions" in A.M. Ross (ed.), Economic Policy and the Labour Market (Berkeley: University of California Press, 1965).

SECTION II
THEORETICAL ANALYSIS OF THE DETERMINANTS
OF THE UNEMPLOYMENT RATE

2.1 Unemployment and the Labour Market

The study seeks to explain the causes of Canadian unemployment, while at the same time inquiring into the workings of the labour market. To achieve this it is possible to adopt either of two approaches. The first relates to an analysis of the demand and supply concepts of the labour market, and then through the concept of excess supply to the concept of unemployment. The second approach is concerned directly with the unemployment rate.

The first approach taken is to use a variable for the supply of labour and another for the demand for labour, and by taking the difference to obtain an estimate of unemployment. Therefore, theoretically justifiable variables for labour supply and labour demand are required. Following the work of Grubel and Maki,¹ who in turn followed Mincer,² it is possible to use the labour force to working age population ratio, and employment to population ratio. The labour force to population ratio (L/P) will serve as the labour supply variable, and the employment to population ratio will act as the labour demand variable. The unemployment measure produced will be the unemployment to population ratio (U/P). This follows from

$$L - E \equiv U$$

where L is labour force,

E is employed persons, and

U is unemployed persons,

thus $L/P - E/P \equiv U/P$

where P is the working-age population.

The interesting outcome of this approach is that the L/P and E/P dependent variables, and hence the U/P variable will be regressed against the same set of explanatory variables. This should possess potential in terms of policy implications and implementation with respect to demand and supply side consequences.

The second approach adopted will consist of a straightforward regression of the unemployment rate (U/L) on the variables deemed to be of explanatory importance.

2.2 Unemployment Insurance Compensation Induced Unemployment

Unemployment Insurance Compensation (UIC) induced unemployment was discussed by Pigou as early as 1933:

... There can be little doubt that the system of state-aided unemployment insurance with substantial rates of benefit, which has been widely extended in this country (Britain) since the close of the war, has enabled wage-earners to maintain rates of wages at a higher level than they would otherwise have been able to do so This circumstance suggests strongly that the goal of long-run tendencies in recent times has been a wage level substantially above that proper to nil unemployment, and that a substantial part of³ post-war unemployment is attributable to that fact.

Recent work of importance includes Feldstein⁴, Gujarati⁵, and Grubel, Maki and Sax⁶.

2.2.1 The Theory.

Essentially the theory underlining the concept of UIC induced unemployment is a simple one.

Consider an 'average' worker earning K dollars per week. In the absence of unemployment benefits the cost of leisure is K dollars per week, abstracting from taxes, work expenses, etc. In the presence of unemployment benefits of B dollars a week, yielding a benefit income ratio $R = B/K$, the cost of leisure for this worker is $(1-R)K$ or, more simply, $K-B$ dollars per week. Clearly, the cost of leisure is a decreasing function of B and R . However, the incentives to consume the cheapened good, leisure, depend crucially not only on the size of B and R but also on the following three costs every worker has to incur if he wishes to receive unemployment benefits: the cost of finding a new job at the end of the period, the cost of not receiving any income between the commencement of unemployment and the initial receipt of benefits, and the cost of documenting to the authorities that search has yielded no suitable work.⁷

In summary the above suggests that:

$$U = f(B/W, DSQL)$$

where U is unemployment

B/W is the benefit income ratio, and

$DSQL$ is a disqualification measure.

The a priori postulates would be that the greater the benefit income ratio, the greater the level of unemployment, this unemployment being UIC induced. The greater the degree of disqualification, the lesser the level of unemployment induced by unemployment insurance payments.

At this point in the study comments are made concerning the UIC induced debate, and a discussion of the appropriate causal variable is postponed.

2.2.2 The Significance of UIC and Related Facts.

All the evidence ... indicates that Canadians are strongly motivated to work and generally hold jobs not only because they have to, but because they like to Canadians as a people regard work as the main vehicle to success, broadly defined, in terms of personal satisfaction and self-fulfilment, they rank work second only to family, or sometimes friendship, ties.

The vast majority of Canadians would prefer suitable work to unemployment insurance, but about one-third would accept unemployment insurance rather than work at the minimum wage, recognising no doubt that at the wages they could command their UIC benefits would exceed the minimum wage. In fact, one-third of unemployment beneficiaries - over one-half of the males and one-tenth of the females - draw unemployment insurance benefits that exceed the minimum wage in their province.

The surveys confirm the importance of pay, advancement, and fringe benefits as fundamental factors in the decision to accept a job. But, once in a job, the greatest personal satisfaction seems to derive from having enough authority and information to be able to work effectively, from friendly co-workers and supervisors, and from interesting assignments with visible results for one's efforts.⁸

It would appear from this passage that Canadians are, in general, a hard-working population and that UIC has only a limited effect on their decision to be unemployed. Regarding the receipt of UIC payments, it may be useful to present certain facts.

The present laws relating to UIC consist of the following:

- a) The recipient must have been in the work force for between ten to fourteen weeks, depending on the province in which application is made, before the recipient is legally entitled to benefits.
- b) The recipient receives sixty per cent of the previous gross wage to a maximum of \$150. Thus if the claimant had previously a gross weekly income of \$300, then the recipient will not be compensated with \$180 (60% of \$300), but instead will receive \$150. In addition, UIC benefits are subject to taxation.
- c) To meet the requirements the claimant is obliged to be seeking work. This will impose costs - informational, transport and so on - on the beneficiary, and these will have to be paid for out of the benefits received.

The above shows the general nature of the Canadian work force and some of the facts relevant to claiming UIC benefits. What relationship do these have with the theory of UIC induced unemployment?

One mechanism would be that higher UIC payments lead to people leaving jobs, so as to claim the increased benefits and so increasing unemployment. They do so, presumably, because then the cost of leisure is reduced, and so they increase the amount of leisure time. Is this a rational approach? It might be if certain legal requirements, such as receiving 60% of the previous gross wage to a maximum of \$150²⁹⁶ and the necessity to continually show evidence of seeking work did not exist. Thus given these additional costs more increases in UIC benefits should only have a short-run effect on unemployment due to informational lags.⁹

A second mechanism would suggest that increased generosity of the UIC system would have effects on the marginal cost of job search. The cost of job search is reduced, and so the duration of job search should be increased. But will this lead to an increase in unemployment? The answer is uncertain. Kaliski has argued

... that if the initial impact of the UI changes was to prolong search and increase turnover, the turnover may subsequently decline as a result of more thorough search and better matching. I was, therefore, gratified to learn that in the two cases in which Lazar found a significant positive impact on turnover (women 25-44 and 45+) that impact reached a peak in 1972 or 1973 and then declined in 1974 and 1975.¹⁰

This again shows that there may be a short-run effect from higher UIC benefits, but that these effects will taper off. Inquiring further into the question of unemployment and increased UIC benefits and quoting from the Economic Council of Canada: "Under the 1971 legislation, persons

with dependents could draw 75 per cent of earnings after roughly the fourth month on benefits or if their prior earnings were very low - that is, less than one-third of the insurable maximum."¹¹

The inference is that long-term unemployment should have increased (because the ratio rises after four months of unemployment), but as Table I shows this was not so. Nickell writing in a British context appears to have theoretical support for this observation,

... it is worth briefly discussing what we might expect to happen to the impact of income variables on the probability of leaving unemployment if the individual has already been unemployed for a considerable length of time. Under these circumstances we might expect the probability of his actually receiving a job offer to be very low and furthermore that the extra utility obtained from being unemployed (e.g. from leisure) will become negligible or even negative because of the stigma and general debilitation associated with long-term unemployment. In this case, it is clear that the reservation wage will fall to a low level, even to the extent that the individual will follow the strategy of accepting the first job he is offered. Variations in the replacement ratio will then have no impact whatever on the probability of leaving unemployment and this is something we might expect to pick up for the long-term unemployed.¹²

The above shows that there is a problem with the way in which UIC payments are associated with the level and duration of unemployment. Even if short-term duration increased this would not necessarily lead to an overall increase in unemployment.

2.2.3 Searching for the Appropriate Variable.

It has been postulated by Grubel¹³ that unemployment is affected by the replacement ratio (B/W), and a disqualification measure. This appears reasonable and is incorporated into the analysis in a modified form. The Grubel disqualification measure is defined as "Disqualifications and

TABLE I
 LONG TERM UNEMPLOYMENT RATE,
 SELECTED AGE GROUPS, 1966-74

	Age Groups		
	<u>14-24 years</u>	<u>25-44 years</u>	<u>45 years and over</u>
1966	1.1	0.6	1.1
1967	1.3	0.7	1.1
1968	1.9	1.0	1.4
1969	2.0	1.0	1.6
1970	2.8	1.5	1.9
1971	4.0	1.9	2.3
1972	3.5	1.9	2.1
1973	2.9	1.6	1.8
1974	2.7	1.3	1.6

Source: People and Jobs, p. 208.

disentitlements for unemployed insurance benefits ... per 10,000 weeks compensated."¹⁴

The modified form proposed uses an analogous measure. This measure will be concerned with the probability of being denied UIC at the initial attempt. It is derived by dividing the number of "initial claims allowed" by the number of "initial claims received". This gives the probability of receiving UIC payments, $p(B/W)$. Multiplying $p(B/W)$ by the replacement ratio, (B/W) , gives the expected value of UIC payments. Thus

$$E(B/W) = p(B/W) \cdot (B/W)$$

and

$$U = f E(B/W) \quad \text{with } f' < 0$$

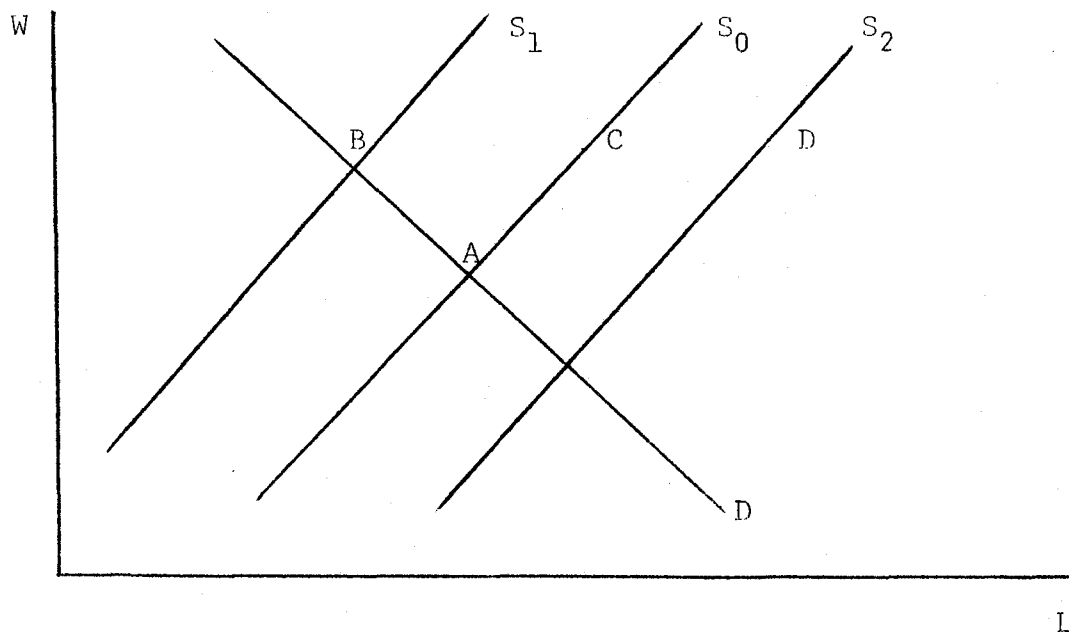
The benefit of this approach is that it recognises the interactive nature of the replacement ratio and the probability of receiving the replacement ratio.¹⁵

2.2.4 The A Priori Relationships

A rise in the replacement ratio implies a reduction in the cost of search and hence a rise in the reservation wage. This implies that fewer people will now be willing to accept employment at any given wage, and so the labour supply curve shifts from S_0 to S_1 , where labour supply is defined to include only those working or accepting work. On the other hand, if labour supply also includes those who are searching but not accepting work, then the relevant curve is still S_0 , or, if additional workers enter the labour force, S_2 . Thus, labour demand declines from A to B, and broadly defined labour supply increases from A to either C or D (see diagram 1). This implies that a rise in $E(B/W)$ should have a negative effect on labour demand and positive effects on labour supply and unemployment.

Illustration 1

The Outcome of the Increase in the Reservation Wage

2.3 Cyclical Unemployment

The rate of growth of the Canadian economy varies, with surges of activity usually being associated with additional investment or exports, and lulls with insufficient demand stemming from either domestic or international weaknesses.¹⁶

The above quotation typifies what might be called a Keynesian description of one of the principal reasons for there to be unemployment in an economy. This theory will not be analysed to any great extent as, hopefully, it is generally agreed that deficiencies in aggregate demand will have consequences for the level of unemployment. The real problem concerning cyclical unemployment does not relate to a theoretical defence of the inclusion of aggregate demand variations, but rather to the choice of the relevant variable by which to measure the phenomenon.

2.3.1 The Appropriate Measure.

One approach taken is to measure the ratio to exponential trend of constant dollar Gross National Expenditure.¹⁷ Another approach is to use a Gross National Product gap. Unfortunately there are problems in using either approach. These problems relate to the assumptions underpinning the construction of the variable, and also the assumption that demand deficient unemployment averages zero over a cycle.

The first set of problems concerns assumptions used in deriving a measure of cyclical unemployment. These relate to growth rates in labour force growth, the growth of productivity and the natural rate of unemployment. The ratio to exponential trend measure assumes that the growth rates of productivity and the labour force are constant, while the gap approach requires certain assumptions concerning the natural rate of unemployment. More is said concerning the natural rate assumption in the section dealing with the definitions and sources of the variables used.

Inquiring into the second problem of demand deficient unemployment averaging zero over the cycle, the following is of use:

There is no justification for this assumption, but the procedure ensures that the 'natural' unemployment rate approximates the average actual unemployment rate.

Further,

The single demand variable is a ratio of actual to trend real GNP. Since this is constrained to average zero for the period as a whole, demand-deficient unemployment must also average close to zero.¹⁸

While admitting of these problems the study nevertheless follows orthodoxy and includes the GNP gap as the cyclical variable. This gap is an estimate of the difference between potential and actual output. This is

a single measure of demand-deficient unemployment, but if a more sophisticated analysis of cyclical unemployment was required, then it might be more appropriate to include several demand side factors. Briefly, these might be concerned with five aspects:

- (i) the competitive position of Canada vis-a-vis the U.S.,
- (ii) the terms of trade,
- (iii) the unemployment rate of the U.S.,
- (iv) Canadian monetary policy, and
- (v) Canadian fiscal policy.

The interested reader is referred to Barber.¹⁹

2.3.2 The A Priori Postulates

To discuss the theoretically expected relationships it must be borne in mind that the GNP gap is given by:

$$\text{GNP gap} = \frac{\text{Actual output} - \text{Potential output}}{\text{Potential output}}$$

In most circumstances the gap will be a negative percentage value, and in the study it did not average zero.

A priori the relationship between the demand for labour and the GNP gap is deemed to be positive. The demand for labour will contract as actual output falls below potential.

For the supply of labour the outcome is ambiguous. Changes in the GNP gap will produce additional worker effects as well as discouraged worker effects. The outcome of the additional less the discouraged effects will be the key to the net flow of workers to the demand shock. If the additional worker effect is greater than the discouraged worker effect following an increase in the GNP gap, then a positive relationship is deemed to exist.²⁰

It is easier to postulate the relationship between U/P and the gap measure. A priori a negative relationship is postulated. The greater the negative value of the gap, the greater the positive value of U/P. A sufficient requirement for this, with $\partial(E/P)/\partial(\text{GAP}) > 0$, is that $\partial(L/P)/\partial(\text{GAP})$ is not positive and larger, absolutely, than $\partial(E/P)/\partial(\text{GAP})$.

The a priori relationship between the unemployment rate and the gap measure is, again, negative. This is analogous to the theorising concerning U/P.

2.4 Seasonal Unemployment

The seasonal nature of much of the unemployment in Canada is, at first glance, one possible explanation for our high unemployment rates.²¹

Seasonal unemployment is usually thought of as being associated with climatic conditions. The underlying theory would be that as weather conditions become unfavourable to the type of production being undertaken, then costs of maintaining the previous level of output will be increased, and demand for the product will decrease. As Smith says

The scheduling of production over the year reflects ... seasonal variation in costs associated with producing, storing and selling the output. Production will tend to be concentrated in the low cost periods of the year...²²

Another approach, as Smith²³ points out, concerns changes in demand across seasons. As seasonal demand for Christmas trees varies, then output will change, as will the levels of employment associated with certain outputs.

In the former case, with increased production costs the supply curve for the particular good shifts to the left, and the equilibrium level of

output is reduced. Whereas in the latter case, the response is found on the demand side, again with a reduction in output. In both cases the level of output is reduced, and this will have consequences for the level of employment.

2.4.1 The Appropriate Measure.

The measure used is the variance of unemployment seasonal adjustment factors.²⁴ A seasonally adjusted observation is an original observation divided by what is called a seasonal factor, that is, by a coefficient which expresses the amount of deviation from the annual average that is being attributed to seasonal factors. In periods when the original observation is low for seasonal reasons, the seasonal factor will be less than one, and in periods when the original observation is high for seasonal reasons, the seasonal factor will be greater than one. Consequently the dispersion of seasonal factors about the period average of unity can be taken as a measure of the seasonal amplitude of a series, and so the variance of the seasonal factors may be taken as the measure of dispersion.

With respect to the above theory of increased production costs and decreased seasonal demand, the seasonal adjustment factor will be less than one, as will the seasonal adjustment factor for employment. Therefore, the seasonal adjustment factor for unemployment will be greater than one.

2.4.2 The A Priori Postulates.

The demand for labour will have a negative relationship to the variance of seasonal unemployment adjustment factors. The mechanism is that average labour demand will be lower because of either higher costs or reduced seasonal demand, and these will be reflected in the adjustment factors.

The supply of labour is not so clear-cut. One approach is that as the seasonal variance approaches zero, workers will experience a more settled labour environment, and possibly turnover will decline. This would produce a negative relationship as favourable, stable conditions would encourage an inflow of workers.

On the other hand, it is possible that the less favourable economic conditions implied by a high degree of seasonality may induce additional labour supply if, for example, spouses of seasonal workers were encouraged to enter the labour market in order to maintain family income. These two opposing possibilities are analogous to additional and discouraged worker effects, and the net outcome cannot be predicted on a priori grounds.

The relationship between unemployment and the seasonal variance measure is deemed to be positive. The mechanism is that the greater the seasonal variance measure is, the less favourable economic conditions are, and thus the greater the level of unemployment.

2.5 Structurally Induced Unemployment: Technology

Structural unemployment has long been a topic of interest to Canadian economists. The hugeness of our country, the diversity of our industries and occupations, the variance in all these add up to a high probability of a mismatch, at any given point in time, between the location and skills of the unemployed, and the location and skill requirements of available jobs. Such a mismatch acts (at least temporarily) as a barrier to mobility preventing some of the unemployed from filling jobs that are vacant.²⁵

The above quotation gives an indication of the relevance of structural unemployment, but over the past twenty years or so there appears to have been an element of controversy concerning the existence of this type of

unemployment. As Killingsworth says "There was a time when reputable economists would not write the word 'structural' without putting it in sanitizing quotation marks, and they would not speak the word without a snicker and a wink."²⁶

2.5.1 A Definition of Structural Unemployment.

Essentially, the theory of structural unemployment can be presented in the form given to it by Lipsey.²⁷ Basically, Lipsey constructs a model which "displays continuous fluctuations in the level of income and employment" and postulates that shocks may be generated by any of several processes. One of the processes chosen is that of structural unemployment. In the spirit of Knowles and Kalachek²⁸ the economy is described as experiencing a stable structural floor to unemployment until the onset of a once-and-for-all structural change. The result is that actual unemployment rises until it reaches the new stable floor. The corollary of this is that bottlenecks and shortages will be manifest in many places in the economy, that the pace of inflation will show a sudden upward step, and also that the price increases will reduce aggregate demand, and hence precipitate the movement to the new unemployment floor. The above model has been refuted by empirical evidence,²⁹ and so attention is given to a more deserving version.

This second approach states that the stable unemployment floor has been moving up during recent times. Again, Killingsworth says, "During the 1950s, there had been increasing discussion of rising structural unemployment as a cause of this upward creep of prosperity unemployment rates."³⁰

This theory requires that bottlenecks and inflation pressures occurred in the last boom period, and if structural problems had been increasing sufficiently to be significant, this would be evidenced by inflationary pressures at a higher level of unemployment and a lower level of aggregate demand than in previous booms, or if unemployment fell to levels comparable with previous booms, it would be evidenced by significantly greater inflationary pressure than in previous booms.

Whether or not it is possible to distinguish between structural and other factors in explaining unemployment depends on the behaviour of employers in laying off workers in the face of declining demand, and in the face of those technological changes which are a possible cause of structural unemployment.

Structural unemployment, then, is joblessness which results from basic changes in the economic structure. These changes include new technology, changes in labour force characteristics and changes in demand via consumer tastes. For present purposes attention is given to the technology aspect of structural unemployment, and first, discussion is made of the controversial nature of this type of unemployment.

2.5.2 The Controversy.

... a controversy raged over whether the sharp increase in unemployment in North America between 1956 and 1961 had primarily, or at least partly, represented an increase in structural unemployment, or whether it had been primarily or wholly due to a deficiency in aggregate demand. One of the major difficulties in this controversy was that the structuralist position seems to have emerged from political polemics and has rarely been formulated in rigorous economic terms by a proponent of this position.³¹

The controversy denying the significance of structural unemployment was centered around the new Kennedy Council of Economic Advisers; and as Killingsworth says,

The Council's insistence that structural problems had not contributed to recent increases in prosperity unemployment rates rested squarely on the view of the labour market which was most frequently stated in economic theory textbooks. Thus, in its 1963 Senate Committee presentation, the Council said the following:

'(The structural analysis fails) to make any allowances for the proven capacity of a free labour market ... to reconcile discrepancies between particular labour supplies and particular labour demands. If relative shortages of particular skills develop, the price system and the market will moderate them, as they have always done in the past. Employers will be prompted to step up their service training programs, as more jobs become available, poorly skilled and poorly educated workers will be more strongly motivated to avail themselves of training, retraining, and adult education opportunities.'³²

But Stoikov³³ re-ignited the debate and his re-examination of most of the anti-structuralist evidence found it to be weaker than appeared at first sight. This led to the presentation of evidence in support of the structural theory. The essence of the Stoikov paper was that the structural hypothesis had been buried prematurely.

Finally one might ask to what an extent can the upward shifts in the unemployment rate of the groups under question be attributed plausibly to the structural factors emphasised by the 'structuralists'? Alternative factors can be posited: increasing discrimination against non-whites, increasing illiteracy among youth One plausible alternative developed in the literature is the particular movement of relative wages as determined by certain institutional arrangements. Whether that can be considered an independent factor from structural changes is questionable. In fact, it is difficult to conceive of increasing structural unemployment in a world of perfectly flexible wages. On the whole then, and in the absence of convincing alternatives, we find the 'mild' structuralist position plausible.³⁴

Further, as Killingsworth states,

The common theme of the empirical studies is that the gritty reality of labour markets departs widely from the simplistic assumptions of economic theory. Knowledge is imperfect, mobility is limited, wage competition among employers is unusual, workers often behave differently from the theoretical 'economic man', jobs are almost never redesigned (in peacetime) to adapt them to changes in the quality of labour available and so on. The point is certainly not that labour markets are completely ineffective, or that the forces of competition and self-interest are non-existent. Rather, the point is that labour markets and the forces that operate within them are often inadequate to overcome the imbalances that grow out of structural changes in the economy.³⁵

2.5.3 The Choice of the Appropriate Measure.

One promising approach to measuring structural unemployment would be to use the elasticity of substitution. As Baumol says

... it is helpful to have a measure of the responsiveness of the optimal proportions among the firm's inputs to changes in their relative prices. The measure used for this purpose is the elasticity of substitution. If a moderate rise in wages relative to the cost of capital leads to a substantial replacement of labour by machinery, we may say the elasticity of substitution is large. On the other hand, if in that case there is little change in the capital-labour ratio, the elasticity of substitution is small.³⁶

The formula for the elasticity of substitution, σ , is given by

$$\sigma = \frac{d(K/E) / K/E}{d(w/r) / w/r}$$

If σ is large, then there would be "a substantial replacement of labour by machinery" following an increase in wages relative to the cost of capital. Thus the larger is σ , the greater is the potential for structural unemployment.

However, the elasticity of substitution is an industry concept, with each industry having its own σ . Therefore, it may not be a suitable variable for aggregation, and because the study requires an aggregate measure the elasticity of substitution is not appropriate but it does suggest an alternative.

This alternative is the ratio of the cost of labour to the cost of capital, w/r , and the mechanism through which unemployment results, following an increase in w/r , is described with reference to changes in the capital-labour ratio. Changes in the w/r ratio will lead to changes in the K/L ratio, and the correlation of the changes is positive. As w/r increases, capital is substituted for labour, and so on the demand side of the labour market there is a decrease in the amount of labour demanded. On the supply side of the labour market the outcome is again unclear, analogous to the seasonal theory, the resulting flow depends on additional and discouraged worker effects. For the overall unemployment level, changes in w/r cause increases in U/P and U/L . Increases in w/r lead to more capital and less labour being used, so E decreases on the demand side, *ceteris paribus*, and so $U \equiv L - E$ increases. The above assumes that L does not decrease by the same amount as does E . Again, this is an empirical matter.

2.6 Structurally Induced Unemployment: Demography

The theory of demographic changes causing unemployment has two main concepts. First, changes in labour force participation ratios, and second, unemployment rates of certain demographic groups. The essence of the theory is that if certain groups possess unemployment rates in excess of the average unemployment rate, and if their share of the labour force increases, then the overall unemployment rate will increase. As the Economic Council says

The increase in the number of young workers is largely a consequence of the increased birth rates registered in the 1940s and 1950s that are now observable in the 14-19 and 20-24 age groups. More important, however, are the recent developments with respect to the participation rate of young workers ... the downward trend in the participation rate of teenagers, both male and female, which had been apparent from 1953 until recent years, has turned sharply upward since 1969-70. The same is true for men aged 20 to 24 Somewhat more than a quarter of Canada's labour force is now composed of people aged 24 or younger, 12 per cent are in the 14-19 category and 16 per cent are in the 20-24 group. Moreover, the rate of unemployment among young people is substantially higher than the Canadian average. For example, in 1974, youths aged 14 to 24 accounted for close to half of the unemployed - double their proportion in the work-force. Whereas the aggregate 1974 unemployment rate was 5.4 per cent, it was 12.7 per cent among men aged 14 to 19, 9.5 per cent among those 20 to 24, and 10.1 per cent and 6.6 per cent, respectively, among young women of corresponding ages.³⁷

The mechanism explaining why young people are of importance in an inquiry into the causes of unemployment concerns two factors. These factors are:

- (i) the share of the working population, and
- (ii) the participation rate of the group aged 14 to 24 years.

The share of the working population increased due to the baby boom, and the participation rate of the group increased sharply from 1969 onwards. The combined effect of the two was to lead to an increase in the proportion of the total labour force occupied by the group aged 14 to 24, and with this group possessing an unemployment rate above the average, then this means that a positive relationship exists between the overall unemployment rate and the ratio of the labour force of people aged 14 to 24 to the total labour force.³⁸

The traditional view³⁹ of increases in the proportion of the work force accounted for by females 25 and over, is that this has caused an increase in the overall unemployment rate. The mechanism by which an increase in the labour force participation ratio of females aged 25 and over causes unemployment to increase requires assumptions. One is that females aged 25 and over are mainly secondary workers, and, following from this, that secondary workers have above average unemployment rates. Therefore an increase in the LFPR of a secondary group will lead to increased unemployment overall. But the assumption that this group has an unemployment rate above the average is questionable. Using annual data from 1953 to 1978 (see Table II), the unemployment rate for females 25 and above is below that of the overall rate.⁴⁰ This would lead to the conclusion that increases in the LFPR of this group would reduce the overall unemployment rate.⁴¹

2.6.1 The Appropriate Measure.

Interest in the structural-demographic theory concerns changes in population and labour force participation rates. Therefore the measure used is a ratio of the labour force of the relevant group to the total labour force. Thus

$$(i) \quad \frac{LF^{14-24}}{LF} \quad \text{and} \quad (ii) \quad \frac{LF^{w25+}}{LF}$$

The measures allow for changes in the LFPR of the included groups, and changes in population factors, such as the baby boom.

2.6.2 The A Priori Relationships.

A positive relationship is expected between the unemployment measure U/L and LF^{14-24}/LF variable, whether they result from an increase in the participation rate of this group, or a decrease in the overall population

TABLE II
 UNEMPLOYMENT RATES FOR THE OVERALL LABOUR FORCE AND FEMALES
 AGED 25 AND OVER, SEASONALLY UNADJUSTED 1953-1978

<u>Year</u>	<u>Overall Labour Force</u>	<u>Females 25+</u>
1953	3.0	1.2
1954	4.6	1.8
1955	4.4	1.9
1956	3.4	1.4
1957	4.7	1.6
1958	7.1	2.6
1959	6.0	2.1
1960	7.0	2.3
1961	7.2	2.5
1962	6.0	2.2
1963	5.6	2.1
1964	4.7	2.0
1965	4.0	1.7
1966	3.6	1.7
1967	4.1	1.9
1968	4.8	2.4
1969	4.7	3.7
1970	5.8	4.5
1971	6.4	5.0
1972	6.3	5.7
1973	5.6	5.4
1974	5.3	5.0
1975	6.5	6.5
1976	7.1	6.7
1977	8.1	7.4
1978	8.4	7.9

Source: Statistics Canada 71-201.

and so a decrease in the labour force, lead to higher levels of unemployment. This is the result of the above average unemployment rates of this group.

The a priori relationship between the unemployment rate and LF^{w25+}/LF is unclear. The traditional view would hypothesise a positive one, whereas the present study makes the case for a negative relationship.

With reference to the supply of and demand for labour, it does not appear to make sense to attempt to explain changes in these measures through the use of two sub-supply of labour concepts. Rather, it would appear to make more sense to recognise that the supply of labour has been increasing as a direct result of the rapid increase in the LFPR of females. The reasons explaining this increase appear to be qualitative in nature⁴², and are difficult to capture quantitatively. But it may be possible to capture the phenomenon by using time as a surrogate variable for the sociological factors.

Therefore, a positive relationship is expected between the supply of labour and time, and following a neoclassical method time is included as a factor causing a change in the demand for labour. But it must be borne in mind that this approach does not say that because time explains supply, that supply explains demand. This would be in line with Say's Law, and the inclusion of a GNP gap would deny that supply creates its own demand. A positive relationship is expected between the demand for labour and time, but that the relationship might be weaker than that existing between the supply of labour and time. The outcomes of the supply of labour and the demand for labour will indicate the relationship between U/P and time. If the economy was experiencing a demand boom, then the demand for labour

would be greater than the supply of labour over that period, and U/P and time are negatively related. The a priori relationships deemed to exist between the dependent and independent variables are summarised in Table III which follows.

TABLE III
SUMMARY OF THE A PRIORI RELATIONSHIPS

Dependent Variable	Independent Variables						
	E(B/W)	Gap	S Var	w/r	LF^{14-24}/LF	LF^{w25+}/LF	T
U/L	+	-	+	+	+	?	
L/P	+	-	?	?			+
E/P	-	+	-	-			+
U/P	+	-	+	+			?

NOTES

1. Grubel and Maki, op. cit., pp. 1-35.
2. J. Mincer, "Unemployment Effects of Minimum Wages," J.P.E., August 1976, pp. S87-104.
3. A.C. Pigon, The Theory of Unemployment (London: MacMillan and Co., 1933), pp. 254-6.
4. M.S. Feldstein, "Lowering the Permanent Rate of Unemployment," (Washington: U.S. Govt. Printing Office, 1973).
5. D. Guyarati, "The Behaviour of Unemployment and Unfilled Vacancies," Economic Journal, March, 1972, pp. 195-204.
6. Grubel, Maki and Sax, op. cit., pp. 174-191.
7. Ibid., pp. 176-7.
8. Economic Council of Canada, "People and Jobs. A Study of the Canadian Labour Market," (Ottawa: Information Canada, 1976).
9. This discussion of short-run effects relates to the myopic nature of the worker encouraged to claim UIC payments. The worker reacts to the increase in benefits by increasing his consumption of leisure, without considering the costs of re-entry into the labour market and the costs of administering the UIC claim. This discussion could comprise a study in and of itself and is only mentioned briefly.
10. S.F. Kaliski, "Notes on Unemployment, Issues in Canadian Public Policy II," Conference held at Queen's University, April 1979.
11. Economic Council of Canada, op. cit., p. 149.
12. S.J. Nickell, "The Effect of Unemployment and Related Benefits on the Duration of Unemployment," Economic Journal, March, 1979, pp. 34-49.
13. Grubel, Maki and Sax, op. cit., p. 180.
14. Grubel and Maki, op. cit., p. 34.
15. With $E(B/W)$ equal to the Initial Expected value of benefits, it may be a useful variable for analysing the propensity to quit than a variable including a disqualification measure. This is so because disqualifications relate to the expectations of benefit continuance, and may be a better measure for analysing duration and effects on search patterns.
16. Economic Council of Canada, op. cit., p. 214.

17. D.R. Maki, and Z.A. Spindler, "The Effect of Unemployment Compensation on the Rate of Unemployment in Great Britain," Oxford Economic Papers, November, 1975, pp. 440-454.
18. C.L. Barber, and J.C.P. McCallum, Inflation and Unemployment: The Canadian Experience (Toronto: James Lorimer, 1980), chapter 2.
19. Ibid.
20. If the relationship between the supply of labour and the GNP gap is positive, then as the GNP gap increases the supply of labour also increases. An increase in the GNP gap would result in a movement to a lower value, say from -3.0% to -5.6%. The response of the supply of labour to the positive GNP gap change would be that the additional worker effect is greater than the discouraged effect, and so a net positive flow would result. Ordinarily, a negative relationship would be expected to exist between the supply of labour and the GNP gap, but this is an empirical question.
21. Economic Council of Canada, op. cit., p. 173.
22. Smith, op. cit., p. 199.
23. Ibid.
24. See the section on the definition of variables for a further discussion.
25. J.M and Chris Green Consineau, "Structural Unemployment in Canada: 1971-74; Did it Worsen?" Relations Industrielles, 33:2, 1978, p. 175.
26. Charles C. Killingsworth, "The Fall and Rise of the Idea of Structural Unemployment," IRRA 31st Annual Proceeding, 1978, pp. 1-13.
27. R.G. Lipsey, "Structural and Deficient-Demand Unemployment Reconsidered," in A.M. Ross (ed.), Employment Policy and the Labour Market (Berkeley: University of California Press, 1965).
28. Ibid.
29. Ibid.
30. Killingsworth, op.cit., p. 2.
31. Peter G. Penz, Structural Unemployment, Theory and Measurement (Ottawa: Program Development Service, Department of Manpower and Immigration, 1969), p. 1.
32. Killingsworth, op. cit., p. 4.
33. V, Stoikov, "Increasing Structural Unemployment Re-Examined," Industrial and Labour Relations Review, vol. 19 no. 5, April 1966, pp. 368-376.

34. Ibid., p. 376.
35. Lipsey, op. cit., p. 13.
36. William J. Baumol, Economic Theory and Operations Analysis, 4th edition (Englewood Cliffs, N.J.: Prentice-Hall, 1977), pp. 287-9.
37. Economic Council of Canada, op. cit., p. 75.
38. The variable used is not restrictly exogenous. It could be argued that changes in immigration policy and UIC benefits lead to changes in labour force participation rates. But against this argument the following defence is offered: Recent work on the increase in the unemployment rate has laid increasing emphasis on LFPRs (see note 39 below), and the question of the exogeneity of a variable appears to be problematical, but given that it is a problem the outcome is that the coefficient will be biased in an upward direction.
39. William H. Branson, Macroeconomic Theory and Policy, 2nd edition (New York: Harper and Row, 1979), p. 406.
40. It may be argued that even if the average unemployment rate is initially lower, relatively large increases in any specific component of supply may raise the relative unemployment of that group (at least temporarily) due to imperfect substitutability. This would mean a positive effect on the overall unemployment rate even if the female unemployment rate remained below average, as long as it rose relative to the average.
41. Again, there is the question of the size of the increase in the LFPR. This issue is not covered in the study and would require research of a different nature than that carried out here.
42. Economic Council of Canada, op.cit., chapter 4.

SECTION III

EMPIRICAL RESULTS

3.1 Introduction

The question of which relationships between which variables are to be tested, that is which model is to be tested, is resolved on the basis of theoretical considerations. By choosing a model one already precludes many possible relationships out of an, in principle, infinite number. Theoretical reflection, therefore, precedes empirical research. The results of empirical research cannot prove a theory to be correct, but they can prove it to be wrong and so stimulate revision of existing theories and the development of new ones.¹

Therefore, in attempting to estimate a model econometrically it is necessary to have a model and a suitable data base. The model has been covered, but there are problems inherent to the selection of a suitable data base. The usual problems relate to sufficient observations to allow for degrees of freedom difficulties, inclusion of variables specified by the model, and consistency across the chosen period.

With any time-series model it would be preferable to include as many observations as possible. This is particularly true for the present study due to the inclusion of the cyclically sensitive GNP gap variable. Thus, it would be advantageous to have as a period of analysis, one which contained substantial cyclical variation.

But the desire for a long time period clashes with the generation of the variables inherent to the study, so a trade-off is encountered. In a Canadian context it is possible to collect data over relatively long periods, but if the data are to be consistent then the appropriate period of analysis would tend to be post 1950. This relates to the comparative breakthrough in

the early 1950s by the Dominion Bureau of Statistics, and so the most appropriate starting date for the model's estimation appeared to be 1953.²

The next question to be answered concerned the number of observations. Clearly the greater the number of observations the better. With the analysis running from 1953 to the present (1978), it was possible to obtain 104 quarterly observations.

Having outlined the model to be estimated and the data to be collected, the next step was to obtain estimates of the variables thought to be of relevance in explaining the causes of Canadian unemployment. As stressed in section 2, the approach taken is to use a labour supply variable and a labour demand variable, and also a residual unemployment measure, U/P, and the unemployment rate, U/L, as the dependent variables. The dependent variables are explained by the included independent variables through the use of ordinary least squares. The equations are single equations, and not a simultaneous equation system.

3.2 Definition of Variables and their Sources.

L/P - the supply of labour concept measure. The participation rate represents the labour force as a percentage of the population 15 years of age and over. The participation rate was obtained from various issues of Statistics Canada, 71-201. Note that revisions to the Labour Force Survey were introduced in 1976, following a year of parallel operation with the former survey, and estimates from January 1975 to December 1978 are taken directly from the revised survey. For the period 1966 to 1974, the data are based on revisions to the estimates produced from the former survey. Estimates for years prior to 1966 have not been revised.

E/P - the demand for labour measure. The employment population ratio represents the proportion of the Canadian working age population that is actively engaged in the production of goods and services in the Canadian economy, and is defined as the ratio of the number of persons employed to the total working age population. The estimates of employment are those generated by the Labour Force Survey (Statistics Canada, 71-201, various issues), while the population estimates are independently derived from other sources (Statistics Canada, 91-518, various issues).

U/L - the unemployment rate represents the number of unemployed persons as a per cent of the labour force, collected from various issues of Statistics Canada, 71-201.

GNP gap - the cyclical component (or measure of demand deficiency) was obtained from the Statistics Canada Quarterly Econometric Model (SCQUEM), Econometrics Section, Current Economic Analysis Division. It should be noted that this measure is a negative value when there is a deficiency in aggregate demand. The measure is given by:

$$\text{GNP gap} = \frac{\text{Actual output} - \text{Potential output}}{\text{Potential output}}$$

The measure is analogous to the one obtained by Brox and Cluff.³ Their paper shows that their measure is in line with the "Trend Through Peaks Method," "The Capital-Output Ratio Method," and "The Okun Method," but "that our estimates have a better theoretical basis than competing series."⁴ The authors, however, admit that there are problems with their measure, and so, by assumption, with the measure used in this study. The problems concern the use of a natural rate of unemployment of 5%, and the way in which the capital stock is measured. Nevertheless, they conclude

that "our estimates do accurately capture the path of the productive capacity of the Canadian economy."⁵

E(B/W) - the expected value of the replacement ratio. The measure is derived by:

$$E(B/W) = (1-DEN) \times (B/W)$$

The Denial component relates to the probability of not receiving UIC benefits at the initial stage of application. It is the complement of the probability of receiving UIC payments. Thus (1-DEN) is the ratio of initial claims allowed to initial claims received, expressed as a percentage. The sources for the Denial data are Statistics Canada, 73-504, for 1953/I to 1958/IV, and Statistics Canada, 73-001, for 1959/I to 1978/IV.

The replacement ratio, B/W, is the ratio of the average weekly benefit to the average weekly wage in manufacturing. The source for both is Statistics Canada, 11-003. The replacement ratio is corrected for the fact that benefits became subject to tax in 1972.

S Var - the seasonal measure was produced by estimating the variance of the unemployment seasonal correction factors. The correction factors are given by twelve monthly figures, and hence a yearly indication of whether or not seasonal unemployment is changing can be obtained. With respect to a quarterly analysis of seasonal unemployment this is not the case. To overcome this quarterly variances were calculated. The method used was to assume a monthly average seasonal correction factor of 100, and then obtain four quarterly variances. Thus:

$$S \text{ Var} = \sum_{i=1}^3 \frac{(X_i - \mu)^2}{N}$$

where X_i for $i = 1$ to 3 relate to the monthly correction factors for the quarter, and μ is the average, assumed to be 100. The source for the correction factors is Statistics Canada, 71-201.

w/r - the measure of structural unemployment was given by the ratio of the real cost of labour to the real cost of capital. The real cost of labour, w , is given by:

$$w_t = \frac{W_t}{LLE_t (GNEPD_t) (1+pr)^t}$$

where W_t is the total wage bill for quarter t ,

LLE_t is the labour force employed in quarter t ,

$GNEPD_t$ is the GNE price deflator for quarter t ,

and $(1+pr)^t$ removes the gain attributable to productivity increases. The productivity (pr) component is obtained by regressing the real wage, w_t , on time.

$$\log(w_t) = a_0 + a_1 (\text{TIME})$$

and pr is given by a_1 . The values for W_t , LLE_t , and $GNEPD_t$ were obtained from SCQUEM.

The cost of capital measure was given by the interest rate on prime loans of chartered banks, corrected for inflation. Thus:

$$r_t = RPM_t - \pi_t$$

where RPM_t is the relevant interest rate, and

π_t is the current inflation rate, as measured by the percentage change in the consumer price index.

Both measures were obtained from SCQUEM. Thus the structural variable was given by:

$$\frac{W}{r}_t = \frac{\frac{W_t}{LLE_t (GNEPD_t)(1+pr)^t}}{RPM_t - \pi_t}$$

The Demographic variables.

LF14-24/LF - the youth demographic variable. The labour force of the group aged 14 to 24 divided by the total labour force. Source Statistics Canada, 71-201.

LFW25+/LF - the female demographic variable. The ratio of the female labour force aged 25 and over to the total labour force. Source as for LF14-24/LF.

Time - used in the labour supply and labour demand equations.

SDUM1, SDUM2, and SDUM3 - the seasonal dummy variables included to allow for the fact that the included independent variables are not seasonally adjusted.

3.3 Background to the Econometrics

This section briefly deals with four aspects of the estimation of the theoretical model. These are the functional form used, the inclusion of lagged independent variables, the problem of autocorrelation, and the level of significance used in the statistical tests.

The functional form used is a linear additive one. The theoretical section of the study has attempted to explain the causes of Canadian unemployment through the inclusion of the independent variables. In the discussion of the mechanisms through which the independent variables affected the dependent variables, the study was primarily interested in constructing straightforward cause and effect relationships. This can be contrasted with the approach taken by Grubel et al,⁶ where independent variables interact

with each other in explaining the dependent variable.

The variables thought to be most susceptible for lagging were the cyclical variable (GAP), and the technological variable (w/r), but it is accepted that arguments could be made for lagging other independent variables.

The presence of autocorrelation, as Kmenta⁷ says, leads to a bias in the variances of the regression coefficients. The result is that statistical inferences cannot be made with any degree of confidence. The solution to this problem is to correct the model for autocorrelation, and the technique used is the Hildreth-Lu approach.

The significance of the regression coefficients was tested at the 5 per cent level, and the critical values of t with ninety degrees of freedom are 1.66 for a one-tail test and 1.99 for a two-tail test. The critical value for the F-ratio with nine variables and ninety-three degrees of freedom is 2.00 at the 5 per cent level of significance.

3.4 The Results

TABLE IV

REGRESSION RESULTS, QUARTERLY DATA, CANADA 1953/I - 1978/IV. NOT CORRECTED FOR AUTO CORRELATION

DV*	C	GAP	GAP-1	E(B/W)	w/r	w/r-1	S Var	T	$\frac{LF^{14-24}}{LF}$	$\frac{LF^{w25+}}{LF}$	S1	S2	S3
L/P	47.51 (.81)	.0114 (.0249)	.0842 (.0253)	9.49 (2.02)	-.00055 (.0038)	-	.00105 (.00026)	.121 (.0078)	-	-	-2.33 (.34)	.73 (.27)	1.77 (.26)
									$\bar{R}^2 = .94$	F = 180.2	d = .56		
E/P	51.05 (.73)	.099 (.022)	.085 (.023)	8.95 (1.84)	-.0082 (.0034)	-	.00044 (.00024)	.055 (.0071)	-	-	-3.73 (.31)	-.27 (.24)	1.61 (.24)
									$\bar{R}^2 = .91$	F = 116.5	d = .7		
U/P	-3.54 (.62)	-.088 (.019)	-.00055 (.019)	.47 (1.54)	.0077 (.0029)	-	.00062 (.0002)	.065 (.0059)	-	-	1.39 (.25)	1.01 (.2)	.17 (.2)
									$\bar{R}^2 = .90$	F = 111.8	d = .68		
U/L	-.38 (2.33)	-.20 (.031)	- (.281)	8.46 (2.81)	- (.0051)	.0094 (.0051)	.00095 (.00032)	-	-22.47 (9.06)	36.61 (7.95)	.22 (.42)	.85 (.29)	1.05 (.47)
									$\bar{R}^2 = .70$	F = 25.47	d = 1.14		

Note: Standard errors in parentheses.

Means of Variables:

L/P = 56.52	GAP = -1.11	w/r-1 = 99.7
E/P = 54.57	GAP-1 = -1.02	T = 52.5
U/P = 1.94	E(B/W) = .22	S Var = 65.95
U/L = 5.57	w/r = 100.1	$LF^{14-24}/LF = .24$
		$LF^{w25+}/LF = .19$

Durbin-Watson critical values
with n = 100 and k = 9
at the 5% level

$d_L = 1.86$
 $d_U = 1.49$

∞

* DV = Dependent variable.

TABLE V

REGRESSION RESULTS, QUARTERLY DATA, CANADA 1953/I - 1978/IV. CORRECTED FOR AUTOCORRELATION

DV*	C	GAP	GAP-1	E(B/W)	w/r	w/r-1	S Var	T	$\frac{LF^{14-24}}{LF}$	$\frac{LF^{w25+}}{LF}$	S1	S2	S3
L/P	51.08 (.92)	-.177 (.0127)	.0322 (.0145)	-.463 (1.83)	-.00136 (.00229)	-	.000479 (.000102)	.102 (.0122)	-	-	-1.55 (.146)	.592 (.126)	1.82 (.9D-1)
									$\bar{R}^2 = .96$	F = 277.6	$\rho = .9$	d = 2.23	
E/P	54.26 (.95)	.0315 (.0122)	.0151 (.0138)	-.2 (1.75)	-.0049 (.0022)	-	-.00015 (.00009)	.0333 (.0128)	-	-	-3.13 (.14)	-5.44 (.121)	1.71 (.09)
									$\bar{R}^2 = .98$	F = 549.2	$\rho = .91$	d = 1.81	
U/P	-3.11 (.65)	-.0535 (.0133)	.0138 (.015)	-.193 (1.8)	.0043 (.0022)	-	.0006 (.0001)	.0667 (.0064)	-	-	1.55 (.15)	1.11 (.13)	.112 (.101)
									$\bar{R}^2 = .90$	F = 101.5	$\rho = .72$	d = 2.11	
U/L	-8.46 (3.71)	-.0938 (.0272)	-	1.19 (3.51)	-	.0103 (.0044)	.00101 (.00018)	-	36.56 (14.89)	15.53 (9.98)	.921 (.299)	.583 (.224)	-1.71 (.63)
									$\bar{R}^2 = .74$	F = 34.7	$\rho = .78$	d = 2.06	

*DV = Dependent variable

3.5 Interpretation of the Results

The aim of this section is to contrast the empirical findings with the a priori expectations. The results used are those that have been corrected for the presence of autocorrelation. The results are interpreted in three ways, these are

- (i) their sign,
- (ii) their statistical significance, and
- (iii) their contribution factor.⁸

Finally, some comments are made concerning the overall significance and stability of the regression equations.

3.5.1 The Gross National Product Gap.

The GNP gap was postulated to be negatively related to U/L, U/P, and L/P, but positively related to E/P. The results show that theory is supported by empiricism in all situations where the GAP variable is unlagged. The introduction of a lag produces theoretically incorrect signs, but the coefficients are not statistically significant. This is in contrast to the unlagged GAP variable which is statistically significant in all four equations.

The coefficient value for the GAP variable, with respect to the unemployment rate, is -0.094 (see Table V). A one unit increase in the GNP gap leads to a 0.094 of a unit increase in the unemployment rate. Over the time period analysed the GNP gap has increased by a quarterly average of 15 percentage points. Thus, holding all other things constant, increases in the GNP gap would have increased the unemployment rate by 1.4 percentage points.⁹ The unemployment rate, seasonally unadjusted, for 1978 was 8.4 per cent of the labour force. If the GNP gap had not changed over the period, then the unemployment rate would have been 7.0 per cent.¹⁰ This is the natural rate

of unemployment for 1978, and is in general agreement with recent literature on the Canadian unemployment rate.¹¹ Therefore, if the GNP gap had been maintained at the 1953 level through appropriate economic policies, then the unemployment rate would have been 1.4 per cent lower. More will be said concerning the appropriate economic policies in the Conclusions.

3.5.2 The Expected Replacement Ratio.

The expected replacement ratio, $E(B/W)$, is shown to have the wrong theoretical sign in the supply of labour equation, and the unemployment/population equation, although in both cases the coefficients are insignificant. For the demand for labour and the unemployment rate equations the signs are in accordance with the a priori postulates, but again the variable is insignificant in explaining either phenomenon. The usual replacement ratio, B/W , was also included in the regressions, in place of $E(B/W)$, but was found to be insignificant in all cases.¹²

The coefficient value for the expected replacement ratio is 1.19, and the expected replacement ratio experienced a decrease of approximately four per cent from 1953 to 1978. Therefore, the unemployment rate should have decreased by .0476 of a percentage point, holding all other things constant.

For the period 1971/IV to 1978/IV, the average increase is $1\frac{1}{4}$ per cent, and so the unemployment rate should have increased by .068 of one percentage point, holding all other things constant.

3.5.3 The Technological/Structural Variable.

The cost of labour to the cost of capital ratio, w/r , was included so that changes in unemployment caused by technological factors might be captured.

In the U/P, U/L, and E/P equations the coefficient has the correct a priori sign, while in the supply of labour equation the sign is negative.

This shows that an increase in the ratio leads to a decrease in the supply of labour, and that discouraged worker effects dominate additional worker effects. This finding must be treated with caution as the coefficient is not statistically significant. The other three coefficients are significant and the ratio, w/r , was found to work best with a one period lag in the unemployment rate equation.

The coefficient value for the w/r ratio, with respect to the unemployment rate, is 0.0103, and indicates that a one unit increase in the ratio leads to a very small increase in the unemployment rate. The percentage decrease in $w/r-1$ over the period has been 79.5 percentage points, and thus the unemployment rate should have decreased by .82 of a percentage point.

3.5.4 The Demographic Variables.

The study used TIME, and the two demographic variables, LF14-24/LF, and LFW25+/LF to capture the effects of changes in societal attitudes, and changes in participation rates and population changes in causing Canadian unemployment. The TIME variable was used in the L/P, E/P, and U/P equations. In all three it possesses the theoretically correct sign, and is also highly significant statistically. It is interesting to note that the coefficient in the supply equation is greater than that in the demand equation, this would appear to question Say's Law and point to the relevance of including a GAP variable.

The two labour ratio variables were used in the unemployment rate equation. The LF14-24/LF variable is positive and statistically significant, whereas the sign on the LFW25+/LF variable is positive but not statistically significant. Thus the youth measure agrees with a priori theory, and the female measure answers the question posed in the theoretical section. In

the theoretical section two opposing theories were postulated. Empiricism has shown the theory of increased unemployment to be caused by increases in the participation rate of prime age females to be correct. But this must be viewed in the context of the coefficient being statistically insignificant.

The coefficient value for the LF14-24/LF measure is 36.56, and the percentage increase in this variable, over the period, has been four per cent. Thus, holding all other things constant, the increase in the unemployment rate attributable to this group is 1.46 percentage points.

The coefficient value for the measure LFW25+/LF is given by 15.53, and the average increase over the period analysed is 13 per cent. So the unemployment rate has been increased by over two percentage points by the increase in this measure, all things held constant.

3.5.5 The Seasonal Variance Measure.

The seasonal variable, S Var, possesses the theoretically correct signs in the E/P, U/P, and U/L equations, and is statistically significant in each also. In the supply of labour equation the coefficient is positive. This indicates that the additional worker effect is greater than the discouraged worker effect, the coefficient is again statistically significant.

The coefficient value is .00101 for S Var with respect to the unemployment rate. The Seasonal Variance measure has experienced a decrease of eight hundred units over the period 1953 to 1978. The outcome is that the unemployment rate should have decreased by 0.8 percentage points due to changes in seasonality factors.¹³

TABLE VI
THE CONTRIBUTION TO THE CHANGE IN THE UNEMPLOYMENT RATE
OVER DIFFERENT PERIODS IN PERCENTAGE POINTS

	<u>1953-78</u>	<u>1953-70</u>	<u>1970-78</u>
GAP	1.40	0.87	.60
E(B/W)	-0.05	-0.12	0.07
w/r-1	-0.82	-1.46	-0.16
S Var	-0.80	-1.04	-0.09
LF ¹⁴⁻²⁴	1.46	0.08	0.45
LF ^{w25+}	2.00	1.24	0.81
	<u>3.20</u>	<u>-0.43</u>	<u>1.68</u>

3.5.6 The Overall Model.

The explanatory power of the regression equations is highly satisfactory when the F-ratios are compared with the critical value, and the \bar{R}^2 values are also adequate.

The equations were subjected to the Chow test so that stability could be tested for. If the equations passed the Chow test, then predictions made from them would have greater validity. The Chow test requires that the time period be split at some meaningful point in time, and the point selected was the third quarter of 1971 when the UIC system was liberalised. The critical value of F for the Chow test at the 5 per cent level of significance is 2.00 with the appropriate degrees of freedom. The F values obtained were: the supply equation (2.15), the demand equation (3.18), the unemployment/population equation (1.16), and the unemployment rate equation (8.4).

Therefore the supply of labour, the demand for labour and the unemployment rate equations fail the Chow test, and so it must be concluded that their estimated coefficients are unreliable for prediction purposes.

In testing for the presence of multicollinearity the Klein rule of thumb was used.¹⁴ This method's use shows that multicollinearity is not a problem in any of the four equations. But it must be borne in mind that this approach has been criticised.¹⁵

NOTES

1. H. Visser, The Quantity of Money (London: Robertson, 1971), p. 207.
2. This reflects the introduction of the Labour Force Survey. The Labour Force Survey, which was begun in November, 1945, was taken at quarterly intervals until November 1952. Since then it has been carried out on a monthly basis.
3. J. Brox, and M. Cluff, "Potential Output and the Real GNP Gap," Canadian Statistical Review, January 1979, pp. i-xi.
4. Ibid., p. xi.
5. Ibid., p. xi.
6. Grubel, Maki and Sax, op. cit., p. 181.
7. Jan Kmenta, Elements of Econometrics (New York: MacMillan Publishing Co., 1971), pp. 278-82.
8. The contribution factor indicates the change in the unemployment rate attributable to the independent variable. It is given by

$$\partial U / \partial X_i \times \Delta(X_i \text{ to } X_n)$$
9. The contribution factor is used for the unemployment rate, and not for the supply of and demand for labour. This is due to the fact that the principal concern of the present study is unemployment.
10. This assumes that the unemployment rate in 1953 was the natural rate of unemployment. This may be heroic.
11. Grubel and Maki, op. cit., pp. 1-35.
12. Using the expected replacement ratio, B/W, instead of E(B/W), the following result was achieved for the unemployment rate equation. Standard errors are in paranthesis.

$$\begin{aligned}
 U/L = & -8.05 - .097(\text{GAP}) + .32(\text{B/W}) + .01(\text{w/r}-1) \\
 & \quad (.027) \quad (4.46) \quad (.004) \\
 & + 34.9(\text{LF14-24/LF}) + 16.1(\text{LFW25+}/\text{LF}) + .001(\text{S Var}) \\
 & \quad (14.7) \quad (9.9) \quad (.0002) \\
 & + .94(\text{S1}) + .61(\text{S2}) - 1.65(\text{S2}) \\
 & \quad (.28) \quad (.21) \quad (.63)
 \end{aligned}$$

$$\bar{R}^2 = .74 \quad D-W = 2.06 \quad F = 34.49$$

13. Table VI shows the factors contributing to the increase in unemployment over third time periods. The time periods are 1953 to 1978, 1953 to 1970, and 1970 to 1978. The periods are chosen arbitrarily. The unemployment rate increased by 5.4, 2.7 and 2.6 percentage points respectively.
14. G.S. Maddala, Econometrics (New York: McGraw-Hill, 1977), p. 185.
15. Ibid., p. 186.

SECTION IV

CONCLUSIONS

The principal aim of this study was to take a "new" approach to the causes of Canadian unemployment. This was attempted through the construction of new theoretical determinants, and then that theory was tested empirically. The findings show that demand and supply side factors cause unemployment. However, it must be remembered that the unemployment rate equation failed the Chow test, and therefore the regression coefficients are not as reliable as they might be. Nevertheless, it is possible to draw some conclusions from the results.

4.1 The statistically significant variables causing Canadian unemployment on the supply side are the change in wage rates relative to the cost of capital, seasonality factors as captured by the S Var measure, and the ratio of youth to total labour force. The only demand side variable, the GNP gap, was found to be a statistically significant cause of unemployment.

4.2 The question of unemployment being caused by increases in the level of the replacement ratio is answered in the negative. The findings of previous studies are challenged, and the general consensus that increases in UIC benefits will lead to increases in the unemployment rate requires further examination. This finding is not only based on the "new" measure, $E(B/W)$, but also on the standard one, B/W .

4.3 The claim that increases in the female labour force participation ratio will lead to an increase in the unemployment rate is, also, found to be unproven. Although, given the increasing labour force participation of women, and the fact that the difference between the overall unemployment

rate and the unemployment rate of the female group is decreasing rapidly, it might be possible to postulate that in the foreseeable future this group will be significant in explaining the causes of Canadian unemployment.¹

4.4 The findings point to two aspects. First, further research is required concerning the question of UIC induced unemployment. This study shows that unemployment is not caused by changes in the level of unemployment insurance payments, but other studies have shown the opposite.

Second, the question of unemployment being caused by demographic influences appears to be important, and so worthy of a separate study.

NOTES

1. At the time of writing (March 1980), the unemployment rate for females aged 25 years and over is greater than the overall unemployment rate.

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