

The Incongruence Between the Theory of Hysteresis
and the Empirical Tests for the Canadian Labour Market

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Section 1.0 - Introduction

Ever since the recession of the early 1980's, the Canadian economy has experienced unprecedented high levels of unemployment. The unemployment rate is one of the most well-tracked indicators of an economy, as well as the rate of growth of aggregate output and the rate of inflation. High unemployment leads to reduced potential GDP and to increased inequality of income distributions. During the last two decades, there have been many fundamental changes affecting many Canadian workers, such as increasing numbers of long-term unemployed and many changes in the unemployment insurance program. The upward trend in unemployment since the Second World War has raised questions about the mainstream view of the economy's ability to correct itself.

Variations in unemployment are generally classified as cyclical or structural. Cyclical unemployment fluctuates around the natural rate or full employment, whereas structural unemployment causes the natural rate to change. Structural unemployment occurs when there is a mismatch in the demand for labour and skills supplied. This imbalance is due to demographic changes or changes in labour market institutions, due to shifts in the composition of economic activity.

There is a divergence of views among economists as to the causes and solutions for persistent unemployment. The common view is that structural change has moved the natural rate

upward, with actual rates tending to oscillate about it. In Canada, factors such as the rise in female participation into the labour force and legislation that provide unemployment benefits have been suggested to explain the rise in unemployment rates. The natural rates rose for many countries; however, there was a concern whether structural factors could be the only explanation. Another view is that when a shock hits an economy, such as an increase in oil prices, actual unemployment rises and moves up the natural rate, which is determined in part by structural factors. Once the shock has passed, the natural rate can be higher. However, the temporary shock could last a long time or be permanent. This view of unemployment is seen as being history-dependent, which leads to the concept of hysteresis or persistence.

Hysteresis is not a new phenomenon, but it is an alternative theory to explaining unemployment. The problem of persistent unemployment originates from Europe where increasing unemployment rates in Europe challenged the notion of the economy returning to a unique long-run equilibrium. Compared to the US, the Canadian unemployment rate has been higher since the mid 1980's, especially during the 90's; this might explain why the priority of research has been to explain the differences between the two economies. The Canadian rate of unemployment increased dramatically in the 1980's and 1990's. Canada's unemployment rate during the 1981-82 recession increased to about 12.0 % and declined slowly. Even during the 90's, the average rate is still over 8.0 %, but it has been declining slowly. Figure 1 illustrates the increasing unemployment rate over the last two decades, from 1976 to 1997. This trend of persistence has led to the idea of hysteresis in Canadian unemployment.



Figure 1.

Source: Statistics Canada

Although economists accept that structural changes have occurred and unemployment rates are at higher equilibrium rates, the controversy rests in the direction of causality. Have structural changes caused the high levels of unemployment experienced, or has the past rate of unemployment had an effect on the current rate? Another way to consider the problem is whether structural unemployment has been exogenous or endogenous. This paper summarizes the literature and empirical evidence of hysteresis as the key to understanding unemployment in Canada from a macroeconomic and microeconomic perspective. Much of the empirical evidence obtained to date has been generated by research within the macroeconomic framework, with very few studies couched within the microeconomic framework. In fact, the two approaches are disparate.

Given the number of explanations put forth in explaining unemployment persistence, empirical studies of hysteresis can be grouped into four test approaches which fall under a macro approach or a micro approach. The hysteresis issue from the macro perspective consists of

testing for unit roots in the unemployment rate and empirical analysis within a Phillips curve framework. Empirical evidence that have micro foundations involve testing for insider-outsider wage formation and testing for negative duration dependence among others, but these are the two which will be dealt with in this paper.

At the macroeconomic level, the main concern has focussed on models with the Phillips curve for inflation and unemployment for the economy as a whole. Also, typical macroeconomic studies involve the investigation into time series properties of the unemployment rate. In these studies, researchers have tried to determine whether unemployment has exhibited persistence. But there has been increasing attention paid towards the microeconomic foundations because the persistence of high unemployment following the last recession and recovery still raises many questions as to what is occurring in the labour market. The causes of the high unemployment rate still need to be addressed. That is, what are the behavioural mechanisms occurring at the level of the individual firm or worker, that can explain unemployment persistence observed at the level of the economy?

As mentioned earlier, there are two main mechanisms that will be addressed. The insider-outsider wage determination model provides a viewpoint of how the decision-making processes of workers, unions and firms can impact changes in aggregate wages, employment and unemployment for the economy. On the other hand, unemployment duration is seen as another important factor affecting the aggregate unemployment rate. A focus at the microeconomic level will examine two Canadian empirical studies of duration dependence of individual unemployment as the cause of hysteresis.

Reviewing the results of various Canadian studies, the question that this paper tries to answer is: Is there a clear link in hysteresis that is observed at the macro level but is caused by factors at the micro level? A link between the macro and micro level is important in our understanding of the functioning of labour markets. However, given the empirical evidence

presented in this paper, it appears that there is still a wide gap between the two as little research has dealt with the actual causes of persistence. In other words, there has been no theoretical or empirical models of the link (ie. behavioural channels) between micro foundations for hysteresis and the aggregate level of hysteresis. There is an analogy between the two levels, but no more. The research which has been focussed on the micro behavioural mechanisms tends to be quite technical and limited in scope.

This paper will now summarize the evidence on whether the Canadian labour market is characterised by hysteresis. Section 2 will provide a brief overview of competing theories and the various models of hysteresis that try to explain the workings of the labour market and some policy implications. Section 3 will cover some International experience but will focus on the empirical evidence of the Canadian economy. Finally, Section 4 will provide some comments and concluding remarks as to the status of hysteresis in Canada and potential for further research.

Section 2.0 - History of the Labour Market, Policy Implications and Theories of Hysteresis

This section will provide a history of how labour market theory and performance has evolved, some policy implications, and then an overview of the various theories of hysteresis that have been proposed. Although a number of theories have been proposed, a few of the theories are not very explicit in explaining hysteresis or persistence.

Most theories of unemployment attempt to explain the fluctuations and levels in unemployment, and why levels are different between countries. The view of Friedman(1968) was that economic fluctuations were temporary fluctuations from the natural rate of unemployment, which is the long-run equilibrium level of unemployment. The natural rate, also known as the NAIRU, could be observed to change with the structural characteristics of the economy. However, interpretations of the natural rate encountered problems around 1980 as the natural rate had risen, or so people thought. The relevance of the natural rate theory had grown since that recession due to the slow recovery that followed. As actual unemployment increased, the conventional structural determinants could not totally explain the persistence.

Standard macroeconomics suggest that either supply side factors have raised the equilibrium (ie. the natural rate of unemployment) or a negative demand shock has raised unemployment temporarily above its equilibrium rate. In Europe, the unemployment rate did not return to initial levels once inflation had been stabilized. Canada was experiencing high levels of unemployment as well, but not to the same degree. The main problem of the 90's has been that the rate of job creation was slow. One would expect a great deal of restructuring to have contributed to unemployment from skills mismatching due to the large number of people that have dropped out or delayed entering into the labour force to invest in more training for a more technologically oriented workplace. These people would normally return to the labour force during times of economic expansion, which would slow the decline in the unemployment

rate.

Major structural adjustments were attributed to technological advances as well as other factors. For example, Bean(1994) suggests many structural factors that could explain the European unemployment problem such as:

- 1) the slowdown in productivity growth
- 2) changes in tax and import prices such as for oil
- 3) increased wage bargaining of unions
- 4) increased mismatch between the demand and supply of various markets of labour
- 5) effects of increasing unemployment benefits, which results in raising the reservation wage
- 6) increases in the price markup due to higher interest rates, and
- 7) changing demographics.

These changes were believed to raise aggregate unemployment rather than the traditional shocks to aggregate demand or supply. Instead of the traditional macroeconomic stabilization policies, policy for structural changes consider microeconomic intervention geared to making labour and product markets to be more flexible by way of training and becoming more adaptable and competitive.

However, if unemployment is due to inter-sectoral shifts in labour demand, then a slow process of labour reallocation across sectors could raise the unemployment rate. One can observe that there has been inter-sectoral restructuring and within-firm restructuring as a result of modernization. However, studies by Lilien(1982) and Samson(1985) do not provide evidence that increases in unemployment are due to inter-sectoral shifts in employment. These studies try to model changes in growth rates of employment between industries. Subsequent American studies have attempted to measure the magnitude of structural unemployment. Their lack of findings to support the sectoral shifts as an explanation for unemployment resulted in the search for another explanation for persistent unemployment.

A basic concept underlying hysteresis is the ability of transitory shocks to have permanent effects in a dynamic model setting. According to Reed(1997, p.393), “ The distinguishing feature of a hysteretic model is that a solution cannot be obtained from the present state of explanatory variables. The past history must be invoked and the equilibrium is path dependent.” Hysteresis is very much a statistical concept in which past values are used to explain the present values. It is a phenomena that is thought to commence during periods of high unemployment and harsh economic conditions. One of the problems encountered in the literature is the definition of hysteresis and the various interpretations.

Transitory shocks are manifested in the persistence of unemployment. In summary, there have been three different interpretations or competing approaches in trying to explain persistent unemployment. First, increased unemployment has been attributed to exogenous structural changes, but it has been difficult to determine which factors were responsible. Second, unemployment persistence has been temporary and the natural rate hypothesis still holds. This implies that it is not really persistence. That is, unemployment is still converging toward a unique natural rate. Finally, if the equilibrium unemployment rate is dependent on the actual past rate of unemployment, then this implies hysteresis and invalidates the natural rate hypothesis, as structural changes are deemed to be endogenous.

Although European countries and Canada showed signs of hysteresis in their unemployment rates, the structural factors could not be isolated in order to determine the appropriate reform needed. The main obstacle was the difficulty to estimate the size and duration of these effects on the NAIRU.

Other concepts related to hysteresis are models of the economy that exhibit multiple equilibria and the measurement of potential output. Multiple equilibria implies the existence of two equilibria or states that the economy can come to rest, instead of a unique one. This approach is similar to hysteresis in that a temporary shock could cause the economy to move to

another equilibrium permanently, after the shock had occurred. However, much of the research is still in the exploratory stages as to how each equilibrium is determined. But these two outstanding issues will not be covered in further detail in this paper.

There are several interpretations of hysteresis. For the macroeconomic studies, the presence of a unit root in the unemployment rate, which defines the unit root process, should be equal to one. This would imply the presence of hysteresis and it is referred to as “pure” or “full” hysteresis. Basically, the parameter of the estimated unemployment rate should be equal to exactly one. However, this condition was relaxed, allowing for hysteresis to mean persistence and the sum of the lagged unemployment rate coefficients could be close to one. That is, the unemployment rate was a function of its past values. This is commonly referred to as “partial” hysteresis.

Bean(1994), Jones(1995) and Reed(1997) provide a summary of the main behavioural channels which might give rise to hysteresis. Hysteresis is thought to be generated by a number of microeconomic behavioural effects such as,

- 1) insider/outsider models (or union models) in which negative shocks to employment reduce employment, and workers are not rehired as the insiders prevent the decline in real wages needed to reabsorb the unemployed;
- 2) human capital models, which argue that the unemployed remain in this state because their skills deteriorate;
- 3) hiring bias against the long-term unemployed;
- 4) institutional models, where restrictions on labour market behaviour may produce slow adjustment to shocks such as policy induced unemployment benefits; and
- 5) under-investment of capital stock after a recession.

Although many theories of unemployment have been suggested, some have become more popular than others, as will be seen by the problems encountered in the various approaches of

testing in section 3. The following subsections will expand further on the various models, which provide a basis for a micro-foundation for hysteresis.

2.1 Insider-Outsider Models with Extensions Based on Union Membership

This Insider-Outsider theory has received much attention as a possible explanation for wage rigidity. Insider-outsider models of wage determination have become popular in the microeconomic modelling of hysteresis. This model was developed by Blanchard and Summers (1986) and Lindbeck and Snower (1986, 1988a, 1988b). Wages are set in a bargaining process between a firm and its current work force (the insiders) with no concern for the welfare of the unemployed (the outsiders).

As the insiders make it costly to replace workers, this gives the insiders some bargaining power that enables them to ask for higher wages than what are economically justified. In addition to these turnover costs, other factors that can provide a source of insider power are hiring and recruiting costs, legislation regarding severance pay and advance notice, and training costs.

Insiders are able to harass new employees or withdraw cooperation in order to discourage them from applying for jobs. Indirectly, this seems to raise wages and lower employment. In fact, these actions of harassment and withdrawing cooperation can be seen as a form of labour turnover costs. Given these costs, there is no incentive for firms to hire the unemployed who are willing to underbid the wages of the insiders.

For the monopoly union model, union behaviour is such that workers and union negotiate a real wage, and the firm determines the level of employment. As the product demand and demand for labour by the firm are not known, this wage might be obtained through bargaining. This union model is basically the framework used for the insider-outsider model. When

employed workers are governed by unions who have bargaining power, the interests of the unemployed are not defended. Subsequently, the responsiveness to wages given the unemployed is greatly reduced. Higher wages can lead to smaller employment and therefore lasting effects on employment. In effect, this can cause an increase in the natural rate.

After Blanchard and Summers' seminal paper, the insider-outsider theory has had various extensions. For example, one extension analyses the unemployed in terms of being short-term unemployed and long-term unemployed. Graafland (1992) and Lever (1991) treat the insiders as the employed and the short-term unemployed. In this case, the real wage has a positive correlation with the number of people who are considered to be long-term unemployed. In other words, the long-term unemployed tend to put less downward pressure on wages than the recent unemployed because they reduce search effort or firms do not want to hire them. However, as short-term unemployed become long-term unemployed, unemployment can persist.

2.2 De-skilling and Loss of Human Capital

Temporary increases in unemployment can become permanent when unemployed workers are impacted through de-skilling and the loss of human capital. Research has shown that training and accumulation of human capital can be reduced by a recession. When workers are laid off, their human capital deteriorates such that they have a poorer chance in gaining employment. This could lead to unemployment persistence.

2.3 Effects of Unemployment Duration

Effects of unemployment duration can produce effects that appear to be like hysteresis. If employers prefer to hire individuals who have been out of work for a short period of time over someone unemployed for a longer duration, then this policy could lead to persistent unemployment. In other words, the probability of leaving unemployment falls as the time spent unemployed increases with time. Layard and Nickell(1987) conclude that in Britain, the influence of the unemployed on wage-setting behaviour varies inversely with the duration of unemployment. The literature indicates that people who are unemployed for shorter durations are preferred to those unemployed for a longer duration. Not only is there a deterioration of human capital, but as people withdraw from the labour force, there is more upward pressure on wages.

Evidence indicates that if high unemployment continues for a long time, then the duration effect should increase as the unemployed are viewed as less employable. This duration theory is believed to provide an explanation for the inflexibility of wage determination, especially in Europe, when they experienced a large number of long-term unemployed.

2.4 Effects of Unemployment Insurance

The unemployment insurance system is another mechanism that is believed to contribute to hysteresis. Unemployment could increase by subsidizing a person's job search, as this raises the duration of unemployment spells. The effect of receiving UI benefits over time could cause downward pressure on wages on individuals who are continually unemployed. In other words, the more often someone is unemployed, there is less chance of earning a good wage. Also, Canada's regional extended benefits program is believed to cause people to repeatedly use the system, year after year.

2.5 Underinvestment in Physical Capital

The underinvestment in physical capital by firms has been suggested as a behavioural mechanism that can give rise to hysteresis. The equilibrium level of unemployment would increase if recessions could prevent the buildup of physical capital by firms. An overview of this literature has been carried by Blanchard(1990). Empirically, the American economy contradicted this theory. Therefore, this theory does not appear to be an important factor given its lack of empirical support and lack of a wage-setting response.

2.6 Summary of the Theories of Hysteresis

None of the various explanations are mutually exclusive. In fact, there are two potential causes of hysteresis, the effects of de-skilling and loss of human capital and the effects of duration, that are very closely related. It is difficult for empirical testing to differentiate between the two. Each theory has had some contribution to hysteresis effects that have been observed in the labour market.

It has been found that the impact of recessions are more persistent in Europe than in the US or Canada. Also, there is a consensus that the European labour market exhibits path dependency in their equilibrium rate of unemployment. In other words, the current equilibrium was dependent on its past values. Hysteresis has been a more important issue in Europe than in other countries such as Canada or the US. But on the other hand, unemployment persistence has been more of a problem in Canada than the US, and this paper tries to assess whether this phenomenon can help explain the persistent high unemployment rates that the Canadian labour market has been experiencing.

As much of the focus to date has been based on a macro data approach, there is growing evidence that analysis of micro data of the labour market may prove to be more suitable in analysing this phenomena in order to shed light on this complex issue of unemployment persistence. The underlying behavioural mechanisms can be mainly attributed to the insider-outsider wage bargaining and duration effects that the long-term unemployed experience. The insiders are able to obtain higher wages given their bargaining power and the high costs of hiring the unemployed. As the long-term unemployed begin to withdraw from the labour market, this could raise wage pressure and dampen employment. Although hysteresis at the macro level - a statistical phenomenon - has analogs at the micro level, the linking behavioural channels have not been developed very much, especially empirically.

Section 3.0 Empirical Studies on Hysteresis in Canada and Econometric Issues

There have been many empirical studies carried out trying to explain and identify hysteresis. Although studies have shown that European labour markets have exhibited this phenomena, the evidence for Canadian labour markets has been mixed. A review of some of these studies and econometric approaches will be provided as an illustration as to the difficulty in measuring and interpreting this phenomena.

The following sections survey the empirical literature on the assessment of hysteresis in labour markets for Canada, with a few major studies at the international level. The literature on hysteresis is vast and has resulted in a number of empirical test approaches. This survey is not an exhaustive summary of all the empirical evidence on hysteresis to date. However, it is evident that testing for hysteresis is sensitive to the econometric specification.

Empirical studies have basically followed four approaches of testing, which will be presented in the next four subsections as follows :

- 1) Testing the macroeconomic framework ; mainly studies of the Phillips curve relationship, which examines the relationship between inflation and unemployment and the presence of hysteresis,
- 2) Testing for univariate properties of time series ; studies involving variables such as the rate of unemployment, where unit root tests attempt to see if the level of a variable is stationary,
- 3) Testing for insider-outsider effects in wage formation ; microeconomic studies involving firm data rather than the global economy for the wage bargaining models, and
- 4) Testing for duration dependence in transitions into employment ; these studies concern long-term unemployment and the concept of duration dependence and how it relates to unemployment for individuals.

Unfortunately, the link between the macro phenomenon of hysteresis and the

microfoundations is accomplished by “handwaving” with reference to analogies that assume that a plausible economic story at the micro level is also influential at the aggregated, macro level. In fact there are very few studies that actually deal with data at the individual or firm level.

3.1 Testing the Macroeconomic Framework

The main objective of the studies in this section is to test two competing theories for the natural rate of unemployment. Canadian studies over the last decade have basically been assessing whether traditional Phillips curves should allow for hysteresis in the natural rate. This is the standard debate on hysteresis and its implications for the conduct of economic policy. Friedman's standard natural rate theory asserts that the natural unemployment rate depends only on structural factors such as demography, social policy and institutions. On the other hand, hysteresis theory argues that, in addition to the structural factors just mentioned, the actual level of unemployment and recent values of it could also have an impact on the natural unemployment level.

If the rate of unemployment experiences a shock and rises, that shock to the actual unemployment rate can become permanently imbedded in the natural rate of unemployment, so the NAIRU increases. This means that the threshold rate of unemployment before inflation goes up is raised, resulting in upward pressure on inflation. For example, if the natural rate increases, inflation used to take effect when the unemployment rate went down to 5%, whereas now inflation will be ignited when unemployment goes below 6%. As the NAIRU creeps up, the economy has more chance of overheating.

The purpose of all these studies have been to illuminate the debate over whether monetary policy has been too restrictive, causing the recession in Canada and the dispute of the appropriate measurement of the natural rate. According to the natural-rate view, the unemployment or loss of output is considered temporary, with the natural rate of unemployment and the potential level of output as anchors for any temporary shock.

From a policy point of view, the impact for determining the presence of "full" hysteresis in these Phillips curve type studies is the potential consequence on the sacrifice ratio, where the

sacrifice ratio is the temporary unemployment (or output loss) that can result from a permanent reduction of 1% in the rate of inflation. Also, the presence of "full" hysteresis implies that the standard natural-rate hypothesis no longer holds.

In this framework, the distinction between a permanent increase in unemployment versus a persistent increase in unemployment is relevant. The implications of hysteresis are important for monetary policy, as the costs associated with anti-inflation policies can have permanent effects rather than temporary effects if "full" hysteresis is present. It is only the presence of "full" hysteresis that matters in these Phillips curve studies. On the other hand, there is no difference in the meaning and implications of "full" or "partial" hysteresis when testing for unit roots in section 3.2; both cases indicate the degree of persistence of the unemployment rate.

Much of the empirical evidence of hysteresis in Canada consists of the macroeconomic research on the determinants of inflation and unemployment, where the general approach has been to estimate an expectations augmented Phillips curve equation, and to measure an unemployment gap or output gap. The modelling issues involves the specification of inflationary expectations, linearity of the Phillips curve, determination of potential output, and the nature of the labour-market. As the natural rate cannot be actually observed, research related to the estimation of the natural rate have wide confidence intervals.

The majority of the Canadian macroeconomic studies conform to the following basic framework as detailed and summarized by Jones(1995), as well as other researchers. As mentioned earlier, hysteresis is said to occur if the "natural" rate (U^{**}_t) is not only a function of structural and demographic variables (X_t) but also the past value of the actual unemployment rate U_{t-1} . A mathematical presentation is as follows,

$$U^{**}_t = d(X_t) + h(U_{t-1})$$

Next, a Phillips curve equation is considered that relates the rate of inflation to a measure of the gap or change between the actual and the natural rate of unemployment.

$$\Pi_t = a \Pi_{t-1} + b (U_t - U^{**}_t)$$

where Π_t is the rate of inflation,

U_t is the actual rate of unemployment,

U^{**}_t is the "natural" rate of unemployment,

$a * \Pi_{t-1}$ proxies lagged inflationary expectations,

By substituting the above definition of the natural rate, with the presence of hysteresis, into a derivative of the Phillips curve, we obtain the relationship that implies that both the level and the change in the rate of unemployment can be included in the Phillips curve equation,

$$\begin{aligned} \Pi_t &= a \Pi_{t-1} + b (U_t - h U_{t-1} - d (X_t)) \\ &= a \Pi_{t-1} + b (1-h) U_t + b h (U_t - U_{t-1}) - b d (X_t) \end{aligned}$$

The approach to testing for hysteresis has been to look for a negative effect given the change in the rate of unemployment on the rate of inflation, and no effect on the standard level effect. In other words, the level of the unemployment rate (U_t) should be an insignificant determinant of the rate of inflation (ie. $h = 1$), while the change (ie. the difference between $U_t - U_{t-1}$) in the rate of unemployment should be significant. Once again, "full" hysteresis implies that the past rate of unemployment (U_{t-1}) affects the natural rate with a coefficient of one, implying that there is no unique natural rate. Otherwise, if the coefficient is less than 1, it is referred to as "partial" hysteresis. The main idea is that basically the change term takes over the

role that the level of unemployment played in the conventional Phillips curve analysis.

A summary of the literature will now be provided chronologically by author since the late 80s, as these papers are all based on the Phillips curve framework. Once again, the goal for all these studies is to show that all other factors held constant, the change in the unemployment rate will increase the natural rate, causing inflationary pressure. This literature concerning the Canadian labour market has studied the increase in the unemployment rate, with only one study by Fortin(1991), indicating “full” hysteresis. These studies have used different independent variables and time spans in the analysis, or extended the empirical model by building on the earlier studies.

This is a brief overview of the seven studies that follow. First, initial research of Fortin(1989) will be summarized, as it provided the groundwork for the other studies. Although his specification of unemployment lags produced unsuccessful results, this paper led to subsequent improvements. Even though Fortin(1991) found no evidence of hysteresis in Canada using data over 1956-84, this is the only paper that supports the “full” hysteresis hypothesis for the 1973-90 period. Cozier and Wilkinson(1991) rejected labour market hysteresis based on Phillips curve estimates over the 1964-88 period. The results of Fortin(1993) indicate a higher degree of persistence in unemployment for US than Canada. However, these results are questionable as the US has not experienced high levels of unemployment. . Subsequently, Poloz and Wilkinson (1992) and Jones (1995) also obtain results that are borderline. One of the more recent studies, by Nott(1996), extends the study by Fortin(1991) with more current data up to 1995.

Now a more detailed summary of these various Canadian empirical studies will be provided with their different specifications. Initial research undertaken in **Fortin(1989)** tries to show that the increase in the unemployment rate has been Keynesian such that employment would respond to traditional policy by induced demand expansion. After several estimations,

Fortin specifies inflation as a function of the unemployment rate for adult men, lagged food inflation, energy and import price inflation, the change in indirect tax rate excluding food and energy, and wage and price controls.

Fortin investigated the absence of a level effect from the unemployment rate for adult men by including 3 lags of unemployment. He used annual data from 1956-1984, and the price variable used was consumer price inflation for all items excluding food. His preliminary test for hysteresis consisted of testing the hypothesis that the constant and the sum of the coefficients of current and lagged unemployment equal zero. He concludes no evidence of hysteresis is present. In other words, his estimates of the natural rate of unemployment resulted in a stable natural rate hypothesis. The problem with this study, as well as others, is the lack of data to include the late 1980s and 1990s in order to capture hysteresis. In addition, a term with the change in the unemployment rate is required to test for "full" hysteresis. In fact, his specification has been extended and re-estimated by the other studies to follow which will include the change term that is needed to test for hysteresis.

Fortin(1991) is the first study to find the presence of "full" hysteresis. His specification is similar to Fortin(1989) but adds lagged values of the change (ie. difference) in the adult male unemployment rate (ΔU_t) as these additional lags are required to study hysteresis. The dependent variable used is the same but he uses annual data for a longer time period from 1957-1990, and with more current data. Once again, Fortin specifies inflation as a function of the unemployment rate for adult men, lagged food ($\text{Food } \Pi_{t-1}$), energy and import price inflation ($\text{Energy } \Pi_{t-1}$ and $\text{Import } \Pi_t$), the change in indirect tax rate excluding food and energy (Indirecttaxchange), and wage and price controls (AIB). His estimation of the equation has been reproduced in column (1) of Appendix A. The specification is as follows,

$$\begin{aligned} \Pi_t = & \text{Constant} + a * \Pi_{t-1} + b_1 * U_t + b_2 * \Delta U_t + b_3 * \Delta U_{t-1} \\ & + b_4 * \Delta U_{t-2} + c_1 * \text{Food } \Pi_{t-1} + c_2 * \text{Energy } \Pi_{t-1} + c_3 * \text{Imports } \Pi_t \\ & + c_4 * \text{Indirecttaxchange}_t + c_5 * \text{AIB} \end{aligned}$$

where Π_t	=	annual percentage change in the CPI excl. food and energy
const	=	constant
U_t	=	unemployment rate for men over 25 years old
ΔU_t	=	$UMALE_t - U_{MALE_{t-1}}$
ΔU_{t-1}	=	unemployment rate, one-year-lagged change
ΔU_{t-2}	=	unemployment rate, two-year-lagged change
Food Π_{t-1}	=	relative annual percentage change in the CPI for food
Energy Π_{t-1}	=	relative annual percentage change in the CPI for energy
Imports Π_t	=	relative annual percentage change in a merchandise imports price index excl. food and energy
Indirecttaxchange _t	=	annual change in indirect tax rate
AIB	=	dummy variable for 1976-1978 wage price controls

Once again, changes in the unemployment variable have much more impact in the measurement of hysteresis than just the level of unemployment. Fortin introduces two annual lagged values of the unemployment change term for only 1973-90. However, the final estimation of hysteresis only deals with the parameters, b_1 and b_2 .

According to Fortin, the calculation of the degree of hysteresis can be defined as $h = b_2 / (b_1 + b_2)$. If the value of $b_1 = 0$, then there is full hysteresis present (i.e. $h = 1$). If the value of $b_2 = 0$, then there is no hysteresis (i.e. $h = 0$). This equation displays standard properties for 1957-1972, with negative hysteresis ($b_2 > \text{zero}$) and a natural rate of 4.8%. For 1973-1990, the level effect of unemployment becomes insignificant, while the current change variable (b_2) has a coefficient of -0.38, giving strong evidence of hysteresis. Neither the

constant effect nor the level effect is significant for 1973-1990, and by dropping these two variables, the final model results in "full" hysteresis. The degree of hysteresis is 86.5% (s.e. 18.3), which is an indication of high persistence.

Fortin suggests four explanations that could impact hysteresis, such as deep recessions, unemployment insurance changes in 1971, the slowdown in productivity after 1972, and the divergence in unionization between Canada and the US. However, Fortin casts doubt that these factors could account totally for the change in his results, implying that the results are not definitive. However, he does make comments as to the macroeconomic policy and the welfare of Canadians should the results hold true. He suggests an alternative to the cause of unemployment is the recent monetary policy of obtaining lower and stable inflation, which makes unemployment higher and more unstable.

The next two papers, produced by the Bank of Canada, deal with labour market hysteresis in Canada, and indicate the increased importance and relevance of the hysteresis phenomenon. These papers consider hysteresis in unemployment and hysteresis in output. However, the emphasis will be on empirical results of the output gap, instead of the unemployment gap. Nevertheless, their approach is similar.

Cozier and Wilkinson(1991) attack the hysteresis issue from another viewpoint using an output gap instead of the unemployment gap, with the estimation of an empirical Phillips curve. Instead of measuring the natural rate of unemployment, the employment viewpoint is used by considering the potential output or GDP of the economy. The equation specified in the paper is similar to the specification of the other studies. Inflation is a function of not only its lagged values, but a lagged output gap (YGAP) and its change ($\Delta YGAP$), wage and price controls (AIB), the real commodity price (PCOM) and the real oil price (POIL). However, the most important variables are the level and change of the output gap, where $YGAP = (Y - Y^*)$ which is

the percentage deviation of output from potential output(Y^*).

$$\Delta\Pi_t = a + \sum_{i=1}^4 \beta_i \Delta\Pi_{t-i} + \delta_1 YGAP_{t-1} + \delta_2 \Delta YGAP_{t-1} + b \Delta AIB$$

$$+ \sum_{i=0}^4 c_i \Delta PCOM_{t-i} + \sum_{i=0}^1 d_i \Delta POIL_{t-i} + e_t$$

Once again, hysteresis is considered present if the coefficient on the change in the gap is significant and the level of the gap is not significant. Instead of annual data, quarterly data were used in this study, beginning in the third quarter of 1964 and ending with the fourth quarter of 1988. Results for the output gap indicate that both the level and change are significant and have a positive impact on the rate of inflation. Therefore, there is evidence of “partial” hysteresis. This has raised questions as to the reliability in measuring the level of potential or equilibrium output.

But the overall conclusion is that Canadian labour markets do not exhibit “full” hysteresis and therefore supports the natural-rate hypothesis, which means that costs of disinflation are only temporary. Once again, if results indicated “full” hysteresis, this would imply that the costs of disinflation were permanent. They are able to assess the sacrifice ratio, the output loss associated with a 1% decline in inflation, which would not be possible if “full” hysteresis was found to be present.

Poloz and Wilkinson (1992) try to cast hysteresis in a different light. It is a replication and extension of two previous studies of output-inflation dynamics by Fortin(1991) and Cozier and Wilkinson(1991). Again, the basic equation is the rate of inflation as a function of the expected rate of inflation, a measure of excess demand (GAP), the change in excess demand (Δ GAP), and other exogenous variables that determine the process of inflation. The main difference is the significance of the level gap variable in determining inflation. Cozier &

Wilkinson start by estimating a relationship between inflation and the level of the output gap, and test for the importance of the change in the gap. They found that the differenced gap is significant, but the level of the gap remains statistically significant when the change is included.

This paper tries to isolate factors that could explain the differences by trying different specifications of the equations. For example, hysteresis is no longer present when other variables representing market slack were used. Instead of adult male unemployment, the rates for adult female or youth unemployment were used.

In summary, there is more evidence against the hysteresis proposition than in support of it, but the studies provide some suggestions for future research. They recommend areas that have not been considered, such as non-linearities in the Phillips curve, which would produce biased estimates if a linear form were imposed, and question whether the measure of inflation is appropriate. The purpose in testing for nonlinearities is the potential for different behaviour in different ranges of unemployment on inflation. The implication for hysteresis is that hysteresis might be present for double digit unemployment but not for single digit unemployment.

Fortin (1993) is a study focussed more on the policy debate of inflation and the persistence of unemployment. He uses aggregate data for Canada for 1973-1990 and for the US from 1966-1990 with a specification similar to Fortin (1991). He finds a strong presence of hysteresis with insignificant unemployment level effects and significant change effects in unemployment, with a high degree of persistence of 77% for Canada and 81% for the US. In fact, the "full" hysteresis hypothesis cannot be rejected for both countries. However, the US results seem doubtful given that the US economy has not been experiencing high unemployment. Fortin comments that studies using quarterly data instead of annual data in order to increase the number of degrees of freedom are not appropriate as wage and price adjustment take place on a yearly basis. But this is debatable. Finally, Fortin is concerned with the robustness of data with such a short time span, as the causes of unemployment are still unknown.

Jones (1995) extends previous studies with an expectations-augmented Phillips curve where the lagged inflation term is a proxy for inflationary expectations. Jones compared the competing articles of Cozier and Wilkinson(1991) and Fortin (1991) that have been already presented. As these two studies produced opposing results, Jones tests for robustness by checking for alternative specifications and different lag structures and break points (ie. an appropriate split in the data) . He concludes that there is no evidence of hysteresis, like most other studies.

With persistent double digit unemployment rates following the recession of the early 1990s, the question of hysteresis in Canada became an important issue again. **Nott (1996)** extends Fortin(1991) with more current data to examine whether the evidence for hysteresis is robust. First, she is able to replicate his results after a few revisions to the data for the span of 1957-90 and estimates hysteresis at 71%. Her estimation results can be found in column (2) of Appendix A to show their starting point was similar. Unfortunately, results of her modifications and extension of data to 1995 indicate no sign of hysteresis. Although this study uses data that includes the 90s recession, the results provide clear evidence against the hypothesis of “full” hysteresis.

Basically, all these studies used a Phillips curve framework to test for the presence of hysteresis. The time spans, frequency of data and explanatory variables were all different in trying to assess the significance of level or change effect. It is not clear whether it is more appropriate to use annual or quarterly data as annual data is an average, aggregated over time. Even though some studies estimated a fairly high degree of persistence, the overall picture was one of very little evidence of “full” hysteresis using this approach. In conclusion, we cannot reject the natural-rate hypothesis given that hysteresis does not seem to be a major factor.

3.2 Testing for Unit Roots in the Rate of Unemployment

This section uses a different approach in testing for the validity of the natural rate hypothesis. This leads to the concept that unemployment is non-stationary in that the generating process for the unemployment time series does not converge to a constant level. With respect to the unemployment rate, this constant level can be referred to the natural rate. The testing framework of this approach is different from the standard Phillips curve approach. This approach simply tries to determine the degree of persistence in the unemployment rate. This section summarizes an area of research involving the univariate properties of a time series. Univariate testing has tried to indicate non-stationarity, where a unit root implies an upward trend and a process that is not stationary. These tests do not have much economic significance and are considered atheoretical. In effect, this approach is considered only a statistical exercise. In particular, this approach does not really provide any meaningful information concerning the underlying economic behavioural mechanisms.

The main concern with the unit root hypothesis is the ability to interpret the results. If hysteresis is modelled by a unit root process, it is not a stable data generating process. Also, it is interpreted as a local linear approximation of a non-linear process.

The basic framework that unemployment depends on past unemployment is as follows,

$$u_t = p u_{t-1} + \varepsilon_t$$

There are basically three cases to consider,

- (1) If $p=1$ then this indicates a unit root and a non-stationary process. In other words, there is persistence or “full” hysteresis.
- (2) If $p<1$ but p is still pretty high. This is referred to as “partial” hysteresis .
- (3) If $p=0$ or close to 0, then there is no persistence.

The interpretation here is that unemployment is a persistent process . Under “partial” hysteresis, the meaning is equivalent to “full” hysteresis, but at a lower magnitude. The shocks to the unemployment rate are not considered permanent, but they take a long time to die out. In other words, the unemployment rate does not bounce back after a shock.

The next three studies have only statistically tried to model unemployment. Although there is evidence of hysteresis in Canada, these studies cannot really be compared given their different time spans, frequency of data, and different number of significant lags. The number of included lags is considered ad hoc. In fact, this approach is considered a specific case to a more general class of ARIMA models, which stands for an autoregressive integrated moving average model, and these models were designed to explain the past behaviour of a series. The integrated part refers to taking a difference (i.e. a unit root) in order to make a time series stationary. The AR part or the autoregressive term can be interpreted as a degree of unemployment persistence. However, as mentioned before, the number of lags have little economic meaning, which raises the concern over their validity.

Jones(1995) estimates for Canada a number of univariate models for the unemployment rate. In this macroeconomic analysis, the hypothesis tested is "full hysteresis" which means a unit root in unemployment. However, the rejection of “full” hysteresis does not imply a lack of persistence in unemployment. In effect, it is more important to know why hysteresis is present. He pursues the issue of how much persistence exists, whether it is significant, and its causes. Even though he finds evidence of a unit root, Jones does not believe that the rate of unemployment could follow a unit-root process. He claims that the rate cannot fall to zero or increase to 100 per cent, which contradicts the unit-root model.

The framework he used is as follows;

$$y_t = \alpha + \beta t + \phi y_{t-1} + \sum_{j=0}^k \Delta y_{t-j}$$

where there is a constant, time trend term and a number of lags(k) of the time series (i.e. unemployment rate) in question. The autoregressive parameter ϕ is tested for a unit root, in that it is equal to one. Jones used annual data (1960-90) and monthly data (January 1954 to January 1991) for the unemployment rate at the national level and for the rate for prime-age males (aged 25-44). Also, he uses the original data instead of seasonally adjusted data. He estimates his equation with OLS and includes up to four lags, with and without a time trend. In assessing the significance of a unit root with a Dickey-Fuller test, he finds that there is a unit root for the unemployment rate for both annual series, except when the equation has a trend and one lagged variable. On the other hand, for the monthly data, the unit-root hypothesis is rejected for all lag specifications, and he does not reject the alternative of stationarity. Given the presence of seasonality in the data, this noise is thought to complicate the unit-root test.

A comment on this literature is that if a test is unable to reject a low unit root, then the power of the statistical test of the existence of a unit root cannot be implied. This may help support Jones' belief that unemployment does not follow a unit root. An alternative approach suggested is that it is more appropriate that the stationarity hypothesis be rejected in order that hysteresis be accepted. However, Jones comments that "in any finite sample, it is hard to distinguish between a stationary series with a high degree of persistence and a (non-stationary) series with a unit root."¹ Nevertheless, the next study uses this approach.

Jaeger and Parkinson(1994) use a different framework, called an unobserved components model of the unemployment rate, and analyse United States, UK, Germany, and

¹ Jones(1995), p.80.

Canada with quarterly data between 1961-1991. The model finds hysteresis when cyclical shocks are found to have an impact on structural unemployment. The evidence rejects stationarity and finds hysteresis present for Canada, Germany and the United Kingdom, but not for the United States.

Reed(1996) studies quarterly seasonally adjusted unemployment rates for 16 countries from 1970 to 1994. Reed is in agreement with Jones about unit root testing and suggests, “the failure to reject unit roots does not provide evidence in support of the unit root hypothesis. In order to do that, we must reverse the burden of proof by posing stationarity as the null hypothesis.”² He tests for some degree of stationarity as the null hypothesis. His findings indicate that hysteresis is present in all countries, especially for Canada and Australia. The only exception was for the United States. He applies an Augmented Dickey-Fuller (ADF) test to an equation for each country by including up to nine lagged auto-regressive terms. Canada had one significant lag, whereas Australia had 8 significant lags. The number of significant lags for the other countries varied between one and 8 lags. As mentioned earlier, the number of lags do not necessarily have any economic meaning since they are ad hoc. Nevertheless, the test for stationarity is generally rejected, implying hysteresis.

For this approach to testing, the overall conclusion has been that there is hysteresis present. Given the studies presented, the methodological approaches are similar and are difficult to interpret. Compared to the Phillips Curve approach, there is no distinction between “full” and “partial” hysteresis. However, given the potential problems in discerning an estimate equal to exactly one, the research seems to indicate a high degree of persistence, expressed as a linear combination of past lagged values. So we can conclude the presence of persistence in the unemployment rate for certain countries.

² Reed(1996), p.593.

3.3 Testing for Insider-outsider Effects in Wage Formation

Turning to the Insider-Outsider approach, which is a possible channel for the behavioural effects of hysteresis at the microeconomic level, there are two bodies of empirical literature. First, many of the studies pertain only to Europe and use macro data, such as Blanchard and Summers. These studies adopt the Phillips curve framework and resemble the articles cited in section 3.1. Second, there are those studies that use micro data, with the unit of observation being either a firm or a worker. These studies include Christofides and Oswald (1989) and Doiron(1995).

The main issue associated with this theory is to see if the market power of incumbent workers can provide a microfoundation for the existence and persistence of involuntary unemployment. In other words, this could lead to a rise in unemployment persistence or hysteresis. When an exogenous shock to the labour market makes employment fall, job seekers are less likely to be re-employed than if the labour market were more competitive. The upward pressure on wages acts as a barrier to employment.

There has not been much progress in analysing the microeconomics of wage and employment determination for Europe or Canada, based on the membership dynamics in the insider-outsider model as introduced by Blanchard and Summers(1986). The literature surrounding this model remains very theoretical, and the behavioural channels between the wage-setting behaviour and the general equilibrium model of unemployment have not really been modelled. Bean(1994) and Jones(1995) claim its theoretical nature will limit its acceptance in the analysis of hysteresis. The lack of empirical evidence would also support this view.

Nevertheless, a few papers will be presented, but their overall results do not suggest any evidence of hysteresis. One paper is a survey of the literature; but the studies mainly concern Europe and are rather outdated. Also, we find that many studies have been tested with aggregated data in a framework similar to the Phillips curve, and only a couple of studies were based on

micro level data. Then a second paper tests the insider-outsider hypothesis using Canadian data related to firms.

The paper by **Lever (1995)** surveys predominately European empirical work on insider-effects in wage formation. However, Lever focuses on the insider-outsider effects and duration effects in wage formation because it is difficult to distinguish between them. For example, the characteristics of insiders and outsiders can vary among researchers. According to Lindbeck and Snower(1986,1988), Blanchard and Summers(1986,1987) and Gottfries and Horn(1987), the insiders are the current employees, whereas the outsiders are the unemployed. As we will see in the next study, some studies consider the insiders are union members and outsiders are nonmembers. Yet other researchers define the insiders as the employed and short-term unemployed, while the outsiders are the long-term unemployed. It is this third variation for wage determination that appears to be more similar to duration dependence theory.

Lever investigates studies to see whether the effects of insider-outsider or duration dependence theory on wage formation can explain unemployment persistence. The theoretical model studied concerns the relationship between previous employment level and the wage rate. He suggests that there is a small negative impact of unemployment on the wage rate. So, if the long-term unemployed are unable to bring about changes to lower the wage, unemployment persistence could occur. As the insider-outsider and duration dependence theory indicate that wage effects are different if they are unemployed for a short-term versus long-term, it is not easy to differentiate each one separately. Any evidence of long-term unemployment on wage determination supports both the insider-outsider or duration dependence theory.

Finally, he provides a summary of thirteen empirical studies, in which only one uses Canadian data. Given the lack of empirical evidence for Canada, Table 1 provides a selected summary of only six of the studies with the type of data, testing framework and testing result for each study. Insider-outsider effects is tested in a Phillips curve framework, a wage level equation,

or a model with both features. Here, the traditional Phillips curve studies look at how previous unemployment can affect current wage growth, where the focus is on only changes in the labour market tightness (instead of its level) that affect wage growth. Lever indicates that this framework may not necessarily be appropriate either. Like the first two approaches to testing, note that each study uses data of different frequencies and time spans, which render a comparison difficult. Studies analyze mainly annual data going back as far as 1953 to the mid 80s. So, the studies are quite outdated, and no studies exist for the late 80s and early 90s. Finally, the studies are carried out mainly for the UK, European countries and the US.

The only Canadian study in this survey, by **Christofides and Oswald(1989)**, looked at the effect of the change in the employment level on the rate of change of the real wage for quarterly data from contracts between establishments and unions for the period 1978-84. Although the change of the regional unemployment rate appeared to provide a better fit than the level, the results were insignificant. Also, the lagged level of employment is not significant, with the overall conclusion of no hysteresis.

In summary, in Lever's survey of the literature, there is some effect of wage rates on previous employment, but it is either a small or insignificant effect. He concludes that although there is some evidence of persistence on unemployment due to insider-outsider and duration dependence effects, it cannot cause "full" hysteresis. However, several suggestions were made regarding the direction of future research. The influence of training costs in the determination of wages still needs to be tested, and more empirical studies at the micro level are required. Finally, if the long-term unemployed are significant in numbers, the causes have not been addressed.

Table 1. Selected Empirical Studies on Insider-Outsider Effects in Wage Formation

Data	Testing Framework	Testing result
Blanchard and Summers(1986) Annual aggregate data for France, Germany, UK and USA (1953-84)	Phillips curve wage equation which includes current and lagged (un-)employment or (un)employment lagged once and twice besides consumer price (in rate of change) and time trend	By comparing coefficients on current and lagged (un)employment the hysteresis effect appears to be the largest for UK, somewhat less for France and Germany and the lowest for USA
Graafland(1988) Annual aggregate data for the Netherlands, France, Germany, UK and USA (1962-85)	Phillips curve wage equation which includes unemployment rate and either lagged unemployment rate or long-term unemployment rate	Hysteresis effect in the Netherlands is as relevant as in Germany and UK, and more relevant than in France and USA; long-term unemployment has no wage-depressing effect in the Netherlands
Lever(1991) Annual aggregate data for the Netherlands (1965-87)	Real wage level equation which includes both aggregate and long-term unemployment rate, labour demand equation	Unemployment rate has a negative impact on the wage, long-term unemployment rate appears insignificant (i.e. <u>no duration effect</u>)
Nickell and Kong(1992) Annual data for 14 two-digit industrial sectors in Britain (1961-85)	Nominal wage level equation which includes both industry-specific variables (output price, material input price, capital intensity, technical progress) and aggregate variables (aggregate wage, industry unemployment, aggregate unemployment, tax rate)	Industry variables are significant, their impact is positively related to union's power; unemployment has a negative impact on the wage rate (<u>no pure hysteresis</u>)
Christofides and Oswald(1989) Quarterly data from contracts between 420 Canadian establishments and 68 unions (1978-84)	Real wage equation(rate of change) which includes real industrial product price change, level and change of regional unemployment rate (wage curve and Phillips curve) and lagged change in employment level	Product price appears to have a positive and significant impact; the change of the unemployment rate performs better than the level of the unemployment rate (rejection of Phillips curve); lagged employment level appears to be insignificant (<u>no hysteresis effect</u>)
Nickell and Wadhvani(1990) Annual data for 219 UK manufacturing firms (1974-82)	Nominal wage level equation which includes both firm-specific variables (revenue per head, financial variables) and market variables (aggregate wage, industry and aggregate unemployment)	Relative weight of firm-specific and of market variables in wage determination is 0.11 and 0.89, respectively; a change in firm's employment has a positive impact on the wage rate, but this result is not robust

Source: Lever(1995)

A test of the insider-outsider hypothesis has been developed by **Doiron(1995)**. This research is considered to be one of the first tests of the insider-outsider model to a micro dataset for Canada; she extends the Carruth and Oswald(1987) model to determine wages and employment for a labour market that is unionized. The model is estimated with wages, employment, inputs and output for the wood products industry in British Columbia with annual data for the period 1964 to 1984. It is assumed that the insider is a union member, where the union is only concerned about the employment of its workers.

The insider-outsider hypothesis is that the union is only interested in the employment of its members, and there is no trade-off between wages and employment. In other words, the union is not interested in increasing its membership. Doiron's model opposes the model specified above where unions generally attach a positive weight to insiders AND outsiders. The insider-outsider hypothesis is rejected according to her results as unions do care about membership greater than its current level.

The insider-outsider theory has been given much attention in explaining hysteresis, especially in Europe. As for Canada, there really has not been any empirical results to support the hysteresis hypothesis. Even if Doiron's study indicated significant hysteresis effects for that industry, it is not reasonable to assume that it would be true for the economy as a whole, especially since the majority of workers in Canada are not unionized. Even for Europe, many studies use aggregated data instead of data on the individual firm. Conclusions on the relationship between real wage and unemployment cannot be made as the evidence is absent . Therefore, the insider-outsider theory cannot provide a microfoundation in explaining the persistence in unemployment.

3.4 Testing for Duration Dependence

There is evidence that the interest in long-term unemployment is an important factor that explains the rise in unemployment in Europe. In Canada, long-term unemployment has become more common, but compared internationally, the incidence is still considered low. Nevertheless, a microeconomic study of negative duration dependence in Canadian unemployment could provide a robust micro-foundation for hysteresis at the macro level. Figure 2 shows this upward trend for those unemployed for more than a year.

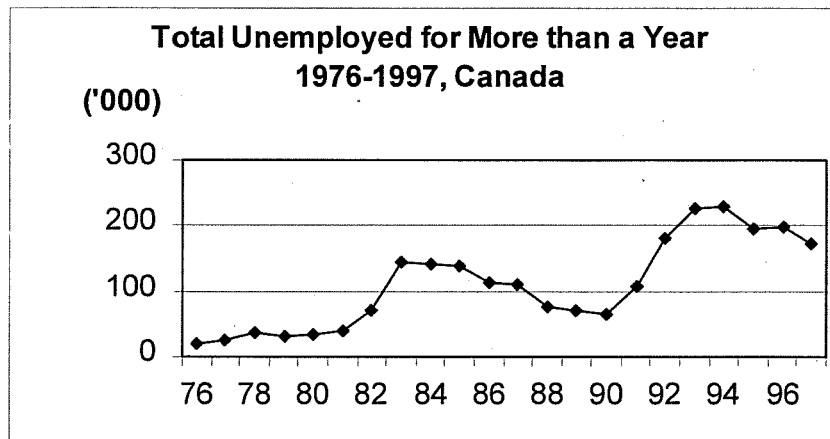


Figure 2.

Source: Statistics Canada

The hysteresis hypothesis might apply if the deterioration of skills or of search effectiveness increases unemployment. The concept of dependence is related to the longer-term unemployed, who find it more difficult to find jobs. The probability of leaving unemployment is tested for a decreasing function of unemployment duration. The interpretation with respect to the unemployment rate is the time which spells of unemployment are extended by negative duration

dependence. This translates into an increased probability of being unemployed and this could serve to increase the overall unemployment rate. This explains why the lagged unemployment rate is positively correlated with the current unemployment rate. Also, this phenomena can only be observed at the individual level, compared to the other approaches of testing that has been done.

The measure of the unemployment rate used in micro studies, as measured by Gunderson & Riddell(1993), is the following identity

$$\text{unemployment rate} = \text{duration of unemployment} \times \text{incidence of unemployment}$$

The duration of unemployment refers to the time unemployed before finding a job or leaving the labour market. The incidence of unemployment is the proportion of the labour force who become unemployed during a given time period. This identity is valid in steady state and permits a better understanding of the dynamic nature of the labour market.

Hazard models are used because they can estimate duration dependence for the individual, and therefore it could provide a microeconomic foundation for hysteresis for the economy. Longer durations of unemployment are indicated by a declining hazard function. The probability of an unemployment spell ending in a given period can be calculated, where it is conditional on the spell having started at the beginning of the period.

First, a summary of two microeconomic based studies tries to investigate the role of the long-term unemployed and the impact of UI benefits on the persistence of unemployment. There has been some research in drawing a connection with the duration of unemployment benefits and the duration of unemployment spells during the 80s, but it has not been conclusive in explaining the persistence in unemployment at the macro level. Then in the next sub-section, two studies are presented that tests the de-skilling or human capital theories. Jones(1995) and Wilkinson(1997) suggest that the impact of hysteresis can be measured only at the individual worker level.

Osberg(1993) uses Labour Force Survey information from 1981, 1983, and 1986 to study

the probability of transition from unemployment in January to employment in February for each of the three years. He analyses duration dependence for the time passed since the previous job. Osberg estimates that, for both men and women, negative duration dependence is obtained for the short-term unemployed in 1983 and 1986. His interpretation in the decline in the hazard rate indicates "sorting" or stigmatising, whereby unobserved differences sort the unemployed. Sorting is important because it is observationally equivalent to negative duration dependence.

3.4.1 Comparison of Two Studies on Duration Dependence as a Microeconomic Approach to Hysteresis

This final section focuses on an approach from a microeconomic perspective that shows potential in getting some supportive empirical results for the hysteresis hypothesis. These two Canadian studies analyse duration dependence of unemployment for individuals by testing for negative duration dependence. The main thrust of Jones(1995) work is on the importance of long-term unemployment in Canada. Wilkinson(1997) basically replicates the study by Jones with more current data, but has provided some modifications and extensions.

The research by **Jones (1995)** on the analysis of Canadian unemployment duration involves data from the Labour Market Activity Survey (LMAS) for the two year period of 1986-87. The novelty of this survey is that it follows the same individuals for two years. This survey data has known limitations in distinguishing between the state of being unemployed and being out of the labour force. Nevertheless, he gets around the problem by creating a new data file by merging Labour Force Survey and demographic information from the LMAS to enable an analysis of the determinants of unemployment duration.

There is an indication of negative duration dependence, but Jones' results are not conclusive. As a result, this analysis of individual joblessness spells does not support the

hysteresis hypothesis. Data limitations could be blamed for the poor results for duration effects that could generate hysteresis. Problems experienced with the data can be attributed to missing data and errors resulting from misclassification. More technical problems associated with this dataset are non-response and loss of respondents over time.

Wilkinson(1997) extends the study by Jones with more current data and has made some estimates as to the magnitude of hysteresis on the unemployment rate. He uses the LMAS for 1988-90, but he does not link to the LFS file. His approach supports the de-skilling hypothesis of hysteresis, but to such a small degree that it cannot explain unemployment at the aggregate level. In other words, these estimates of hysteresis are thought to be too small for standard macroeconomic methods. Hysteresis effects are estimated to add less than 0.1 percent to the overall unemployment rate. He comments that these results provide additional support to the earlier macroeconomic studies that the costs of inflation are only temporary.

Once again, there has not been any study of duration dependence during the 90s, which includes the 90s recession. Wilkinson suggests that the new of Survey of Labour Income Dynamics could provide us with data of the early 90s, in order to gain a better understanding of the labour market. The overall conclusion is the same for these two studies. There is little doubt that long-term unemployment can partly explain changing labour markets, but it is not certain that it can lead to hysteresis. The degree of negative duration dependence cannot be translated from the small number of people experiencing long-term unemployment to produce hysteresis for the whole economy. This would imply no link between the macro and micro level of the economy.

Section 4.0 Comments and Potential for Further Research

The objective of this paper was to assess whether labour markets in Canada are characterized by hysteresis. An assessment of the various theories of hysteresis was presented from the macro perspective and then the micro perspective was considered; however, the majority of the empirical studies have focussed on a macro approach. Overall, the empirical results are very disjointed in that each of the 4 test approaches are independent of one another. Evidence from the literature indicates that support for the hysteresis hypothesis is mixed.

The first macroeconomic approach to measuring hysteresis has been exhausted with the Phillips curve framework that models inflation and unemployment. Studies at the macro level have provided some evidence in support of the hysteresis hypothesis, in that the unemployment rate showed signs of persistence. In other words, Canadian labour markets do not appear to exhibit "full" hysteresis, but there was evidence of "partial" hysteresis. Factors causing the NAIRU to increase in the 1990's are still thought to be temporary instead of permanent. It is only hysteresis if the NAIRU is rising because of shocks to actual unemployment.

As for the second approach, much of the evidence from this time series approach is atheoretical with an emphasis on testing for stationarity and determining the degree of persistence of unemployment. Findings indicated hysteresis, as the tests found unemployment to be a non-stationary process and therefore the univariate approach indicated persistence in labour markets. The main problem has been in the economic interpretation of the various significant lags.

As a result of these findings, the consensus is that there is still a need for testing at the microeconomic level in analyzing the observed persistence in unemployment, in order to provide an explanation as to the causes of unemployment. However, the microeconomic evidence related to the insider/outsider model and duration dependence proved weak as well. The theory of insider-outsider models has not been tested much. Although the insider-outsider model makes a

lot of sense intuitively at the micro level, Jones(1995) feels that it is too theoretical to be a viable framework. Blanchard makes a comment in Ball(1997) that the insider-outsider wage bargaining model has not been as promising empirically .

On the other hand, the duration dependence approach seemed to be the most promising explanation in trying to provide a microfoundation to the persistence of unemployment experienced at the macro level. However, there does not appear to be any clear link for any micro-foundation to the macroeconomic level given the small hysteresis effects estimated by Wilkinson(1997). So, there does not appear to be strong evidence for the types of duration dependence effects that might generate hysteresis. Due to the lack of data, little research has been carried out on more current data of the 90s for duration dependence. However, the data that Wilkinson(1997) suggested to use, a new longitudinal data source called The Survey of Labour Income Dynamics (SLID) that was initiated in 1993, is now available. It could be promising for future research, as it was designed to overcome the data problems encountered with the LMAS.

With the measurement of hysteresis still relatively undeveloped, little progress has occurred. The links between a pattern of persistence at the macroeconomic level and the precise behavioural mechanisms which have been modelled at the microeconomic level are tenuous. The channels have not really been modelled, either empirically or theoretically. Thus, for the most part, one can only draw analogies or parallels between the observed macroeconomic outcome and the microeconomic outcomes that give rise to it. As the evidence gives no definitive answer, this leaves the hysteresis hypothesis an outstanding issue.

As the results are difficult to interpret, there is a belief that hysteresis is not the most appropriate way to analyse persistence in unemployment. However, once hysteresis is present, the next question is to know why it occurs. It is the cause of persistence that is what is most important. Otherwise, if hysteresis does not occur, then what does explain the high unemployment rate?

It seems that the interest in hysteresis is no longer popular given the declining unemployment in the late 90s and its inability to identify the causes of persistence. There is a renewed interest that structural unemployment is responsible for the high levels of unemployment. Individuals who do not adapt to the structural and technological changes in the workplace could add to the statistics of the growing number of long-term unemployed.

APPENDIX A

Estimations by Fortin(1991) in column (1) and Nott(1996) in column (2)

* Indicates Fortin's notation ** Indicates Nott's notation

Regressors		(1)	(2)
Constant			
	1957-72	2.03	1.93
		(0.41)	(0.47)
	1973-90	0.35	1.02
		(0.54)	(0.65)
Π_{t-1}^*	DPCXFE(-1) **	1.00	1.00
U_t	UMALE		
	1957-72	-0.42	-0.39
		(0.10)	(0.12)
	1973-90	-0.06	-0.16
		(0.08)	(0.09)
ΔU_t	DUMALE		
	1957-72	0.26	0.22
		(0.13)	(0.16)
	1973-90	-0.38	-0.39
		(0.14)	(0.17)
ΔU_{t-1}	DUMALE(-1)		
	1957-72	-----	-----
	1973-90	-1.01	-1.06
		(0.11)	(0.14)
ΔU_{t-2}	DUMALE(-2)		
	1957-72	-----	-----
	1973-90	-0.30	-0.24
		(0.11)	(0.13)
Food Π_{t-1}	DPCF(-1)-DPCXFE(-1)	0.13	0.13
		(0.03)	(0.04)
Energy Π_{t-1}	DPCE(-1)-DPCXFE(-1)	0.11	0.13
		(0.03)	(0.03)
Imports Π_t	DPMXFE-DPCXFE(-1)	0.07	0.04
		(0.03)	(0.03)
Indirect tax change $_t$	DRTIXFE	0.21	0.19
		(0.08)	(0.10)
AIB	CONT	-1.10	-1.11
		(0.35)	(0.41)
ADJ. R-SQUARED		0.98	0.98

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