Terminating Disability Benefits and Subsequent Re-occurance

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Acknowledgements

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I - Introduction

The looming financial crisis an individual faces after being diagnosed with an employment impairing disability is eased by the provision of Disability Insurance (DI) in the United States and Canada Pension Plan Disability (CPPD) benefits in Canada. By providing a monthly benefit to people who have contributed to the program and meet the CPP legislated definition of disabled, the plan provides a degree of financial security to those people who are no longer able to work. The CPP is a publicly administered program that provides retirement benefits, death benefits, and survivor benefits in addition to disability benefits. Disability benefits are available until age 65, at which point an individual is transferred to retirement benefits. However, while the program allows for people to remain on disability benefits until they reach retirement, the program is based on the principle that benefits will only be necessary for a temporary period of time as the individual either recovers from the disability or adapts to it and is able to rejoin the work force in a different capacity.

There are two reasons why policymakers and program administrators place a great deal of emphasis on returning people to the work force. Firstly, the program is no longer responsible for paying a monthly benefit. Secondly, the individual is presumably working again and earning income, and they are once again contributing to the plan. Reducing the amount of monthly payments to beneficiaries is an important objective of plan administrators. However, the measurement of the 'savings' related to the cessation of disability benefits is difficult because it requires knowledge of an individual's future in the labour market. There is always the chance that a person will return to disability benefits, either because of a recurrence of the original disability, or because a new disability has now arisen.

This paper will attempt to determine which variables are relevant to explaining the event that an individual returns to disability benefits. By examining certain empirical patterns, this paper aims to help policymakers identify factors affecting the likelihood that a group of beneficiaries who have left the plan will return to benefits at some point in the future. In addition, a literature review will provide an appropriate background to the topic and outline some of the economic and policy issues involved in disability benefits. There is a great deal of research in the field of labour economics that applies to disability benefits, and the review presented here is certainly not exhaustive, but the papers discussed have been selected to highlight the major issues and to give some context to the issues that I examine in this paper.

II - Literature Review

The study of disability benefits and various levels of workers' compensation falls into the domain of Labour Economics. These benefits and other facets of the programs affect an individual's decision to work and be an active participant in the labour force. As a result, economic analysis can be applied to many aspects of these programs. For example, there is a risk that any kind of social insurance benefit might induce certain workers to leave the labour force, reducing labour supply. The higher the benefit available, the greater the risk of work disincentives. This is primarily an individual decision based on preferences for income versus leisure reflected in the utility function, non-market income, wage level, and parameters of social insurance programs. The essential question is at what point does a benefit become so high that it induces too many people to drop out of the labour force? The problem, as with so many economic problems, is finding a trade-off between costs and benefits. The costs are typically the expenditures required to provide a comprehensive program with an adequate degree of income

maintenance. These costs include the actual benefits paid, the administrative costs that keep the program running, and the costs of helping individuals leave disability benefits. On the other side of the ledger, the benefits are numerous and often hard to measure and quantify. For example, how does one measure the security an individual member of the labour force feels, knowing that there is a social safety net in place in the unfortunate event of a debilitating disease or injury? The challenge facing policymakers is to provide adequate income maintenance for those with disabilities, while avoiding work disincentives for those who can work, and providing rehabilitation or retraining for individuals so that they are once again capable of being gainfully employed, all at a reasonable cost to the taxpayer.

Workers' compensation is a program designed to provide benefits to individuals who are injured or become ill *as a result* of their employment. The DI and CPPD are in place to provide benefits to those people who are injured or ill and *not* entitled to workers' compensation because the injury or illness is not a result of their employment. Workers' compensation is considered a social contract between employers and employees. Employees have traded their right to sue employers in the event of an accident in return for a guarantee of benefits regardless of whose fault the accident was. The employers avoid costly litigation and possible punitive damages that could threaten the firm's financial well-being.

Workers' compensation and its reform are examined in the compilation of papers entitled "Workers' Compensation: Foundations for Reform," edited by Gunderson and Hyatt (2000). In their introduction, Gunderson and Hyatt consider a very important policy issue: how to define what has become a common aliment among workers, low-back pain. Included in their compilation is a summary of a paper by Frank in which he identifies four issues relating to low-back pain: "[it] cannot be objectively diagnosed; its underlying causes can seldom be

determined, making it difficult to attribute it to work and to a specific work environment; in most cases, there is no obvious cure, and in fact physician-induced over-diagnosis and over-treatment are apt to be harmful; for these reasons, there is often a tendency to view low-back pain claims as unnecessary and even fraudulent." [1] This single example of an illness or aliment that could prevent an individual from being gainfully employed illustrates the richness of this policy domain, and is suggestive of the potential to lead to several findings and conclusions. The problems with the range in severity, treatment, and consequences are not limited to the case of lower back pain, but apply to many other categories and types of disabilities as well. The severity of the disability is a relevant factor involved in the disincentive to work, as an individual with a severe disability has higher disincentives than an individual with a mild disability. Furthermore, a disability can become increasingly severe as time passes, so there must be a threshold at which a person decides to apply for a benefit.

In his own paper, Gunderson (2000) considers workers' compensation as a whole and examines the changes that have taken place as the labour force has evolved over the last century. In addition, Gunderson outlines changes that, in his own view, still need to take place. For example, he cites the aging population and notes that there have been changes in the demographic composition of beneficiaries of workers' compensation as a result. Benefits are being paid out to older workers, making return to work adjustments more difficult and resulting in these older workers simply continuing to collect a benefit until reaching the eligibility age for retirement. Technological changes over time have resulted in 'non-traditional' disabilities and injuries as well as new cures and treatments. Thus, any consideration of patterns over time must take into account the natural evolutionary changes that have occurred and will continue to occur over time.

[1] Gunderson and Hyatt, page 10.

Worker's compensation benefits are paid to those individuals who are injured or become disabled as a direct result of their employment. While the focus of this paper is on disability benefits, which are provided outside the scope of worker's compensation, many of the problems highlighted above also apply to the CPPD and DI policymakers and program administrators and demonstrate the magnitude of the issues they face.

The analytical framework that is usually applied to this policy issue is the standard model of labour supply. Most theories of labour supply are concerned with the number of hours a person is willing to supply in relation to the allocation of their total time endowment between work and leisure. It is assumed that a rational individual values leisure time and places some degree of utility, or satisfaction, on that time and that conversely, an individual derives disutility from having to work. The question an individual faces is how much time he or she is willing to supply at a given level of wage and non-labour income. An employed individual has clearly chosen to sacrifice some of his or her leisure time because he or she has been compensated. This means that their indifference curve, reflecting their utility level, is tangent to their budget constraint and they have reached an interior solution. The onset of a disability has a number of potential consequences for this equilibrium. Any reduction in the number of hours worked will reduce utility as the definition of an equilibrium implies that any deviation from the point must be on a lower convex indifference curve. In addition, the disability may also reduce the ability to enjoy leisure, thus affecting the slope of the utility function and changing the number of hours supplied or the wage demanded. In order to be eligible for a CPP disability benefit, the individual must cease to work, and thus in the terms described above, provide zero hours of labour. However, the budget constraint curve has shifted up to reflect the income received from

the benefit. This is known as a corner solution, because the equilibrium point is now at the corner of the budget constraint where no hours of labour are provided.

While the preceding economic theory may lead the reader to believe that the onset of a disability instantly results in a new equilibrium, this is not the case. The time during which a person is considered disabled can be broken down into three stages: the time between the onset of sickness or injury and prior to the application of benefits, the time during which benefits are collected, and the time following the termination of benefits because the person has been cured or rehabilitated. During the first stage, the individual may be trying to determine how restrictive the disability is in terms of their working abilities. In addition, the application process set by policymakers and program administrators may impose a waiting period before benefits are paid, which is designed to reduce disincentives. During the second period, the individual is usually restricted from working any hours or else risks jeopardizing the continuation of benefits. However, retraining and rehabilitation are often provided to individuals who are judged likely to recover from their disability. The third and final stage of a disability is the recovery or adaptation period during which an individual has ceased to receive benefits and has returned to the work force.

Much of the literature and research is concerned with one of these three stages. The first stage has perhaps received the most attention from researchers, both in terms of theory and empirical analysis, as the decision to apply for disability benefits is complex, and any number of variables may be a factor in the decision. Policymakers are interested in variables that lengthen the duration between the onset of a disability and the application for disability benefits, such as employer accommodation in the work place. Research into the second stage, and the identification of factors like the provision of vocational rehabilitation that encourage an

individual to cease collecting benefits, are also relevant to policymakers. Finally, the third stage, in particular what keeps a former disability beneficiary active in the labour force, is also a concern of policymakers. Studies of each of these three stages will be reviewed; however, the empirical study in this paper will focus on the third stage.

There are two papers reviewed here that focus on the first stage of the disability benefit process. In the first, Burkhauser, Butler, and Weathers (2001) deal with several policy implications relating to the timing of the application for DI benefits. Specifically, the authors are interested in the impact of employer accommodation, state-level DI allowance rates, and the dollar amount of DI benefits on the time between the onset of a disability and the application for benefits. Using data from the American Health and Retirement Study (HRS), the authors note that only 16 percent of males and 13 percent of females apply for DI benefits in the first year following the onset of a disability. [2] According to Burkhauser et al., approval rates vary from state to state and over time. In addition, in states with higher rates of approval, people have a higher propensity to apply for benefits. This variation is used to identify the impact of administrative decision-making or ease of program access on the application behaviour of individuals.

The dollar amount of the DI benefits is referred to as the Primary Insurance Amount (PIA) and is based on the earnings history of the individual receiving the benefit. Typically, the replacement rate of the benefit, the percentage of income that is replaced, is used to measure the relationship of DI benefits to DI applications. However, the authors reconsider this approach and instead use the actual dollar amount. They contend that using the replacement rate overemphasizes the causal relationship between DI benefits and applications. The replacement

[2] Burkhauser, Butler and Weathers (2001) 52.

rate is considered progressive as low earning individuals tend to have a higher proportion of their income replaced and are more likely to apply for benefits.

Finally, in considering employer accommodation, the authors make use of a survey of in which individuals are asked "At the time your health started to limit your ability to work, did your employer do anything special to help you out so that you could stay at work?" The authors use this survey question to define employer accommodation.

To analyze the probability of applying for DI benefits from the time of the onset of the disability, Burkhauser et al. develop and estimate an empirical model of the probability that an individual j applies at a particular time t_j where $f_j = h_j(t_j) \exp(-\int_0^{t_j} h_j(s)ds)$, where $h_j(t_j) = \exp(X'_j\beta + t_j\gamma_1 + t^2_j\gamma_2 + \varepsilon)$. [3] The variables are defined as X_j being the vector of policy variables and other explanatory variables for individual j, β being the vector of coefficients, t_j being time, γ_1 and γ_2 being the coefficients for time and time squared and ε being unmeasured heterogeneity. This model is estimated from a data set from the HRS using a Cox Proportional hazard model. Burkhauser et al. conclude that the global acceptance rate of DI applications and the level of the benefits significantly affect the timing of DI applications. They predict that a 20 percent increase in the acceptance rate can result in applications being made approximately 1 year earlier. A 20 percent increase in the amount of DI benefits can reduce the time between onset and application by 1.2 years for males and 1.7 years for females. Finally, they conclude that universal employer accommodation can increase the time between onset and application by 4.4 years for males and 3.8 years for females. [4]

The second paper dealing with the initial stage of disability benefits is by Black, Daniel and Sanders (2002) who carry out a case study involving a single industry and the impact of an

[3] Ibid, page 55.
[4] Ibid, page 69.

economic decline on the participation rate for disability programs. The OPEC crisis sparked an increase in the price of oil in the early 1970s, resulting in an expansion in the coal industry, particularly in the Southeast U.S. Unfortunately, the coal boom ended in a bust by the mid 1980s, and employment in the coal industry has consistently fallen since. Black et al. attempt to find a relationship between this marked decline in production and a rise in disability participation among coal miners. Using U.S. Census data from 1970, 1980 and 1990, the authors identify counties within four states where the coal industry employs at least 0.5 % of the labour force. Of note is that relative wages during the upswing of both coal workers and non-coal workers rose in coal producing regions relative to the wages of workers outside those regions. Using the county-level data, the authors estimate regressions for the following model, $\Delta y_{ist} = \beta_0 + year_{st}\beta_{1st} + x_{ist}\beta_2 + \beta_3\Delta(earnings_{ist}) + \varepsilon_{ist}$, where Δy_{ist} is the first difference of the logarithms of the real Supplemental Security Income (SSI) or DI payments in county i in state s, $year_{st}$ is a state-year dummy variable, $\Delta(earnings_{ist})$ is the first difference of the logarithm of real earnings in county i, x_{ist} is a vector of control variables and ε_{ist} is an error term. The control variables include proximity to metropolitan areas, access to medical care and provision of public services such as transportation.

Using Ordinary Least Squares and 2-Stage Least Squares estimates of their model, Black et al. find a very weak link between earnings growth and DI and SSI payment growth. The authors acknowledge two issues related to the impact of local economic conditions on disability program participation. The first issue is that the scope of the study is limited to an industry that is predominant in rural areas and virtually non-existent in urban areas. The second issue is that the coal industry is a male dominated field in which 95 percent of workers were male in 1990. In addition, almost a third of workers do not have a high school diploma. The authors conclude that

the permanent or long term employment implications of an economic shock have a bigger impact on disability participation rates than the changes in earnings. The coal industry bust left many workers having little or no other marketable skills unemployed, and these individuals were faced with the threat of long-term unemployment. The permanent or long-term loss of employment had a bigger impact than the short-term, transition periods of labour market changes. The implications of this research are certainly interesting, as socio-economic factors such as the unemployment rate have an effect on the incentive to work, and that could encourage disability applications. However, it should be noted that the authors are examining a single industry in a specific area of the U.S, and thus it is unclear how broadly applicable these results are.

For the second stage of the disability process, I discuss four papers that are relevant. In the first, Campolieti (2001) has studied the Canadian Pension Plan Disability benefit in her paper "Disability Insurance and the Labour Force Participation of Older Men and Women in Canada." Campolieti is concerned in particular with the effect of CPPD on the labour force participation rates of older workers, whom she defines as individuals between the ages of 45 and 64 years. The author estimates a simple regression model of labour force participation, where the average replacement rate for CPPD, the unemployment rate, the average remaining years of life for persons aged 45 to 64, a dummy variable for Quebec, a set of year-specific dummy variables, controls for differences in eligibility criteria, and a residual term are all included as explanatory variables. Campolieti uses aggregated provincial data from 1976 to 1997, the period for which participation rates are available at the provincial level.

Campolieti concludes that CPPD has had a significant effect on the labour force participation rates of older workers and in particular, she isolates the benefits paid by CPPD as the principle reason. The estimates for the effect of a relaxation of eligibility requirements did

not produce consistent results. These findings suggested that the 1987 to 1994 period should be associated with an increase in participation rates, but this was not consistent with the actual growth in the number of beneficiaries that occurred over this period. Campolieti provides no explanation for the conflict between expectations and actual results. Most of the decline in labour force participation can be attributed to the benefit paid and not the eligibility requirements.

Hum and Simpson (1996) also consider disability in Canada, and the belief that "a significant portion of the disabled population can, with minor accommodation, be incorporated into mainstream labour markets," [5] is their primary concern. In addition, the authors consider "employment equity" policies and the disabled. Of the four main targets of employment equity legislation, women, aboriginals, visible minorities and the disabled, the first three are generally considered to be victims of discrimination, not difference in productivity. There are assumed to be additional costs in hiring or accommodating an individual with a disability that do not apply to the hiring of women, aboriginals or visible minorities. Using the Labour Market Activity Survey and the Health and Activity Limitation Survey, the authors conclude that the severity of the disability and gender are significant factors when considering the labour market performance of individuals with a disability. However, they provide little detail on the models they employed. The implications, according to Hum and Simpson, are that treating people with disabilities as a homogeneous group will likely lead to disappointing results. Policy design must carefully examine the severity of disabilities and employment accessibility to achieve the desired effect.

Bound and Waidmann (1992) study disability transfer programs and the possible relationship with the labour force attachment of older males. Using data from the U.S. National Health Interview Survey, the authors find that the proportion of disabled males increased sharply

[5] Hum and Simpson, page 285.

in the 1970s. Comparing this increase to the behaviour of labour force participation rates at the same time, and using a theoretical model approach, Bound and Waidmann conclude that the decline in labour force participation coincides with the increase in disability beneficiaries. The authors further conclude that the increase in disability beneficiaries was not the result of a deterioration in the health of older males in the labour force, but that disabilities were better accommodated by employers prior to the expansion of disability insurance programs in the early 1970s. This would suggest that the increased availability of disability benefits has provided individuals with a disincentive to work, and has encouraged people to drop out of the labour force who would have otherwise continued to work. The authors dispel the argument that there are too many people taking advantage of the generosity of the program and argue that the evidence suggests that those people receiving a benefit suffer from "potentially disabling conditions." [6]

Rupp and Scott (1998) examine differences in duration of DI spells related to age, gender and diagnosis. Considering the three principal reasons that DI benefits can be terminated - retirement, death and recovery - the authors note that the vast majority of DI benefits end in either retirement or death. Duration differences across disability types are more prevalent among the younger age groups. Considering two examples, among beneficiaries aged 18 to 34 years old, duration varies between 5.1 years for those diagnosed with a neoplasm and 25.5 years for those diagnosed with a mental disorder. In the 50 to 61 years of age group, the difference is 3.4 years to 15.6 years. [7] This indicates that one should interact age effects with specific effects for the type of disability.

[6] Bound and Waidmann, page 1417.
[7] Klaman and Rupp, page 144.

Focusing on the group of DI beneficiaries terminated because of recovery, Rupp and Scott consider the program changes that have occurred. Most important are the changes to Continuous Disability Review (CDR) policies. Continuous reviews of individuals receiving a disability benefit were conducted to verify that their disability continued to be work-limiting, and that they were still entitled to benefits. During the early 1980s the Reagan Administration emphasized the importance of CDRs to limit growth of DI rolls, but political and legal issues forced a suspension of CDRs by the mid 1980s. In 1983, 182,000 cases were removed from DI benefits, while in 1995, only 475 were removed. However, the Personal Responsibility and Work Opportunity Reconciliation Act of 1996 has introduced stricter provisions, particularly relating to cases where alcohol and drug addiction are contributing factors. The increased use of CDRs has a doubled edged effect, as they not only reduce the number of people collecting disability benefits, but also reduce the incentive to apply.

Five research papers relating to the third stage of the disability process, the stage following termination of the benefit and returning to work, are reviewed that provide a comprehensive overview of the relevant issues. Schechter (1999) considers return to work strategies in his paper entitled "Industry, Occupation and Disability Insurance Beneficiary Work Return." In studying the American New Beneficiary Follow-up survey, Schechter interprets the figures provided by the survey and notes that more than half of respondents cited financial need as their reason for returning to work (55.2%), more than double the next highest response, which was a personal desire to return to work (19.9%). Approximately one fifth of those returning to work were offered some type of employer accommodation. In particular, the construction industry and wholesale and retail trade industry were willing to provide accommodations, such as getting someone to help with work, purchasing special equipment, and providing shortened

workdays. However, no particular industry had a disproportionate number of former DI beneficiaries returning to work. Consistent adjustments, such as changes in hours worked or rates of pay that occurred following the termination of benefits, were evenly distributed across all industries and occupations. Schechter concludes that industry-specific return-to-work strategies or legislations would not be productive

Using the same New Beneficiary Follow-up survey in her paper, "Return of Disabled Worker Beneficiaries to the DI Program," Dykacz (1998) noted that of the close to 20,000 DI beneficiaries who had a recovery termination, approximately 5,300 returned to the DI program. She also attempts to explain the relationship between several variables and returning to the DI program following a recovery termination. Because of the possibility that an observation in the data could be right-censored, Dykacz uses a proportional hazards or Cox regression model. The survey only observes individuals until mid-1993 and as a result, at the end of the observation period, an individual may not have returned to the DI program, reached age 62 or died. The result is the right censoring of the data. Gender and marital status coefficients are not significant, while age at recovery, Primary Insurance Amount (PIA) and vocational or job training all have statistically significant coefficients. The vocational and job training coefficient is negative, indicating that individuals who are part of a rehabilitation program are less likely to return to the DI program; however, this effect diminishes over time. In addition, older workers show a greater tendency to return to the DI program, likely caused by an inability to adjust to new work circumstance.

In a second paper by Burkhauser, written with Daly (1996), the role of public policy following the onset of a disability is studied. In particular, Burkhauser and Daly are interested in the relationship between employment and disability. The Americans with Disabilities Act

(ADA) was passed in 1990 with the objective of delaying labour force exit following the onset of a disability. The authors extend the typical population used in disability studies to include not only those currently receiving DI benefits but also those with a disability but currently working full-time or part-time. According to the authors, "among working-age men with disabilities, two of every three worked in the labour market, and 43 percent worked full-time in 1988." [8] Using the Health and Retirement Survey (HRS), the authors determine that the ADA is likely to be more beneficial to those individuals already employed at the time of the onset of the disability. Because close to 70 percent of individuals claiming a disability in the HRS reported that the disability began during their working life, the evidence suggests that the ADA may be able to delay entry onto disability rolls.

Burkhauser and Daly believe that there is a limit to the effectiveness of accommodation in keeping individuals with a disability in the labour force. The authors do not believe that accommodation has the power to carry the average individual with a disability until 62 years of age, the earliest possible age for Social Security eligibility. In addition, the ADA states that employers must provide accommodation to employees with a disability "unless it imposes an undue hardship on the employer." [9] Prior to the implementation of the ADA, it is obvious that employer accommodation would be designated for employees who were likely to have a higher chance of success per dollar spent on accommodation. A profit maximizing firm will likely only spend money on accommodation if it believes that the accommodation will lead to a profit maximizing result. The ADA will increase accommodation to workers with a lower expected success rate. While there is a clear benefit to encouraging accommodation, the authors believe that it is a tool best used in conjunction with other policies designed to discourage application for

[8] Burkhauser and Daly, page 65.
[9] Ibid, page 78.

DI benefits. Similar to the Earned Income Tax Credit expansion in 1996 that raised the wages of wage earners with two or more children, an increase in the minimum wage for disabled workers is proposed. This is designed to raise incentives to work. Also, education and job training are promoted as important tools in providing sustained income growth among those with a disability.

A final suggestion by Burkhauser and Daly that is considered in more depth by Berkowitz and Dean (1996) is vocational rehabilitation. Despite existing since 1920 in various forms, there has been only limited success in placing DI beneficiaries back into the labour force. The empirical evidence provided by the authors reinforces their conclusion that once people begin to receive DI benefits, few ever leave. The authors conclude that the current DI system is not designed to allow beneficiaries to simply and effectively return to work and that the necessary changes to the system that would better accommodate vocational rehabilitation carry high costs and uncertainty.

Finally, Butler, Johnson and Baldwin (1995) examine recipients returning to work and the success of first returns to work in their paper entitled "Managing Work Disability: Why First Return to Work is Not a Measure of Success." Using a survey of 11,000 Canadian workers injured on the job between 1974 and 1987, the authors attempt to analyze the determinants of four mutually exclusive work patterns: (1) single absence, successful return; (2) single absence, unsuccessful return; (3) multiple absence, successful return; and (4) multiple absences, unsuccessful return. Butler et al. assume that if a worker was employed for several years at the same job prior to their disability, then the workers were at equilibrium in the allocation of time between work and leisure. They begin by introducing and measuring a measure called residual disability, which is estimated to be $D_i = d(N_i, T_i, M_i)$, where N_i is the nature of the disability, T_i is

the time since the injury, and M_i reflects the disability management policies of the employer. [10] The value of the nature of the disability variable is highest at the time of the injury and declines over time. If the effects of the injury are eliminated, the variable reaches a value of 0. The disability residual is then used to estimate the offer wage that the individual might receive. The offer wage, W^0_i is a function of productivity, which is measured by education (E_i), experience (X_i), demand for labour (S_i) and the degree of disability (D_i) and is calculated at $W^0_i = f(E_i, X_i, D_i, S_i)$. A multinomial logit model including independent variables representing characteristics that affect post-injury offer wage and reservation wage functions is specified using a utility function given by $U_{ij} = U(W^0_{ij}, L_j) = X'_i\beta_j + \varepsilon_{ij}$ to distinguish between the four patterns of work.

The estimates of the probability of returning to work indicate that age, education, the replacement ratio, labour union membership, and category of disability are all significant influences. Confirming the predictions of labour economic theory, the probability of returning to work diminished as the proportion of the wages replaced by benefits increased. In addition, Butler et al. found that union members were more likely than non-members to return to work. The authors did not find that gender had any influence on the decision to return to work. They also found that older workers were less likely to be successful after either the first return to work or several returns to work. Finally, the authors conclude that management of disabilities on the part of the employers is perhaps the most important implication of their study. According to the authors, "patterns of post-injury employment are determined by a set of influences that include workers' characteristics and workplace accommodations that offset the limiting effects of impairments." [11]

[10] Butler, Johnson and Baldwin, page 454.
[11] Butler, Johnson and Baldwin, page 466.

The literature reviewed in this paper places a high degree of emphasis on the disincentives to work that any wage replacement scheme is susceptible to generate. Disability benefits are thought to be no exception and the goal of policymakers should be to reduce the effect of those disincentives. Frank identifies the problems associated with identifying the nature and severity of disabilities. This is supported by Gunderson (2000) and his comments on the increasing incidence of non-traditional disabilities and injuries. Burkhauser, Butler and Weathers (2001) focus on the event to which a disincentive to work might apply, the application process. They isolate employer accommodation as a key variable in delaying or preventing the application for benefits, and therefore in reducing disincentives. Black, Daniel and Sanders (2002) are also concerned with the pre-application time period and the economic factors that affect an individual's decision to apply. The combination of poor economic conditions and the availability of benefits provides a disincentive to work.

Once an individual begins to collect a benefit, the disincentives to work continue; however other variables begin to play a role in shaping the disincentive to work. Campolieti (2001), Hum and Simpson (1996), Bound and Waidmann (1992) and Rupp and Scott (1998) all consider the stage when an individual is collecting a benefit and the disincentives that they face. In each study, the general conclusion is that the actual benefit is providing some disincentive to work.

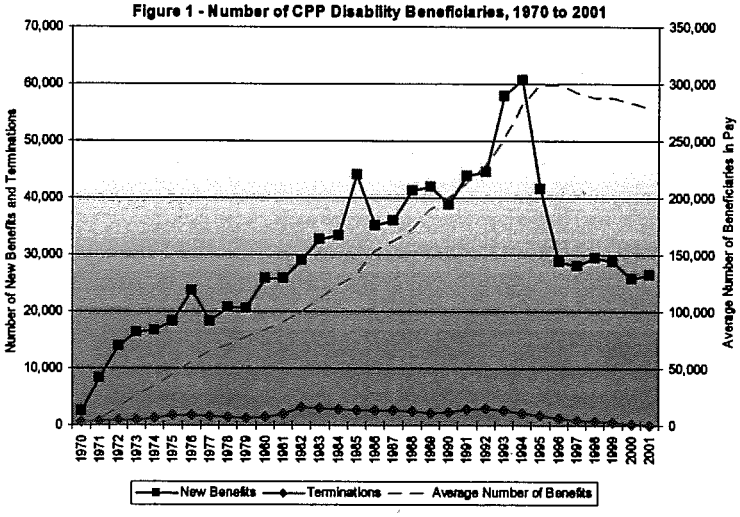
Schechter (1999), Dykacz (1998) and Burkhauser and Daly (1996) are each concerned with the level of employer accommodation provided to individuals returning to the labour force. Butler, Johnson and Baldwin (1995) consider the post-disability benefits and the disincentives to work. They identify several variables, such as disability management, as disincentive reducing variables.

III - The Canadian Pension Plan

The current public pension system, known as the Canadian Pension Plan or CPP, is a federally administered program managed by Human Resources Development Canada (HRDC). The CPP came into effect on January 1st, 1966 and is financed by mandatory contributions that are collected by employers, and transferred to HRDC. Upon reaching age 65 individuals become eligible for retirement benefits and based on the level of contributions made over the course of the individual's career. In addition, a death benefit is available, and spouses and children are eligible for Survivors benefits in the event that the contributor dies.

The focus of this paper is on the disability benefits available through the CPP for individuals who meet the CPP legislation definition of "disabled." Generally, these illnesses or injuries are not work related, as worker's compensation regimes, which are a provincial juri sdiction, pay for those cases. According to HRDC, a person is eligible to receive benefits if a diagnosed disability is deemed to be 'severe and prolonged,' meaning that it prevents working regularly at any job, and that the condition is long-term. In order to be considered eligible for a benefit, a person has to have contributed to the CPP in four of the last six years and over the same time not earned less than 10 percent of each Year's Maximum Pensionable Earnings (YMPE). CPP Disability benefits cover disabilities that

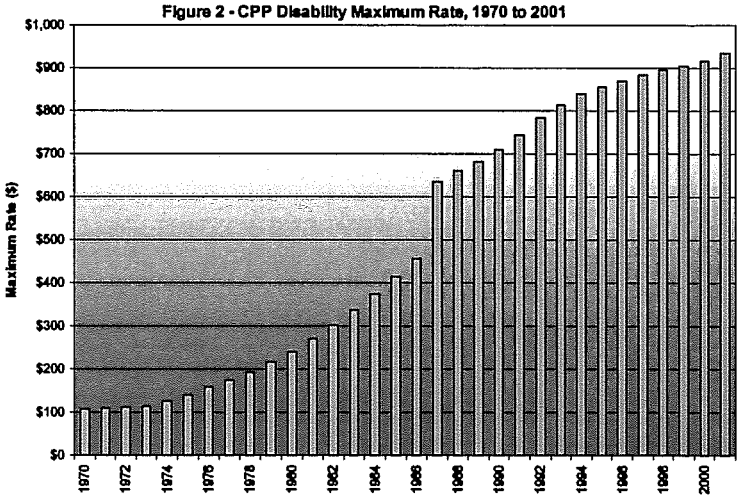
Figure 1 - Number of CPP Disability Beneficiaries, 1970 to 2001



are both mental and physical, as long as they meet the above criteria.

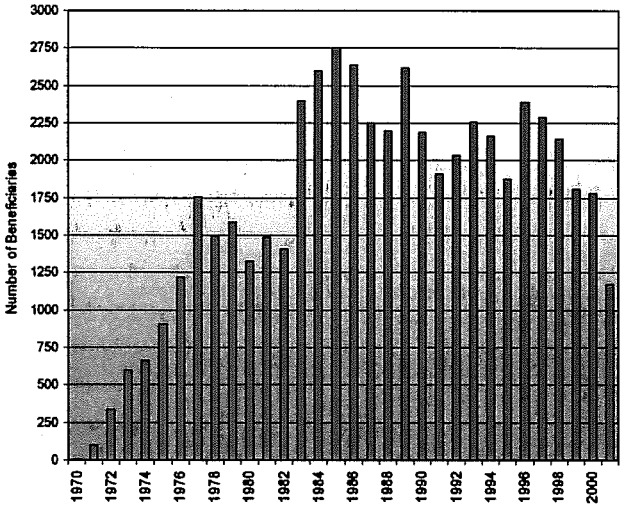
Figure 1 illustrates the evolution of CPPD since it began in 1970. Clearly the number of people that are actively receiving benefits has risen substantially since 1970, although there has been a slight decline in the last five years. This coincides with a dramatic decline in the number of new beneficiaries over the same time period. The number of terminations represents the number of people who have had CPPD benefits terminated because they were deemed to be cured of their disability. There are only three reasons that a benefit can be terminated, one of which is to be cured. The other two are death and transfer to retirement benefits upon reaching age 65. The initial rise in beneficiaries in the beginning of the 1970s can be contributed to the development of the program.

Figure 2 - CPP Disability Maximum Rate, 1970 to 2001

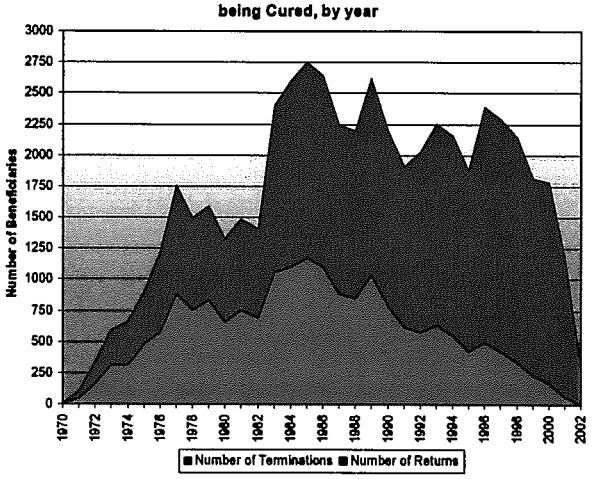


The amount of benefit a person receives is determined by their prior contributions and is calculated as a percentage of a maximum benefit level. The maximum rate is adjusted to inflation once a year; thus as a percentage of the maximum benefit, an individual's benefit is also adjusted. Figure 2 illustrates the rise of the maximum benefit since 1970 and includes the

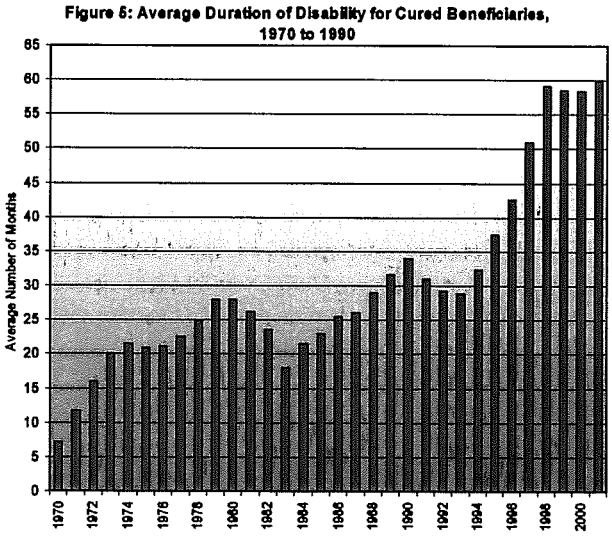
Figure 3: Number of Terminations (Cured), 1970 to 2001



adjustment to the benefit level made in 1987. The maximum benefit in 2001 was $935.12 per month.



With respect to the category of people who have collected disability benefits and then terminated their benefits when they were cured, some interesting observations can be made. Overall, there were 54,650 beneficiaries who ceased to receive benefits since 1970 because their medical status was upgraded to cured, which represents 5.7% of total CPPD beneficiaries during this period. The number of terminations with the reason given as cured has declined consistently since 1996, with a particularly large drop in 2001. The number of beneficiaries terminated annually peaked in 1985 at 2,751. After 1996, when 2,392 benefits were terminated, there was a dramatic decline in the number of terminations to 1,171 in 2001, the lowest total since 1975. This declining number of terminations, coupled with the increasing average duration of benefit spells is worrisome to policymakers because in addition to adding financial pressure to the program, it is contrary to the goal of returning workers to the labour force where they will be participating and contributing members once again.



Of the 54,650 terminated beneficiaries, 19,008 (34.8%) began collecting benefits for a second time at a later date. In 1985, 2,751

beneficiaries were terminated, of which 1,169 returned at some point in the future. Prior to 1983, 50.4% of terminated beneficiaries eventually returned to collecting benefits. In 1983 and thereafter, 30.2% of terminated beneficiaries eventually returned to collecting benefits.

As illustrated in Figure 5, there has been a rising trend in the average duration of benefits at the time of termination since 1970. The average duration of cured beneficiaries in 1975 was 20.9 months, compared with 59.8 months in 2001. While there are data for benefits in 1970, this was the start of the program and it had obviously not yet matured enough to provide reliable duration estimates. The years 1983 and 1993 both represent the lowest averages in the 1980s and 1990s, with durations of 18.0 and 28.9 months, respectively. Figure 6 also shows that average duration of benefits has increased over time, particularly the duration of those associated with the Musculoskeletal System and Injury and Poisoning types of disability, which reached highs of 83.4 and 87.8 months respectively in 2001. In the majority of cases for these types, the average duration has more than doubled since 1991.

Figure 6: Average Duration of Benefits, by Disability Type, by Year

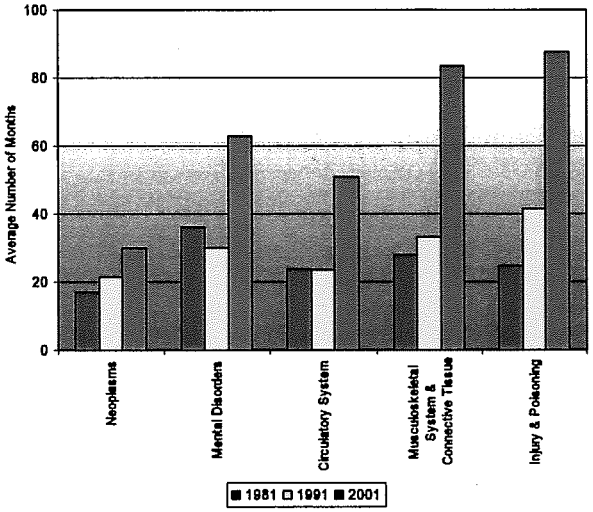
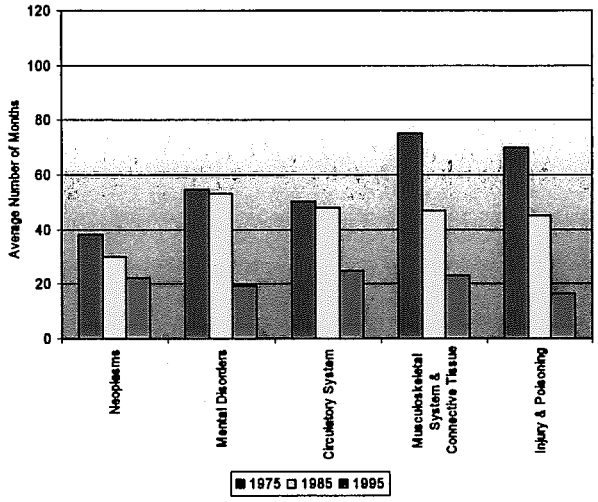


Figure 7 shows that the average duration between disability claims, for beneficiaries with the same disability category, decreased in each of the disability categories, in particular between

Figure 7: Average Duration Between First and Second Disability Claim (Same Disability), by Disability Type, by Year



1985 and 1995. The average number of months an individual spent inbetween claims for a Musculoskeletal System disability fell from 74.9 months in 1975 to 23.0 months in 1995. Injury and Poisoning Disability durations deceased from 70 months to 16.4 months over the same period. These estimates are Mean Completed Spell average durations, which means that the calculation is made on a sample of workers over a given window of time where the beginning and end of each spell is known.

The decline in the duration between spells of disability benefits is cause for concern. The potential reasons for this decline are numerous. Two points made in the literature review need to be revisited here. Gunderson's contention that changes in production technology have resulted in non-traditional disabilities and injuries and the need to find cures for these aliments is certainly something to be considered. In addition, the issue of employer accommodation should be considered. Is the decline in duration between spells the result of a lack of employer accommodation? While these two issues are not the focus of this paper, a third possibility is the focus of this paper.

The trend toward higher average durations beginning in the late 1990s and continuing to the present could be the result of an administrative change in the way disability applications are dealt with. Changes to the adjudication process implemented in 1995 provide strict guidelines for the assessment of the severity and prolongation of the individual's disability. Adjudicators were instructed to use objective medical evidence as the basis for their decision and not socio-economic factors such as the current state of employment. The result has been a decline in the number of new beneficiaries each year and it is assumed that the current beneficiaries are more severely disabled than those of previous years, leading to long spells of benefits. This is a possible explanation for the decline in the number of terminations each year as well.

IV - Empirical Analysis

As the description of the CPPD benefits makes clear, policymakers have an incentive to encourage beneficiaries to return to work. Not only is there a reduction in the amount of program outlays paid to these people, but there is more revenue coming into program coffers as beneficiaries become contributors once again. However, the successful return to work of a disability beneficiary is not guaranteed, and the possibility of returning to the program is very real. A successful return is defined as returning to work permanently, without returning to disability benefits sometime in the future. Thus, policymakers are faced with the dilemma of deciding at what point does the expense associated with encouraging an individual to return to work outweigh the possible gains and make it unprofitable.

Vocational rehabilitation programs are designed to retrain workers so that their marketable abilities in the labour force are not hindered by a disability. Counselling and guidance are available to individuals who demonstrate an interest in returning to work. An individual could return to their former employer or find a new employer and have a modified job or a different job using newly acquired skills. This is done through skills or education upgrading or retraining. The expenses associated with this program can be in the tens of thousands of dollars above and beyond the benefit amount for any given CPPD beneficiary. Vocational rehabilitation hinges on the successful return of an individual to the labour force. An unsuccessful return to the labour force that results in returning to disability benefits means that in most cases, the investment in vocational rehabilitation was a lost investment.

In order to estimate the possible gains to vocational rehabilitation, an estimate of the probability of a successful return of an individual or group of individuals is required. As the literature review has clearly demonstrated, there are a host of possible variables associated with a

disability claim that could result in either a successful or unsuccessful return to disability benefits. In addition to the specific type of disability, there is the issue of gender, age, marital status, income and many others. These are variables that can be considered exogenous to the individual's choices and are relatively time invariant. Additionally, the individual is expected to have some motivation to return, a drive or desire to work again. This can be considered to be the utility an individual derives from work, and like a utility function, is unique from person to person and therefore difficult to observe and measure. In addition, many individuals have a fairly strong desire to return to work, as CPPD does not replace all lost wages.

For the sake of argument, we can assume that all individuals have a desire to work and be productive members of society. However, the individual is still faced with many variables beyond their control when seeking gainful employment after recovering from a disability. The labour market is littered with daunting obstacles to employment, such as possible discrimination and adverse labour market conditions. The business cycle produces periods of high economic growth and prosperity in which anyone seeking to be employed is able to find a job at a fair wage. However, it is common knowledge that the same cycle also produces periods of slow growth, or even negative growth, and high unemployment sending some of the most productive workers scrambling for new jobs. In addition, the Burkhauser and Daly paper suggests that being employed at the time of the onset of a disability has a significant impact on the delay in applying for disability benefits. By extension, during a period of high unemployment, we can assume that more people are likely to re-apply for disability benefits after a reoccurrence of their disability.

Intuitively, these periods of recession would likely hurt those people recently returning to work following a disability or those contemplating a return to work particularly hard. Those

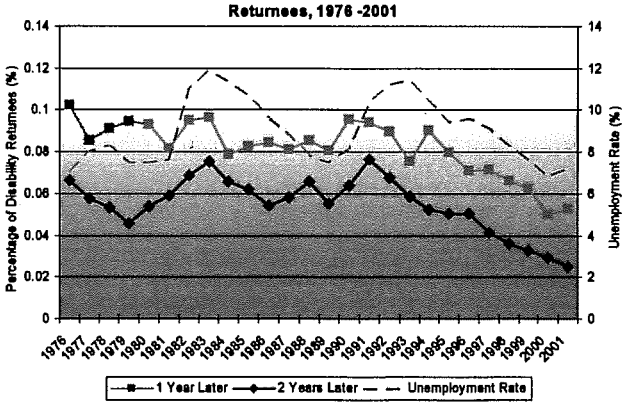
people recently returning to work may be faced with a lack of seniority that make them early targets for the downsizing axe. It is possible to assume that as the elapsed time since the termination of disability benefits increases, the likelihood of a return to benefits diminishes. In addition, those individuals attempting to find work and leave disability benefits are sometimes faced with slack labour market conditions. As a result, an individual may accept a less desirable job. Thus, the time at which an individual terminates his or her benefits is also likely to influence the successful return to work. Therefore, it is my hypothesis that the probability of returning to disability benefits is influenced by the year of the termination. The year of termination variable creates cohorts of returnees that can be used to identify policy effects among other influences. Consider the example of the recession in the early 1980s. The unemployment rate increased from 7.6 in 1981 to 11.0 in 1982. This increase in the unemployment rate affects not only the group of people who terminated benefits in 1982, but also those who terminated prior to 1982. The 1981 cohort had been off benefits for approximately one year and were faced with a higher unemployment rate, likely making them more susceptible to a return to benefits. The 1980 cohort, terminated for approximately two years, was also susceptible to increasing returns to receiving benefits. Conversely, as the business cycle is improving, the likelihood of a return to benefits, for any of the previous cohorts, should be declining.

The hypothesis that I will attempt to prove or disprove is that the probability of returning to disability benefits after having been terminated is influenced not only by factors such as age at termination, type of disability and gender, but also by the year of the termination. This hypothesis is similar to the research done by Black, Daniel and Sanders, who studied the effects of a coal boom and bust on disability rolls in a specific region, but unique in that I am attempting to expand the scope of the idea to a national level. None of the research I have studied uses a

similar approach or data at the micro level for disability programs in Canada. The data used to test this hypothesis are from the Human Resources Development Canada (HRDC) Master Benefit File (MBF). The MBF contains historic and current information on all CPP beneficiaries. Beginning by selecting those individuals who have received a CPPD benefit, I am able to identify those particular individuals who have terminated their benefits because they have been deemed cured. As mentioned earlier, benefits can also be terminated because a person has reached age 65 - those individuals are automatically transferred to a retirement benefit - or because the individual has died. There are other reasons such as suspensions, but none of them involve significant numbers to warrant further discussion, and the determinants of suspensions and other types of termination reasons fall outside the scope of this paper.

Selecting those individuals with a termination reason given as 'cured' yielded 54,648 individuals since 1970. Narrowing that field further to those individuals who experienced a second spell of disability benefits revealed 19,008 unique individuals. These 19,008 beneficiaries returned to disability benefits at some point following their first termination with either the same disability or a second disability. For simplicity, only the termination of the first spell of disability and the start of the second spell are examined, and no distinction will be made between those individuals with the same or similar disability and those individuals with a different disability. A cross-tabulation of the data produces a table with the number of individuals terminated in a given year and the years in which they subsequently returned. The people who terminated in a given year are

Figure 8: Unemployment rate and Percentage of Disability Returnees, 1976 -2001



considered a cohort, and comparison between cohorts is possible. For example, an individual terminated in 1975 is part of that cohort group and is one of 481 terminations that year.

When the unemployment rate in Canada is plotted against the percentage of returning disability benefits one year following termination of benefits as in Figure 8, we can see that as the unemployment rate increases in 1981 and 1982, the percentage of returnees increases one and two years later. Similarly in the early 1990s, as unemployment once again began to rise, so too did the percentage of returnees. The Pearson Correlation Coefficient was computed in order to measure the linear relationship between the unemployment rate and the percentage of disability returnees one year later and a value of 0.273 was obtained. This value is quite low, suggesting that if any relationship exists, it is a very weak one.

Black, Daniel and Sanders (2001), studied the effects of the coal industry boom and bust on the disability participation rates of coal producing counties, concluding that there was a relationship between the bust of the coal industry and the increase in disability participation. Their research indicates a stronger relationship than this, which is undoubtedly due to the fact that they are investigating a single industry in a specific part of the U.S., whereas this paper has taken an aggregated approach and looked at unemployment and disability across the whole of Canada.

In addition, several other variables will be taken into consideration to compare with the year of termination. The age of the individual at the termination of their benefits will be included. As Campolieti (2001) suggested, older individuals over the age of 45 who are collecting a CPPD benefit are less likely to return to the labour force. Also, the number of months that an individual collected a disability benefit can be used as an estimate of the severity of the disability. The fewer the months, the less severe the disability. A measure of the benefit

rate should also be included. Using the percentage of the maximum benefit as opposed to the actual benefit amount allows for a constant comparison over time. The percentage of the maximum that an individual receives does not change over the course of the collection of benefits; thus a person who collected 50% in 1975 can be compared with a person who collected 50% in 1995 without concern for inflation. The type of disability an individual has can be classified into 17 different categories and each category will also be examined. The provision of vocational rehabilitation, as suggested by Berkowitz and Dean (1996), is a possible influence on a successful return to work and a dummy variable indicating whether an individual was part of a vocational rehabilitation program and a variable measuring the number of months spent in that program will be included. Also included will be gender, province of residence and whether or not an individual lives in an urban or rural environment. Finally, policy and administrative changes in 1987 and 1995 will be represented by dummy variables. In 1987, eligibility restrictions were relaxed, while in 1995, eligibility restrictions were tightened. The year in which benefits came into pay for individuals, known as the effective year, has been identified and the impact of those changes can be estimated for individuals who began to collect benefits during those different periods.

Each of these variables is available for each of the 54,648 individuals in the data set. Dummy variables for year of termination, category of disability, gender, province of residence, vocational rehabilitation and effective year were created [12]. A variable for those with an effective year between 1987 and 1994 inclusive was created and another variable for those with an effective year between 1995 and the present was created. A binary variable was created to identify those individuals who terminated disability benefits and then had a subsequent return to

[12] A table with the list of disability categories and the definitions of other variables used in this paper is available in Appendix 1.

benefits. A value of 1 was assigned to individuals who returned, while those who have not returned were assigned a value of 0.

The sample size used is 54,649 observations. The average age at termination is 45.4 years old. The average number of months spent on disability is 32.7. There are 39,619 males in the sample. The average percentage of the maximum rate is 81.5 percent.

A Probit model will be employed to estimate the influences of the variables I have mentioned. The dummy variables for those terminated in 2001, disability category 17 (Injury and Poisoning) and living in Ontario were dropped from the model to avoid the 'Dummy Variable Trap.' Table 1 shows the coefficient estimates obtained from this model, together with their standard errors, t-ratios and elasticities at the means of the explanatory variables. The latter measures the change in the probability of returning to benefits from a one percent change in the explanatory variable. [13]

[13] While this elasticity calculation is not correct for dummy variables, Greene (2003, 668) notes in fact it is often quite accurate.that

Table 1: Coefficient Estimates for Probit Model

Variable	Estimated Coefficient	Standard Error	T-Ratio	Elasticity at Means
SPELL	0.000	0.000	-0.571	-0.006
TERMAGE	0.002	0.001	2.721	0.082
PERCENT	0.317	0.031	10.338	0.284
GENDER	0.044	0.014	3.103	0.035
DISCAT1	0.231	0.063	3.680	0.002
DISCAT2	0.438	0.024	18.408	0.052
DISCAT3	0.524	0.046	11.328	0.009
DISCAT4	0.271	0.121	2.241	0.001
DISCAT5	0.357	0.022	15.976	0.054
DISCAT6	0.365	0.028	13.127	0.024
DISCAT7	0.307	0.021	14.648	0.056
DISCAT8	0.319	0.047	6.750	0.006
DISCAT9	0.252	0.036	6.987	0.009
DISCAT10	0.387	0.045	8.663	0.008
DISCAT11	0.432	0.449	0.963	0.000
DISCAT12	0.223	0.102	2.175	0.001
DISCAT13	0.305	0.019	16.220	0.082
DISCAT14	0.346	0.066	5.241	0.003
DISCAT15	0.548	0.214	2.563	0.000
DISCAT16	0.101	0.062	1.640	0.001
VOC	0.722	0.227	3.182	0.002
VOCSPELL	-0.007	0.015	-0.443	0.000
URBRUR	0.113	0.014	8.145	0.095
MULTI	0.053	0.012	4.458	0.034
NFLD	0.064	0.031	2.107	0.003
NS	0.238	0.023	10.324	0.018
PEI	0.026	0.030	0.866	0.001
NB	0.178	0.068	2.598	0.001
QUE	-0.050	0.090	-0.557	0.000
MAN	-0.078	0.031	-2.516	-0.003
SASK	-0.116	0.032	-3.673	-0.005
ALTA	-0.113	0.021	-5.358	-0.011
BC	-0.069	0.016	-4.263	-0.013
YUK	-0.164	0.191	-0.859	0.000
NWT	-0.066	0.199	-0.331	0.000
EY_1	-0.034	0.029	-1.161	-0.014
EY_2	0.298	0.048	6.154	0.032
CONSTANT	-2.740	0.088	-31.308	-3.019

Variable	Estimated Coefficient	Standard Error	T-Ratio	Elasticity at Means
CO70	2.495	0.417	5.989	0.001
CO71	1.836	0.147	12.474	0.004
CO72	1.921	0.103	18.675	0.013
CO73	2.026	0.092	22.017	0.024
CO74	1.922	0.090	21.283	0.026
CO75	2.070	0.087	23.853	0.038
CO76	1.940	0.084	23.065	0.048
CO77	2.010	0.082	24.658	0.071
CO78	2.018	0.082	24.552	0.061
CO79	2.061	0.081	25.315	0.066
CO80	1.991	0.083	24.097	0.053
CO81	2.010	0.082	24.506	0.060
CO82	1.972	0.083	23.827	0.056
CO83	1.842	0.081	22.848	0.089
CO84	1.809	0.080	22.653	0.095
CO85	1.814	0.079	22.832	0.101
CO86	1.796	0.079	22.651	0.096
CO87	1.738	0.078	22.162	0.079
CO88	1.730	0.075	23.076	0.077
CO89	1.737	0.072	24.100	0.092
CO90	1.657	0.072	22.980	0.073
CO91	1.542	0.073	21.183	0.059
CO92	1.428	0.072	19.696	0.059
CO93	1.420	0.072	19.761	0.065
CO94	1.340	0.072	18.602	0.058
CO95	1.238	0.072	17.130	0.047
CO96	1.097	0.069	16.013	0.053
CO97	0.994	0.068	14.637	0.046
CO98	0.847	0.068	12.363	0.037
CO99	0.666	0.070	9.451	0.024
CO00	0.457	0.072	6.330	0.016

Maddala R-Squared : 0.103
Log Likelihood Function : -32328
Log-Likelihood (0) : -35308
Likelihood Ratio Test : 5959.14

There are several interesting findings obvious from this table. Using the likelihood ratio test statistic to test the null hypothesis that the estimated slope coefficients are equal to zero, 5,959.14 is greater than the chi-squared value with 50 degrees of freedom and a 95% confidence

level, 67.22. [14] Therefore, the null hypothesis is rejected. The coefficients of the year of termination, the cohort variables, have the highest levels of significance and the highest estimated coefficients. The T-ratios for each cohort variable are significant at the 95% level, but begin to decline after the 1989 year of termination. For the estimated coefficients, beginning in 1985, there is only a single increase in 1989. Examining the disability categories, only two categories have insignificant coefficients, categories 11 and 16 or Complication of Pregnancy and Childbirth and Symptoms, Signs and Ill-defined Conditions. The reason for the insignificance could be the low numbers of individuals who are in these categories. Combined, these two categories represent approximately 1% of the total population in this data set. Two of the largest categories in terms of numbers of individuals are categories 2 (Neoplasms) and 13 (Musculoskeletal System and Connective Tissue), which make up approximately 35% of the population in this data set. These are two categories that are of significant interest to policymakers and administrators because of their size. The dummy variable for Musculoskeletal System disorders had the highest elasticity at the mean, 0.082, of any category and the Neoplasm dummy variable had an elasticity higher than most of the remaining categories. Mental disorders, which account for 14% of terminations also produced a high elasticity of 0.056.

The coefficients of gender and age at termination estimates are both significant. Based on the elasticity at the mean, the gender dummy variable has a larger effect on the probability of returning to benefits than many of the types of disabilities. The age at termination variable has a higher elasticity at the mean than many of the non-cohort year variables on the left side of the table. A 1 percent increase in the age at termination, which is only a matter of months, results in an 8 percent increase to the probability of returning.

[14] There are 68 degrees of freedom in this model, however 50 degrees are used as an approximation of the chi-squared value.

There are regional differences identified by the estimated co-efficients of the provincial dummy variables. The only regions with insignificant coefficients, Prince Edward Island, Quebec, Yukon and North West Territories, are regions with low numbers of individuals in the data set.[15] The three remaining Maritime provinces, Newfoundland, New Brunswick and Nova Scotia all have significant and positive estimated coefficients and positive elasticities at the mean, while the remaining provinces to the west all have negative coefficients and negative elasticities at the mean. This suggests that individuals who live in the three Maritime provinces are more likely to return to disability benefits compared to an individual terminating benefits in Ontario. The unemployment rates for these three provinces have been higher historically than the rate in Ontario and are usually the highest in the country.

The dummy variable used to indicate whether an individual lived in an urban area has a significant estimated coefficient and a high elasticity at the mean. The positive value of the estimated coefficient indicates that individuals living in urban area have a higher likelihood of returning to disability benefits and the high elasticity suggests that this variable is a strong indicator. This result is somewhat counter intuitive, one would expect that an individual living in an urban area would have more opportunity to find employment in another field that would not be affected by any lingering disability while a person living in a rural area could be limited by the number of job opportunities. Conversely, an individual living in an urban area might have more social services available within the community, such as meals provided through a church, that could reduce the need to return to work whereas a rural area would be limited in the services it could provide.

[15] Quebec administers its own public pension program the Quebec Pension Plan (QPP) and as a result, the only individuals living in Quebec and receiving a CPP benefit had to have contributed to the plan while working outside of Quebec.

The coefficient of the provision of vocational rehabilitation variable is significant and positive. This is counter-intuitive as one would expect that an individual who participates in a vocational rehabilitation program would be more likely to succeed in returning to work. The presence of another disabling condition, represented by the 'multi' variable, is significant, although its estimated coefficient is smaller than those of many of the other variables. However, the 'multi' variable does have a higher elasticity at the mean than the vocational rehabilitation dummy variable, suggesting that it has a stronger impact on the probability of or returning to benefits.

The low value for the Maddala R-squared statistic, 0.103, is a concern. While it is difficult to achieve good R-squared values from micro data, this value is particularly low. Clearly, there is something missing from this model. Upon further consideration, variables for the type of return to work and the education level would likely be important considerations to include in this research. Butler, Johnson and Baldwin state that "The advantages of education and skills in offsetting the effects of physical limitations on job performance appear both important and obvious," in the summation of their paper. Unfortunately, these variables are not available from the Master Benefit File used for the original data set. However, this information is available from a second data source within HRDC and merging the two data sets yields a file with 6,091 individuals who match both data sets. Unfortunately, the data set is reduced from 54,648 observations to 6,091 observations to obtain this information, but the sample size is still sufficiently large enough to produce viable results. The second database is called the Rules Based Reassessment System and contains individuals selected during the adjudication to be reassessed at some point in the future, usually at a date specified by the adjudicator. Dummy variables for return to work (RTW) categories such as full-time, part-time, seasonal and

temporary work are created. Dummy variables for academic levels such as apprenticeship, technical training, completed high school, some high school, undergraduate degree and post-graduate degrees are also created.[16]

The sample size for the second model is 6,091 observations. The average age at termination is 43.9 years old. The average number of months spent on disability is 56.6. There are 3,872 males in the sample. The average percentage of the maximum rate is 76.3 percent.

The coefficient of percent of the maximum rate, which represents how high the disability benefit is for each individual, remains significant and positive. The estimated elasticity is higher than those of all of the other variables, indicating that it plays a bigger role in the decision to return to benefits. The amount of money a person can receive as a disability benefit is likely the biggest consideration in the decision to apply for a benefit. Just as labour economic theory dictates, the higher the benefit amount, the greater the disincentive to work and likelihood of withdrawing from the labour force. A 1 percent increase in the percentage of the maximum rate is likely to be a few dollars a month, yet it can produce a 28 percent increase in the probability of returning to benefits.

A second probit model was estimated and included the new return to work and academic levels, but with a smaller sample size. The same dummy variables dropped in the first model are dropped here, and other return to work and other academic level are also dropped from the new groups of dummy variables. Table 2 shows the results.

[16] A complete list of both the return to work and academic level variables is available in appendix 2.

Table 2: Coefficent Estimates for Probit Model

Variable	Estimated Coefficient	Standard Error	T-Ratio	Elasticity at Means
SPELL	-0.002	0.001	-2.599	-0.180
TERMAGE	-0.001	0.003	-0.346	-0.049
PERCENT	0.292	0.117	2.499	0.283
GENDER	0.045	0.046	0.980	0.036
DISCAT1	0.257	0.164	1.572	0.005
DISCAT2	0.305	0.093	3.265	0.031
DISCAT3	0.556	0.170	3.272	0.009
DISCAT4	0.274	0.365	0.750	0.001
DISCAT5	0.445	0.073	6.110	0.134
DISCAT6	0.327	0.091	3.572	0.031
DISCAT7	0.245	0.086	2.856	0.030
DISCAT8	0.521	0.209	2.494	0.006
DISCAT9	0.446	0.120	3.712	0.019
DISCAT10	0.261	0.135	1.933	0.009
DISCAT11	5.271	119.420	0.044	0.001
DISCAT12	-0.679	0.585	-1.161	-0.003
DISCAT13	0.185	0.072	2.572	0.057
DISCAT14	0.137	0.214	0.639	0.002
DISCAT15	-0.339	0.720	-0.471	0.000
DISCAT16	0.233	0.180	1.299	0.004
EY_1	-0.097	0.107	-0.912	-0.078
EY_2	0.144	0.149	0.963	0.041
VOC	0.243	0.394	0.616	0.003
VOCSPELL	-0.010	0.024	-0.416	-0.002
URBRUR	0.165	0.051	3.228	0.163
MULTI	-0.008	0.043	-0.193	-0.007
NFLD	0.326	0.136	2.404	0.009
NS	0.176	0.084	2.108	0.016
NB	0.212	0.121	1.755	0.008
PEI	0.348	0.228	1.530	0.003
QUE	-0.078	0.280	-0.279	-0.001
MAN	-0.043	0.104	-0.416	-0.002
SASK	0.358	0.108	3.326	0.016
ALTA	0.115	0.064	1.794	0.017
BC	0.078	0.055	1.414	0.017
YUK	-0.147	0.619	-0.237	0.000
NWT	-0.166	0.403	-0.411	-0.001
CONSTANT	-2.615	0.278	-9.401	-3.329

Variable	Estimated Coefficient	Standard Error	T-Ratio	Elasticity at Means
CO72	6.438	119.420	0.054	0.001
CO73	6.690	59.529	0.112	0.006
CO74	6.553	42.053	0.156	0.011
CO75	6.795	48.352	0.141	0.009
CO76	3.146	0.566	5.554	0.007
CO77	6.763	35.947	0.188	0.016
CO78	6.618	29.829	0.222	0.022
CO79	6.688	26.021	0.257	0.029
CO80	3.527	0.528	6.674	0.013
CO81	6.873	26.105	0.263	0.030
CO82	3.561	0.529	6.735	0.015
CO83	3.457	0.412	8.389	0.025
CO84	3.127	0.314	9.945	0.035
CO85	3.363	0.314	10.726	0.046
CO86	3.080	0.294	10.475	0.042
CO87	2.438	0.258	9.460	0.032
CO88	2.731	0.251	10.875	0.039
CO89	2.668	0.210	12.702	0.070
CO90	2.391	0.192	12.478	0.075
CO91	2.320	0.196	11.845	0.059
CO92	2.156	0.184	11.687	0.068
CO93	2.126	0.176	12.054	0.087
CO94	1.831	0.169	10.849	0.098
CO95	1.767	0.162	10.908	0.132
CO96	1.471	0.154	9.568	0.163
CO97	1.195	0.147	8.136	0.215
CO98	0.903	0.144	6.259	0.184
CO99	0.889	0.144	6.158	0.147
CO00	0.461	0.149	3.098	0.069
RTW_FULL	-0.310	0.053	-5.860	-0.080
RTW_PART	-0.187	0.057	-3.274	-0.039
RTW_PREV	-0.100	0.109	-0.916	-0.004
RTW_TEMP	-0.184	0.116	-1.586	-0.008
RTW_SEAS	-0.249	0.134	-1.851	-0.007
ACAD_APP	0.147	0.102	1.452	0.015
ACAD_TEC	0.187	0.091	2.061	0.040
ACAD_CHS	0.093	0.090	1.035	0.022
ACAD_ELE	0.365	0.099	3.695	0.050
ACAD_POS	0.114	0.122	0.930	0.006
ACAD_SHS	0.226	0.087	2.612	0.060
ACAD_DEG	0.177	0.105	1.683	0.018
ACAD_TRA	0.242	0.107	2.265	0.020

Maddala R-Squared: 0.288
Log Likelihood Function : -2580.6
Log-Likelihood (0) : -3614.1
Likelihood Ratio Test : 2066.86

There are some interesting changes evident from the new variables and the reduced data set. Again the likelihood ratio test statistic is used to test the null hypothesis that the estimated

coefficients are equal to zero. In this case 2066.86, the value of the statistic, is greater than the chi-squared value with 50 degrees of freedom at the 95% confidence level, 67.22. [17] Therefore, we reject the null hypothesis. For this model with the return to work and education level variables the R-squared value has increased to 0.288. While it is still low, I think the model has improved significantly with the inclusion of this data. Examining the cohort termination year variables, the coefficients of the dummy variables for 1976 and 1980 are significant despite being surrounded by insignificant variables from 1972 to 1981. Beginning in 1982, the coefficients of all the cohort variables become significant. However, the estimated coefficients of the cohort variables begin to decline in 1982. The estimated coefficient falls from 3.561 to 0.461 over this period. There is no change in the trend of declining coefficients during the early 1990s, suggesting that the economic recession that occurred during this time had little effect. However, over the same period, the elasticities at the means increased, reaching a high in 1997 of 0.215 before declining to 0.069 in 2000. Typically, elasticities measure the change in the dependent variable for a 1% change in the independent variable, however in the case of the termination cohorts, it is a change from one year to the next. There are slight decreases in the elasticities in 1982 and 1983 and again in 1991 and 1992.

Only the full-time or part-time return to work categories have significant coefficients in this model and both have negative estimated coefficients. Full-time return to work has an estimated coefficient of -0.310 compared to part-time work, which is estimated to be -0.187. This indicates that individuals who terminated disability benefits and are fortunate enough to find full-time employment are less likely than their part-time counterparts to return to disability benefits sometime in the future. In addition, the full-time and part-time categories had the

[17] There are 79 degrees of freedom in this model, however 50 degrees are used as an approximation of the chi-squared value.

highest elasticities (in absolute value) at the mean in the return to work category. An individual with full-time employment is likely to be earning a higher income than a part-time employee, which according to the theories of labour economics discussed earlier in this paper, suggest that they are less likely to apply for disability benefits.

The academic levels with significant coefficients in this model are technical college certificates, elementary school education, some high school education and on the job training. Each of the estimated coefficients of these variables is positive and the highest coefficient corresponds to the lowest level of education, elementary school. Additionally, the highest elasticities at the mean are for the elementary and some high school categories. The suggestion by Butler, Johnson and Baldwin, that a higher level of education encourages a successful return to work is reinforced here. An individual with education at a technical college is more likely to succeed than an individual with some high school education. The lowest elasticities at the means are for the post graduate and undergraduate degrees, which indicates that the higher the level of education, the lower the impact on the probability of returning.

There are some changes to the regional estimates of the first model, in particular, Saskatchewan has a positive and higher estimated coefficient. The coefficient is higher than that of the Maritime provinces, even that of Newfoundland which traditionally has the highest unemployment rate in the country. However, higher elasticities at the mean are found in the western provinces, Saskatchewan, Alberta and British Columbia.

The coefficients for gender, age at termination and the provision of vocational rehabilitation are all insignificant in this model. The estimated coefficient and elasticity at the mean for the percentage of the maximum rate remain among the highest values of the model, once again reinforcing the labour economic theory.

Using the Davidson and Mackinnon method of testing for heteroscedasticity in a Probit model, the lagrange multiplier statistic produced, 29.45, is greater than the chi-squared statistic with 12 degrees of freedom at the 95% confidence level, 21.03. [18] This indicates that there is heteroscedasticity in the model. The same test for heteroscedasticity was applied to the original model, however this produced a positive definite matrix and no lagrange multiplier statistic could be calculated. In the test on the second model, all the explanatory variables estimated were included.

V - Conclusion

Overall, the findings of this paper can be considered a foundation for further research in the area of disability benefits and payments. Initially, it may appear more as an extension of the work done by Black, Daniel and Sanders; however I think that by using disability recipient data from any industry and over a much longer period of time, in addition to the data being Canadian, this paper is unique and can serve as a foundation itself for further research.

In particular, the relationship between the type of disability and the duration between disability spells is undoubtedly a key issue in the study of disability benefits. The differences that appear in the provincial variables are the most interesting to me, especially when it is obvious that the provinces with the highest likelihood of a return to benefits are also the provinces with the highest levels of unemployment.

CPP Policymakers and administrators have attempted to remove consideration of socio-economic factors from the adjudication process of applying for disability benefits in the 1990s. I think there are several indications that they have been successful to some degree, however this is not to say that the economic environment does not influence an individual's decision to apply.

[18] Greene, page 892.

The reduced number of new beneficiaries and the increased duration of benefits suggests that only individuals with a 'severe and prolonged' disability are in fact receiving a benefit. Ultimately, it is still the decision of the individual to apply or re-apply for benefits.

The variable that may be of most interest to policymakers is the vocational rehabilitation indicator and number of months spent in the vocational rehabilitation program. The estimated coefficient of the vocational rehabilitation dummy variable in the first model seemed to indicate that participating in the program increased the likelihood of a return to benefits. The estimated coefficient in the second model was insignificant.

The use of probit models to estimate the effects of several key variables at the micro data level produced interesting, if inconclusive results. The low values of the R-squared statistics indicate that the models may not be complete. However, when using micro data, it can be difficult to achieve better R-squared statistics. The findings in this paper with respect to calendar effects correspond, though not to the same degree, to those found in the paper by Black, Daniel and Sanders. In addition, the importance of the level of education of an individual underscores the findings of Butler, Johnson and Baldwin. While the effect of the age at termination does not conflict necessarily with the conclusions made by Campolieti, the lack of significance of the estimated coefficients is a disappointment.

In the conclusion of the paper by Butler, Johnson and Baldwin, the authors make an important comment about how the "patterns of post-injury employment are determined by a set of influences that include workers' characteristics." These characteristics are difficult to identify and can very different from person to person, making it hard to try and create a single model that encompasses all these individuals and their unique characteristics. When measuring the savings to the benefit program of an individual ceasing to collect payments because they are deemed to

be cured, the economic environment in which they find themselves is one of many factors that need to be considered. However, the presence of heteroscedasticity in the model is a concern, and certainly an area in which to continue research. Eliminating the heteroscedasticity would produce a better model. In addition, further research at the micro level could examine the duration disability benefits periods.

VI - Appendix 1

Disability Categories

Variable Name	Description
Discat1	Infectious Diseases
Discat2	Neoplasms
Discat3	Endocrine,Nutritional, Metabolic Diseases & Immunity Disorders
Discat4	Blood & Blood-Forming Organs
Discat5	Mental Disorders
Discat6	Nervous System & Sense Organs
Discat7	Circulatory System
Discat8	Respiratory System
Discat9	Digestive System
Discat10	Genitourinary System
Discat11	Complication of Pregnancy, Childbirth & the Puerperium
Discat12	Skin & Subcutaneous Tissue
Discat13	Musculoskeletal System & Connective Tissue
Discat14	Congenital Anomalies
Discat15	Certain Conditions Originating in the Perinatal Period
Discat16	Symptoms, Signs & ill-Defined Conditions
Discat17	Injury & Poisoning

Return to Work

Variable Name	Description
RTW_Full	Full Time
RTW_Part	Part Time
RTW_Prev	Previous Employer
RTW_Temp	Temporary Employment
RTW_Seas	Seasonal Employment
RTW_Oth	Other

Academic Level

Variable Name	Description
Acad_app	Apprenticeship
Acad_tec	Technical College
Acad_chs	Completed High School
Acad_ele	Completed Elementary School
Acad_pos	Post Graduate Degree
Acad_shs	Some High School
Acad_deg	Undergrade Degree
Acad_tra	On the job training
Acad_oth	Other

Other Variables

Variable Name	Description
SPELL	Duration of Disability Benefit in months
TERMAGE	Age of individual at date of benefit termination
PERCENT	Percentage of the Maximum Rate
GENDER	Gender Dummy Variable, Males=1, Females=0
EY_1	Dummy Variable, Effective Years from 1987 to 1994 = 1
EY_2	Dummy Variable, Effective Years from 1995 to 2000 = 1
VOC	Individual Participated in Vocational Rehabiliation Program = 1
VOCSPELL	Number of month spent in VR Program
URBRUR	Dummy Variable for Urban or Rural address, Urban=1, Rural=0
MULTI	Presence of secondary associated disability = 1
NFLD	Newfoundland = 1
NS	Nova Scotia = 1
NB	New Brunswick = 1
PEI	Prince Edward Island = 1
QUE	Quebec = 1
MAN	Manitoba = 1
SASK	Saskatchewan = 1
ALTA	Alberta = 1
BC	British Columbia = 1
YUK	Yukon = 1
NWT	North West Territories = 1
CO##	Equals 1 in the cohort year of termination, 1970 to 2001

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