THE UNIVERSITY OF CALGARY

Experience Rating of Workers' Compensation in Alberta

by

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A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE

DEGREE OF MASTER OF ARTS

DEPARTMENT OF ECONOMICS

CALGARY, ALBERTA

NOVEMBER, 1995

THE UNIVERSITY OF CALGARY

FACULTY OF GRADUATE STUDIES

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ABSTRACT

Experience rating is a method of adjusting insurance premiums based on the insured's past claim record. The introduction of experience rating to worker's compensation premiums by the Alberta Workers' Compensation Board in 1987 provides the basis for the study. The aim is to empirically determine the safety effects of experience rating in Alberta, using data from the years 1951 to 1992.

A profit-based model of safety is employed to analyze the safety effects of experience rating. The model and changes to it are presented, focusing on experience rating and other safety programs. This will include a discussion of the theory behind the programs and a brief history of Alberta's safety climate. An econometric study is performed. It takes advantage of a "natural experiment" that occurs with the introduction of experience rating in Alberta. Results of this experiment are discussed and conclusions drawn.

ACKNOWLEDGEMENTS

I offer my sincere thanks to Dr. Christopher Bruce and Dr. Frank Atkins for their guidance and assistance. Thanks also to Dr. Elizabeth Wilman for helping make my graduate school experience a good one, and to the secretarial staff for their smiles and kindnesses.

Finally, I offer my deepest and most heartfelt gratitude to Tara, for editing help and most importantly, for her continued love and support.

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CHAPTER ONE: INTRODUCTION

The aim of this paper is to perform an empirical analysis of the safety effects of the experience rating program introduced in Alberta in 1987. The program has been of interest to workers' compensation boards trying to lower risk of injury and payouts to injured workers.

Two empirical studies have been performed in Canada and the results are mixed. Bruce and Atkins (1993) found that experience rating in Ontario decreased the risk of fatality in construction and forestry. Lanoie (1992b) concluded that a proxy for experience rating in Quebec had very little effect. The few American studies have relied on proxies as well. Two studies (Chelius and Smith, 1983; Worrall and Butler, 1988) found lower injury rates using firm size as a proxy for experience rating. Kniesner and Leeth (1989) achieved similar results using numerical simulation.

However, no study has examined the more comprehensive experience rating program in Alberta. Anecdotal evidence from the Alberta Workers' Compensation Board (WCB) suggests that the program has been successful in raising safety levels. Jeff Smith of the Alberta WCB speculates that before experience rating, firms had been exposing workers to a level of safety that was lower than socially optimal (Interview, 1994).

Experience rating is an attempt to give firms incentives that will aid them in providing the socially optimal level of safety; that is, the point where marginal social costs equal marginal social benefits. The optimal level cannot be determined exactly by theory or empirically. But, an empirical test can be undertaken to determine how the 1987 experience rating program affected safety.

The principal goal of this paper is to conduct an empirical investigation of the safety effects of the 1987 program. The results may be important to other WCBs wishing to lower their occupational safety costs. Raising safety levels lowers the amount a WCB, and in a fully premium funded system, an employer, must pay in WC benefits. Governments wishing to lower spending and raise popularity with voters may look at experience rating as a way to accomplish their aims.

1.1) The Profit-based Model of Safety

The purpose of this section is to describe a model of workplace safety and how changes in certain variables affect a firm's incentive to invest in safety in the workplace. The model used in this chapter is based on one by Bruce and Atkins (1993). For simplicity's sake a one-period model is used, rather than the two-period formulation created by Bruce and Atkins. Firms are assumed to be risk neutral; individuals are risk averse.

Each term will be presented and explained before the entire model is displayed.

The Model:

In general, a profit function for an individual firm is employed in order to determine the effects on the firm's incentive to invest in safety. The incentive to invest may be affected by changes in the variables. The terms of the profit function are shown below; with changes to the model being discussed following the final model description. The profit function used for firm i is

$$\pi_i = \text{Expected Revenue}_i - \text{Expected Cost of Labour}_i - \text{Cost of Insurance}_i - \text{Cost of Safety}_i$$

1.2) Terms of the Profit Function:

1.2.1) Expected Revenue

An important part of the profit function is the expected revenue gained by the firm.

$$\text{Expected Revenue}_i \equiv [1 - p_i(e_i)]R_i(L_i) \qquad (1.1)$$

Define: e_i to be expenditure per employee on safety by the firm; $p_i(e_i)$ to be the probability of a worker in firm i being injured (or the expected percentage of workers in firm i who are injured); R_i to be the revenue gained by the firm; and L_i to be the number of employees in firm i. The term in square brackets is the percentage of workers that are healthy since $p_i(e_i)$ is the expected percentage injured. Furthermore, it is assumed that p_i is inversely related to e_i. As the probability of an employee being injured on the job is raised, expected revenue declines, *ceteris paribus*.

1.2.2) Expected Cost of Labour

$$\text{Expected Cost of Labour}_i \equiv [1 - p_i(e_i)]w_iL_i \qquad (1.2)$$

In this term, w_i is the market determined wage rate for firm i, and $[1 - p_i(e_i)]$ is the probability that all employees are healthy. w_i is determined from the assumption that expected utility in the risky market is equal to utility in the risk-free market. Define: w_0 to be the market determined wage in a hypothetical risk free labour market; U^n to be utility in the healthy state; U^a to be utility in the injured state; and b_i to be the level of workers' benefits in the injured state. w_0 and b_i are assumed to be fixed. The equilibrium level of wages, w_i adjusts until the following condition is met:

$$(1 - p_i)U^n(w_i) + p_iU^a(b_i) = U^n(w_0) \qquad (1.3)$$

As in the revenue term, when the probability of injury rises, the expected cost of labour to the firm falls. In general, the market wage does not equal the actual benefit distributed to injured workers due to the possibility of moral hazard.[1] The total amount of

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[1]Moral hazard recognizes that the incentive for workers to take precautions is compromised if they are fully compensated for all accidents that occur to them (Bruce and Atkins, 1993). The substitutability of employer for worker precautions as well as the ability of the employer to monitor and punish or reward worker actions will determine whether or not there will be an under investment in safety. This is because the firm has an incentive to invest in safety precautions because workers demand compensating wage differentials for

premium paid by the firm is equal to $r_i L_i$ which is the premium required for each employee multiplied by the number of employees in the firm. Thus, the total premium in the profit function is given by (1.4).

1.2.3) Cost of Insurance

$$\text{Cost of Insurance}_i \equiv r_i L_i \equiv \{p + \beta[p_i(e_i) - p]\} b_i L_i \qquad (1.4)$$

(1.4) is the firm's cost of insurance in this model.

It is assumed that premiums per worker, for firm i, can be denoted r_i. Let

$$r_i = \{p + \beta[p_i(e_i) - p]\} b_i \,. \qquad (1.5)$$

Here, b_i is the level of benefits mandated by the workers' compensation board and p is the average industry accident rate.

Since the model being referred to here refers to a single time period, the probability of an injury, p_i,is based on the safety expenditures of the current period only, e_i.

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working conditions that are less safe than they would like if no differential were paid. There is an implied inverse relationship between the level of safety expenditures and the wage in the risky market. If a firm can substitute its own expenditures on safety for employees' expenditures, this means that anything that lowers worker investment in safety will bring about a rise in employer investment. If the firm can closely and accurately monitor employees' expenditures on safety, it may be able to induce them to take optimal precautions by offering the appropriate rewards and punishments.

Since I assume that employers cannot monitor worker actions accurately, workers' compensation benefits are set *lower* than the forgone wage, providing workers with a private incentive to minimize accident costs. Therefore, workers' compensation boards use $b_i < w_i$ which gives (1.5).

Workers' Compensation Board premiums are based upon some combination of the accident rates of the industry and the firm. The "weight" that the Board places on the safety record of the firm relative to that of the industry is measured by the term β, which is termed the "adjustment factor". As β approaches zero, relatively less weight is placed on the firm's own safety record and more is placed on the industry's. As this occurs, the premium-setting scheme approaches what is known in the insurance literature as flat rating. Under flat rating, a firm's record does not affect the workers' compensation premiums charged it. At the other extreme, as β approaches one, the scheme approaches self rating, a situation in which the firm bears sole responsibility for the amount of the premiums charged it.

The insurance program in place prior to 1987 in Alberta was known as merit rebate. The merit rebate plan had a β value that was lower than that offered by the experience rating program which was in place from 1987 onward. Thus, when experience rating was introduced in 1987, it was as if β rose.

1.2.4) Cost of Safety

One of the important terms in this model describes the effects of inspection (or regulation) on a firm's profits. The cost of safety to a firm is the amount spent on safety, e_i, plus the costs brought about by a regulatory program. Specifically, it is the total cost of safety inputs, plus the expected cost to the firm of being fined due to non-compliance.

Define p_i^F to be the probability of the firm being fined, if inspected. It is a positive function of the difference between the required and actual levels of safety expenditures, e^* and e_i, respectively. p_i^I is the probability of the firm being inspected, assumed to be exogenously determined. F_i is the fine that would be imposed on firm i, if found to be in violation of regulations. Thus, per employee cost of safety is

$$\left[e_i + p_i^F\left(e^*, e_i\right) \cdot p_i^I \cdot F_i\left(e_i\right)\right]. \qquad (1.6)$$

The total expected value of fines and the value of safety expenditures for firm i is given by multiplying the term in brackets by the number of employees. Therefore, the regulation term is given by (1.7)

$$\text{Cost of Safety}_i \equiv \left[e_i + p_i^F\left(e^*, e_i\right) \cdot p_i^I \cdot F_i\left(e_i\right)\right] L_i \ . \qquad (1.7)$$

1.3) A Profit Function: The Model

Recalling the general profit function for firm i

$$\pi_i = \text{Expected Revenue}_i - \text{Expected Cost of Labour}_i - \text{Cost of Insurance}_i - \text{Cost of Safety}_i$$

If the specific terms discussed earlier are substituted into the profit function, it becomes:

$$\pi_i = \left[1 - p_i(e_i)\right] R_i(L_i) - \left[1 - p_i(e_i)\right] w_i L_i - \left\{p + \beta\left[p_i(e_i) - p\right]\right\} b_i L_i - \left[e_i + p_i^F\left(e^*, e_i\right) \cdot p_i^I \cdot F_i(e_i)\right] L_i \qquad (1.8)$$

where

p_i = probability of injury for workers in firm i

e_i = safety expenditures purchased by firm i, per employee

R_i = revenue gained by firm i

L_i = number of labour units employed by firm i

w_i = wage rate that makes workers indifferent between working for firm i and working in the reference market

p = industry average injury rate

β = administratively determined "adjustment factor"

b_i = workers' compensation payment to injured worker while disabled

p_i^F = probability of firm i being fined if inspected

e^* = level of safety expenditures required by a regulatory program, per employee

p_i^I = probability of firm i being inspected

F_i = fine assessed to firm i, per employee

1.4) Effects of Changes to the Profit Function

In this section, I investigate the effect that changes in certain variables have on the incentive to provide safety and, therefore, on profits. The incentive (for a profit maximizer) to provide safety is defined as $\frac{\partial \pi_i}{\partial e_i}$, and will be either positive or negative.

1.4.1) Changes in Benefit Levels:

If benefit levels are changed, the effect on the incentive to provide safety is shown by the sign of $\frac{\partial \pi_i^2}{\partial e_i \partial b_i}$. If the derivative of the profit function is taken with respect to b_i (the order of derivatives is unimportant), the result is

$$\frac{\partial \pi_i}{\partial b_i} = -[1 - p_i(e_i)]\frac{\partial w_i}{\partial b_i}L_i - \{p + \beta[p_i(e_i) - p]\}L_i \ . \qquad (1.9)$$

The sign on $\frac{\partial w_i}{\partial b_i}$ in (1.9) is constrained by the assumption that the expected utility in the risky market is equal to utility in the risk-free market, shown earlier as

$$(1 - p_i)U^n(w_i) + p_i U^a(b_i) = U^n(w_0) \qquad (1.3)$$

where U^n is utility in the healthy state, and U^a is utility in the injured state. If the total derivative of (1.3) is taken with respect to w_i and b_i and rearranged, the result is

$$\frac{\partial w_i}{\partial b_i} = -\frac{\frac{\partial U^a}{\partial b_i}}{\frac{\partial U^n}{\partial w_i}}\left(\frac{p_i(e_i)}{1 - p_i(e_i)}\right) \qquad (1.10)$$

If (1.10) is substituted into (1.9), we get

$$\frac{\partial \pi_i}{\partial b_i} = [1 - p_i(e_i)]\frac{\frac{\partial U^a}{\partial b_i}}{\frac{\partial U^n}{\partial w_i}}\left(\frac{p_i(e_i)}{1 - p_i(e_i)}\right)L_i - \{p + \beta[p_i(e_i) - p]\}L_i \qquad (1.11)$$

which reduces to

$$\frac{\partial \pi_i}{\partial b_i} = \frac{\dfrac{\partial U^a}{\partial b_i}}{\dfrac{\partial U^n}{\partial w_i}}(p_i(e_i))L_i - \{p + \beta[p_i(e_i) - p]\}L_i \tag{1.12}$$

When the derivative of (1.12) is taken with respect to e_i, this gives

$$\frac{\partial \pi_i^2}{\partial e_i \partial b_i} = \left(\frac{\overset{(+)}{\dfrac{\partial U^a}{\partial b_i}}}{\dfrac{\partial U^n}{\partial w_i}} - \overset{(+)}{\beta} \right) \overset{(-)}{\frac{\partial p_i}{\partial e_i}} L_i \quad . \tag{1.13}$$

(1.13) is the change in incentive to invest in safety given by a change in benefits. However, it is of uncertain sign without certain assumptions. Since it is assumed that w_i is generally larger than b_i, $\dfrac{\dfrac{\partial U^a}{\partial b_i}}{\dfrac{\partial U^n}{\partial w_i}}$ will exceed unity, given the two assumptions of: diminishing marginal utility, and that marginal utility in the healthy state is equal to or greater than that in the injured state. This implies that the term in the brackets is positive, as $\beta \leq 1$, which in turn implies that $\dfrac{\partial \pi_i^2}{\partial e_i \partial b_i} < 0$. That is, as workers' compensation benefits rise, the firm's incentive to invest in safety is predicted to fall.

In addition, it can be easily seen that as β approaches zero (flat rating) it is more likely that the sign of $\dfrac{\partial \pi_i^2}{\partial e_i \partial b_i}$ will be negative. This is consistent with intuition: an increase in workers' compensation benefits provides a lesser incentive to invest in safety, the lesser is the weight placed on the firm's record in calculating its insurance premiums. This section is summarized by the testable Hypothesis 1.

> **Hypothesis 1**: The incentive for a firm to invest in safety falls, as real benefit levels rise, *ceteris paribus*.

1.4.2) Changes in Regulation:

Here, I will examine what happens, *ceteris paribus*, if there is an increase in overall inspections for an industry. Such an increase will raise the likelihood that each firm in that industry, including i, will be inspected. The derivative of the profit function is taken with respect to the amount of safety expenditures; the partial derivative of the result is taken with respect to p_i^I, the probability of inspection; the sign on the final result gives us the change on the incentive to invest in safety. The order in which the partials are taken is irrelevant to the outcome. In the interest of simplicity, the derivative of the profit function with respect to p_i^I is taken first. This gives

$$\frac{\partial \pi_i}{\partial p_i^I} = -\left[p_i^F\left(e^*, e_i\right) \cdot F_i\left(e_i\right)\right] L_i \qquad (1.14)$$

If the derivative of (1.14) is taken with respect to e_i, the effect of changing industry inspections on the incentive to provide safety can be seen. This gives

$$\frac{\partial \pi_i^{\,2}}{\partial e_i \partial p_i^I} = -\left[\overset{(-)}{\frac{\partial p_i^F}{\partial e_i}} \cdot F_i\overset{(+)}{\left(e_i\right)} + \overset{(+)}{p_i^F} \cdot \overset{(-)}{\frac{\partial F_i}{\partial e_i}}\right] L_i > 0. \qquad (1.15)$$

(1.15) is unambiguously positive because of the assumptions implicit in the positive and negative signs over the partial derivatives in the equation . It is clear from (1.15) that the introduction of a regulatory program implies a greater incentive for a firm to provide safety, *ceteris paribus*. Testable hypotheses of the effects of regulation will be developed in Chapter Two.

1.4.3) Changes to the Adjustment Factor, β:

As noted earlier, the change from a merit rebate plan to experience rating acted like an increase in the degree to which a firm's premium is based on its own claim record. To see how this affects the incentive to invest in safety, partial derivatives of the profit function are taken. This is no different than changes to any other variable. The partial of the profit function with respect to β yields

$$\frac{\partial \pi_i}{\partial \beta} = -p_i(e_i)b_iL_i + pb_iL_i \qquad (1.16)$$

The change in the incentive to invest in safety is found by taking the partial of (1.16) with respect to safety; it is

$$\frac{\partial \pi_i^2}{\partial \beta \partial e_i} = -\frac{\partial p_i}{\partial e_i} b_iL_i > 0 \qquad (1.17)$$

As shown in (1.17), as the value of β rises, the incentive to provide safety will also rise, *ceteris paribus*. This implies that firms which were subject to the switch from merit rebates to experience rating in 1987 will show higher levels of safety. A testable hypothesis of the effects of a change in β is developed in Chapter Two.

1.4.4) Changes in Employment:

It is also necessary to be aware that changes in many of the variables in this model may have secondary effects on employment in a firm. For example, something that causes a change in the level of safety may affect profit, which may affect employment levels. The change in employment may then have offsetting effects on safety. Any change intended to raise safety may then not be as effective as planned.[2]

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[2] To see the offsetting effect, first the derivative with respect to employment is taken:

$$\frac{\partial \pi_i}{\partial L_i} = [1 - p_i(e_i)]\overset{(+)}{\frac{\partial R_i}{\partial L_i}} - [1 - p_i(e_i)]w_i - \{p + \beta[p_i(e_i) - p]\}b_i - [e_i + p_i^F(e^*, e_i) \cdot p_i^I \cdot F_i(e_i)] \gtreqless 0$$

(1.18)

Next, the derivative of (2.16) is taken with respect to e_i which gives

$$\frac{\partial \pi_i^2}{\partial e_i \partial L_i} = -\frac{\partial p_i}{\partial e_i}\frac{\partial R_i}{\partial L_i} - \frac{\partial p_i}{\partial e_i} w_i - \beta b_i \frac{\partial p_i}{\partial e_i} - \left[\frac{\partial p_i^F}{\partial e_i} \cdot p_i^I \cdot F_i + p_i^F \cdot p_i^I \cdot \frac{\partial F_i}{\partial e_i}\right] > 0 \quad (1.19)$$

(1.19) is the effect on the incentive to provide safety due to a change in the number of employees. An example of the offsetting effect works as follows. A program is put in place forcing a firm to provide more safety; safety rises; profit falls; employment falls; the

1.4.5) Employee Driven Effects on Safety

The model developed in this chapter is based solely on the presumption of an individual firm maximizing its profit. However, the level of safety at the workplace may be partly explained by the exogenous demands of employees of the firm. In this section, *real industry wage* and *unemployment* are shown to be expected to affect workplace safety.

The first assumption made is that safety is a normal good. That is, as workers' real wages rise, greater safety is demanded. Secondly, as real wages rise, the opportunity cost of an accident grows, raising an individual's incentive to take care. This is also considered to be an increase in safety.

In the profit-based model of safety, there is no allowance for the impact of real, industry wage rates--it must be considered exogenous to the model. The assumptions above lead to the development of Hypothesis 2.

Hypothesis 2: Higher real, industry wage rates are associated with higher workplace levels of safety, *ceteris paribus.*

The rate of unemployment may also affect workplace safety. The level of safety is lowered if workers are willing to trade off the likelihood of continuing employment for safety. Workers may prefer to accept lower levels of safety if they know the employer is more likely to fire an employee who does not accept the lower levels of safety.

This trade off is explained in the following manner. The greater the rate of unemployment, the tighter the job market. The tighter the job market, the less likely the employee is able to easily find a similar job if fired. Therefore, the employee is willing to give up some safety in order to keep her job. The trade off is described in Hypothesis 3.

Hypothesis 3: The incentive for a firm to invest in safety will fall, as

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incentive to provide safety falls since (1.19) states $\frac{\partial \pi_i^2}{\partial e_i \partial L_i} > 0$.

the rate of unemployment rises, *ceteris paribus*.

Hypothesis 2 and Hypothesis 3 arise from assumptions made about the individual's utility function. For ease of explanation and simplicity of mathematics, they are considered exogenously to the profit-based model of safety.

1.4.6) Other Possible Effects:

One must take note of the possibility that an increase in p_i^I may reduce a worker's efforts to prevent accidents. This may happen if the worker thinks that inspections may force an increase in safety inputs by the firm. In other words, the worker sees safety inputs as a substitute for the probability of being inspected.

The possibility that this substitution would affect safety hinges on the key assumption that total safety inputs must *include* precautions taken by the worker. If workers take fewer precautions, a firm's actual purchase of safety becomes less effective, since the firm's purchases and the worker's efforts act in opposing directions. Assuming actual safety inputs purchased by the firm remain unchanged, the following occurs: the probability of inspection rises; safety falls because workers take fewer precautions; the probability of an accident rises; profits fall. If this occurs, the firm's incentive to invest in safety *falls* with an increase in p_i^I, the opposite of what is intended by the regulator.

1.5) Summary

Few studies have examined the effect of experience rating on safety. In this chapter, a profit-based model has been developed to predict the change on a firm's incentive to invest in safety due to the introduction of experience rating. In this model, a firm's profit is based on expected revenue, expected costs of labour, costs of insurance, and costs of safety.

The model developed here makes it possible to form and test hypotheses. The hypotheses are:

Hypothesis 1: The incentive for a firm to invest in safety falls, as real benefit levels rise, *ceteris paribus*.

Hypothesis 2: Higher real, industry wage rates are associated with higher workplace levels of safety, *ceteris paribus*.

Hypothesis 3: The incentive for a firm to invest in safety will fall, as the rate of unemployment rises, *ceteris paribus*.

Chapter 2 will examine the introduction of experience rating into Alberta in 1987; and the regulatory climate in which it was implemented. Particularly, how the value of β has changed due to the implementation of experience rating is considered. In addition, the changes in probability of inspection and level of fines due to the passage of the Alberta Occupational Health and Safety Act is considered. Further testable hypotheses are generated in Chapter Two.

In Chapter 3, an econometric study of the safety effects of many variables is performed. OLS regression on time series data is employed for the years 1951-1992 over six broad industries. Hypotheses 1, 2, and 3 are tested using relevant variables.

CHAPTER TWO: WORKPLACE SAFETY IN ALBERTA: 1951-92

Government legislation has changed the face of workplace safety in Alberta. To identify factors that may have affected workplace safety in Alberta, major changes in workers' compensation legislation in Alberta must be reviewed. Such a review is necessary to specify variables in the following empirical study. Since empirical data are available from 1951 to 1992, these years are analyzed.

This chapter focuses on three major programs: the 1987 experience rating program; the merit rebate plan, experience rating's predecessor; and the Alberta Occupational Health and Safety Act (AOHS), passed in 1976. The aim of the chapter is to predict how safety in Alberta will change given changes in Alberta's safety legislation climate, notably by the above programs. The review begins with a brief outline of Alberta's safety climate. This is followed by more detailed examination of experience rating, merit rebates, and AOHS.[3]

2.1) Regulatory History of the Alberta Workers' Compensation Board: 1951-92[4]

This section outlines Alberta's general safety climate over the empirically studied time period. It is assumed that the goal of all regulatory change is to lower workplace injury and death.

The Alberta Workers' Compensation Board (WCB) was formed due to the Hillcrest coal mine disaster of 1914. Claims from injured workers and the families of those killed forced the government into finding some formalized means of compensation. This means of compensation appeared as the Alberta WCB in 1918; coal mining was the only industry

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[3]Except where noted, all information in this chapter has been obtained from the Labour Gazette or the annual reports of the Alberta Workers' Compensation Board.

[4]A more detailed account follows this chapter in the appendix

represented. In the 1920's, the list of industries grew to include logging and some types of metal manufacturing. More industries were added in the 1930's and 1940's but the WCB's scope and depth of coverage could hardly be considered to be comprehensive. The most significant safety program in the WCB at this time was the merit rebate plan; introduced on an official basis in 1940. The merit rebate plan was intended to raise workplace safety by giving firms a reduction in premium for having relatively low accident rates.

By the beginning of the 1950's, workers' compensation legislation in Alberta was a hodgepodge of *ad hoc* solutions to problems that had appeared since the founding of the WCB. Much of the legislation was overlapping or did not form a cohesive set of rules and regulations.

In the 1950's new safety regulations were put in place for most industries, including coal mines, oil and gas wells, and pipelines. In 1952, the waiting period for workers' compensation (WC) benefits was significantly reduced. Reducing the waiting period may raise the number of WC claimants, since the opportunity cost of an injury falls. The safety education and training aspect of the WCB was also expanded during this time. This included the provision of first aid schools and the introduction of safety plaques for the best safety record.

In the 1960's, new regulations were implemented for many industries, notably welding, mechanics, and oil and gas. For example, strength standards for elevators and escalators rose. A bimonthly newsletter devoted solely to safety in industry was also initiated in 1962. First aid requirements were made more stringent for all employers. The number of plaques issued for exemplary safety records more than doubled during the 1960's.

The regulatory change of the 1970's continued the path struck in the 1960's. Additional regulations were introduced for various industries, especially construction, ventilation, and electricity. The Alberta Occupational Health and Safety Act (AOHS) was passed in 1976. AOHS was a significantly large package of safety and regulatory legislation which was intended to raise safety in most industries in Alberta

The 1980's were years of change as well. Although there were minor changes in public safety education, the most significant change was the phasing out of the merit rebate plan in 1986 and its replacement by experience rating in 1987. The experience rating program is virtually the same today as then; having been only slightly tinkered with in 1988.

The experience rating system was enhanced by the introduction of the Work Injury Reduction Program (WIRP) in 1990. WIRP began as a pilot program in the roofing and meat packing industries, and has since expanded to include large employers in many industries.

The regulatory climate in Alberta changed from 1951 to 1992. Over the years, programs were introduced to increase safety through: altered safety standards; changed financial insurance incentives; and increased safety knowledge by workers and firms. During this time, it is also reasonable to assume that the effectiveness of safety equipment was increased steadily. The combination of the above safety changes plus technological improvement implies a gradual increase in workplace safety in Alberta from 1951 to 1992.

2.2) Merit Rebates, Experience Rating, and AOHS

Many programs have been initiated by the Alberta WCB to increase safety since 1951. Merit rebates, experience rating and the Occupational Health and Safety Act are programs intended to give incentives to firms to invest in greater safety. Other programs, outlined above, do not contain the drastic changes that allow separate examination; they are considered to be part of the trend to higher safety over the years.

2.2.1) Merit Rebates and Super Assessments

Merit rebates were the precursor to today's experience rating plan. The phrase 'merit rebate' is used to refer to both merit rebates and super assessments; they are two sides of the same coin. The idea of merit rebates began in the 1920's with discussions within the Alberta WCB. The discussions proposed insurance incentives for the prevention of accidents; essentially, the basis for merit rebates.

At this time, in "...practically all industries..." there were claim assessments performed and subsequent premium adjustments (Memo, WCB, 1983). The first suggestion of a formal "merit rebate" program occurred in the WCB's annual report of 1932, for retail stores and restaurants. Merit rebates were described as follows:

> "The scheme is calculated to increase the interest in accident prevention measures. It provides a rebate to the employer whose industry comes within the classification to which the merit is applied, and the degree of merit varies according to the accident experience of the individual employer and group in which the industry is located." (1983).

Merit rebates were officially implemented in 1940, in the coal mining and lumbering industries. This was quickly followed by the industries of drilling (refineries), meat packing, and building and steel construction.

After a minimum firm size requirement was fulfilled, the merit rebate program provided for discounts on a firm's WC insurance premium. The discount (rebate) was given if the firm's actual compensation and pension payments were less than 75% of the amount expected by the WCB to be claimed by that firm's employees for that year. The compensation and pension payments that firm i's employees were <u>expected</u> to claim in year n is termed the *current assessment*, CA_n. The payments <u>actually</u> claimed by the firm's employees is termed the *actual assessment*, AA_n. The current assessment was estimated by the WCB based on the average claim history of the industry to which the firm belonged.

Prior to 1952, only employers with annual current assessment of over $500 were allowed to participate in merit rebates. In 1952, this was lowered to annual assessments of \$100 and greater, bringing significantly more employers into the program; particularly smaller ones.

In 1946, super assessments were introduced. A super assessment is a surcharge added to the workers' compensation premium. The addition of a super assessment occurred if compensation and pension payments totaled more than 105% of the current assessment. The maximum merit rebate and maximum super assessment fluctuated between 0.25 and 0.33 of current assessment until 1970. In 1970, the maximum discount or surcharge offered by both programs stabilized at 0.33 of current assessment. The plan is described algebraically below.

Merit Rebates and Super Assessments

$$\text{Adjustment} = \begin{Bmatrix} 0.75CA_n - AA_n \text{ iff } AA_n < 0.75CA_n \\ 0 \text{ iff } 0.75CA_n < AA_n < 1.05CA_n \\ AA_n - 1.05CA_n \text{ iff } AA_n > 1.05CA_n \end{Bmatrix} \quad (2.1)$$

where

CA_n = The current assessment for the firm in year n--payments expected to be claimed by firm i's employees.

AA_n = The actual assessment in year n--payments actually claimed by firm i's employees.

Maximum Adjustment of Premium= 33 1/3% of CA_n

The merit rebate plan has remained virtually unchanged from 1940-1987. This is evidenced by an Alberta WCB experience rating program proposal which stated, "The merit rebate and super-assessment limits have changed several times over the years. The program, however, has essentially remained the same." (1985, p.28). Further confirmation comes from Pat Buckie of the Alberta WCB who stated that virtually the same percentage of employees in the same industries had been covered throughout the life of the program (Interview, 1994).

Unfortunately for policy makers, the merit rebate and super assessment plans were never very successful in providing firms with incentives to reduce injuries in an industry. A WCB review of the merit rebate/super-assessment program confirms this idea (1984). The review concludes that "...any effectiveness the program might have had has been destroyed by the extremely large and increasing proportion of assessment income that reflects the unallocated costs of the Board." (1984, p.72).

Unallocated costs were the total of: claims over three years old; administrative expenses; the occupational health and safety levy; reimbursements to Alberta Health Care; and other cost reliefs given to employers. They are assumed to be a proportion, n, of actual assessments.

Unallocated costs harmed the plan's effectiveness in the following manner. Employers were able to subtract unallocated costs from AA_n. Yet, unallocated costs were included in CA_n. This resulted in a falsely high probability of a firm receiving a rebate-- AA_n was essentially made smaller. The WCB raised insurance rates in the industry to cover the increased rebates in years following. Though the merit rebate program provided the appearance of firms improving their record, virtually no incentive was created for the firm to invest in greater safety.

The allowance for unallocated costs was the same in the super-assessment program. The allowance resulted in relatively few surcharges. Firms, allowed to write off their unallocated costs, rarely had $AA_n > 1.05CA_n$. Thus, surcharges appeared only rarely. Eventually, the imbalance in rebates to surcharges grew to the point where, in 1984, total merit rebates exceeded total super assessments by a ratio of 43 to 1 (WCB, 1985).

If unallocated costs are added, the adjustment (2.1) becomes

$$\text{Adjustment} = \begin{Bmatrix} 0.75CA_n - (1-n)AA_n \text{ iff } (1-n)AA_n < 0.75CA_n \\ 0 \text{ iff } 0.75CA_n < (1-n)AA_n < 1.05CA_n \\ (1-n)AA_n - 1.05CA_n \text{ iff } (1-n)AA_n > 1.05CA_n \end{Bmatrix} \tag{2.2}$$

where n = proportion of AA_n that is unallocated costs.

With no allowance for unallocated costs, n=0. If there *is* allowance for unallocated costs, n>0. n>0 implies a greater likelihood of a rebate; and if there is a rebate, one of greater size. Similarly, n>0 implies a lesser likelihood of a super assessment; and if there is a super assessment, one of lesser size. The problem of unallocated costs was significant-- up to 50% of CA_n--due mainly to the fact that a sizable number of large claims were not settled in three years.

Due to the subtraction of unallocated costs, a strong case can be made for the hypothesis that the merit rebate/super assessment program was virtually ineffective in giving safety incentives to employers. The merit rebate seems to have been simply composed of a money transfer; from WCB to firm by rebate, and from firm to WCB by raised current assessment. The Alberta WCB agreed that merit rebates were ineffective; it introduced a proposal for an experience rating program in 1985. Merit rebates and super assessments were phased out in 1986.

2.2.2) The 1987 Experience Rating Program

1987 saw the introduction of experience rating to Alberta. Like merit rebates, experience rating is a program that gives financial incentives to employers to invest in greater safety. The introduction of the program was wide-ranging, encompassing all major industries. By contrast, a previous introduction of experience rating, in Ontario in 1984, applied to very few industries (Bruce and Atkins, 1993). There have been few revisions to Alberta's experience rating since 1988. Experience rating was revised slightly in 1988 to allow smaller employers to join gradually.

Experience rating is a program that adjusts employers' WC premiums according to firm-specific levels of injuries or costs of accidents. Experience rating is possible only when the provider of WC insurance is a monopoly in a region, as is the WCB in Alberta. A monopoly provider is necessary because experience rating is not actuarially fair.

In order to be actuarially fair, a premium must equal the sum of: the amount the insurer *expects to be claimed* in the time period under consideration, plus an administrative charge. This occurs only in a competitive insurance industry. In a competitive insurance industry, β is determined by market forces. The exact determination of β is based on criteria such as size of firm and the firm's "credibility" (probability of actual claims falling within the range predicted). However, in an insurance monopoly, the insurer sets β at the level it deems appropriate, for any reason it chooses. Therefore, if the insurer is a monopoly, the policy-maker is able to create greater incentives through the manipulation of β. Since monopoly insurers are more numerous in Canada than in the United States, the North American policy implication of experience rating is mostly limited to Canadian provincial WCBs.

Experience rating is similar to merit rebates in that firms with relatively poor claim records are penalized with a premium surcharge while those with relatively good records are given discounts. The industry's average dollar claim record is subtracted from that of the firm. A specific formula determines how much weight is placed on the difference in claim costs.

In Alberta, to qualify for participation in experience rating, a firm is required to have total premiums of $3000.00 or greater within the experience period. The experience period in Alberta is the first three of the previous four years. Since premium rates vary widely by industry, the minimum size of participating firm varies widely. For example, a medical office paying $0.20 per $100 of payroll in premiums might require 17 full-time employees to reach the $3000 threshold, while a meat packing plant paying $12.00 per $100 of payroll might require only 1 part-time employee to reach that level (Interview - Jeff Smith, Feb. 3, 1995).

Initially, a firm's three-year record of claim costs (the amount of WC claims registered during the experience period) is examined. The industry's average claim cost, c, is subtracted from the claim cost of the firm, c_i. The result is divided by c to determine the firm's *experience ratio*.[5] The experience ratio is then multiplied by a *participation factor,* PF, determined by size of the firm.[6] The participation factor is intended to shield smaller employers from excessive changes to their assessment rates (WCB, 1992). The maximum participation factor is given to only about 2.3% of all employers in Alberta, covering between 29% and 76% of workers, depending on the industry.

PF is multiplied by an *eligibility factor*, EF. Employers with three years experience in the program have an eligibility factor of 1; those with two years experience have a factor of 2/3; and those with only one year experience have an eligibility factor of 1/3. Multiplication of the experience ratio, the participation factor, and the eligibility factor gives the discount or surcharge. Algebraically, the premium charged to an experience rated firm in Alberta is

$$r_i L_i = \left[p + \frac{(c_i - c)}{c} (PF \times EF) \right] b_i L_i \qquad (2.3)$$

where
r_i = WC premium, per employee
p = probability of injury in firm i's industry; assumed to be fixed in the short run
c = average industry claim costs
c_i = firm's actual claim costs
PF = Participation Factor
EF = Eligibility Factor
b_i = benefit per employee
L_i = number of employees

---

[5]The maximum experience ratio is $\left|\frac{c_i - c}{c}\right| = 0.8$.

[6] In Alberta, PF is a minimum of 0.05, increasing by 0.01 for each $2500.00 of industry rate assessment during the experience rating period, to a maximum of 0.5. In 1987 the participation factor was zero; after that and prior to 1991, it was 0.01 for each $800.00 of industry rate assessment.

In this case, the firms' total discount or surcharge is

$$\left[\frac{(c_i - c)}{c}(PF \times EF)\right] b_i L_i \qquad (2.4)$$

If the premium is actuarially fair, $c_i = r_i L_i$. Additionally, (2.3) implies that, if $c = c_i$, the adjustment, (2.4), is equal to zero.

In essence, the theory behind experience rating and merit rebates is similar. As seen in chapter 1, the cost of insurance for the firm is

$$r_i L_i \equiv \{p + \beta[p_i(e_i) - p]\} b_i L_i \qquad (1.4)$$

Recall from Chapter 1 that β, the adjustment factor, is the relative weight a firm's record is given in determining its insurance premium. From (2.3) it can be seen that, as $\frac{c_i - c}{c}$ plays the same role in (2.4) that $p_i(e_i) - p$ plays in (1.4),

$$\beta = PF \times EF \qquad (2.5)$$

Under experience rating in Alberta, the maximum PF is 0.5 and the maximum EF is 1. Therefore, the maximum weight that can be applied to a firm's past claims record is 0.5. If the adjustment under merit rebates equaled the discount under experience rating, β would be unchanged following a switch from merit rebates to experience rating. The implication, from (1.8), is that such a change would not affect a firm's incentive to provide safety. If such a switch occurred, safety would remain unchanged, *ceteris paribus*, for all firms to which it applied.

Two factors make it unlikely that β has the same value under both merit rebates and experience rating. First, the maximum surcharge or discount for firms participating in merit rebates is smaller than that for firms participating in experience rating (331/3% and 40% respectively). Second, the ineffectiveness of merit rebates seen earlier implies a lower β since, in practical terms, a lesser amount of the firm's premium is based on its past record. For these two reasons, the value of β is assumed to be greater under experience rating than under merit rebates.

If β changes, from (1.17) in Chapter 1, the change in the firm's incentive to provide safety can be determined. Recall

$$\frac{\partial \pi_i^2}{\partial \beta \partial e_i} = -\frac{\partial p_i}{\partial e_i} b_i L_i > 0 \qquad (1.17)$$

Since β is assumed to be greater under experience rating than under merit rebates, the positive sign on (1.17) implies that the switch from merit rebates to experience rating in 1987 produced a rise in the firm's incentive to invest in safety. Thus, theory predicts that empirical study will yield an observable rise in safety levels of firms in experience rated industries. This is made even more likely given that experience rating covers a greater proportion of firms than did merit rebates. The above analysis is contained in Hypothesis 4.

> **Hypothesis 4**: The incentive for a firm to invest in safety will rise, as β rises due to the implementation of experience rating in Alberta in 1987, *ceteris paribus*.

2.2.3) Alberta Occupational Health and Safety Act

In 1976, revised safety regulations were introduced for most industries in Alberta. The bundle of new regulations and penalties was known as the Alberta Occupational Health and Safety Act (AOHS). The Occupational Health and Safety Act brought the industrial accident prevention branch of the WCB under a division of the provincial Department of Labour. AOHS represented a more structured and cohesive set of regulations than had ever existed previously. This Act included revised regulations for the general workplace as well as in specific industries.

Under AOHS, greater power was given to site inspectors to gather evidence and to stop work if it was considered to be unsafe. Better medical record keeping for workers in hazardous industries was required. Better display of more detailed information about toxic substances used by a firm was required. The amount of fine levied for non-compliance to regulations rose; for the firm and for the individual worker.

From 1951 to 1976, safety regulations had been tightened at a fairly steady rate in Alberta. AOHS represented a much larger leap in standards, in both degree and scope, than had previously existed. For this reason, AOHS is considered to be a large exogenous shock on Alberta's safety climate; this type of shock can be relatively easily studied empirically.

The passing of AOHS did not only provide for an increase in inspections (though this was a portion of the Act). However, to simplify the analysis, its passage is considered to be a rise in the likelihood of inspection.

The profit function (1.8) implies that a rise in the likelihood of safety inspection will result in a rise in the incentive for a firm to provide safety, *ceteris paribus*. This is detailed by

$$\frac{\partial \pi_i^2}{\partial e_i \partial p_i^I} = -\left[\frac{\overset{(-)}{\partial p_i^F}}{\partial e_i} \cdot \overset{(+)}{F_i(e_i)} + \overset{(+)}{p_i^I} \cdot \frac{\overset{(-)}{\partial F_i}}{\partial e_i}\right] L_i > 0 \qquad (1.15)$$

The profit function and (1.15) predict that the firm's incentive to invest in safety will rise due to the passage of AOHS in 1976. Specifically, since the probability of inspection rises, the positive sign on (1.15) shows that a firm's incentive to invest in safety is expected to rise.

As noted above, AOHS included a provision for an increase in the amount of a fine for non-compliance to a regulatory standard. From the profit function (1.8), this is equivalent to a rise in $F_i(e_i)$. The change in the incentive for a firm to invest in safety is determined by the sign on

$$\frac{\partial \pi_i^2}{\partial F_i \partial e_i} = -\frac{\overset{(-)}{\partial p_i^F}}{\partial e_i} \cdot p_i^I \cdot L_i \qquad (2.6)$$

(2.6) is greater than zero as implied by the superscripted negative sign over the partial derivative. That (2.6) is positive implies that given a rise in the level of fine, the incentive for a firm to invest in safety will rise.

The passage of AOHS in 1976 included provisions for higher probability of inspection and higher levels of fines for non-compliance. From the profit-based model of safety in Chapter 1, both provisions raise a firm's incentive to invest in safety. Consequently, the expectations from this section may be summarized by Hypothesis 5.

> **Hypothesis 5**: The incentive for a firm to invest in safety will rise, due to the passage of the Alberta Occupational Health and Safety Act in 1976, *ceteris paribus.*

2.3) Summary

Although safety at Alberta workplace generally rose from 1951 to 1992, three programs intended to raise safety are examined in detail in this chapter. Merit rebates, experience rating, and the Occupational Health and Safety Act (AOHS) were all implemented to increase safety.

The profit-based model of safety introduced in Chapter 1 is used to predict how safety will change given certain changes involving these three programs. The hypotheses developed in this chapter are:

> **Hypothesis 4**: The incentive for a firm to invest in safety will rise, as β rises due to the implementation of experience rating in Alberta in 1987, *ceteris paribus.*
>
> **Hypothesis 5**: The incentive for a firm to invest in safety will rise, due to the passage of the Alberta Occupational Health and Safety Act in 1976, *ceteris paribus.*

These two hypotheses, and the three developed in Chapter One, form the basis for the empirical analysis of safety in the Alberta workplace in Chapter Three.

CHAPTER THREE: EMPIRICAL ANALYSIS

In this chapter, a "natural experiment" is utilized in an attempt to determine the safety effects of the introduction of experience rating. The introduction of experience rating to all industries in Alberta in 1987 provides the basis for the analysis. In the first section the data are described; in the second results are presented and interpreted; in the third conclusions are drawn.

Specifically, the main goal of this chapter is to test the following hypotheses:

Hypothesis 1: The incentive for a firm to invest in safety falls, as real benefit levels rise, *ceteris paribus*.

Hypothesis 2: Higher real, industry wage rates are associated with higher workplace levels of safety, *ceteris paribus*.

Hypothesis 3: The incentive for a firm to invest in safety will fall, as the rate of unemployment rises, *ceteris paribus*.

Hypothesis 4: The incentive for a firm to invest in safety will rise, as β rises due to the implementation of experience rating in Alberta in 1987, *ceteris paribus*.

Hypothesis 5: The incentive for a firm to invest in safety will rise, due to the passage of the Alberta Occupational Health and Safety Act in 1976, *ceteris paribus*.

3.1) The Data

The data are gathered from Statistics Canada in six broad industries. The data are annual, covering the years 1951 to 1992.

3.1.1) Safety

Following Bruce and Atkins (1993) the measure of safety used is *fatalities per employed worker*. This avoids the difficult problem of aggregating accidents or injuries. Aggregating accidents is problematic because: first, as type and severity may differ year to year, comparing injuries year to year may not be legitimate; and second, there is no generally accepted method of weighting injuries to reflect severity and thus classify injuries.

3.1.2) Experience Rating

The introduction of experience rating in Alberta in 1987 is constructed as a dummy variable where "1" represents the presence, and "0" , the absence, of the program. Since experience rating in Alberta was introduced in all industries at the same time, all industries exhibit a "0" previous to 1987 and "1" thereafter.

3.1.3) Alberta Occupational Health and Safety Act (AOHS)

The passage and application of the 1976 Occupational Health and Safety Act is represented by a dummy variable created identically to the variable for experience rating. It has a value of "0" in the absence of the Act (pre-1976), and a value of "1" in its presence (1976 and following).

3.1.4) Other Determinants of Safety

Other factors than experience rating and AOHS may have an impact on safety, and so must be taken account of in the analysis. The first of these is the *real, industry wage rate.* The hypothesis with respect to this factor is that safety is a normal good. As real wages rise, so does safety. Secondly, as real wages rise, the opportunity cost of an accident grows, raising an individual's incentive to take care. For both of these reasons, it is expected that high real, industry wage rates are associated with low accident rates.

A second factor that may affect safety is the amount of *benefit* paid to the injured employee. The model developed in Chapter 1 predicts that as benefits increase relative to wage (i.e. the *benefit-wage ratio* rises), the incentive to invest in safety is reduced; and that reductions in the incentive will be greater, the lesser is the weight placed upon the firm's record in determining its insurance premium.

A third factor affecting safety may be the *rate of unemployment*. Unemployment is used as a measure of labour market "slackness", or difficulty in finding a new job. If unemployment is high (slack labour market), jobs are scarce. In a slack labour market, workers may accept a lower safety standard at work if they know the alternative to acceptance is a high probability of being unemployed. Therefore, it is expected that a high rate of unemployment is associated with a high level of accidents.

3.2) The Estimates

In this section the effects of the introduction of experience rating, the passage of AOHS, changes in the real wage, changes to the maximum benefit to wage ratio, and changes in the unemployment rate are modeled. One problem that is immediately apparent in the data is that fatality rates generally trend downward over time. Such a trend must be taken account of econometrically to prevent false inferences being drawn from the results.

To ascertain whether certain econometric methods (such as co-integration) must be used before performing ordinary least squares regression, Augmented Dickey-Fuller (ADF) tests are performed. The standard test is the t-statistic on ρ from the following regression:

$$(1-L)X_t = \rho X_{t-1} + \sum_{i=1}^{r} \beta_i (1-L)X_{t-i} + e_t \qquad (3.1)$$

where X is the variable being considered, e_t is an error term, and L is the lag operator. The number of lags added to the right hand side of (3.1), is chosen using a standard Akaike procedure. This ensures that the residuals are white noise.

The ADF test *with drift* simply adds a constant to (3.1); the ADF test *around trend* adds a constant and a linear time trend, T.

$$\text{ADF with drift: } (1-L)X_t = \alpha + \rho X_{t-1} + \sum_{i=1}^{r} \beta_i (1-L)X_{t-i} + e_t \quad (3.2)$$

$$\text{ADF around trend: } (1-L)X_t = \alpha + \rho X_{t-1} + \sum_{i=1}^{r} \beta_i (1-L)X_{t-i} + \gamma T + e_t \quad (3.3)$$

The results of the ADF tests are presented in Table 1, with the number of lags chosen reported in parentheses.

It is necessary to determine whether the trend in the variables is deterministic or stochastic. If the trends are stochastically related to one another, the system can be modeled so as to take account of the relation. The Augmented Dickey-Fuller tests are aimed at determining whether the variables are stationary after first differencing (also known as integrated of order one and denoted I(1)). Dickey-Fuller tests are Wald tests, testing under the alternative hypothesis. The null hypothesis is I(1), while the alternative is I(0), i.e. the variable is stationary before first differencing.

The critical value for the ADF around trend is -3.18 at 90% confidence and -3.50 at 95% confidence. Table 1 shows that one series, fatalities per worker, rejects I(1) for five of six industries at 95%, and for all industries at 90% with this test. This is taken to mean that fatalities per worker is stationary, or I(0), around trend. To eliminate the possibility that the other series would have to be differenced twice before becoming stationary, (3.3) is changed so that the null hypothesis is now I(2) rather than I(1). All series reject the null of I(2)--the unemployment rate, the benefit-wage ratio, and the real wage are taken to be stationary after first differencing, or I(1). Thus, the I(1) variables must be first differenced for ordinary least squares regressions. Since fatalities per worker is I(0), and since all other series are I(1), co-integration is deemed unnecessary. This being the case, ordinary least squares may then be performed.

3.2.1) The Ordinary Least Squares Regressions

In order to test the safety effects of the 1987 experience rating program, linear OLS

TABLE 1. TESTS FOR STATIONARITY

Variable	ADF t-statistic on $\hat{\rho}$	ADF with drift t-statistic on $\hat{\rho}$	ADF around trend t-statistic on $\hat{\rho}$
Real Wage			
Construction	1.31 (0)	-2.04 (0)	-0.91 (0)
Manufacturing	1.78 (1)	-1.94 (1)	-1.33 (1)
Mining	0.80 (3)	-3.60 (0)	-0.13 (0)
Service	1.55 (1)	-2.04 (1)	-0.63 (0)
Transportation	3.22 (0)	-2.92 (0)	-0.52 (0)
Trade	0.35 (2)	-2.09 (0)	0.44 (0)
Benefit-Wage Ratio			
Construction	0.14 (0)	-1.84 (0)	-1.96 (0)
Manufacturing	0.11 (0)	-2.91 (0)	-3.09 (0)
Mining	0.02 (0)	-3.03 (0)	-3.11 (0)
Service	0.33 (0)	-2.30 (0)	-2.77 (0)
Transportation	0.14 (0)	-2.85 (0)	-3.17 (0)
Trade	0.64 (0)	-1.96 (0)	-3.10 (0)
Fatalities per 1000 Workers			
Construction	-1.27 (3)	-1.52 (2)	-3.95 (3)
Manufacturing	2.14 (4)	-0.21 (2)	-6.12 (0)
Mining	1.40 (2)	0.43 (2)	-3.28 (0)
Service	-0.27 (4)	-3.52 (0)	-3.71 (0)
Transportation	0.14 (2)	-2.54 (0)	-4.44 (0)
Trade	1.56 (4)	-2.93 (0)	-4.80 (0)
Unemployment Rate (prairie provs.)	0.14 (0)	-1.38 (0)	-2.60 (0)

Note.

- The number of lags chosen by the Akaike Information Criterion (AIC) is shown in parentheses for the test on each variable.

regression was applied to annual data, using PC RATS. The general form of the equation was estimated as follows:

$$\ln Y_t = a_0 + a_1 \text{Trend}_t + \sum_{i=2}^{3} a_i (1-L) \ln X_t + \sum_{i=1}^{2} b_i D_i + \varepsilon_i \qquad (3.4)$$

where

Y_t = probability of fatality (risk of fatality per 1000 workers).

Trend_t = a time trend.

X_1 = real wage.

X_2 = benefit-wage ratio.

X_3 = unemployment rate (average for the Prairie provinces: Alberta, Saskatchewan, and Manitoba).

D_1 = dummy for Alberta Occupational Health and Safety Act.

D_2 = dummy for Alberta's Experience Rating program.

The results of ordinary least squares regression are presented in Table 2. For each equation, coefficients are reported, with t-statistics for each appearing beneath.

For each industry, a final econometric form is found. The final form is the specific estimation used for that industry. In each industry, the same algorithm is used to determine the final equation. First, the equation is estimated using all available independent variable series (this is Regression 1). Next, retaining the constant, time trend, and both dummies, equations are estimated using only one of the available X_i variables (real wage, benefit-wage ratio, and unemployment rate). These are Regressions 2, 3, and 4. Regression 5 contains no X_i variables.

Regressions 1, 2, 3, 4 and 5 together provide a basis for further model specification. Using the forms that provide a relatively high statistical significance, Regressions 6, 7, or 8 are those estimated to determine the final form of the equation for each industry.

Regression 6 is the final form chosen for construction and mining. Regression 5 is chosen for the service industry. Manufacturing and transportation use Regression 7 as their final form, while trade is defined by Regression 8. The OLS regression results are presented in Table 2.

TABLE 2. RESULTS OF ORDINARY LEAST SQUARES

Construct.	Constant	Trend	$\Delta \ln X_1$	$\Delta \ln X_2$	$\Delta \ln X_3$	D_1	D_2
Regression 1	0.06	-0.00	-0.25	0.08	-0.06	-0.19	-0.24
	(0.67)	(-0.11)	(-0.52)	(0.35)	(-0.45)	(-1.52)	(-2.14)**
Regression 2	0.04	0.00	-0.21	-	-	-0.20	-0.25
	(0.59)	(0.01)	(-0.48)			(-1.69)*	(-2.27)**
Regression 3	0.04	0.00	-	0.10	-	-0.20	-0.25
	(0.47)	(0.05)		(0.43)		(-1.67)*	(-2.23)**
Regression 4	0.05	-0.00	-	-	-0.03	-0.18	-0.25
	(0.53)	(-0.02)			(-0.27)	(-1.51)	(-2.32)**
Regression 5	0.05	-0.00	-	-	-	-0.18	-0.25
	(0.74)	(-0.14)				(-1.60)	(-2.32)**
Regression 6	0.05	-	-	-	-	-0.19	-0.25
	(1.26)					(-2.86)**	(-2.63)**

Manufact.	Constant	Trend	$\Delta \ln X_1$	$\Delta \ln X_2$	$\Delta \ln X_3$	D_1	D_2
Regression 1	-0.57	-0.02	-3.35	0.08	-0.25	-0.39	-0.10
	(-3.98)**	(-2.69)**	(-1.73)*	(0.25)	(-1.48)	(-2.22)**	(-0.65)
Regression 2	-0.61	-0.01	-3.49	-	-	-0.46	-0.10
	(-4.31)**	(-2.41)**	(-1.81)*			(-2.69)**	(-0.66)
Regression 3	-0.75	-0.02	-	0.13	-	-0.40	-0.09
	(-6.17)**	(-2.45)**		(0.40)		(-2.31)**	(-0.58)
Regression 4	-0.70	-0.02	-	-	-0.27	-0.33	-0.10
	(-5.75)**	(-2.46)**			(-1.57)	(-1.88)*	(-0.67)
Regression 5	-0.77	-0.01	-	-	-	-0.42	-0.11
	(-6.99)**	(-2.07)**				(-2.49)**	(-0.72)
Regression 6	-0.67	-0.02	-	-	-0.26	-0.32	-
	(-5.95)**	(-3.01)**			(-1.58)	(-1.86)*	
Regression 7	-0.58	-0.02	-3.49	-	-	-0.45	-
	(-4.36)**	(-2.99)**	(-1.82)*			(-2.67)**	

Mining	Constant	Trend	$\Delta \ln X_1$	$\Delta \ln X_2$	$\Delta \ln X_3$	D_1	D_2
Regression 1	0.47	-0.04	0.54	0.36	-0.36	0.07	-0.60
	(2.50)**	(-3.85)**	(0.21)	(0.82)	(-1.64)	(0.31)	(-3.12)**
Regression 2	0.34	-0.03	2.41	-	-	0.02	-0.60
	(1.94)*	(-3.50)**	(1.00)			(0.09)	(-3.06)**
Regression 3	0.42	-0.03	-	0.41	-	-0.04	-0.60
	(2.85)**	(-3.54)**		(0.95)		(-0.20)	(-3.30)**
Regression 4	0.50	-0.04	-	-	-0.38	0.07	-0.62
	(3.38)**	(-4.03)**			(-1.84)*	(0.33)	(-3.30)**
Regression 5	0.47	-0.04	-	-	-	0.00	-0.59
	(3.49)**	-(4.89)**				(0.01)	(-3.12)**
Regression 6	0.47	-0.04	-	-	-0.36	-	-0.62
	(3.96)**	(-6.57)**			(-1.84)*		(-3.38)**

Service	Constant	Trend	$\Delta \ln X_1$	$\Delta \ln X_2$	$\Delta \ln X_3$	D_1	D_2
Regression 1	-2.24	0.04	4.46	-0.30	0.13	-0.64	-1.01
	(-8.60)**	(2.77)**	(1.59)	(-0.46)	(0.37)	(-1.83)*	(-3.28)**
Regression 2	-2.23	0.04	4.41	-	-	-0.61	-1.00
	(-9.12)**	(2.86)**	(1.61)			(-1.86)*	(-3.33)
Regression 3	-2.08	0.04	-	-0.35	-	-0.69	-1.02
	(-8.79)**	(2.65)**		(-0.54)		(-2.05)**	(-3.30)**
Regression 4	-2.11	0.04	-	-	0.08	-0.72	-1.00
	(-8.61)**	(2.64)**			(0.24)	(-2.07)**	(-3.25)**
Regression 5	-2.03	0.03	-	-	-	-0.65	-0.97
	(-9.44)**	(2.63)**				(-2.02)**	(-3.25)**

Trade	Constant	Trend	$\Delta \ln X_1$	$\Delta \ln X_2$	$\Delta \ln X_3$	D_1	D_2
Regression 1	-1.48	-0.01	-3.77	0.64	-0.13	-0.37	-0.42
	(-8.72)**	(-1.00)	(-1.67)*	(1.63)	(-0.62)	(-1.70)*	(-2.15)**
Regression 2	-1.46	-0.01	-4.57	-	-	-0.41	-0.45
	(8.96)**	(-0.96)	-(2.07)**			(-1.87)*	(-2.30)**
Regression 3	-1.63	-0.01	-	0.82	-	-0.32	-0.36
	(-10.99)**	(-0.68)		(2.13)**		(-1.52)	(-1.87)*
Regression 4	-1.58	-0.01	-	-	-0.11	-0.26	-0.39
	(-9.80)**	(-0.81)			(-0.51)	(-1.15)	(-1.93)*
Regression 5	-1.53	-0.01	-	-	-	-0.24	-0.36
	(-10.60)**	(-1.18)				(-1.11)	(-1.78)*
Regression 6	-1.51	-0.01	-3.62	0.66	-	-0.41	-0.42
	(-9.34)**	(-0.88)	(-1.62)	(1.69)*		(-1.91)*	(-2.15)**
Regression 7	-1.63	-	-3.39	0.68	-	-0.54	-0.48
	(-18.28)**		(-1.54)	(1.76)*		(-3.86)**	(-2.73)**
Regression 8	-1.72	-	-	0.83	-	-0.44	-0.42
	(-24.50)**			(2.17)**		(-3.50)**	(-2.40)**

Transport.	Constant	Trend	$\Delta \ln X_1$	$\Delta \ln X_2$	$\Delta \ln X_3$	D_1	D_2
Regression 1	0.13	-0.03	-3.79	0.20	-0.41	0.09	-0.44
	(0.83)	(-3.27)**	(-1.94)*	(0.53)	(-1.98)*	(0.41)	(-2.37)**
Regression 2	0.03	-0.03	-2.74	-	-	0.02	-0.43
	(0.22)	(-2.86)**	(-1.41)			(0.09)	(-2.23)**
Regression 3	-0.05	-0.03	-	0.19	-	0.10	-0.38
	(-0.32)	(-2.84)**		(0.47)		(0.47)	(-1.94)*
Regression 4	0.02	-0.03	-	-	-0.31	0.19	-0.39
	(0.11)	(-3.23)**			(-1.50)	(0.89)	(-2.06)**
Regression 5	-0.11	-0.02	-	-	-	0.05	-0.42
	(-0.83)	(-2.60)**				(0.25)	(-2.19)**
Regression 6	0.03	-0.03	-2.80	-	-	-	-0.43
	(0.20)	(-4.56)**	(-1.52)				(-2.28)**
Regression 7	-0.06	-0.02	-	-	-0.26	-	-0.40
	(-0.50)	(-4.33)**			(-1.31)		(-2.13)**

Notes.
- * denotes significance at 90% confidence.
- ** denotes significance at 95% confidence.
- t-statistics are presented in parentheses.
- Δ denotes difference; equivalent to (1-L).

3.2.2) Regression Results

Here, results of the final econometric estimations are reported. The results will be discussed in the following section. The only consistent result across industries was that in all industries, one or both of the policy dummy variables is significant. In construction, the coefficient of the dummy variable for AOHS is -0.19 and the coefficient of the dummy for experience rating is -0.25. Both dummies are significant to a 95% confidence level. It must be noted that the dummy for experience rating represents the effect of AOHS as well, since AOHS applies in all years that are represented by experience rating. Only the dummy on AOHS was estimated for manufacturing, its coefficient of -0.45 significant to 95% confidence. In mining, the coefficient on the experience rating dummy is -0.62 (to a 95% confidence level). In the service industry, both dummy variables are significant, with coefficients of -0.65 and -0.97 for AOHS and experience rating (both to 95% confidence), respectively. In trade, both dummies are significant to 95%; the coefficients on AOHS and experience rating are -0.44 and -.042, respectively. In transportation, the only significant result is the -0.43 coefficient on the experience rating dummy (significant to 95%). All industries but construction and trade show a trend in fatality risk over time that is significant to a 95% level of confidence.

The results from the X_i variables are not consistent across industries. In three of the six industries, one of the X_i variables is significant. The coefficients on the X_i variables are only necessary for aid in determinations of actual reduction in risk.

3.2.3) Discussion

As noted in section 3.2.2, the imposition of experience rating occurred in conjunction with the regulations imposed by AOHS. Thus, the coefficient on the experience rating variable actually measures the *incremental* effects of that program, since AOHS applies at the same time as experience rating. In this section, the discussion will focus on the dummy variables, since the determination of the effects of AOHS and experience rating is the true aim of this paper.

The dependent variable, fatalities per thousand workers, is continuous and in logarithmic form, yet dummy variables, by their nature, are not. This means it slightly more difficult to determine the relative change on the dependent variable caused by inclusion of the dummy variables. The procedure to find the change in risk is first, to determine the levels of risk, with and without the significant dummies for the industry under consideration, and second, simply compare the levels to find the percentage change. To find the level of fatalities per thousand workers, $\hat{Y}_t$, the anti-log of the estimated equation is taken. This appears as

$$\hat{Y}_t = e^{\left(\hat{a}_0 + \hat{a}_1 \overline{\text{Trend}} + \sum_{i=2}^{3} \hat{a}_i \overline{(1-L)\ln X_i} + \sum_{i=1}^{2} \hat{b}_i D_i\right)} \qquad (3.5)$$

with all independent variables evaluated at the mean (the mean for the dummies is always 1 when estimated in the equation; the mean of the trend is always 21.5[7]. The X_i variables in (3.5) are only included if they are estimated in that industry's final equation.

In construction, the passage of AOHS permanently decreases the risk of fatality by approximately 17%. Experience rating lowered the risk by an additional 22% from AOHS's level. Construction was a major target of the changes imposed by AOHS. This may explain why AOHS is quite effective in raising safety. However, since experience rating seems to have been even more effective in raising safety, it is likely that the profit maximizing level of safety under the combination of AOHS and experience rating is higher than that under AOHS regulations alone.

It is assumed that the additional drop in risk of death as indicated by a significant

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[7] This is because the trend takes on a value equal to n, i.e. 1 for the first observation, 42 for the last. $\frac{\sum_{n=1}^{42} \text{Trend}}{n} = 21.5$.

coefficient on D_2 is due solely to experience rating. Though a "synergetic", or multiplicative effect, between AOHS and experience rating may be suggested, there is no evidence to suggest it is a significant factor in explanation. An important reason for it being unlikely is that AOHS and experience rating work through entirely separate and different administrative mechanisms.

In manufacturing, the coefficient on the dummy for AOHS implies a 36% permanent decrease in risk of death. Experience rating's lack of significance in manufacturing has been explained by Jeff Smith (Interview, 1995) of the Alberta WCB, as due to manufacturing's relatively high profile in previous safety promotion programs. Like construction, much of AOHS's legislation applied directly to manufacturers. Unlike construction however, experience rating's appearance was mostly irrelevant for manufacturers--firms may already have been at safety levels equal to or higher than those that would have been induced by experience rating.

In mining, the coefficient on the experience rating dummy implies a 46% permanent drop in risk of fatality due to the imposition of experience rating. AOHS's regulations were not significant in mining. The large drop in risk of death may be because mining firms are more amenable to financial incentives than firms in other industries. Further, mining firms may not respond to AOHS regulations for reasons unique to the mining industry. For example, since mining is one of the more dangerous industries (the average risk of death is second only to construction), perhaps workers and administrators in the mining industry tend to be more fatalistic than in some other industries. This fatalism may lower the effectiveness of AOHS-type safety programs, such as those based on increasing miners' safety knowledge.

In the service industry, the coefficients on the dummies imply a 48% drop in risk due to AOHS and a further 27% drop from the first when experience rating comes into effect. It is uncertain why service is so amenable to both AOHS and experience rating. To explain the effectiveness of AOHS regulations, one can hypothesize that service workers are more able to be creative in finding ways to perform their tasks safely given a changing regulatory environment. This is because firms in the service industry may not require large capital investment; service workers are less constrained by their equipment and more flexible in the manner in which they do their jobs.

In trade, the dummies represent a permanent drop in risk of 36% due to AOHS, and a drop of 34% from the first level due to experience rating. It is difficult to say exactly why such large decreases occur in trade. Workers for firms in the trade industry face, on average, the smallest risk of death of the industries studied. The innate safety in trade is a possible explanation for the relatively large impact by both programs. In other words, since a very small number of deaths are likely to occur in the absence of any program, a reduction by a single death annually may cause a large decrease in risk of death. This being the case, it is probably unwise to use the relatively impressive results from trade for making strong policy statements.

In transportation, the coefficient on the experience rating dummy implies a 33% drop in risk of fatality due to experience rating. The regulations imposed by AOHS have no significance in transportation. The effectiveness of experience rating lies in sharp contrast to the insignificance of the AOHS dummy. AOHS's ineffectiveness is most likely due to the fact that the transportation industry was not a major target of AOHS.

A likely explanation of experience rating's effectiveness in transportation lies in the size of transportation firms. Transportation firms tend to be fairly large (particularly in sub-industries like railroads), and due to the design of the experience rating program, are given a relatively larger financial incentive to increase safety than smaller firms. If the average size of transportation firms is larger than firms in other industries, transportation firms will exhibit a larger reduction in risk.

It is interesting to note that construction and trade show no measurable trend in risk over time. This is evidenced by the fact that the coefficients on the trend variable were highly insignificant for these two industries. An explanation may be that safety technology has remained largely unchanged. Modern tools and techniques in construction and trade are quite similar to those in 1951. If safety equipment is constant, time is unlikely to have much effect on safety. In industries like manufacturing and mining, safety technology has changed much since 1951, possibly evidenced by their highly significant time trends.

3.3) Conclusions

The empirical findings in this paper tend to support those of Bruce and Atkins (1993), Kneisner and Leeth (1989), Worrall and Butler (1988), and Chelius and Smith (1983). Although the methods and locales of investigation differed, all found higher levels of safety brought on by experience rating in workers' compensation.

In this paper, a "natural experiment" is performed, one that studies the wide-ranging 1987 introduction of experience rating in Alberta, Canada. The results indicate a higher level of safety induced by experience rating, in conjunction with the Alberta Occupational Health and Safety Act. However, results are not consistent across industries.

Yet, some general observations are notable. In all industries, either AOHS or experience rating appear to increase safety. In all six industries, statistically significant in four of them, risk of fatality falls over time. This is likely due to technological advancements that occurred from 1951 to 1992. In five of six industries, experience rating appears to be responsible for a large rise in safety (only manufacturing was unaffected by experience rating). The average decrease in the risk of death due to experience rating is 32%. Hypothesis 4, higher safety brought on by a higher β, is supported by this analysis.

In industries where both AOHS and experience rating matter, the addition of experience rating to AOHS significantly lowers further the risk of death in all cases. In mining and transportation, industries where only experience rating matters, experience rating reduces the death risk by a relatively large amount (46% and 35%, respectively). This is qualified by the knowledge that experience rating occurs in conjunction with AOHS. Hypothesis 5, higher safety brought on by tighter regulation, is supported by this analysis.

Although the results seem encouraging for those whose goal it is to raise workplace safety, some words of caution must be noted. Safety is a rather vague notion; its measurability is not certain. First, safety may not simply be manifested as a measure of fatality risk. Second, it may be distorted by uncertainty: unreported accidents, communication problems, and changing social and managerial attitudes. A further reason for caution is that three of five hypotheses developed in this paper were not supported by the empirical analysis (Hypotheses 1,2, and 3).

From a policy perspective, however, experience rating appears to have been a success in raising safety at the Alberta workplace. Workers' compensation boards across Canada would be wise to study Alberta's "experiment". Boards and provincial governments wishing to increase safety at work should seriously examine the introduction of experience rating in their jurisdiction.

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APPENDIX TO CHAPTER TWO

This is an outline of events during the years for which I have data on which to base an empirical analysis in Chapter Three.

1951: The Reserve for Disasters (a fund for damage caused by major calamities) is modified. Alberta Federation of Labour asks for increased safety devices under the Alberta Workers' Compensation Board.

1952: The waiting period for benefits following an accident is decreased from either three or six days to one day (the day immediately following the accident).

1953: New regulations are implemented regarding the care and use of explosives in coal mines, under the Coal Mine Act. Similarly, new regulations concerning oil and gas well safety come into effect.

1954: The Workmen's Compensation Act imposes new rules for the operation and maintenance of machinery and equipment in grain elevators, flour and feed mills, and seed-cleaning plants.

1955: The Coal Mines Regulation Act is completely revised. This includes many new provisions for safety in the mines, as well as for miners' health.

1956: First aid and safety schools conducted by the Alberta WCB are continued and expanded.

1957: Under the Oil and Gas Conservation Act, new safety provisions are introduced in drilling and production with respect to storage and explosives. The WCB adds a prosthetic department, opens an office in Lethbridge, and increases the number of industries it covers.

1958: No significant events occur within the Workmen's Compensation Board.

1959: Regulations are put in place about the construction of pipelines. The Accident Prevention Department of the WCB opens an office in Grande Prairie. Safety plaques for the best accident record are issued in each of nine major industries.

1960: New regulations are added for window cleaning; the installation, manufacture and inspection of electrical equipment; grain elevators; and lumber operations. More safety clinics are conducted by the WCB. Safety plaques are now offered in eleven industries.

1961: There are new regulations for electrical installations in oil fields, as well as changes in the standards and specifications in elevators and escalators. The WCB opens a new office in Red Deer. A bimonthly news bulletin devoted to safety in industry is launched.

1962: Welding regulations for boilers and pressure vessels are strengthened. Some rules regarding explosives are improved.

1963: The welding vocation comes under new training and certification guidelines. The Accident Prevention Department adds safety supervisors to bring the total number to twenty-nine.

1964: The number of industry safety councils is increased to eighteen, each issuing plaques for superior safety records. The number of WCB claims representatives is increased.

1965: A new apprenticeship code comes into effect for mechanics and glassworkers. Safety committees are prescribed for firms with twenty or more employees. These committees must send the WCB a monthly report. This gives the effect that more direct responsibility is placed on employers to see that their safety committees carry out the proper duties. Additionally, more staff is added to the Accident Prevention Department and the number of industry safety councils is increased to twenty.

1966: Surveys are instituted concerning accident prevention. The distribution of over 500000 pieces of literature on this topic takes place.

1967: First aid requirements for employers are made more stringent, as are certification standards in the Boilers and Pressure Vessels Act. The surveys instituted in the previous year are continued and the program expanded.

1968: New criteria for chair lift and rope tow safety are instituted, while there are now twenty-one safety councils.

1969: There is a replacement of standards in the petroleum and gas industry, as well as new legislation for electrical and boiler safety while there are now twenty-five safety councils for various industries. The Alberta WCB continues its emphasis on education, especially concentrating on training courses.

1970: The WCB introduces new classifications for industries' premiums; the Safety Advisor Program (surveys) is continued, and the number of safety councils is increased to twenty-seven. The new premium classification system is simply a minor adjustment of the previous one, however. A Disability Evaluation Committee is established.

1971: New laws are established regarding the storage, handling, preparation, and firing of explosives. In the timber industry, premiums are now assessed on the basis of payroll, where previously they were based on production. The Safety Advisor Program is expanded. Twenty-two safety councils are active in 1971.

1972: New health regulations for most occupations are implemented, as are improved standards for ventilation and woodworking. Nineteen new Safety Advisor programs are initiated.

1973: The government emphasizes their active goal of occupational safety, that of accident prevention. New construction rules are brought about, and there are amendments that concern electrical equipment and installation. The name of the Workmen's Compensation Board is changed to the Workers' Compensation Board. The WCB attempts to decentralize services. Twelve new Safety Advisor programs are initiated.

1974: More authority is given to inspectors to deal with first aid problems. More detailed construction safety rules are set forth. Firms now pay premiums on a quarterly basis, not biannually. More inspections and training are undertaken.

1975: Inspection of firms continues.

1976: The Occupational Health and Safety Act is passed. This brings the industrial accident prevention department of the Workers' Compensation Board under a division of the Department of Labour. This is now known as Alberta Occupational Health and Safety (AOHS). This Act includes revised regulations on: first aid, general accident prevention, agriculture safety, timber safety, petroleum and natural gas safety, construction safety, explosives safety. It also provides for severe penalties to be imposed in the case of a violation.

1977: No significant events occur in 1977 in regards to occupational health and safety in Alberta.

1978: There are many seminars and speaking engagements given by the WCB. There is a review of classifications in the manufacturing industry.

1979: No significant events occurred in 1979 in regards to occupational health and safety in Alberta.

1980: A new industry classification unit is formed. This is created in order to charge appropriate rates for each industry.

1981: Continuation of programs, no significant new events.

1982: Change in workers' compensation benefits from 75% of gross income to 90% of net income. Maximum insurable earnings are now $40000 per year.

1983: Workers' Compensation Board reduces staff by 3%, other programs continue.

1984: No significant events occur in Alberta with regard to worker safety.

1985: Experience rating is discussed in planning stages. Public education is given high priority by the WCB.

1986: There is a phasing in of experience rating and a phasing out of the merit rebate and super assessment system. The central office of the WCB is moved.

1987: Experience rating becomes fully operational as of January 1, 1987. There is a continuation of public education and speaking engagements.

1988: Due to problems affecting small businesses, the experience rating system is revised to allow graduated participation for some employers. This dampens the impact of discounts and surcharges on smaller employers).

1989: The Workers Compensation Board identifies 42 out of 800 industries where there are specific problems with injuries. A goal of reducing injuries in these industries by 15% in five years is set. This is to be done with the "Window of Opportunity" pilot project which offers cheaper assessments for good safety records, starting with two serious safety offenders, meat packing and roofing.

1990: The Work Injury Reduction Program (WIRP, a continuation of the Window of Opportunity program) is implemented, with meat packing and roofing being the first participants in January of this year. Other industries join in July and September. The initial reports about this program are favourable.

1991: WIRP continues, with good reports. There are changes in many WCB industry classifications (from 716 classes to 621 classes), as well as a change in the number of rating units (on which to base premiums) from 297 to 244.

1992: The WCB undertakes some administrative changes. WIRP is expanded, but still accounts for only 1% of employers with WCB accounts. This includes a "Projected Experience Rating" tool being created to predict the future experience rating position of employers. Harmonization between WIRP and Alberta Occupational Health and Safety (AOHS) occurs through the Partners in Injury Reduction (PIR) program.

1993: The WCB is newly equipped with systems technology to more efficiently serve the needs of injured workers and employers. WIRP is retitled the Voluntary Incentive Plan (VIP) and "...was strengthened through an actuarial review, refinement of its relationship with the Occupational Health and Safety Division of Alberta Labour (OH&S), and a closer link with claims management training through the Post Injury

Loss Reduction program." (p.11, 1994).