University of Alberta

Deregulation and Freight Rates: Analysis of the Canadian Railway Industry

by

Sebastian Augustine Maurice ©

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of Master of Science

in

Agricultural Economics

Department of Rural Economy

Edmonton, Alberta

Fall 1997

0-612-22636-0

University of Alberta

Library Release Form

Name of Author: Sebastian Augustine Maurice

Title of Thesis: Deregulation and Freight Rates: Analysis of the Canadian Railway Industry

Degree: Master of Science

Year this Degree Granted: 1997

612, 815-4th Ave. S.W.
Calgary, AB
T2P 3G8

Oct. 2, 1997

University Of Alberta

Faculty of Graduate Studies and Research

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled Deregulation and Freight Rates: Analysis of the Canadian Railway Industry submitted by Sebastian Augustine Maurice in partial fulfillment of the requirements for the degree of Master of Science in Agricultural Economics.

Dr. Mel Lerohl

Dr. Kevin Chen

Dr. Allan Warrack

October 2, 1997

Abstract

This thesis has two objectives: First, it assesses whether movements in freight rates can be predicted in a deregulated environment. This problem is addressed by analysing the US experience under deregulation. Several studies are analysed, that, generally, fail to reach a consensus on the effects of deregulation on the changes in freight rates. Given the lack of consensus from these studies, it leads to the belief that any prediction of freight rates in Canada is likely to be dependent on the market structure, and even then, rates may still remain uncertain.

Second, a survey was developed and mailed out to farmers in one region of Alberta. Using the results from the survey, several functional forms are estimated, for each crop, wheat, barley, and canola, in an attempt to get a range of the demand response of farmers as rates increase. Shipper responses range from 0.011 to 0.75, in absolute value, as rates increase. A LOGIT analysis shows a probability of decreasing acres planted of wheat to be 49.6% and that for canola to be 16.1%. Furthermore, railways were shown to have a revenue gain in the range of 12 to 66 percent, due largely to the lack of response of shippers, in this sample, to rate increases.

Contents

List of Tables

List of Figures

Chapter 1

Introduction

1.1 The Research Problem

The railway industry in Canada is going through major changes. Government policies, recently, are encouraging the industry to rely more on the market than on government. Recent changes have led to western farmers paying the full cost to transport their grains to ports, which had been subsidized by the government. Deregulation of freight rates, while not yet in place, is likely in the future. This gives rise to two problems: One, is it possible to determine future movements in rail rates in Canada?. Two, what are the implications of the demand function of farmers on railway transportation revenue and changes in crop production levels.

In the context of the grain sector, the railway industry, made up of two major Class I freight railways, Canadian National (CN) and Canadian Pacific (CP), has been focused on providing the grain industry with transportation services. The major competitive element between the railways has been to offer shippers incentive rates (i.e. lower rates for larger shipment size). A move towards a more competitive environment has meant eliminating many government regulations that protected farmers from the price volatility of the marketplace (McKinnon, 1995). The major reform to date has been the elimination of the Western Grain Transportation Act (WGTA) (see Appendix G for a further discussion) that subsidized the cost of the movement of western grain. This change has forced farmers to pay the full cost of transporting grains to port. The expected backlash from farmers did not materialize for several reasons (Globe & Mail, 1995b):

> 1) the WGTA was eliminated at a time when grain prices were at their highest in several years: wheat was selling at $201 per tonne, and as a result, the increase in cost caused by the elimination of the WGTA was barely felt by farmers;
> 2) farmers were given $1.6 billion in compensation, as well as $300 million for a new delivery system; and
> 3) ending the WGTA subsidy eased compliance with World Trade Organization (WTO) rules.

The subsidy to the railways was eliminated August 1, 1995. This subsidy enabled railways to keep freight rates low but also discouraged the needs to cut costs and rationalize the railway industry (McKinnon, 1995). Maximum rate regulation, still in place, does not allow railways to increase rates beyond a certain annual level.[1] The fact that railways are not free to increase rates

[1] For example, maximum average rates will rise by 80 cents in 1995-1996 year over the

beyond the maximum rate level has been opposed by the railways (McKinnon. 1995). But the government has proposed to review this situation (in the year 1999) to see whether maximum rate regulation benefits the industry by encouraging efficiency of the grain transportation handling system. and by sharing the efficiency gains as between shipper and railway (Bill C-14. p.74: see Appendix G for a discussion on Bill C-14). CP is. however. expecting freight rates to be market based by the year 2000 (CP Rail System. 1994).

It is unsure at this time that maximum rates will be eliminated by the Government of Canada. Despite earlier intentions to introduce full commercial rates by the year 2000. the current proposal is to re-visit the regulation issue in 1999 (McKinnon 1995. Bill C-14). CN is "very disappointed by the changes (to revisit the issue rather than introduce full commercial rates) the federal government has made in grain transportation legislation. It is believed that the government has put in place a regime that raises farmers' costs by removing subsidies. but does not encourage improvements in efficiency" (McKinnon. p.3).

It was estimated that the elimination of the WGTA has added an extra $15 per tonne to shipping grain for producers (Globe & Mail. 1995a). It is not clear the impact this increase in rates. and hence the elimination of the WGTA has had on the farm operations in Canada.

1994-1995 rate to reflect the increase in the cost base due to the elimination of the CN adjustment (this was a portion of the government subsidy paid to CN directly (Transport Canada. 1995)).

1.2 Objectives of the Thesis

This thesis addresses the issues of whether the movements in freight rates can be predicted after deregulation in Canada; and of determining the range of demand responses of farmers to rate increases. Using one of these responses. impacts on railway revenue and on crop production levels as rates increase. are computed. To fully understand the research problem. it may be helpful to understand the policies that are responsible for transforming the agricultural (transportation) industry in Canada (see Appendix G for a discussion).

The thesis has two objectives: First. to determine whether movements in rail rates can be predicted after deregulation. This will be assessed via a literature review of the US experience under deregulation. Highlighted here are the factors that influence freight rates. and whether movements in freight rates can be predicted in Canada. Second. determining the range of demand responses. By using particular demand response results. impacts on railway transportion revenue and on changes in crop production levels. as rail rates increase. will be analysed. This objective is addressed via a survey method.

1.3 The Thesis

This thesis has several components. Chapter two describes the procedures involved in computing current maximum rates. The theory of railroad rates is discussed and presents a look at the variables that effect rates. Sections entitled "Economics of Railroad Transportation". and "Computing Maximum Rates" are included to show the effects rates have on the railroad industry.

and how they are computed.

Chapter three assesses the direction of changes in freight rates under deregulation in the United States (US). Chapter three outlines the Staggers Act (SA) which was the first major step in deregulating the US railway industry. The main impacts of the SA are highlighted. The next section looks closely at the areas most effected by the SA. Summarizing US studies on rail deregulation captures the main conclusions. as they relate to rail rates.

Chapter four is an attempt to get an estimate of the range of farmer response to rate increases. after which an assessment of the effects of a particular response on grain transportation revenue is done. It presents first hand information from farmers in Spirit River. Alberta. This chapter outlines the method used to survey farmers and assess their responses. The attempt in this chapter is to contribute to a better understanding of the demand response of farmers in Spirit River. Alberta. and the impacts of these responses on railway transportation revenue and crop production levels. as rates increase.

Several appendices provide information concerning the issues of rate setting as well as the thesis in general. Appendix A shows the National Transport Agency (NTA) guidelines for maximum rates. Appendix B shows NTA maximum rates for wheat. durum. designated barley. and feed barley. while appendices C and D show Canadian and US rail rates. Appendix E is general railway analysis. Appendix F shows the survey instrument and summary results. Appendix G. discusses the WGTA and Bill C-14. Appendix H analyses US and Canadian rail rates. Appendix I discusses the logit model used to show the probabilities of decreasing acres planted of wheat, barley, and canola. Appendix J. shows the data used in estimating the demand responses of farmers to rate increases.

Chapter 2

Foundation of Freight Rates

2.1 Introduction

This chapter is an overview of the foundation of maximum rates. The chapter begins by explaining the railway industry characteristics, and interactions between shipper and railway. This is followed by a discussion of the economics of railroad transportation, and the theory behind railroad rates. The discussion then turns to determining rates in Canada. It is hoped that this chapter will give the reader a better understanding of the chapters to follow.

2.2 Industry Characteristics

The Canadian railway industry is made up of two major carriers: CN and CP. They accounted for 90 percent of rail freight revenues in Canada in 1993, with CN earning about one-third more than CP (NTA 1994, p.50). CN is publicly owned and operates in eight Canadian provinces and eleven U.S.

states (NTA 1994, p.51).[1] In 1993, CN operated in excess of 30,000 km of track in Canada and the U.S., and had 68,423 freight cars (NTA 1994, p.51).

CP is privately owned by CP Ltd. and provides service in eight provinces and 19 U.S. states (NTA 1994, p.51). In 1993, CP operated 31,000 km of track in Canada and the U.S., and had 48,400 freight cars (NTA 1994, p.51).

The financial position of the two railways can be seen in Tables 1.1 and 1.2. By comparing the two tables, losses were incurred more often by CN than by CP. The loss taken by CN and by CP in 1992 may have been associated with a bad wheat harvest (fall in volume) which lead to a fall in farmers cash receipts from $2,744 million in 1991 to $2,231 million in 1992 (Statistics Canada 1993/1994, Table 25). The Total revenue for freight for both railways fell from $6,034 million in 1991 to $5,786 million in 1992 (Canadian Economic Observer, p.90). Moreover, both railways show an increase in revenues from 1992 to 1993. However, a net loss was incurred by CN in 1993, and a net gain was incurred by CP in the same year.

Table 1.1 Financial Results for CN ($ Millions)

	1988	1989	1990	1991	1992	1993
Operating Revenue	3,781	3,515	3,385	3,469	3,440	3,460
Operating Expense	3,297	3,208	3,305	3,291	4,135	3,328
Operating Income	484	307	80	178	(695)	132
Net Income (Loss)	(13)	90	(77)	(34)	(908)	(57)

Source: National Transportation Agency of Canada 1993, p.208

[1] Presently, CN is privately owned.

Table 1.2 Financial Results for CP Rail ($ Millions)

	1988	1989	1990	1991	1992	1993
Operating Revenue	2.717	2.465	2.488	2.549	2.338	2.477
Operating Expense	2.312	2.255	2.212	2.501	2.593	2.242
Operating Income	405	210	276	48	(255)	235
Net Income (Loss)	224	127	164	(7)	(193)	77

Source: National Transportation Agency of Canada 1993. p.208

The relation between farmers and railroads is built on the commitment of service that one provides for the other. Farmers (or shippers) grow grain which they deliver to their local elevators. and is transported by the railways to port locations. Less grain to transport means less grain transportation revenue for the railways. Therefore. railways have to be concerned with the effects of higher rates on farm operations and the changes farmers will make as a result of higher rates. These concerns make the issue of rate increases important from both a farmer and a railway perspective.

2.3 Economics of Railroad Transportation

The economics of railroad transportation differs from the economics of other modes of transportation such as airways. waterways. trucking. etc. The differences lie in the nature of the business itself: The amount of capital investment required for a railway operation is great. The laying of the tracks. building tunnels. buying cars. are all needed for railway operations. Moreover. the possibility of entry in a railway industry is minimal to almost zero due to large sunk costs. It can also be said that the possibility of exit is minimal. The rail business can only be used to provide rail service because the capital involved in their operation is highly specialized, and fixed. Moreover, trucking is the main source of competition for the railways in Canada, especially on routes closest to ports (PPP 1994, p.47).

Both CN and CP ship grains and other commodities to port locations. In some areas, the two have monopoly power but in other areas they have parallel lines and so compete for business. Because of rate regulation, the railways cannot price above the maximum rate level. So in the areas where they have monopoly power, it should be expected that railways will raise prices to its maximum level, and below, where they compete with other railways. By examining Appendix C, it can be seen that this is generally the case for maximum rates: For example, in the Aldersyde subdivision, which is serviced by CP exclusively, maximum rates are charged for all stations, i.e. distance between Champion station and the Vancouver port is 723.6 miles, the maximum rate for this distance is $24.04 (found in Schedule III[2] of Appendix A, using the 701-725 block), and indeed this is what is charged by CP; other distances can be interpreted similarly. For the Camrose subdivision, which is serviced by CN exclusively, maximum rates are also charged for all distances in this area. Examining rates in this way, maximum rates are charged most of the time which would imply that incentive rates for farmers are not in wide use; incentive rates, per tonne, would be lower than maximum rates; this observation seems to concur with the railways complaint that maximum rates leave little margin to negotiate incentive rates with farmers (McKinnon

[2]Schedule III is the legislated maximum rates set by the government.

1995).

2.3.1 Theory of Railroad Rates[3]

Given the nature of capital in the railroad industry, capital can not be expected to flow in and out at a rapid pace. Therefore, setting up rival rail operations to compete with the existing railways will be difficult.

The costs of railways can be divided into two components: variable and fixed. Variable costs depend upon the volume of traffic, and fixed costs are independent of the volume of traffic. Covering total cost, as a means to maintain operations, does not necessarily apply to the rail industry (Levin 1981a, 1981b). In a competitive case, the railways may price below marginal cost and still earn revenue. The reason is that if a traffic won't move at a high rate, it is to the railway's advantage to quote a lower rate to get the traffic moving. As long as this rate covers variable cost, and makes some contribution to fixed cost or overhead for that line, which will be incurred in any case, then this operation of the railway is contributing to revenue.

Differences in the "cost of the service" influence different rates for different commodities. Some commodities are more expensive to transport than others, for example, they require expensive equipment, special facilities, or fast service (Locklin 1972, p.148). If there is no return on capital invested, it will not be replaced. The key point to note here is that competition in the railway industry may not equate rates with marginal cost. Rather it may push them down below this level (Locklin calls this ruinous competition).

[3]This section is based on the study by Locklin(1972).

Another point is that railways' product, transportation, is normally priced at different rates for different commodities. For example, if the rate to transport wheat is less than the rate to transport coal, the coal shipper does not purchase wheat transport instead. Also, if the cost of transport from A to B is less than from C to D, this will not cause substitution away from C to D to A to B. In other words, railway service (and hence shipper demand) is dedicated.

The term "value of the service", which can be defined as the difference in the cost of producing a commodity in two places (Locklin 1972, p.159), is important because it provides an upper limit to the freight rate in a competitive environment. If a rate charged prevents traffic from moving, it is beyond the value of service level. Any rate that is less than or equal to the value of service will move traffic. Any rate that prevents shippers from choosing another mode of transportation must be less than or equal to the value of the service level.

The term *charging what the traffic will bear* means charging the rate on each commodity or major traffic movement which, when considering the volume of the traffic, will make the largest contribution to fixed cost. This concept is shown in Figure 2.1 (Locklin, p.161), where D is the demand curve for the transportation of a certain commodity, and C is the (constant) variable cost curve[4]. Figure 2.1 shows the following: Were a railway to charge a rate

[4]This representation of variable cost differs from the conventional economic representation. The reason for this is that expenses that vary with output but not in direct proportion to it, are broken down into a fixed and a variable element: the variable element varies in proportion with output. This is the reason why the variable cost curve is parallel

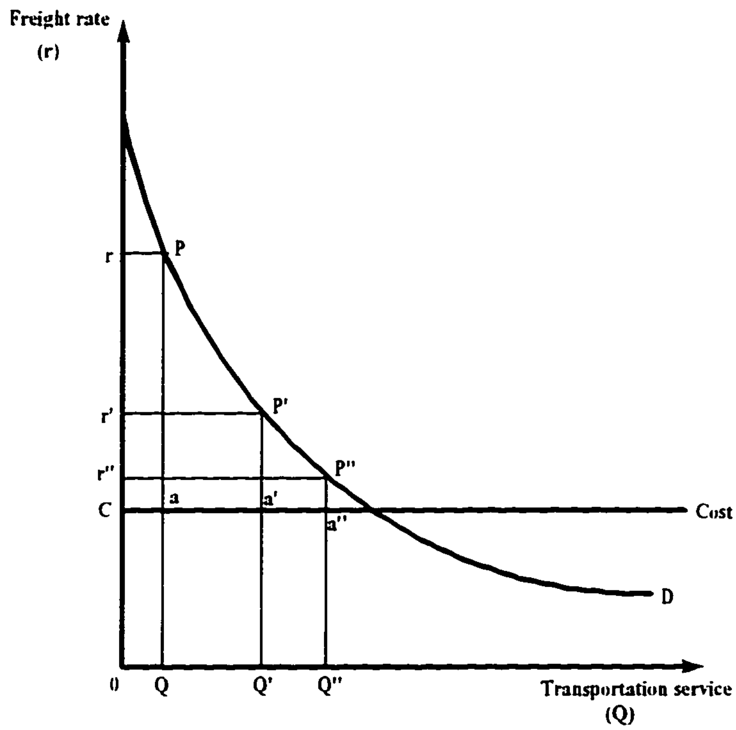

Figure 2.1: Charging what the traffic will bear

such as $0r$, the revenue that would be generated would be $0r \times 0Q$ or the area $0rPQ$. The direct expenses would be area $0CaQ$, and the total contribution to fixed cost would be area $CrPa$. If a low rate r'' is charged, total contributions to fixed cost would be $Cr''P''a''$. But the optimal or largest level of contributions to fixed cost would be somewhere between these two levels, say at $0r'$. The exact magnitude of these areas will depend on the response of the demand curve. In areas where the railways have monopoly power, the demand for transportation will be relatively inelastic; and where there is competition, the demand curve will be more elastic. This figure represents a particular commodity on a particular haul, which is a small portion of the carriers business (Ibid., p.161). To achieve optimal or maximum profits it would make sense to charge different rates for different commodities and for different hauls of the same commodity (Ibid.). The nature of these rates will depend on the cost of moving the particular commodity and the elasticity of the demand curve for that *particular* commodity.

2.4 Procedures for Computing Maximum Rates

The following discussion summarizes methods for computing maximum rates for grain shipments. Historically, the National Transportation Agency (NTA) did a costing review of the railways every four years (PPP 1994a, pp.67-68). The last costing review was done in 1992, and is no longer done by the NTA. The last review was completed in 1994, and the rates corresponding to it can

to the transportation service axis.

be found in the Annual Rate Scale Order, 1995-1996 (Canada Gazette 1995, p.1315). The review enables the Agency to determine whether railway costs have risen or fallen, and thus whether to raise or lower freight rate ceilings.[5]

The second factor highlighted by a costing review is the productivity gains. These gains occur as a result of labour downsizing, the elimination of cabooses, the construction of tunnels, greater use of electronic data processing, improvements in the quality of the track and rolling stock, and a general commitment to doing things better (Ibid., p.62). The benefits from productivity gains between costing years are enjoyed by the railways, and they are not required to pass on these gains in the freight rate. When a costing review is done, these savings are explicitly incorporated in the freight rates.

The 1992 costing review would be the last to be done. On May 29, 1996 Bill C-14 (formerly known as Bill C-101) received royal assent and was put in force July 1, 1996. BILL C-14, replaces Bill C-76, the *Budget Implementation Act* passed in July 1995, and eliminates the quadrennial costing review method of setting rates, with adjustments for inflation between costing years. Bill C-14 keeps the input price index that adjusts previous years rates for inflation. The precise equation, which adjust previous years rates, is called the *Freight Rate Multiplier (FRM)*, which has the input price index as one of its arguments (see Appendix G for a further discussion).

[5]Regression methods, as discussed in below, were used to compute these ceilings, but due to the introduction of Bill C-14 (Appendix G) the freight rate multiplier (FRM) now determines these ceilings. Nonetheless, the regression method, for computing maximum rates, shows where the rates originated. Now, the FRM, similar to an inflation index, simply multiplies previous years rates to get current maximum rates.

Note that this method of multiplying last year rates by this index or multiplier fails to take into account any productivity gains. whereas costing reviews captured the productivity gains. The resulting savings were then incorporated in the freight rate. The implication is that if productivity gains were realized by the railways. this will lead to lower costs for the railways: under the old cost based method. these gains would be reflected in the freight rate. but under the new method. a measure of inflation. will most likely adjust freight rates upward. Thus. the gap between freight rates and cost become wider under the new method.

One effect of rising inflation is to raise the input cost of railways. This may be a concern for farmers who may see increasing freight costs every year. even in times when railway costs are falling due to productivity gains which may not be reflected in the price index. The only situation that may keep freight rates low is if there is competition among the railways. In that situation. the competitive market is likely to determine the optimal freight rates. But due to this multiplier. the railways are permitted. potentially. to charge higher and higher freight rates.

2.4.1 Computing Maximum Rates

The total cost of the railways. which is the cost of moving grains to ports. is determined by the following equation

$$\begin{aligned} Total\ Cost = &\ Total\ Volume\ Related\ Cost\ + Total\ Line\ Related\ Cost \\ &+ Contribution\ To\ Fixed\ Costs \end{aligned} \tag{2.1}$$

where the variables are defined in Tables E.2-E.4 in Appendix E. The contribution to fixed costs is normally estimated to be around 20 percent of total costs. Twenty percent is chosen because when costs are computed. usually 80 percent of the operations costs are accounted for. and 20 percent would then be classified as a contribution toward fixed costs (Vercammen. p.2) and most likely be assigned to grain traffic[6]. But this is problematic since nobody knows what traffic caused the majority of the fixed costs. i.e.. was it grain traffic. coal traffic. sulphur traffic. etc. But since grain is the more frequent commodity being shipped on branchlines and main lines. fixed costs get assigned to grain. (Property taxes railways have to pay to municipalities are considered contribution to fixed costs.)

The incremental cost. determined by the NTA. associated with one more unit of shipment: the marginal cost of shipping one more unit (tonne) of grain. can be determined. This requires converting the total cost (C) to a cost per tonne figure. To determine this cost per tonne. a regression is run to determine what freight rate is adequate for what distance. and to separate the fixed component of costs (α) from the variable component (β). shown below. For example. the NTA has used (prior to Bill C-14) the following regression to set ceiling freight rates for railways

$$\frac{C}{Tonne} = \alpha + \beta(MILES) + \epsilon \tag{2.2}$$

where α and β are parameters to be determined. and ϵ is an identical and independently distributed error term (i.i.d). $\frac{C}{Tonne}$ is the cost per tonne. and

[6]Personal communication with a transportation analyst at the Alberta Agricultural Research Institute (AARI) (1995).

MILES is in 25 mile blocks. the first observation in MILES is 325 miles or less (see Appendix A. Schedule III). For example. cost per tonne data and the amount of 25 mile blocks in a particular subdivision. can be determined. Running this regression with the data described gives the following results[7]

$$\frac{C}{Tonne} = 10 + 0.51(MILES). \tag{2.3}$$

where α. which can be interpreted as some fixed cost assigned to grain traffic[8]. is equal to $10 and $\beta = 0.51$ cents. Using these results. Figure 2.2 shows how the maximum rate was computed. In Figure 2.2. the regression line cuts at the mid-point of the 25 mile blocks. and since each 25 mile block costs 0.51 cents. to ship grain a distance between 801-825 miles would cost $26.59[9] per tonne. for a distance between 826-850 it would cost $27.10/tonne. for a distance between 851-875 it would cost $27.61. and for a distance between 876-900 it would cost $28.12. To determine the next years rates. these rates in Schedule III will. now. be multiplied by the freight rate multiplier (FRM). The next chapter addresses this point. by analysing several studies that try to determine movements in freight rates.

[7]These results were obtained from a transportation analyst at AARI. 1995.

[8]Recall that this fixed cost component will vary according to the type of traffic being hauled. For example. fixed costs associated with coal. sulphur. etc. will generate a different number.

[9]This is calculated as follows: $\$26.59 = \frac{51}{25} \cdot 813 + 10 = 16.59 + 10$.

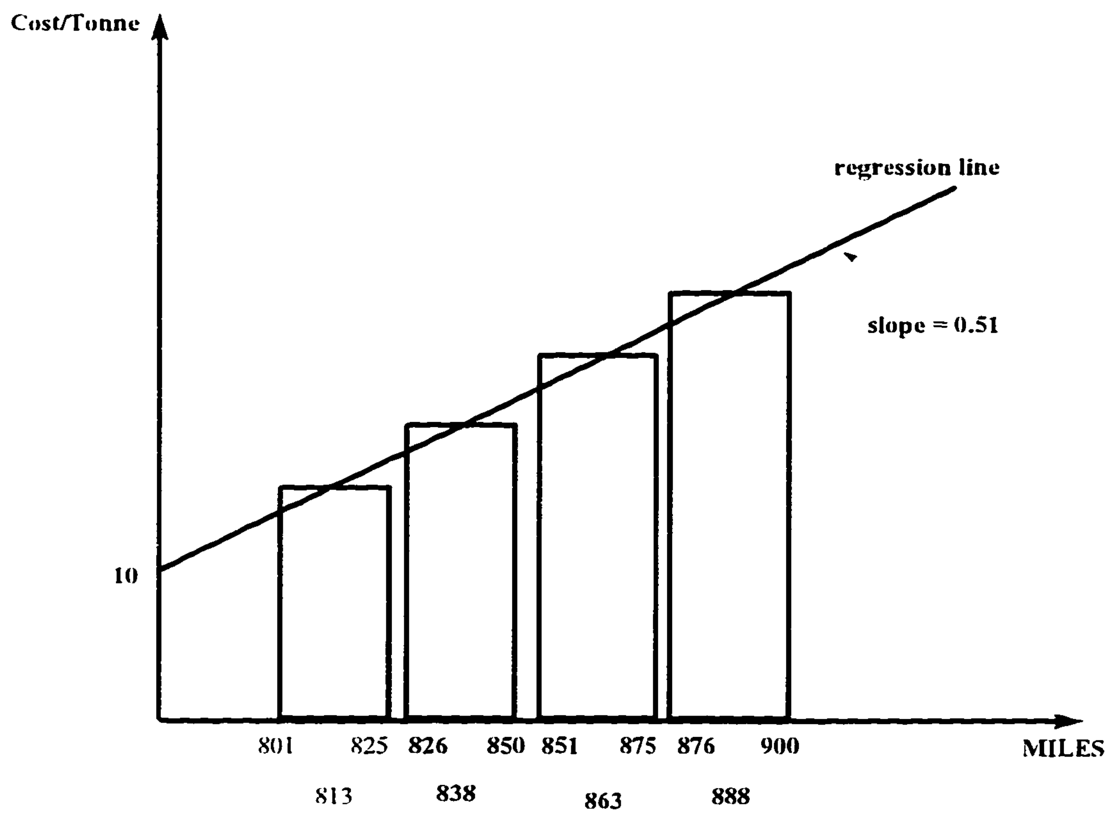

Figure 2.2: Total Cost Regression

Chapter 3

Can Movements in Deregulated Rates Be Predicted?

3.1 Introduction

The focus of this chapter assesses the direction and/or amount of change in rail rates following deregulation. The assessment is done by analysing changes in rates in the US (the interested reader may refer to appendix H for comparisons between US and Canadian rates). This chapter outlines the US railroad industry as it entered deregulation. Several studies are reviewed which analyse the effects between the rail industry and freight rates. From these studies it may be possible to assess the direction of deregulated rates in Canada.

3.2 Relevance of the US Experience to Canada

Using the US Experience for the purpose of predicting the movements in deregulated rates in Canada can be justified on the grounds that the two industries are similar (Trethway et al., 1997), in terms of their market structure and operating strategies (Sheikh, 1993). The US railway industry is larger than the Canadian industry and has an oligopolistic structure (Sheikh, p.122). Specifically, the Canadian Class I industry is one-seventh the size of the US Class I industry measured by freight revenues and tonnage (Sheikh, p.123). The Canadian rail industry employs twenty-five percent of the number of employees in the US, and operates one-third the length of track (Ibid.). The total railway freight revenue generated by the Canadian Class I railways is equivalent to the US Class I railways (Ibid). Between 1984 and 1993, both industries experienced declines in traffic resulting in lower freight revenues (Sheikh). The fall in average tonnage in both countries, led to an increase in the average length of haul which resulted in an increase in tonne-kilometres (Sheikh).

The increase in efficiency of the US railways has been due to their success in controlling expenses and in reducing the length of track (Sheikh; Trethway et al.). Overall, labour productivity in both countries has been great. Over a ten year period, the Canadian and the US railways reduced employment by the same proportions (Sheikh). Freight revenues per tonne on both sides of the border were similar in 1984 and 1986. Revenue per tonne-kilometre, for the US, was higher than the Canadian railways between 1984 and 1986; the two were equal in 1987 (Sheikh: Trethway et al.). The unit cost for the two railways was also similar: in 1986 the unit cost was 2.7 cents and fell to 1.9 cents in 1990 for the US: the Canadian unit cost was 2.3 cents in 1986 and increased to 2.6 cents in 1990 (Sheikh. p.128). With lower unit costs. the US railways were able to offer shippers lower rates than the Canadian railways: "This may lure (Canadian) shippers south of the border wherever possible" (Sheikh. p.128). In the past decade. both Canadian and US railways have made efforts to reduce their labour costs (Sheikh). These costs for the two railways has. in general. declined (Ibid.). The performance of Canadian railways. measured by their operating ratios (the proportion of operating revenues absorbed by operating expenses) was better than the US railways from 1984 to 1988 (Sheikh. p.131). Moreover. both Canadian and US railways have made major improvements in productivity (Ibid.). Productivity gains for Canadian railways was higher from 1986 to 1992: for 1993 the gain was higher for US railways (Ibid.). The number of employees on both sides of the border has also been declining (Sheikh).

Given the above comparisons. the two industries do seem to share many of the same gains. and losses. Furthermore. given the proximity of the US and Canadian rail industries. the two are in a position to compete and in fact do compete for shippers (Sheikh).

3.3 Staggers Act

The Staggers Act (SA) of 1980 was a turning point in US rail history. It deregulated the industry in terms of removing freight rate ceilings, increasing competition among carriers, and easing rationalization procedures. The SA was preceded by the Railroad Revitalization and Regulatory Reform Act of 1976 (the 4-R Act). The 4-R Act started the process toward regulatory reform of the industry. The SA simply extended upon the changes put into law by the 4-R Act.

The 4-R Act required the Interstate Commerce Commission (ICC) to develop a set of guidelines for (Alexis 1982, p.54):

1. determining market dominance,
2. encouraging carriers to establish peak, seasonal, and regional rates,
3. providing published rates for distinct services.

The market dominance criteria helps the ICC to determine what areas would and would not be regulated. If a railroad has monopoly power in a specific area, where shippers are held captive, a rate ceiling remains in place to protect captive shippers. The test the ICC uses to determine whether a railway has market dominance is by the revenue adequacy test. If the railway's revenue adequate then its rate of return on assets is less than the industry cost of capital. It is revenue inadequate if its rate of return is greater than the industry cost of capital (McFarland 1987, p.389). If a railway is found to be revenue inadequate then the ICC gives it unlimited powers to set its own rates.

Although the government still regulates those areas where the railways are found to be revenue adequate, SA greatly deregulated the industry. Railroads are given total control in restructuring their rates, and rationalization of lines is solely under their control. The SA encouraged the railways to set contract rates. These contracts between shipper and railway typically specify the minimum size for single shipments and minimum volumes to be shipped over the length of the contract (MacDonald 1989a, p.6). The elimination of rate bureaus[1] decreased greatly the probability of collusion between railways. Specifically, railways would find it more difficult to coordinate pricing with the proliferation of confidential contracts. The elimination of rate bureaus combined with the wider use of contract rates signaled to the industry that competition was critical for an efficient industry, coupled with the liberalization of abandonment procedures, the prospects for financial success are promising.

3.3.1 Staggers Act: Its Impact

The post-Staggers era has had a positive effect, in terms of increasing railroad efficiency by lowering costs, on the US rail industry (Levin 1981b; MacDonald 1989a, 1989b; Sheikh 1993). First, wheat exports, after the SA, fell sharply in the 1980s (MacDonald 1989a), possibly due to increased rationalization. The fall in exports led to a fall in the demand for transportation to ports

[1] Rate bureaus gave the railroads freedom to cooperate in setting rates (MacDonald 1989a, p.6). Cooperating in this way was believed to violate the Sherman Antitrust Act of 1897 (Locklin 1972, p.269).

and exerted a downward pressure on transportation rates. This increased domestic rail flow as surplus rail cars were diverted to domestic use. It has been cited frequently in the literature (MacDonald 1989a. 1989b) that rail rates for shippers close to barges have been lower. but as shippers get farther away from barges. rail rates increase. Thus rail rates have been sensitive to competition from secondary sources such as barges.

The rapid diffusion of unit trains (approximately 110 cars) and multi-cars allowed railways to offer shippers lower rates. as railways per-unit cost for transporting grain to port became smaller as shipment sizes increased. Because unit trains offer a dedicated service. meaning that equipment is dedicated for a particular route (and commodity) serviced by a unit train. this equipment is used more intensively and. as a result. the capital costs of this equipment are spread over a larger volume of grain. lowering costs per bushel (MacDonald 1989a. p.28).

The erosion of rate equalization policy changed the nature of the railway industry. The regulated grain rates varied widely across regions but were equalized among shippers within regions. The equalized rate structure was designed to protect small shippers. But the policy of rate equalization failed to account for the increase in cost associated with unit trains. Rate equalization favored small shippers because railways were obligated. under the *common carrier obligation*. to provide service on unprofitable branchlines. The SA of 1980 eased branchline abandonment procedures. as a result. many of these unprofitable lines were abandoned.

Concerns over the issue of captive shippers stimulated debates which centered on limiting the market power of railways in these areas. The SA stated that all rates below a critical ratio of revenue to variable cost will be *per se* legal (Levin 1981a). The definition of this critical ratio has been addressed in the literature. particularly by Levin (1981a). His model and methodology is discussed below.

3.4 US Studies

Several US studies focus on the effects of deregulation on freight rates. The US has had approximately seventeen years to adjust to rate deregulation. In those years. productivity of the US rail system has increased. and no evidence is found of the railways taking advantage of their monopoly power in *those* areas where they have monopoly power (Levin 1981a. 1981b: McFarland 1989: Sheikh 1993). The literature has also shown that given the nature of the railway industry. it would be incorrect to assume that price equal to marginal cost allocates resources efficiently. The reason is that the rail industry exhibits economies of density. By definition. economies of density occur when a railroad has some ability to exercise its market power (Winston. et al. 1990). i.e. in a case where it is a monopolist. Or. to use the definition given by McFarland (1987). economies of density is present if a 1 percent increase in the volume of railroads traffic. holding its mix of traffic. input prices. and its network size constant. leads to a less than 1 percent increase in its costs. If economies of density is present. marginal cost pricing would not be sufficient to maintain operations, rather applying Ramsey pricing (which says that pricing above marginal cost may be efficient when fixed costs are present) would lead to the efficient allocation of resources. The markups over marginal cost should be highest the less elastic the shippers demand (McFarland 1987, p.387).

Contrary to this belief, some authors believe (see Meyer and Tye, 1988) that a Ramsey pricing equilibrium is not sustainable. They believe the use of contracts, between shipper and carrier, is the mechanism that eliminates any excess capacity in rail operations. Therefore, in the case where contracts are widely used, the belief is that marginal cost pricing will lead to the efficient allocation of resources. But most contracts are confidential between carrier and shipper and so data on the rates and volume shipped will not, in general, be available for empirical verification of this belief.

3.4.1 Boyer 1987

Boyer's study on railroad deregulation finds that rate deregulation did *not* lead to a fall in railroad rates. He bases this finding on OLS regression results[2]. The log-lin (logged dependent variable, linear independent variables) regression model he used consisted of four variables: the dependent variable was the natural logarithm of real rates, the independent variables

[2]Given the R^2 value of 0.918, and no sign of autocorrelation, suggests that Boyer's model is well specified. However, the coefficient on DEREG was statistically insignificant with a t-value of 0.75. Furthermore, Boyer should have presented an F-test to show the possibility of whether all the coefficients are simultaneously zero: if not, this would have made his finding more credible because not all the variables (coefficients) would be zero. This would add to the belief that his model is well specified and so would minimize the effect of a statistically insignificant coefficient on DEREG.

were a dummy variable (DEREG) representing deregulation (0 for years 1970-1979 and 1 for years 1980-1985). a weight variable (WEIGHT) representing the average weight of freight trains. and a year variable (YEAR) representing the calendar year. The coefficient on the DEREG variable is the basis for his finding: the results gave a value of 0.021 on the DEREG variable suggesting that the effect of deregulation has been to raise the rate level by about 2 percent (Boyer. p.411). Moreover. the point estimate suggests only a 15 percent chance that rail rates have fallen since deregulation (Ibid).

3.4.2 Levin 1981a

Levin does a simulation study to see the impact of rate flexibility on rail prices. The simulation is designed as follows: The analysis simulates the effects of rate deregulation under set assumptions about the degree of inter-railroad competition.[3] In this case. when the number of competitors is small. the prices are dependent on the nature of the strategic interaction between the competing firms (Levin. p.3)[4].

Levin concludes (p.4). "it is very difficult to gauge with precision the degree of interrailroad competition that is likely to exist in a regime of rate

[3] Competition between rail carriers.

[4] The sensitivity of the equilibrium prices (and profits) to the degree of interrailroad competition is parameterised and given the symbol ρ. ρ can be interpreted as a measure of the degree of competition: mathematically. it is the ratio of the demand elasticity perceived by the representative firm and the demand elasticity of the rail industry (Levin. p.3). This measure is the critical determinant of industry prices. Using a conjectural variation model[5]. $\rho = n/k$ (Levin. p.3). where n is the number of firms. and k is the change in industry output resulting from a one-unit change in individual firm's output (Levin. p.3). $\rho = 1$ implies $n = k$. and this is the case of a monopolist: ρ tends to infinity if the number of firms tends to infinity or k tends to 0.

deregulation." As one may notice, Levin (implicitly) assumes that there is a connection between deregulated rail prices and the degree of competition.

The structure of railroad costs has important effects on the competitive structure of railroad markets (Levin). Consider this quote from Levin (p.8)

> "It is sometimes mistakenly inferred from statistical evidence of constant returns to firm size that a competitive equilibrium with marginal cost prices which covered total cost would be sustainable in a deregulated environment. Such reasoning neglects the critical fact that indivisibilities in rail technology make small numbers competition inevitable."

Thus Levin believes that marginal cost pricing will not be sustainable in deregulated environment because "very few, if any, rail links in the United States have traffic density sufficient to support a large number of competing firms with independently owned and operated track" (p.9).

Given the above information pertaining to demand functions, competition, market behaviour, and costs, Levin simulates *equilibrium* levels of freight rates and output which would have prevailed in a deregulated rail industry in 1972. The approach taken for bulk commodities is as follows. Levin takes the ICC costs as a proxy for marginal costs, and assumes no interrailroad competition. He then simply equates marginal revenue with marginal cost to solve for the profit maximizing monopoly ($\rho = 1$) price in each market. Similarly, he calculates price for $\rho = 3$.

Levin finds that when $\rho = 3$, produce rates fall substantially. Grain rates are also unlikely to increase, since grain markets are more accurately represented by an intermediate degree of competition than by monopoly behaviour (Levin). Levin concludes that "interrailroad competition is a crucial determinant of the level of prices in a deregulated environment. He expects average price increases on manufactures between 6 and 43 percent, and average price increases on bulk commodities of 7 and 65 percent (Levin, p.24). Furthermore, Levin states (Levin, p.24) that deregulation should be accompanied "by measures designed to maintain an adequate degree of interrailroad competition".

Levin's study may be criticized on the grounds that the assumptions used to simulate impacts of rate deregulation are unrealistic because ρ is treated as an integer; rather, it may be best to treat ρ as a continuous variable in the study; if ρ is defined over an (continuous) interval, then all changes in the degree of competition will be picked up by the study. For example, the effects of the degree of competition for $\rho = 1$, and 3 are known, but what about values between these two numbers? How does rate deregulation effect prices then? In any event, Levin's study has much to offer in the way of setting up a study to analyse rate deregulation.

3.4.3 Levin 1981b

This paper looks at similar issues as in Levin 1981a. The model used in this study is precisely the one explained above. Levin examines the consequences of full and partial deregulation using a simulation model (discussed above). Railroad industry demand curves for manufactured commodities are derived from a multinomial logit model of modal choice (Levin). For bulk commodities. modified versions of the demand equations estimated by Freidlaender and Spady (1978) are used. Market equilibria are simulated under several assumptions: 1) truck prices either remain unchanged or fall 10 percent with deregulation: and 2) railroad marginal costs (MC) (=average costs (AC)) either remain unchanged or fall by 10 percent (Levin. p.395). Three changes in regulatory policy are simulated: 1) complete deregulation of railroad rates: 2) complete rate flexibility up to a ceiling price equal to 250 percent of average variable cost: and 3) complete rate flexibility up to a ceiling of 160 percent of variable cost (Levin. p.395). The effects of these policies are measured against two benchmarks: the regulated status quo and a regime of ideal or. second best optimum regulation (p.395). 1972 data is used for this study. Levin states (p.395). "...marginal cost pricing is not only implausible as the outcome of deregulation. it is also a questionable regulatory objective. since the railroads would incur substantial losses".

Levin requires the railroads to earn at least an 8 percent rate of return in the simulation study. The results again show that interrailroad competition is a critical component for the proper functioning of the industry (i.e. minimizing the presence of market distortions). Since Levin's paper is generally concerned with social welfare. its importance lies in showing that rate deregulation may reduce rates if accompanied by policy to promote interrailroad competition. Moreover. Levin finds that the maximum rate should be 250 percent of variable cost rather than the legislated 160 percent ceiling because railways can earn an 8 percent rate of return, which is required for financial viability.

One immediate critique of his study is that he equates MC with AC. This is not necessarily correct. Since it is known that $MC = \frac{\partial TC}{\partial q}$ and $AC = \frac{TC}{q}$ hence $MC \neq AC$ where q is output, and TC is total cost (see Varian (1992)). Thus treating the two curves as equal, as opposed to using marginal costs, may lead to differing results. Specifically, MC measures the rate of change of TC with respect to q, whereas AC measures the level of costs associated with a per unit of output q. The effect of this difference on Levin's results can be explained by understanding his market equilibria simulation assumption two: railways MCs (which he measures using AC's) either remain unchanged or fall by 10 percent. This *fall* is where the implication arises making assumption two unlikely to be true. Using the definitions of AC and MC, suppose the number -0.10 represents a 10 percent fall in AC and MC, then $MC' = \frac{\partial^2 TC}{\partial q^2} = -0.10$ and $AC' = \frac{\partial AC}{\partial q} = -0.10$. It is claimed that $AC' \neq MC'$: To show this, integrate both MC' and AC' to get an expression for TC, it is from the comparison of the two TCs that the claim is proved. For example, $\int MC'dq = -0.10q + C_1 = MC$, integrating MC get $\int MCdq = \frac{-0.10}{2}q^2 + C_1q + C_2 = TC_1$. Next, $\int AC'dq = -0.10q + C_3 = \frac{TC_2}{q}$ gives $TC_2 = -0.10q^2 + C_3q$: so $TC_1 \neq TC_2$, where C_1, C_2, and C_3 are arbitrary constants. Since $TC_1 \neq TC_2$, treating them as if they were, makes assumption two unlikely to be true. However, while this does not invalidate Levin's results, because AC can be treated as a close approximation to MC.

it simply makes it less precise.

3.4.4 MacDonald 1989b

This study analyses the importance of rate competition among railroads for the export shipment of agricultural commodities: corn, wheat, and soybeans. The emphasis is on the connection between rail rates and competition. MacDonald gives four reasons for this emphasis, first (p.151), "the effects of rail deregulation on rates and services depend on the extent of competition among railroads and between railroads and other transportation modes". Second, the ICC still retains control over maximum rates where shippers are held captive. Third, due to mergers, the number of railroads has been reduced and this effects the rate setting behaviour in the industry. Fourth (p.152), "the effects of rail competition on rail rates contributes to the broader interest in the relationship between market structure and performance".

The model used by MacDonald to determine rate differences is a simple logarithmic function that has revenue per tonne mile as the dependent variable. The independent variables are miles, tonnes, volume, a market concentration measure, a dummy variable which equals 1 for intrastate shipments, another dummy variable which represents competition for competing rail lines and another for water transports, and three dummy variables which represent quarters of the year.

The results show that increased competition is associated with lower rates. Monopoly and duopoly with equal sized firms, in corn, leads to an 18 percent declines in rates. Going from a monopoly to a market with three firms, rates decline at a slower pace (MacDonald, p.157). Also, shippers that have access (or are in closer proximity to) other competing modes pay lower rates relative to those whom are more distant.

These results suggest that the degree of competition in the industry is a critical determinant of freight rates. Also, the proximity of other competing modes to shippers has a significant effect on rate levels. Moreover, the addition of an extra competitor in the industry has significant effects on rates. This paper presents a convincing argument that rail rates are effected by the degree of competition in the industry.

MacDonald notes that these results are for three commodities and do not claim to make a general statement about rate changes. However, showing the changes in rates for every commodity that is shipped by rail would be ideal.

3.4.5 McFarland 1989

The study conducted by McFarland has tried to settle the disagreement in the literature concerning rate movements after deregulation: rates increasing post-deregulation (Boyer, 1987) and rates falling post-deregulation (Winston et al. 1990; MacDonald 1989a; MacDonald 1989b). The method used by McFarland to settle the disagreement is through estimation of an econometric model with log-linear specification. The dependent variable is railroad rates which are a function of input prices, traffic characteristics, demand, and technological change (p.260). In particular, he specifies

$$p = mC'(A, t, x)$$

where p is the rate set by the railroads, m is the markup, and C' is marginal cost which is a function of A, a vector of traffic characteristics, t, a time trend that proxies for technological change, and x, as input prices. The complete specification of the above function is

$$LP = a + a1 \text{ LDENS} + \text{a2 LALH} + \text{a3 LBK} + \text{a4 LGNP} + \text{a5 T} + \text{a6 DR} + \text{a7 TR}$$

where LP is the log of the average rate per revenue ton-mile, which is deflated by the Association of US Railroads (AAR) index of railroad input prices. A is represented by three variables: the log of traffic density, $LDENS$; the log of average length of haul, $LALH$; and the log of the share of total carloads that are bulk traffic, LBK; all three variables are expected to have negative signs. T, a time trend variable equal to the number of years since 1969, is used to represent technological change and assumed to have a negative sign. The markup, m, which a railroad can charge is assumed by McFarland to be influenced by the strength of demand and by deregulation. Shifts in demand are assumed to be caused by business activity, and hence are measured by the log of GNP, $LGNP$, this variable is assumed to be positively related to LP, i.e. an increase in demand causes rates to rise. The effects of deregulation is measured using two variables: DR, a dummy variable which is 0 up to 1980, and 1 from 1981, and TR, which is equal to DR times T. TR is included to allow for the possibility that the greater flexibility under deregulation enables railroads to quicken the pace of cost-saving measures, i.e. increase efficiency.

Estimation of the above model gives the following results: When both DR and TR were included in the model, deregulation has had two separate effects on rates. Railroad's freedom to set rates under deregulation may have led to higher rates, but that deregulation also caused efficiency to rise i.e. through technological innovations, thus causing rates to fall (p.261). McFarland then computes the net effect of TR and DR by adding their coefficients and multiplying it by the value of TR in that year. After this computation, the conclusion is that deregulation either slightly reduced or had no effect on railroad rates (p.261). However, McFarland states that just because rates did not rise does not imply that rates on a specific route for a specific commodity did not rise. His conclusion can thus be viewed as a general case for the years 1969-1987.

McFarland's study raises some concerns. First, it is unsure why the net effect of deregulation is measured by adding up the coefficients of TR and DR, and then multiplying it by TR for that year i.e. $(TR + DR)TR$, which is equivalent to

$$(DR \cdot T + DR)DR \cdot T$$

$$= DR^2 \cdot T^2 + DR^2 \cdot T$$

$$= DR^2(T^2 + T) = net \text{ effect}$$

noting that $TR = DR \cdot T$. Thus the net effect is a function of DR and T. From this net effect, McFarland seems to be saying that technological change is the key component that determines the changes in freight rates.

3.5 Summarizing US Studies

The table below gives a synthesis of the conclusions made by most of the studies in this chapter. and others (not examined). concerning the effects of regulation and deregulation on rail rates.

Table 3.4 Effects of Regulation & Deregulation: Freight Rates

Author(s)	Freight Rates
Boyer (1987)	Freight rates have risen under deregulation. and the distortions from rate regulation have been minimal.
Levin (1978)	Little change in freight rates is expected post-deregulation.
Levin (1981a)	Levin expects average rate increases on manufactured items between 6 and 43 percent. and between 7 to 65 percent on bulk commodities.
Levin (1981b)	In cases where railways have monopoly power. the maximum rate should be 250 percent of variable cost rather than the legislated 160 percent ceiling because railways can earn an 8 percent rate of return which is required for financial viability. Rate deregulation may reduce rates if accompanied by policy to promote interrailroad competition.
MacDonald (1987)	Finds that in a duopoly freight rates increase faster than when more than two firms are in the industry. Furthermore. as concentration increases due to mergers rates will increase.
MacDonald (1989a)	Increases in shipment size have lowered deregulated rates. Declining exports have also lowered rates. And increased interrailroad competition has also lowered rates. In general. rates have fallen in post-deregulation.
MacDonald (1989b)	A decline in grain exports effects rates. Also moving from a monopolist to a duopolist in a corn market 70 miles from barge competition reduces rates by 17.4 percent. while moving further to a triopoly reduces rates another 15.2 percent. For wheat. a 30 percent decline in its rate is due to the spread between multiple-car and unit train usage.
McFarland (1989)	Deregulation either slightly reduced or had no effect on railroad rates. However. rates may have increased on specific routes for specific commodities.

Winston et al. (1990)	In a deregulated environment. average rail rates slightly declined. But when they weight this amount by the probability of the shipper actually choosing rail transportation. which reflects the change in motor carrier rates and private trucking costs due to regulation. average rail rates increase.

The assumptions made about market structure in the above studies range from monopoly to perfect competition. For example. Boyer (1987) bases his prediction of rate increase under an increasingly competitive environment. The reason for the rate increase is due to areas where shippers are held captive. Levin (1978. 1981a. 1981b) expects rates to decrease as the degree of competition is varied from monopoly to increased competition: in the monopoly case rates rose. and as competition increased rates fell or remained unchanged. MacDonald (1987) finds that under duopoly rates decrease faster than when more than two firms are in the industry. He also believes that rates will increase as concentration increases. Winston et al. find that railways increased rates when they have monopoly power. and decreased rates where they are forced to compete. MacDonald (1989a. 1989b) finds that under increased competition rates for grains have decreased. McFarland (1989) finds that rates for grain have decreased under increased competition. But he also finds that railways charge higher rates to customers with an inelastic demand and lower rates to customers with an elastic demand: this implies that the changes in the freight rates after deregulation are dependent on the future market structure.

3.6 Overview of the US Experience

In general, the studies indicate that deregulation has led to higher efficiency and enabled railroads to enjoy productivity gains. Nonetheless, Table 3.4 shows that freight rates have fallen, risen, or remained unchanged under deregulation. Even though many of the studies were conducted roughly 8-10 years after deregulation, there was still no solid consensus on the movements in rail rates. This leads to the belief that predicting the movement of deregulated rates in Canada will not be easy. The next chapter approaches the issue of deregulated rates from another angle, by determining how farmers respond to rate increases, which may be a likely direction of rail rates in Canada under deregulation.

Chapter 4

Analysing the Effects of Rate Increases: A Survey Approach

4.1 The Survey

The survey, shown in Appendix F, is the source for data collection from which the empirical analysis is done. The survey methodology is used because it gives us first hand information of the reaction of farmers to rate increases (a further discussion on this approach is discussed below). The objective of this chapter is first to determine the range of demand responses of farmers for each crop, and then to determine the implications of particular responses on the revenue of the railways and crop production levels. If farmers react to rate changes in predictable ways, then it may be possible to foresee the effects of rate changes on railway revenue from grain shipments. The revenue analysis uses a hypothetical situation to first show how to compute the changes in revenue using elasticities from a particular regression estimation, and then to determine, for this hypothetical case, the magnitude of the changes in revenue.

The survey consists of three sections: Section I asks for the size of the farm in acres by crop. along with the distance to the nearest grain delivery point. Section II. presents the respondents with four scenarios of freight rate increases and asks them whether or not they would change acres planted. The scenarios are as follows: Scenario 1 presents farmers with a $4/tonne rate increase: Scenario 2 presents them with an $8/tonne rate increase: Scenario 3 presents them with a $16/tonne rate increase: and finally. Scenario 4 presents them with a $24/tonne rate increase. (The choice of these particular rates is mainly to capture the wide spectrum of possible increases that may actually occur.) Section II also asks them whether or not they are willing to haul to another delivery point if it offered the current rate. Section III presents them with an open ended question on how they would change their farming business if faced with a major freight rate increase.[1]

With the aid of Statistics Canada. the survey was mailed out to 100 farmers in Spirit River. AB. The choice of the 100 farmers was based on two conditions: 1) each has to operate his/her farm in the same region of Alberta: and 2) each has to be a grain (wheat. barley. and canola) farmer. The Spirit River district was randomly chosen in Alberta. The following

[1]Most farmers answered this question (presented fully in Table F.6). Some said they would sell their farm. some said they would truck their grains to the US. some said they would sell their grains to local markets. some said they would grow specialized crops and/or switch to livestock production. others would grow more canola. and sell more grain to cattle feeders. others would live on a "more modest scale". one farmer even said that he would fight to get rid of the Wheat Board so he could market his own produce and pay actual shipping costs to domestic markets. and some said they would find alternate delivery points.

section discusses how well the farmers in the survey represent the Spirit River District.

4.2 Sample and Census Data: A Comparison

The information presented in this section attempts to show how well farmers. sampled in this study. represent the farmers in the Spirit River district.[2]

The table below shows a comparison between the 1991 Census Division[3] 19. Spirit River[4]. and the sample data:

[2]The Sprit River area. in total. consists of 884 farms (Statistics Canada (1991)). This number combines two districts which divide Spirit River: district 20. which consists of 689 farms. and district 133. which consists of 195 farms.

[3]The 1996 Census did not yet offer the information present in the 1991 Census. needed for this thesis. However. the 1991 Census should be adequate to establish how representative the sampled farmers are of the region. Census Division 19 consists of Fairview District No. 136. Grande Prairie County District No. 1. Improvement District No. 19. Improvement District No. 20. Peace River District No. 135. Smoky River District No. 130. and Spirit River District No. 133.

[4]Census data did not offer information on the number of acres for specific crops in Spirit River. However. it may be deduced. albeit very roughly. the number of acres in wheat. barley. and canola in Spirit River. as follows. Since there are 191 farms reporting land in crops in the Spirit River District. it represents about (191/2403=) 8 percent of the number of farms in Division 19 for wheat. and so there is roughly (.08 × 711.529=) 57.739 acres of wheat. (.11 × 291272=) 31.991 acres of barley. and (.1 × 532691=) 53.269 acres of canola farmed in Spirit River. It should be noticed that more acres are devoted to wheat. then to canola. and then to barley.

Table 4.1 Sample Representation of Spirit River

	Division 19			Spirit River			Sample		
	W	B	C	W	B	C	W	B	C
Farms Reporting	2.403	1.739	1.958				17	17	17
Land in Crops	711.529	291.272	532.691	57.739	31.991	53.269	19.242	2.945	3.920
Farms Reporting					195				
Total Area of Farms					187.125				
Farms Reporting					191			17	
Total Land in Crops		1.535.492			122.490			26.107	
Average Acres per Farm in Crops					641			1.536	

W=Wheat. B=Barley. C=Canola

Sources: Statistics Canada Agricultural Profile of Alberta Part II. cat. 95-383. p.23: Statistics Canada Agricultural Profile of Alberta Part I. cat. 95-382. p.7-12.

Any conclusions resulting from Table 4.1 must reflect the number of farmers reporting. and the lack of census data for Spirit River on acres in crops. However. the census data indicates. for the farmers reporting in Division 19. that more total acres are in wheat than in canola and barley. and more total acres are in canola than in barley. In the sample data (see Table F.1) the total acres in wheat is 19.242 acres[5]. 2.945 acres in barley. and 3.920 acres in

[5]The large acreage in wheat seems to be a small sample phenomenon. in that the

canola. So farmers in the sample also put more acres in wheat than in barley or canola, and more acres in canola than in barley. Given that farmers in the sample allocate acreage to crops similar to farmers in the census data, would lead to the conclusion that farmers sampled in this thesis are likely to be a fairly good representation of the Spirit River district.

4.3 Summary of Survey Results

The response rate from farmers is 17 percent. The results of the survey are shown in Table 4.2 (see Appendix F for a comprehensive summary).

survey was answered mainly by wheat farmers; however, this is not a major concern for the analysis in this chapter because, as shown, the data incorporated in the regression analysis does not use the numbers on crop acreage, rather, it uses percentage changes in acres planted.

Table 4.2 Average Percentage Changes in Acres Planted by Farmers

Scenario	Wheat			Barley			Canola		
	I	D	U	I	D	U	I	D	U
1		23% (4)	y (12)	17% (3)	30% (1)	y (7)	30% (3)	y (8)	
2		51% (5)	y (11)	27% (3)	52% (3)	y (5)	40% (3)	y (8)	
3		49% (8)	y (7)	27% (3)	59% (4)	y (3)	27% (3)	100% (1)	y (6)
4	20% (1)	51% (7)	y (6)	25% (2)	60% (4)	y (3)	33% (4)	100% (1)	y (6)

Source: See Appendix F.

I=Increase, D=Decrease, U=Unchange, y=yes

All percentages have been rounded off to the nearest decimal.

Number in brackets indicate number of farmers who responded.

Table 4.2 shows average percentage changes in farm production under each scenario. Several observations can be made from this table. First, farmers reacted more to scenarios three and four than to one and two, as suggested by the decline in responses in the unchange column. Specifically, under scenarios three and four, farmers chose to reduce wheat production while increasing canola production. This suggests that there is a good chance that wheat production will fall, canola production will rise, and barley production will fall (perhaps by less than the declines in wheat acres) as rates increase.[6]

[6]The reason farmers would move away from wheat production may be due to the higher value per tonne of canola, in relation to freight rates, over wheat. Also, while Table 4.2 indicates the changes in acres planted on a per shipper basis, farmers as a group may react differently. Furthermore, the impacts of rising rates on production mix may be important.

4.4 Justifying The Survey Approach

The reason for using a survey to conduct the analysis in this chapter. as opposed to using results from other studies. such as acreage response models. needs explanation. This study estimates the response of farmers. in a particular region of Alberta. under special cases. to rate increases. Thus the unique features of a survey gives insight into the responses of people in a particular area. under special cases. Responses to particular questions lead to specific responses unlikely to be incorporated in other studies. By using scenarios. as done in the survey here. responses capture a wide range of possibilities. of rate increases. allowing the estimates of demand responses to be more robust.

4.5 The Method

The scenarios. in the survey. enable determining the implications of the demand of farmers facing rate increases. Specifically. estimation of a demand function. discussed fully below. with a specific functional form is shown. and its implications on railway revenue. and crop production levels. is computed.

The total revenue analysis shows one method of using the estimated elasticities to compute revenue changes. While one of the objectives of this chapter is to get a range of demand responses of shippers. from different models. as rates increase. the revenue analysis chooses a particular model for the revenue computations. The revenue analysis uses the response measures from a regression estimation. shown below. as follows: Using a hypothetical case of crop shipment size in tonnes. revenue for the railways is computed using an actual freight rate. As rates increase. this dollar increase is added to the original rate. but now. using the demand response. a new shipment size is computed: the new shipment size is then used to determine revenue after the rate increase. As a justification to this approach. of computing the new shipment size. as will be seen in the next section. a statistically significant correlation is found between freight rates and changes in acres planted for each crop. The demand response is generally negative. so the new shipment size should fall as rates increase but revenue may rise or fall depending on the magnitude of the demand response. The changes in revenue at each rate show the possible monetary effects on the railways from the response of farmers sampled in this thesis as rates increase. It is well known that the responsiveness of demand to price changes is the major factor effecting total revenue. therefore. the method behind the revenue analysis conducted here should be appropriate. The analysis in the following section shows in detail the results of this chapter.

4.6 Results: Estimating A Demand Function

The approach taken in the estimation is as follows: Let the demand of farmers in the survey be the percentage (Q) change in acres planted.[7] as a function of rates (R). willingness to haul (H) in kilometers. and distance to delivery

[7]This is taken to be demand because it is readily available from the survey. it indicates the response of farmers to rate increases. and it is $unit - free$.

point (D) in kilometers. Mathematically, the model to be estimated is given by

$$Q_i = f(D, H, R) \tag{4.1}$$

where i represents wheat, barley and canola.

Given the above model, it becomes important to construct a proper data set out of the survey to enable an estimation of eq. (4.1). The data used in the analysis can be seen in Appendix J. The stacking method is used to construct the data set.[8] The sample size is the number of farmers who answered the survey for the respective crop. For example, since seventeen farmers indicated a change in the acres planted for wheat, the sample size, for the four scenarios, is ($17 \times 4 =$) 68. The same method is used for barley and canola and results in a sample size of ($12 \times 4 =$) 48 for each crop regression. To construct the data set some standards are adopted, as pointed out. First the dependent variable (called PERCENT) is constructed: Referring to Tables F.2–F.5, some farmers did not indicate a percentage change, to get around this problem, the average amount of percentage change of farmers who indicated percentage change is used for those who did not indicate this amount[9]: these amounts can be seen in Table 4.2. Also, *unchange* is indicated by a

[8]By stacking the data, i.e. stacking all the scenarios on top of one another, for each crop, minimizes, to some degree, the adverse effects of a low sample size on the regression analysis. Furthermore, probabilities of changing acres planted are also computed using a LOGIT model: see appendix I for this analysis.

[9]Using percentages as the dependent variable should not cause concern because it directly captures what is needed: the reaction of farmers to rate increases. To reconstruct this variable in other ways, i.e. use absolute values, should make little difference on the inferences drawn from the empirical estimation because the direction of the two variables, absolute changes in acres planted and percentage changes in acres planted, are the same.

zero percent change in acres planted, a decrease in acres planted is indicated by a negative sign, and an increase in acres planted is indicated by a positive sign.

The data set for the RATE variable is constructed by simply stacking the rate increases for the four scenarios. The HAUL variable also incorporates the stacking method, as does the DISTANCE variable. Since HAUL is represented by an interval, the mean interval is taken.

The exact functional form of eq. (4.1) is determined by as follows: The model that gives the highest R^2, F-value, and produced consistent estimators is chosen to be the *best* estimating model. Via SHAZAM, a linear-log functional form is chosen for the wheat, barley, and canola models.[10] The models, which are assumed to have constant input and output prices, are shown in Table 4.4.[11]

[10]This makes sense because the dependent variable is already in percentage form, and the coefficients on the logged independent variables can be interpreted as elasticities.

[11]The error term, ω, is assumed to be normally distributed.

Table 4.3	Variables and	Estimating Model
Type	**Variables**	**Definition**
Dependent	$PERCENT_i$	Percentage change of acres of i planted.
Independent	LN(DISTANCE)	Logged Distance between farm and elevator
Independent	LN(HAUL)	Logged Willingness to haul grain from farm to another delivery point if it realized a lower freight rate
Independent	LN(RATE)	Logged Rates offered to farmers in the survey
	Estimating	**Model**
$PERCENT_i = \beta_{o,i} +$	$\beta_{1,i}\ LN(DISTANCE)$	$+\beta_{2,i}\ LN(HAUL) + \beta_{3,i}\ LN(RATE) + \omega$

Tables 4.4-4.6 show the results of the estimating models for wheat (i=1), barley (i=2), and canola (i=3), respectively. The coefficient on the RATE variables is the important coefficient for this study. The coefficients represent constant elasticities over all rate increases. To justify this approach, of using a constant elasticity demand function, its meaning should first be defined, or rather, an answer to the question, What kind of demand curve gives a constant demand elasticity?, be given. Clearly a linear demand curve is not of constant elasticity since the demand elasticity ranges from zero to infinity. For a demand curve to have a constant elasticity, it must be that revenue be unchanged as price changes by a small amount (Varian 1990). This is illustrated by a convex (to the origin) demand curve with price on the vertical axis and quantity on the horizontal axis such that revenue remains constant at every point on the demand curve. For example, a demand curve with a

constant elasticity of ϵ is represented by (Varian 1990, p.268)

$$Q = Ap^{\epsilon}$$

where A is an arbitrary positive constant, p is price, Q is quantity, and ϵ is an elasticity term generally negative. By taking the natural logarithm of both sides, the above equation becomes

$$\ln Q = \ln A + \epsilon \ln p$$

thus $\ln Q$ is a linear function of $\ln A$ and $\epsilon \ln p$. This does represent the estimating equation in Table 4.3, with a constant term equivalent to $\ln A$, and the coefficient on $\ln RATE$ equivalent to ϵ. But is it likely that this model will capture the behaviour of the shippers in the sample? To validate the model choice, it is best to rigorously test other functional forms, as shown below to see whether similar results occur. If similar results do occur, it is likely that the estimating model results represent the responses of farmers to rate increases and so the estimators are robust. The estimation of other functional forms are shown below along with a discussion.

It is expected that RATE be negatively related to the change in the percentage of acres planted in each model; the DISTANCE variable should be negatively related to the dependent variable because the greater the distance between farm and elevator the higher the transportation costs and hence the greater the impact rising rates will have on farmers' costs; the coefficient on the HAUL variable is likely to differ from one grain regression to another and may be correlated with the DISTANCE and/or RATE variable.

Table 4.4 Regression Results: Wheat

Dependent Variable	PERCENT			
Variable	**Coefficient**	**Value**	**Std. Error**	**T-Value**
	$\beta_{o,1}$	0.18	0.25	0.71
LN(DISTANCE)	$\beta_{1,1}$	-0.009	0.09	-0.1
LN(HAUL)	$\beta_{2,1}$	0.014	0.04	0.33
LN(RATE)	$\beta_{3,1}$	-0.16	0.05	-2.98
SAMPLE SIZE	68			
R^2	0.13			
F-value	8.63			

Numbers have been rounded off to the nearest decimal place.

Table 4.5 Regression Results: Barley

Dependent Variable	PERCENT			
Variable	**Coefficient**	**Value**	**Std. Error**	**T-Value**
	$\beta_{o,1}$	-0.17	0.41	-0.41
LN(DISTANCE)	$\beta_{1,2}$	0.02	0.18	0.14
LN(HAUL)	$\beta_{2,2}$	0.11	0.07	1.57
LN(RATE)	$\beta_{3,2}$	-0.13	0.08	-1.64
SAMPLE SIZE	48			
R^2	0.10			
F-value	1.65			

Numbers have been rounded off to the nearest decimal place.

Table 4.6	Regression Results:	Canola		
Dependent Variable	PERCENT			
Variable	**Coefficient**	**Value**	**Std. Error**	**T-Value**
	$\beta_{o,1}$	-0.3	0.26	-1.16
LN(DISTANCE)	$\beta_{1,3}$	0.11	0.1	1.18
LN(HAUL)	$\beta_{2,3}$	0.12	0.04	2.79
LN(RATE)	$\beta_{3,3}$	-0.14	0.05	-2.56
SAMPLE SIZE	48			
R^2	0.27			
F-value	4.39			

Numbers have been rounded off to the nearest decimal place.

The above results show that RATE is negatively related to the percentage of acres planted in all regressions: DISTANCE is positively related to acres planted in the barley and canola regressions. but not in the wheat regression: and HAUL is positive in all regressions. The coefficient on DISTANCE is not statistically significant at the five percent level in all regressions. The coefficient on HAUL is statistically significant at the five percent level in the canola regression. and close to significance in the barley regression. but not statistically significant in the wheat regression. The RATE coefficient indicates that as rates increase. percentage of acres planted decrease. as expected. The coefficient on the RATE variable is statistically significant at the five percent level of significance in the wheat and canola regressions. and close to significance in the barley regression, compared with a critical t-value of 2 and 64 degrees of freedom in the wheat regression and 44 in the barley and canola regressions. The F-value is statistically significant at the five percent level in the wheat and canola regressions, and very close to statistical significance at the ten percent level in the barley regression, which suggests that the lin-log model is a good functional form. The R^2 values are low but more weight should be given to the t-values and F-values which are *good* in all regressions.

Heteroscdasticity tests were done on all the models. By using the Spearman's rank correlation test[12], it is possible to determine the presence of heteroscedasticity. Some form of heteroscedasticity is found in all models. Thus, the regressions are run using a heteroscedastic-consistent covariance matrix estimation to correct the estimates for heteroscedasticity (see SHAZAM, p.71). This in turn gives us generalized least squares (GLS) since the variance-covariance matrix is not diagonal, and must be written as a general matrix G, and hence reassigns OLS as GLS (Kennedy).

The above results, therefore, suggest that as rates increase, the percentage of acres planted of wheat, barley, and canola is likely to fall. These approximate results have assumed that production of wheat, barley, and canola are independent of each other. This assumption seems valid given the signifi-

[12]Defined as $r_s = 1 - 6[\frac{\Sigma d_i^2}{N(N^2-1)}]$ where d_i is the difference in the ranks, and N = *sample size*. The exact mechanics of the test can be seen in Gujarati p.331. After computing r_s a t-value is constructed, if this t-value is less than a critical t-value at a chosen level of significance, one may reject the presence of heteroscedasticity, otherwise one may not reject it.

cance of the F-value. in all regressions. indicating that not all coefficients are zero. otherwise. if the effect of other variables is significant. the error term would be non-normally distributed giving a statistically insignificant F-value. The results also show that farmers reduce acres planted when rates rise. In the wheat regression. a one percent increase in rates. *ceteris paribus*. leads to a 0.16 percent reduction in acres planted. In the barley regression. a one percent increase in rates. *ceteris paribus*. leads to a 0.13 percent reduction in the acres planted. And. in the canola regression. a one percent increase in rates. *ceteris paribus*. leads to a 0.14 percent decrease in acres planted.

The roles of DISTANCE and HAUL variables can not be ignored. Although the individual impacts of these variables is found to be. generally. statistically insignificant. their role as a group is significant. as indicated by the statistically significant F-values.[13] Positive values on DISTANCE and HAUL coefficients would suggest that as they increase. the percentage changes in acres planted also increase. and vice versa for negative values. However. since these variables are generally statistically insignificant. individually. they don't seem to be an important factor in the decisions of farmers to change acres planted. but may contribute some information as a group. The next section analyses the estimating model for robustness. A robust model or estimators is one that is invariant to re-formulations.

[13]The statistical insignificance of DISTANCE and HAUL would suggest that RATES are the primary factor influencing decisions to change acres planted.

4.7 Estimating Other Functional Forms

Other functional forms, using the variables in the original model (in Table 4.3), are estimated to determine how greatly results vary between models. If results do not vary drastically from the original estimation results, then these results are robust and are likely to represent the responses of shippers, in the sample, when rates increase. The models tested are shown below along with the original model for convenience.

Table 4.7 Functional Form Comparisons

Model Type		Model			
LIN-LOG	$PERCENT_1 =$	0.176	$-0.009\ LN(D)$	$+0.141\ LN(H)$	$-0.162\ LN(R)$
T-values		(0.984)	(-0.13)	(0.308)	(-2.959)
F-value 8.63					
R^2 0.13					
	$PERCENT_2 =$	-0.171	$+0.024\ LN(D)$	$+0.106\ LN(H)$	$-0.131\ LN(R)$
T-values		(-0.608)	(0.17)	(1.45)	(-1.704)
F-value 1.647					
R^2 0.11					
	$PERCENT_3 =$	-0.297	$+0.114\ LN(D)$	$+0.124\ LN(H)$	$-0.139\ LN(R)$
T-values		(-1.52)	(1.49)	(3.178)	(-2.627)
F-Value 4.387					
R^2 0.27					
LIN-LIN	$PERCENT_1 =$	-0.760	$-0.006\ D$	$-0.0002\ H$	$-0.012\ R$
T-values		(-0.822)	(-0.89)	(-0.159)	(-2.415)
F-Value 8.081					
R^2 0.11					
	$PERCENT_2 =$	-0.931	$+0.008\ D$	$+0.002\ H$	$-0.011\ R$
T-values		(-0.649)	(0.634)	(1.078)	(-1.494)
F-Value 1.335					
R^2 0.08					
	$PERCENT_3 =$	-0.331	$+0.009\ D$	$+0.302\ H$	$-0.013\ R$
T-values		(-0.036)	(1.271)	(3.150)	(-2.693)
F-Value 4.294					
R^2 0.26					

RECIPROCAL	$PERCENT_1 =$	-0.567 + 0.294 $1/D$	−0.296 $1/H$ +0.752 $1/R$
T-values		(-3.787) (1.174)	(-0.578) (3.420)
F-Value 9.227			
R^2 0.15			
	$PERCENT_2 =$	0.044 + 0.130 $1/D$	−1.371 $1/H$ +0.571 $1/R$
T-values		(0.174) (0.188)	(-1.581) (1.802)
F-Value 1.74			
R^2 0.11			
	$PERCENT_3 =$	0.472 −0.559 $1/D$	−1.309 $1/H$ + 0.534 $1/R$
T-values		(2.785) (-1.531)	(-2.991) (2.438)
F-Value 3.85			
R^2 0.24			
NO CONSTANT TERM	$PERCENT_1 =$	0.04 $LN(D)$	+ 0.021 $LN(H)$ −0.146 $LN(R)$
T-values		(0.914)	(0.486) (2.503)
F-Value 10.75			
R^2 0.10			
	$PERCENT_2 =$	−0.034 $LN(D)$	+0.106 $LN(H)$ −0.15 $LN(R)$
T-values		(-0.369)	(1.43) (-1.855)
F-Value 1.744			
R^2 0.08			
	$PERCENT_3 =$	0.027 $LN(D)$	+ 0.117 $LN(H)$ −0.17 $LN(R)$
T-values		(0.598)	(3.097) (-2.612)
F-Value 5.86			
R^2 0.26			

The results shown above have one thing in common: all the slope coefficients on the RATE variable are negative and statistically significant, as one would expect.[14] This lends confidence to the fact that the functional forms are fitting the data to a similar curve, in two dimensions, and a hyperplane, in greater than two dimensions[15]. Also, the response coefficient on the RATE variables, in all regressions, is less than one. The results for the Lin-Lin models are as follows. In the wheat model, a $1 increase in RATEs leads to a 0.012% fall in acres planted. In the barley model, a $1 increase in RATEs leads to a 0.011% fall in acres planted. And in the canola model, a $1 increase in RATEs leads to a 0.013% fall in acres planted.

The results for the reciprocal models are as follows. In the wheat model, a $1 increase in RATEs leads to a 0.75% fall in acres planted. In the barley model, a $1 increase in RATEs leads to a 0.57% fall in acres planted. And in the canola model, a $1 increase in RATEs leads to a 0.53% fall in acres planted.

In the models without a constant term, the results are as follows. In the wheat model, a 1% increase in RATEs leads to a 0.15% fall in acres planted. In the barley model, a 1% increase in RATEs leads also to a 0.15% fall in acres planted. And in the canola model, a 1% increase in RATEs leads to a 0.17% fall in acres planted.

---

[14]The slope in the reciprocal models is *negative*: this can be shown simply taking the derivative of the dependent variable with respect to the RATE variable (with coefficient β_3) giving i.e. $\frac{dPERCENT}{dRATE} = -\frac{\beta_3}{RATE^2}$.

[15]This situation, of a hyperplane, becomes complex to visualize and the jargon of linear algebra must be introduced: the regression models are in four dimensions making the regressions a projection on a subspace generated by the independent variables. So the regressions are four dimensional hyperplanes, and this makes it difficult to determine the nature of the regression as a whole, and so restrictions must be placed on variables to make certain conclusions resulting from the regression estimation.

The variations in the results on DISTANCE and HAUL are not great. These variables, however, are generally statistically insignificant. The impacts of DISTANCE and HAUL vary in degree from one model to the next as indicated by the F-values. Statistically significant F-values are an indication that DISTANCE and HAUL are likely to factor into the decision to change acres planted as RATEs increase. The next section tests the likely functional form for the data collected in this thesis. Box-Cox results are not conclusive but do narrow the possible choice of available functional forms.

A comparison of the elasticity at the mean values, for the above models, show some similarities.

Table 4.8 Elasticity at Mean Value

Model Type	Variable	Elasticity at Mean
$Lin - Log_1$	D	0.11
	H	-0.26
	R	2.13
$Lin - Log_2$	D	-0.86
	H	-5.53
	R	4.76
$Lin - Log_3$	D	5.97
	H	8.65
	R	-7.14
$Lin - Lin_1$	D	-0.36
	H	0.04
	R	0.9
$Lin - Lin_2$	D	-1.42
	H	-1.17
	R	2.16
$Lin - Lin_3$	D	2.29
	H	2.46
	R	-3.68

$Reciprocal_1$	D	-0.73
	H	0.54
	R	-1.97
$Reciprocal_2$	D	-0.87
	H	6.67
	R	-4.12
$Reciprocal_3$	D	-5.24
	H	-9.52
	R	5.47
$No-Constant_1$	D	-0.08
	H	0.05
	R	0.99
$No-Constant_2$	D	-0.31
	H	-1.24
	R	2.46
$No-Constant_3$	D	2.24
	H	2.47
	R	-3.70

The differences in the wheat models, subscript 1, show elasticity to be, on average, greater than one, in absolute value, indicating that at the mean value, farmers have an elastic demand to changes in rates. For barley, subscript 2, again the elasticities are all greater than one, in absolute value, and for canola they are also greater than one, in absolute value. These results are consistent at the mean values.

4.8 Box-Cox Test For Functional Form

For completeness. tests were done on the extended Box-Cox model for functional form for each crop model shown here:

$$PERCENT_i^{\lambda} = \beta_o + \beta_1 \; DISTANCE^{\lambda} + \beta_2 \; HAUL^{\lambda} + \beta_3 \; RATE^{\lambda} + \epsilon$$

where $\lambda \in [0, 1]$ and ϵ is i.i.d. If $\lambda = 0$ the model that would best fit the data might be linear. and if $\lambda = 1$ the model that would best fit the data might be Log-Log. It should be noted that since the dependent variable has negative observations. the log transformation is not defined for these values. therefore. the Box-Cox results. which tries to transform the dependent variable. should be carefully interpreted. The models were tested for a Lin-Lin form. $\lambda = 1$. and for a Log-Log form. $\lambda = 0$. using likelihood ratio (LR) tests against a chi-square distribution with one degree of freedom. which is equal to 3.84 at the 5% level of significance. For $\lambda = 1$. if the computed LR test statistic is greater than 3.84 then a linear model can be rejected: for $\lambda = 0$. if the computed LR test statistic is greater than 3.84 then a Log-Log model can be rejected. For the wheat model. the LR test statistics are

$$2[L(\lambda) - L(\lambda = 1)] = 2(-9.371 + 11.659) = 4.576$$

since 4.576 is greater than 3.84. a linear model is rejected at the 5% level of significance: and

$$2[L(\lambda) - L(\lambda = 0)] = 2(-9.371 + 10.893) = 3.044$$

since 3.044 is less than 3.84 a double log model is not rejected. For the barley model. the LR test statistics are

$$2[L(\lambda) - L(\lambda = 1)] = 2(-17.87 + 18.903) = 2.066$$

a linear model is not rejected at the 5% level of significance: and

$$2[L(\lambda) - L(\lambda = 0)] = 2(-17.87 + 18.303) = 0.866$$

a double log model is also not rejected at the 5% level of significance. Laslty for the canola model. the LR test statistics are

$$2[L(\lambda) - L(\lambda = 1)] = 2(1.575 - 1.298) = 0.554$$

a linear model is not rejected at the 5% level of significance: and

$$2[L(\lambda) - L(\lambda = 0)] = 2(1.575 - 1.442) = 0.266$$

a double log model is also not rejected at the 5% level of significance.

The last four results are inconsistent: it is not possible to accept both a linear and a non-linear model. This inconsistent conclusion is likely to be due to negative observations in the dependent variable. in fact. SHAZAM did not transform the dependent variable for this reason. meaning that the results from this estimation should be viewed with caution. and are likely to be invalid. But. in the wheat regression. a linear model is rejected for the double log model which. for what its worth. lends some confidence to the semi-log. non-linear. form chosen to determine farmers' responses to rate increases.

4.9 Model Comparisons

Further diagnostics were done on the estimating equation, in Table 4.3, to determine how well it is specified. Given the, generally, statistically insignificant results on DISTANCE and HAUL in all regressions, tests for collinearity between these variables is done. The result for wheat shows a correlation of -0.62 between these two variables, for barley it is -0.74, and for canola it is -0.66. These values do not indicate a high level of correlation (Kennedy 1992, p.180). Tests for autocorrelation using the Durbin-Watson statistic gives values of 1.97 for the wheat regression, 2.01 for the barley regression, and 1.85 for the canola regression. These values do not suggest any serious evidence of autocorrelation which makes sense because autocorrelation is mainly a time series phenomenon not a cross-sectional one. Test for heteroscedasticity came up positive, thus the regressions were re-estimated using GLS with a heteroscedastic-consistent covariance matrix.

Several modifications are made to the estimating equation to determine whether it is the *best* functional form. For example, regressions are run with DISTANCE included and HAUL excluded and vice versa. In these regressions, the collinearity between RATE and the other independent variable is close to one, suggesting a serious multicollinearity problem in the model. Regressions are run that regressed RATES on DISTANCE and HAUL (variables are in raw form) and it is found that many of the t-values are statistically insignificant, and F-values are also generally insignificant at the five percent level. Regressions are also run that regressed DISTANCE on HAUL and vice versa. In most of the regressions, the t-values on the independent variables are statistically insignificant, suggesting that independent variables are not correlated with the dependent variable.

Furthermore, PERCENT is regressed on logged RATES. The result for the wheat model gives a coefficient of -0.16, which is statistically significant at the 5% level of significance. The result for the barley model gives a coefficient of -0.10, which is close to significance at the 5% level. The result for the canola model gives a coefficient of -0.10, which is very close statistical significance at the 5% level.

Given the above diagnostic results on the original and modified models, it is believed that the estimating model in Table 4.3 offers a good estimation of the demand response, *ceteris paribus*, of farmers as rates increase. However, to further establish the estimating model, the next section presents a comparison between the LOGIT and GLS models to see whether the results between the two models are consistent. The comparison is also helpful in establishing the range of responses shown in Table 4.7.

4.10 LOGIT and GLS Model Results: A Comparison

The similarity between the GLS models in Table 4.3, and the LOGIT models, shown in Appendix I, is that they use similar independent variables, but use different dependent variables: GLS models use percentage changes in acres planted, and the LOGIT models use a dichotomous variable which is equal to 1 for decreasing acres planted and 0 otherwise. In the LOGIT models it is the probabilities of decreasing acres planted that are computed, and in the GLS models it is the responses that are computed. As with the GLS models, the LOGIT models assume constant input and output prices. Appendix I discusses the LOGIT model and its construction fully. Here it is only necessary to discuss the conclusions from the two forms of models in order to determine the consistency of the conclusions between these models. If the conclusions are consistent, then it is likely that the GLS results closely reflect shippers behaviour as rates rise, *ceteris paribus*.

In support of the response results, the LOGIT analysis, also indicates that changes in acres of canola planted are less sensitive to rate increases than changes in acres planted of wheat: Specifically, in the LOGIT analysis, the odds in favour of decreasing acres planted is highest for wheat and lowest for canola, with probabilities of 49.6% and 16.1%, respectively. Looking at the elasticities of wheat and canola, in the original model in Table 4.3, of 0.16 and 0.14 in absolute value, respectively, shows that changes in wheat acres are more sensitive to rate increases than in the canola regression, *ceteris paribus*. These two conclusions are consistent in the sense that high odds of decreasing acres planted is equivalent to a high sensitivity or elasticity to rate increases in changing acres planted.[16]

GLS results are preferred mainly because of the discrete choice nature of the LOGIT model. Moreover, the GLS results are easily compared with

[16]The result for the barley regression is not considered because the coefficient on RATE is statistically insignificant at the 5% level.

other models for consistency. Other advantages of GLS over LOGIT stem from the ease of estimation over LOGIT.

4.11 Acreage Response Study: A Comparison

The following compares the above results, in Table 4.7, to the study done by Meilke and Weersink (1990). This study estimates an acreage response model to changes in government support programs. The authors analyse the effect of support programs on total area harvested and its allocation among individual crops. While the authors analyse several models and crops, only the results for Western Canada and durum wheat, barley, and canola are reported. The dependent variables in the estimated models is the hectares of barley, bread wheat, canola, oats, flax, rye, and durum wheat, the independent variables are the expected returns of the respective crop plus the expected receipts of the other crops. The expected returns for crop C, E(C), is calculated as the product of the expected price and expected yield for that crop (p. 2). The models encompass the following (p. 2): a) a systems approach with symmetry restrictions on the cross-price derivatives of the area function; b) adaptive expectations; and c) risk responsive producers. The use of a systems approach is to minimize on the multicollinearity in single equation area response models (p. 2). The results from the estimation found inelastic response rates for wheat and barley, with values of 0.76 and 0.75, respectively, to cuts in support programs. Canola had an elastic response rate of 1.5.

A direct comparison of the above model to the ones estimated in this thesis would not be correct. because the two models incorporate different variables and data and operate under different assumptions and methods of estimation. but what can be compared is the response of farmers. Cuts in support programs elicit a lack of response from farmers in wheat and barley. but not for canola. In the thesis. farmers were also shown to have a lack of response to rising rates. but for all crops: wheat. barley. and canola in the range of 0.011 to 0.75. Thus. a conclusion that farmers are not responsive to rate increases seems plausible. since the effects of rising rates and cuts in government subsidy programs have the same effect on the operating costs of farmers.

4.12 Results: Impact of Shippers Demand Responses on Railway Revenue

Using the results from the original model. the demand responses can be used to show the implications of rate increases on railway revenue. Consider the following case for the average shipper in the sample. shipping 50 tonnes of wheat. barley and canola from Spirit River. AB to Vancouver. BC a shipment cost of \$27.60/tonne (Appendix B). The cost to the farmer at this rate. and hence revenue to the railways. is \$1.380 (= \$27.60 × 50). If rates increase by \$4. then the rate to this average farmer is \$31.60 and the cost (revenue to the railways) of shipping increases to \$1.580 (= \$31.60 × 50). But the estimated response from the wheat regression is -0.16. so a \$4 increase in rates or a 15 percent ($=\frac{\$4}{\$27.60}$) increase in rates means a 2.4 percent ($= -0.16 \times 15$) fall in the acres of wheat planted and hence a fall in the shipment size. Thus, the 50 tonne shipment now becomes 48.8 tonnes ($= 50 - (.024 \times 50)$) after the $4 rate increase, revenue for the railways is now $1,542.08 ($= \$31.60 \times 48.8$). Therefore, revenue has increased from $1,380 (before the rate increase) to $1,542.08 (after the rate increase) which is a gain of $162.08 or 12 percent ($= \frac{\$162.08}{\$1380}$) of (before increase) revenue. Table 4.9 shows these results.

Table 4.9 Impacts of Rate Increases On Railway Revenue

	Base Rate			Base Quantity Shipped	Base Revenue
	$27.60			50	$1,380
Rate Increase	**Rate After Increase**	**Crop**	**Elasticity**	**Quantity Shipped**	**Revenue**
$4	$31.60	Wheat	-0.16	48.8	$1,542.08
Revenue Gain:	$162.08				
Percentage Gain:	12%				
8	35.60			47.7	1,698.12
Revenue Gain:	$318.12				
Percentage Gain:	23%				
16	43.60			45.35	1,977.26
Revenue Gain:	$597.26				
Percentage Gain:	43%				
24	51.60			43	2,218.80
Revenue Gain:	$838.80				
Percentage Gain:	61%				
$4	$31.60	barley	-0.13	49	$1,548.40
Revenue Gain:	$168.40				
Percentage Gain:	12%				
8	35.60			49.8	1,772.88
Revenue Gain:	$392.88				
Percentage Gain:	29%				
16	43.60			46	2,005.60
Revenue Gain:	$625.60				
Percentage Gain:	45%				
24	51.60			44.5	2,296.20
Revenue Gain:	$916.20				
Percentage Gain:	66%				

$4	$31.60	Canola	-0.14	49	$1.548.40
Revenue Gain:	$168.40				
Percentage Gain:	12%				
8	35.60			48	1.708.80
Revenue Gain:	$328.80				
Percentage Gain:	24%				
16	43.60			45.35	1.977.26
Revenue Gain:	$597.26				
Percentage Gain:	43%				
24	51.60			44	2.270.40
Revenue Gain:	$890.40				
Percentage Gain:	65%				

Table 4.9 shows a revenue gain. as rates increase. for all crops. The highest gain in revenue. 66 percent. results for barley. as rates increase by $24: the lowest gain in revenue. 12 percent. results for wheat. barley. and canola. as rates increase by $4. The gain in revenue is an indication that shippers in the sample are likely to absorb the rate increases in their operations. This. of course. stems from their lack of response to rate increases as indicated by an inelastic demand response in the regressions in Table 4.7.

4.13 Summary and Policy Implications

The main objective of this chapter is to get an estimate of the range of demand elasticities of shippers as rates increase. By using a particular elasticity. it is possible to determine the changes in railway revenue. and crop production levels. as rates increase. Moreover. taking the absolute value of this demand response, and noting that in all regressions this value if less than one, would seem to imply that the shippers in the sample have an *inelastic* demand in the, absolute, range of 0.011 to 0.75. In addition, the regression results suggest that the distance between farm and elevator, and the willingness to haul, do not seem to be an important factor in the decision of farmers to change acres planted, but may be important as a group.

Also, while revenue for the railways increase as rates increase, the acres planted decreases. Thus, the higher rates compensate for the decrease in acres planted.[17] While rising revenue is not surprising, what is interesting is the lack of response from farmers in this sample to rate increases. This lack of response acts in the favour of the railways but should not be seen as total freedom to raise rates to excessive levels. As mentioned, the sampled farmers may very well seek other sources for shipping their grain if rates are excessive.

The generality of the revenue results are dependent, of course, on the level of homogeneity of the farmers in the Spirit River district, of which the farmers in this thesis are a subset, and on the availability of other transportation sources to shippers. If all shippers in the Spirit River district are captive to a particular railway and there is a lack of availability of other transportation sources to shippers, then the inelastic demand, estimated above, would make sense for the general case; however, if shippers are not captive and there exists other sources of transportation, then it should be expected that

[17]It should be noted again that price competitive behaviour is assumed to be constant or non-influential in the estimating model.

shippers will switch to them if rates increase to levels that threaten farm operations and hence they should have an elastic demand. Since the degree of homogeneity, and the availability of other transportation sources to farmers cannot be assessed here, the revenue results should not be used to make any generalizations, other than for the farmers sampled in this study.

The implications of increasing rates (per tonne), above a certain level for wheat, barley, and canola, can mean lower output for the railways, *ceteris paribus*. To minimize a sharp decline in output, railways must be careful not to increase rates to such a level that farmers simply exit the farming industry, sell crops locally as feed, or switch to trucking the grain themselves or using trucking companies.

What railways should take away from this study is that they should be careful when raising rates. While it is not possible to say from this study what the optimal rate is, what can be inferred is that canola and barley acres planted are, generally, less sensitive to rising rates than wheat acres planted.

Given that regulation, or lack of it, is pushing the railway industry towards more competition (i.e. increasing the degree of competition), this may be crucial to keep rates low, and is an influential factor in the pricing behaviour of the railways, as pointed out in US studies. If competition does keep rates low, the result may be fewer farmers leaving the industry, a healthier and a more efficient railway industry, and more opportunities for future farmers to enter the industry.

Chapter 5

Summary and Conclusion

This thesis has two objectives: to determine whether rail rate movements can be predicted after deregulation: and to assess the impacts of demand responses on the transportation revenue of the railways. The first objective is accomplished by analysing the US experience with deregulation set forth by the passing of the Staggers Act. Several studies. concerning the impact of rate deregulation on railroad rates. are analysed. The main inferences from these studies are that it is difficult to predict the movements in freight rates after deregulation: and rates are increasingly different for different routes available that any prediction of the movements of freight rates is likely to depend on the market structure. and the direction of rate changes may well vary by location.

The second objective of this thesis is to determine the impact of demand responses on rail transportation revenue as rates increase. First. a demand function is estimated. A survey of farmers in one area of Alberta is conducted to assess this matter. The results show that freight rates are negatively related to the percentage of acres planted. This suggests that any increase in rail rates may lead to a decrease in the percentage of acres of wheat, barley, and canola planted. Furthermore, wheat, generally, showed the highest percentage decrease as rates increased, followed by canola and barley. Thus, if wheat revenue represents a large share of railway transportation revenue, then the above results would imply that if rates increase, wheat revenue is likely to fall more sharply than revenue from canola and barley. Estimation of several functional forms showed the demand responses to be in the range of 0.011 to 0.75, in absolute value. Railways were shown to have a revenue gain in the range of 11 percent to 63 percent, as rates increased. Also, the elasticity values showed that farmers have an inelastic demand for rail services.

5.1 Future Research

The main weakness in this thesis is the narrow focus of the sample. A larger sample including more respondents and broader area coverage would be desirable. Further, several districts could have been sampled and the information gathered can be analysed with respect to the characteristics of the given area i.e., the degree of rail competition in the area, accessibility of alternative forms of transportation, etc. An extension of the analysis in this thesis could include more detailed questions on the changes made to farm operations when rail rates increase. Information on the diversification of the farm operation could be further probed. One of the unanswered issues from this study is the shifts among crops resulting from increased shipping costs. In addition, farmers responses could, in principle, be related to other aspects of their farm operations. Information on how long farmers have been farming could be asked. Whether farmers rent or own their land could be another question. A question on *main source of income* i.e. from farm or off-farm, could be added to the survey.

The answers to the questions, What role should government play, if any, in a deregulated environment? Can it phase in rate deregulation, or not? And, What are the impacts on farmers and railways if rate deregulation is phased in? should be given some thought. The answers to these questions may be useful in the forecasting of rail rates. For example, if government is to play a role in the transportation of grain, after rate deregulation, this may impact movements in rail rates if government effects, in some way, grain production levels, taxes on railway operations, modifying bargaining agreements between railway employees and management, etc.

Furthermore, the nature of price competition, and the relationship that it forms, between the railways should be further analysed. The form of this relationship should be empirically tested. Once tested, it may be shown by how much rates are effected by price competition. Similar functional forms, in Table 4.7, which incorporate price competition of the railways as a variable, may be used in place of the rate variable or included along with it (as long as multicollinearity is not a problem between rates and the degree of price competition). This method may add further information to the regression model and allow a better estimate of the demand response.

Rate deregulation of the railways is on the horizon, which brings with it changes to the Canadian economy. The effects of these changes, however, can be, fully or partially, anticipated through further research of the railway industry in Canada. As one farmer wrote in the survey, "(The) Freight (rate) is killing the farmer now". This view cannot be confirmed from this study because the effects of rising shipping costs were mainly looked at from the railways perspective. However, farmers in the sample were found to have an inelastic demand which would suggest their willingness to absorb the rising shipping costs.

Appendix A

Schedule III

Schedule III shows the legislated maximum rates for all distances. They are presented here to enable comparison with rates set by the railways (appendix C).

Table A.2 Canada Transportation - Schedule III

	1995-96	Maximum	Rate Scale
Mileage	Range		Rate
325	or	less	$14.39
326	-	350	$14.99
351	-	375	$15.58
376	-	400	$16.18
401	-	425	$16.83
426	-	450	$17.43
451	-	475	$18.02
476	-	500	$18.62
501	-	525	$19.21
526	-	550	$19.81
551	-	575	$20.40
576	-	600	$21.00
601	-	625	$21.59
626	-	650	$22.19
651	-	675	$22.85
676	-	700	$23.44
701	-	725	$24.04
726	-	750	$24.62
751	-	775	$25.22
776	-	800	$25.81
801	-	825	$26.41
826	-	850	$27.00
851	-	875	$27.60
876	-	900	$28.25
901	-	925	$28.85
926	-	950	$29.44
951	-	975	$30.04
976	-	1000	$30.63

1001	-	1025	$31.23
1026	-	1050	$31.82
1051	-	1075	$32.42
1076	-	1100	$33.01
1101	-	1125	$33.67
1126	-	1150	$34.26
1151	-	1175	$34.86
1176	-	1200	$35.45
1201	-	1225	$36.05
1226	-	1250	$36.64
1251	-	1275	$37.24
1276	-	1300	$37.83
1301	-	1325	$38.43
1326	-	1350	$39.02
1351	-	1375	$39.68
1376	-	1400	$40.28
1401	-	1425	$40.86
1426	-	1450	$41.46
1451	-	1475	$42.05
1476	-	1500	$42.65
1501	-	1525	$43.24
1526	-	1550	$43.84
1551	-	1575	$44.43
1576	-	1600	$45.09
1601	-	1625	$45.68
1626	-	1650	$46.28
1651	-	1675	$46.87
1676	-	1700	$47.47
1701	-	1725	$48.06
1726	-	1750	$48.66
1751	-	1775	$49.25
1776	-	1800	$49.85

1801	-	1825	$50.50
1826	-	1850	$51.10
1851	-	1875	$51.69
1876	-	1900	$52.29
1901	-	1925	$52.88
1926	-	1950	$53.48
1951	-	1975	$54.07
1976	-	2000	$54.67
2001	-	2025	$55.26
2026	-	2050	$55.91
2051	-	2075	$56.51
2076	-	2100	$57.10
2101	-	2125	$57.70
2126	-	2150	$58.29
2151	-	2175	$58.89
2176	-	2200	$59.48

Source: Bill C-14. pp.135-136

Appendix B

NTA Maximum Rates

Table B.1 NTA Maximum Rail Rates - 95/96 Crop Year

		Rates CWB	For Ship.	Non	Deduction	For CWB	Ship.	
							DESIG.	FEED
STATION	PROV.	RWY	VANC	T-BAY	WHEAT	DURUM	BAR.	BAR.
ABBEY	SASK.	CP	$31.23	$30.63	$31.23	$31.23	$31.23	$31.23
ABERDEEN	SASK.	CN	33.67	28.85	33.67	30.63	30.85	33.67
ABERNETHY	SASK.	CP	36.64	28.25	36.64	30.03	30.25	36.64
ACME	ALTA.	CP	23.44	37.83	23.44	23.44	23.44	23.38
ADMIRAL	SASK.	CP	33.01	30.04	33.01	31.82	32.04	33.01
AIRDRIE	ALTA.	CP	22.85	37.24	22.85	22.85	22.85	22.75
AKENSIDE	ALTA.	CP	27.00	37.24	N/A	N/A	N/A	N/A
ALAMEDA	SASK.	CP	37.24	23.44	36.11	23.75	23.24	37.24
ALBRIGHT	ALTA.	CN	27.00	46.87	27.00	27.00	27.00	27.00
ALCOMDALE	ALTA.	CN	25.81	37.24	25.81	25.81	25.81	25.81
ALDERSYDE	ALTA.	CP	22.85	37.24	N/A	N/A	N/A	N/A
ALEXANDER	MAN.	CP	39.02	20.40	33.07	22.18	21.81	39.02
ALIX	ALTA.	CP	25.81	37.83	25.81	25.81	25.81	25.81
ALIX	ALTA.	CN	25.81	39.02	25.81	25.81	25.81	25.81
ALLAN	SASK.	CN	33.67	28.25	33.67	30.03	30.25	33.67
ARCOLA	SASK.	CP	41.46	22.85	35.52	24.46	23.94	41.46
ARDEN	MAN.	CP	42.05	19.81	32.48	21.59	21.14	42.05
ARMENA	ALTA.	CN	26.41	37.24	26.41	26.41	26.41	26.41
ARNAUD	MAN.	CP	43.24	18.02	30.69	17.40	16.88	41.77
ARRAN	SASK.	CN	39.02	24.62	37.29	26.40	26.37	39.02
ARROWWOOD	ALTA.	CP	24.04	37.83	24.04	24.04	24.04	24.04
ASHERN	MAN.	CN	46.87	20.40	33.07	22.18	21.78	41.15
ASHVILLE	MAN.	CN	40.68	22.19	34.86	23.97	23.71	40.68
ASPEN-BEACH	ALTA.	CP	25.22	37.83	N/A	N/A	N/A	N/A
ASQUITH	SASK.	CP	33.01	28.85	33.01	30.63	30.85	33.01
ASQUITH	SASK.	CN	32.42	29.44	32.42	31.22	31.44	32.42
ASSINIBOIA	SASK.	CP	33.01	28.25	33.01	30.03	30.00	33.01
ATWATER	SASK.	CN	38.43	23.44	36.11	25.22	25.09	38.43
AUSTIN	MAN.	CP	40.28	19.21	31.88	20.99	20.49	40.28
AVONLEA	SASK.	CN	34.67	28.25	34.67	30.03	30.25	34.67
BALGONIE	SASK.	CP	34.26	25.22	34.26	27.00	27.00	34.26
BALMORAL	MAN.	CP	42.65	17.43	30.10	19.12	18.60	41.18
BALZAC	ALTA.	CP	22.85	37.24	22.85	22.85	22.85	22.74
BANGOR	SASK.	CN	37.83	23.44	36.11	25.22	25.10	37.83
BARNWELL	ALTA.	CP	25.81	34.86	25.81	25.81	25.81	23.63

MORRIS	MAN.	CN	45.09	18.02	30.69	17.66	17.14	41.77
MORRIS	MAN.	CP	43.24	18.02	30.69	17.66	17.14	41.77
MORSE	SASK.	CP	31.23	28.25	31.23	30.03	30.25	31.23
MORTLACH	SASK.	CP	31.82	27.00	31.82	28.78	28.95	31.82
MORUGG	ALTA.	CN	25.81	37.24	N/A	N/A	N/A	N/A
MOSELEY	SASK.	CN	34.86	27.60	34.86	29.38	29.60	34.86
MOSSBANK	SASK.	CP	33.01	27.60	33.01	29.38	29.58	33.01
MOSSLEIGH	ALTA.	CP	24.04	37.24	24.04	24.04	24.04	24.03
MOZART	SASK.	CP	36.64	25.81	36.64	27.59	27.63	36.64
MUNDARE	ALTA.	CN	26.41	36.05	26.41	26.41	26.41	26.41
MUNSON	ALTA.	CN	25.64	36.05	25.64	25.64	25.64	25.64
MYRNAM	ALTA.	CP	29.44	34.86	29.44	29.44	29.44	29.44
N.TRANSCONA	MAN.	CN	44.43	17.43	N/A	N/A	N/A	N/A
N.TRANSCONA	MAN.	CP	42.65	16.83	N/A	N/A	N/A	N/A
NAICAM	SASK.	CP	36.64	27.60	36.64	29.38	29.60	36.64
NEEPAWA	MAN.	CN	41.24	19.81	32.48	31.59	31.16	41.24
NEEPAWA	MAN.	CP	42.65	19.81	32.48	21.59	21.16	42.65
NEILBURG	ALTA.	CN	22.42	32.42	32.42	32.42	32.42	32.42
NEMISKAM	SASK.	CP	37.00	27.24	37.00	27.00	27.00	34.92
NESBITTK	MAN.	CP	39.08	20.40	33.07	22.18	21.78	39.08
NETHERHILL	SASK.	CN	32.82	31.23	32.82	32.82	32.82	32.82
NETLEY	MAN.	CP	43.24	18.02	30.69	19.72	19.21	41.77
NETOOK	ALTA.	CP	26.04	38.05	26.41	26.41	26.41	26.41
NEUDORF-RD	SASK.	CN	36.24	28.25	36.64	30.63	30.85	36.64
NEVILLESCONA	MAN.	CN	40.43	30.04	30.04	30.63	30.63	30.63
NEW-NORWAY	ALTA.	CN	26.41	37.83	26.41	26.41	26.41	26.41
NEW-OSGOODE	SASK.	CN	37.24	28.25	37.24	30.03	30.25	37.24
NEWDALE	MAN.	CP	41.46	20.40	33.07	22.18	21.81	41.46
NEWSTEAD	MAN.	CP	39.68	20.40	33.07	22.18	21.80	39.68
NICKLEN	SASK.	CN	36.64	29.44	36.64	31.22	31.44	36.64
NINGA-SCONA	MAN.	CN	39.48	21.00	23.49	20.11	19.60	39.48
NIOBE	ALTA.	CP	24.04	37.83	24.04	24.04	24.04	24.04
NIPAWIN	SASK.	CP	40.86	28.25	40.86	30.03	30.25	40.86
NISKU	ALTA.	CP	26.41	37.24	26.41	26.41	26.41	26.41
NIVERVILLE	MAN.	CP	42.65	17.43	30.10	18.06	17.55	41.18
NOBLEFORD	ALTA.	CP	24.62	35.45	24.62	24.62	24.62	23.13
NOKOMIS-RD	SASK.	CN	34.86	26.41	34.86	28.19	28.32	34.86
NOKOMISSCONA	SASK.	CN	34.86	26.41	34.86	28.19	28.32	34.86
NORFOLK	ALTA.	CN	23.85	37.83	N/A	N/A	N/A	N/A
NORMAN	MAN.	CN	40.86	21.00	33.67	22.78	22.45	40.86

SIDNEY	MAN.	CP	40.28	19.21	31.88	20.99	20.51	40.28
SIFTON	MAN.	CN	40.68	22.19	34.86	23.97	23.72	40.68
SILVER-PLAINS	MAN.	CN	45.09	18.02	30.69	18.19	17.68	41.77
SILVERTON	MAN.	CN	46.28	22.85	35.52	24.63	24.43	46.28
SIMMIE	SASK.	CP	30.63	30.04	30.63	30.63	30.63	30.63
SIMPSON	SASK.	CN	34.86	27.60	34.86	29.38	29.58	34.86
SINCLAIR	MAN.	CP	40.28	21.59	34.26	23.09	22.58	40.28
SINTALUTA	SASK.	CP	34.86	24.04	34.86	25.82	25.75	34.86
SKIFF	ALTA.	CP	26.41	36.64	26.41	26.41	26.41	24.28
SMART	MAN.	CN	40.86	20.40	33.07	22.18	21.82	40.86
SOMERSET	MAN.	CN	46.87	19.81	32.48	19.59	19.08	43.56
SOURIS-VER	MAN.	CP	39.02	20.40	33.07	21.29	20.77	39.02
SOUTH-EDMONTON	ALTA.	CP	27.00	37.24	N/A	N/A	N/A	N/A
SOUTHEY	SASK.	CP	35.45	27.00	35.45	28.78	28.93	35.45
SOVEREIGN	SASK.	CP	32.42	33.67	32.42	32.42	32.42	32.42
SPALDING	SASK.	CP	36.64	27.60	36.64	29.38	29.59	36.64
SPEERS	SASK.	CN	32.42	31.23	32.42	32.42	32.42	32.42
SPERLING	MAN.	CN	45.09	18.62	31.29	19.06	18.55	42.37
SPIRIT-RIVER	ALTA.	CN	27.60	45.09	27.60	27.60	27.60	27.60
SPIRITWOOD	SASK.	CN	34.26	33.01	34.26	34.26	34.26	34.26
SPRAGUE	MAN.	CN	46.87	14.99	27.66	16.46	15.95	38.71
SPRING-COULEE	ALTA.	CP	26.41	36.05	26.41	26.41	26.41	24.27
SPRINGSIDE	SASK.	CP	38.43	24.04	36.71	25.82	25.73	38.43
SPRUCE-GROVE	ALTA.	CN	24.62	36.64	24.62	24.62	24.62	24.62
ST.BENEDICT	SASK.	CP	37.24	28.25	37.24	30.03	30.25	37.24
SUCCESS	SASK.	CP	30.04	29.44	30.04	30.04	30.04	30.04
SUNNYBROOKEER	ALTA.	CP	27.00	37.83	27.00	27.00	27.00	27.00
SUNNYSLOPE	ALTA.	CP	23.44	38.43	N/A	N/A	N/A	N/A
SUPERB	SASK.	CP	31.23	32.42	31.23	31.23	31.23	31.23
SUTHERLAND	SASK.	CP	33.67	28.25	N/A	N/A	N/A	N/A
SWALWELL	ALTA.	CN	24.44	39.68	24.44	24.44	24.44	24.44
SWAN-LAKE	MAN.	CN	46.87	19.81	32.48	19.61	19.10	43.56
SWAN-RIVER	MAN.	CN	40.28	24.04	36.71	25.82	25.74	40.28
SWAN-RV-VALLEY	MAN.	CN	40.28	24.04	36.71	25.82	25.75	40.28
SWIFT-CURRENT	SASK.	CP	30.04	29.44	30.04	30.04	30.04	30.04
SWP-MILE-70.3	SASK.	CN	33.01	29.44	N/A	N/A	N/A	N/A
SWP-MILE-83.5	SASK.	CN	35.45	29.44	N/A	N/A	N/A	N/A
SYLVAN-LAKE	ALTA.	CN	25.62	40.28	25.62	25.62	25.62	25.62
SYLVANIA	SASK.	CP	39.68	27.00	39.67	28.78	28.92	39.68
TABER	ALTA.	CP	25.81	34.26	25.81	25.81	25.81	23.64

TANGENT	ALTA.	CN	28.25	43.84	28.25	28.25	28.25	28.25
TAYLOR	BC	BC	24.33	N/A	24.33	24.33	24.33	24.33
TEES	ALTA.	CP	25.22	37.83	N/A	N/A	N/A	N/A
TEMPEST	ALTA.	CP	25.81	34.86	25.81	25.81	25.81	23.61
TENBY	MAN.	CN	42.65	20.40	33.07	22.18	21.78	42.65
TESSIER	SASK.	CN	33.67	29.44	33.67	31.22	31.44	33.67
TEULON	MAN.	CP	43.24	18.02	30.69	19.73	19.21	41.77
THACKERAY	SASK.	CP	31.82	31.23	31.82	31.82	31.82	31.82
THE-PAS	MAN.	CN	40.28	28.85	32.38	30.23	30.85	40.28
THEODORE	SASK.	CN	37.83	24.44	26.71	25.82	25.75	37.83
THERIEN	ALTA.	CN	28.25	39.68	28.25	28.25	28.25	28.25
SHORHILD	SASK.	CP	36.41	37.03	36.41	26.41	26.41	36.41
THORSBY	ALTA.	CP	27.00	37.24	27.00	27.00	27.00	27.00
THREEHILLS	ALTA.	CN	28.04	49.68	25.04	25.04	25.04	25.04
TILLEY	ALTA.	CP	25.22	34.26	25.22	25.22	25.22	25.22
TILNEY	SASK.	CN	34.01	27.60	34.01	29.38	29.57	34.01
TISDALE	SASK.	CN	36.64	27.00	36.64	28.78	28.94	36.64
TISDALE	SASK.	CP	36.64	27.00	36.64	28.78	28.94	36.64
TOFIELD	ALTA.	CN	26.41	35.45	26.41	26.41	26.41	26.41
TOGO	SASK.	CN	39.02	23.44	36.11	25.22	25.10	39.02
TOMKINS	SASK.	CP	28.85	30.63	28.85	28.85	28.85	28.21
TORQUAY	SASK.	CP	36.64	24.62	36.64	25.04	24.53	36.64
TORRINGTON	ALTA.	CP	24.04	38.43	24.04	24.04	24.04	24.03
TRAMPING LAKE	SASK.	CP	31.23	31.23	31.23	31.23	31.23	31.23
TREHERNE	MAN.	CP	40.86	18.62	31.29	20.40	19.89	40.86
TREMBLAY	BC	BC	23.87	N/A	N/A	N/A	N/A	N/A
TRIBUNE-V-Y	SASK.	CP	37.24	25.22	37.24	25.68	25.17	37.24
TROCHU	ALTA.	CN	25.04	39.68	25.04	25.04	25.04	25.04
TROSSACHS	SASK.	CP	35.45	25.81	N/A	N/A	N/A	N/A
TUCKER	MAN.	CP	40.86	18.02	30.69	19.75	19.24	40.86
TUFFNELL	SASK.	CP	37.24	24.62	N/A	N/A	N/A	N/A
SUGASKE	SASK.	CP	34.26	27.60	34.26	29.38	29.60	34.26
TURIN	ALTA.	CP	25.81	36.05	25.81	25.81	25.81	23.62
TURTLEFORD	SASK.	CN	32.42	32.42	32.42	32.42	32.42	32.42
TUXFORD	SASK.	CP	33.01	27.00	33.01	28.78	28.92	33.01
TWO HILLS	ALTA.	CP	28.85	35.45	28.85	28.85	28.85	28.85
TYNER	SASK.	CN	37.24	33.01	37.24	34.79	35.01	37.24
TYVAN	SASK.	CP	34.86	26.41	N/A	N/A	N/A	N/A
UNITY	SASK.	CN	30.04	31.23	30.04	30.04	30.04	30.04
UNITY	SASK.	CP	30.63	31.23	30.63	30.63	30.63	30.63

WELDON-83.5	SASK.	CN	35.45	29.44	35.45	31.22	31.44	35.45
WELLING	ALTA.	CP	25.81	36.05	25.81	25.81	25.81	23.64
WELWYN	SASK.	CP	39.02	22.19	34.86	23.97	23.74	39.02
WEMBLEY	ALTA.	CN	26.41	46.87	26.41	26.41	26.41	26.41
WESTBOURNE	MAN.	CP	41.46	18.62	31.29	20.39	19.88	41.46
WESTLOCK	ALTA.	CN	26.41	37.83	26.41	26.41	26.41	26.41
WESTROC	MAN.	CP	41.46	18.62	31.29	20.40	19.89	41.46
WETASKAWIN	ALTA.	CP	25.81	36.64	25.81	25.81	25.81	25.81
WEYBURN	SASK.	CP	34.86	25.22	34.86	27.00	26.49	34.86
WHITE-FOX	SASK.	CP	40.86	28.25	40.86	30.03	30.25	40.86
WILCOX	SASK.	CP	33.67	26.41	33.67	28.19	27.78	33.67
WILKIE	SASK.	CP	31.23	30.63	31.23	31.23	31.23	31.23
WILLINGDON-Y	ALTA.	CP	28.25	36.05	28.25	28.25	28.25	28.25
WILLMAR	SASK.	CN	40.28	24.04	36.71	25.20	24.69	40.28
WILLOWBUNCH	SASK.	CP	37.24	27.60	37.24	29.38	29.06	37.24
WILLOWS	SASK.	CP	33.01	27.60	33.01	29.38	29.07	33.01
WILSON	ALTA.	CP	25.81	35.45	25.81	25.81	25.81	23.60
WIMBORNE	ALTA.	CP	24.04	38.43	24.04	24.04	24.04	24.04
WINKLER	MAN.	CP	42.05	18.62	30.91	17.53	17.02	42.05
WINNIFRED	ALTA.	CP	27.00	33.67	27.00	27.00	27.00	24.92
WINNIPEG	MAN.	CN	44.43	16.83	29.50	18.46	17.95	40.58
WINNIPEG	MAN.	CP	42.05	16.83	29.50	18.46	17.95	40.58
WINNIPEG-EAST	MAN.	CN	44.43	17.43	30.10	19.10	18.59	41.18
WISETON	SASK.	CN	33.42	31.23	33.42	33.01	33.23	33.42
WOKING	ALTA.	CN	27.00	45.09	27.00	27.00	27.00	27.00
WOLSELEY	SASK.	CP	35.45	24.04	35.45	25.82	25.73	35.45
WOOD BAY	MAN.	CP	41.46	19.81	32.19	18.81	18.30	41.46
WOOD-MOUNTAIN	SASK.	CP	33.67	28.85	33.67	30.63	30.85	33.67
WOODGROVE	ALTA.	CN	26.41	37.24	26.41	26.41	26.41	26.41
WOODNORTH	MAN.	CN	40.86	22.19	34.86	23.97	23.47	40.86
WOODROW	SASK.	CP	31.82	28.85	31.82	30.63	30.85	31.82
WOSTOK	ALTA.	CP	28.25	36.05	28.25	28.25	28.25	28.25
WRENTHAM	ALTA.	CP	26.41	36.05	26.41	26.41	26.41	24.25
WROXTON	SASK.	CN	39.02	25.81	38.09	27.59	27.64	39.02
WYMARK	SASK.	CP	30.63	29.44	30.63	30.63	30.63	30.63
WYNYARD	SASK.	CP	36.64	25.81	36.64	27.59	27.64	36.64
YARBO	SASK.	CN	38.43	23.44	36.11	25.22	25.06	38.43
YELLOW-GRASS	SASK.	CP	34.26	25.81	34.26	27.59	27.11	34.26
YORKTON	SASK.	CP	38.43	23.44	36.11	25.22	25.10	38.43
YOUNG	SASK.	CN	34.26	27.60	34.26	29.38	29.58	34.26

Source: FBMI net

The rates in the above table should match with those in schedule III. This table is included because it gives rates for specific origins, and for wheat and barley. Moreover, distances can be easily looked up, in schedule III, for the above stations.

Appendix C

Rates Set by CN and CP

The following rates in Table C.1 were provided by a transportation at AARI (1995).

Table C.1 Actual Rates Set by CN and CP To Vancouver (VC)

SUBDIVISION	STATION	RWY	VC (Miles)	VC PRICE	TH. BAY (TB) (Miles)
Acme	Torrington	CP	706.1	24.04	1311.6
Acme	Linden	CP	691.3	23.44	1296.8
Acme	Sunnyslope	CP	696	23.44	1301.5
Acme	Wimborne	CP	712.5	24.04	1318
Aldersyde	Champion	CP	723.6	24.04	1221.1
Aldersyde	Aldersyde	CP	674.1	22.85	1270.6
Aldersyde	Kirkcaldy	CP	715.9	24.04	1228.8
Aldersyde	Barons	CP	740.6	24.62	1204.5
Aldersyde	Brant	CP	696.1	23.44	1248.6
Aldersyde	Carmangay	CP	731.5	24.62	1213.2
Aldersyde	Vulcan	CP	709.7	24.04	1235
Aldersyde	Nobleford	CP	749.2	24.62	1195.5
Aldersyde	Blackie	CP	687.8	23.44	1256.9
Aldersyde	Mazeppa	CP	682	23.44	1262.7
Alliance	Forestburg	CN	865	27.6	1319
Alliance	Kelsey	CN	833	27	837.8
Alliance	Rosalind	CN	843.6	27	1297.6
Alliance	Heisler	CN	858.1	27.6	1310.1
Alliance	Galahad	CN	872.6	27.6	1326.6
Alliance	Alliance	CN	880.6	28.25	1334.6
Athabasca	Morugg	CN	782.1	25.81	1258.9
Athabasca	Legal	CN	793.4	25.81	1270.2
Barrhead	Manola	CN	815.8	26.41	1292.6
Barrhead	Barrhead	CN	823.2	26.41	1300
Bassano	Iddsleigh	CP	774.4	25.22	1228.5
Bassano	Duchess	CP	744.7	24.62	1198.8
Bassano	Jenner	CP	779.9	25.81	1234
Bassano	Bindloss	CP	824.6	26.41	1278.7
Bassano	Buffalo	CP	804.5	26.41	1258.6
Bassano	Rosemary	CP	736.5	24.62	1190.6
Bassano	Empress	CP	837.9	27	1292
Blackfoot	Borradaile	CN	905	28.85	1127.4
Blackfoot	Vermilion	CN	897.9	28.25	1134.5
Blackfoot	Islay	CN	912.7	28.85	1119.7
Blackfoot	Kitscoty	CN	923	28.85	1108.5
Bonnyville	Glendon	CN	900	28.25	1360.6
Bonnyville	Grand-Centre	CN	942.9	29.44	1403.1

Bonnyville	Bonnyville	CN	918.2	28.85	1378.4
Bonnyville	Therien	CN	896.5	28.25	1356.7
Bonnyville	Mallaig	CN	891.6	28.25	1351.8
Brazeau	Sylan-Lake	CN	925	28.85	1381.8
Brazeau	Joffre	CN	893.5	28.25	1347.5
Brazeau	Kuusamo	CN	932.2	29.44	1386.2
Brazeau	Red-Deer	CN	912.8	28.85	1366.8
Brazeau	Haynes	CN	886.3	28.25	1340.3
Brazeau	Eckville	CN	942	29.44	1396
Brazeau	Leslieville	CN	950	29.44	1407.3
Breton	Calmar	CP	857.3	27.6	1258.2
Breton	Buford	CP	829.1	27	1263.3
Breton	Breton	CP	857.3	27.6	1289.5
Breton	sunnybrooke	CP	843	27	1275.2
Breton	thorsby	CP	835.7	27	1267.9
Brooks	gleichen	CP	692.4	23.44	1200.7
Brooks	carsland	CP	672.5	22.85	1220.6
Brooks	indus	CP	658	22.85	1235.1
Brooks	brooks	CP	750.3	25.22	1142.8
Brooks	sheppard	CP	650.9	22.85	1242.2
Brooks	tilley	CP	764.2	25.22	1128.9
Brooks	dalemead	CP	664.6	22.85	1228.5
Brooks	crowfoot	CP	711.8	24.04	1181.3
Brooks	bassano	CP	719.5	24.04	1173.6
Brooks	cluny	CP	699.9	23.44	1193.2
Brooks	strangmuir	CP	678.1	23.44	1215
Burstall	hilda	CP	1085.4	33.01	1061.5
Burstall	schuler	CP	1096.9	33.01	1073
Calg.Terminal	Cal.-CP	CP	641.3	22.19	1251.8
Camrose	Bashaw	CN	857.6	27.6	1311.6
Camrose	new norway	CN	836.4	27	1290.4
Camrose	hay lakes	CN	804.6	26.41	1258.6
Camrose	armena	CN	811.6	26.41	1265.6
Camrose	ferintosh	CN	843.9	27	1297.9
Camrose	camrose-CN	CN	821.4	26.41	1275.4
Camrose	east-edmonton	CN	775.5	25.22	1229.5
Cardston	Cardston	CP	823.9	27	1239.4
Cardston	raymond	CP	793.4	25.81	1199.9
Cardston	welling	CP	799.3	25.81	1205.8
Cardston	magrath	CP	804	26.41	1210.5
Cardston	spring-coulee	CP	816.1	26.41	1222.6

Coronado	duagh	CN	781.1	25.81	1241.3
Coronado	st.paul	CN	893.9	28.25	1354.1
Coronado	woodgrove	CN	810.2	26.41	1270.4
Coronado	redwater	CN	800	25.81	1263.5
Coronado	elk point	CN	911.7	28.85	1371.9
Coronado	radway	CN	816.9	26.41	1277.1
Coronado	vilna	CN	863.5	27.6	1323.7
Coronado	waskatenau	CN	823.7	26.41	1283.9
Coronado	warspite	CN	830.5	27	1290.7
Coronado	gibbons	CN	789.3	25.81	1249.5
Coronado	smoky-lake	CN	838.3	27	1298.5
Coutts	craddock	CP	791.3	25.81	1197.8
Coutts	warner	CP	809.5	26.41	1216
Coutts	coutts	CP	833.5	27	1240
Coutts	milk-river	CP	820.8	26.41	1227.3
Crowsnest	pincher-creek	CP	776.5	25.81	1238.6
Crowsnest	ft.macleod	CP	748.4	24.62	1210.5
Crowsnest	cowley	CP	783.7	25.81	1245.8
Crowsnest	pearce	CP	758.1	25.22	1200.8
Crowsnest	brockett	CP	766.8	25.22	1228.9
Drumheller	rosedale	CN	1069.5	32.42	1228.1
Drumheller	craigmyle	CN	1111.8	33.67	1185.8
Drumheller	drumheller	CN	1073.9	32.42	1223.7
Drumheller	munson	CN	1085.5	33.01	1212.1
Drumheller	norfolk	CN	1007.9	31.23	1289.7
Drumheller	michichi	CN	1096.4	33.01	1201.2
Drumheller	delia	CN	1104.4	33.67	1193.2
Drumheller	lyalta	CN	1015.2	31.23	1282.4
Drumheller	baintree	CN	1069.5	32.42	1228.1
Drumheller	rosebud	CN	1049.9	31.82	1247.7
Drumheller	rockyford	CN	1039.2	31.82	1258.4
Drumheller	calgary-CN	CN	994.4	30.63	1303.2
Edmonton-Te	Edm.CN	CN	766.8	25.22	1233.8
Edson	carvel	CN	735	24.62	1265.6
Edson	stony-plain	CN	742.7	24.62	1257.9
Edson	evansburg	CN	698.7	23.44	1301.9
Edson	spruce-grove	CN	746.9	24.62	1253.7
Grand-Prair	Gr.Prair	CN	798.4	25.81	1640.5
Grand-Prair	hythe	CN	837	27	1679.1
Grand-Prair	bverlod.	CN	827.3	27	1669.4

Grand-Prair	dimsdale	CN	807.5	26.41	1649.6
Grand-Prair	wembley	CN	813.8	26.41	1655.9
Grand-Prair	woking	CN	835.2	27	1603.7
Grand-Prair	clairmont	CN	804.9	26.41	1634
Grand-Prair	albright	CN	832.4	27	1674.5
Grand-Prair	sexsmith	CN	811.9	26.41	1627
Grand-Prair	daw.-cr.	CN	886.9	28.25	1720
Grand-Prair	pouce-cou	CN	880.9	28.25	1723
Hardisty	Amisk	CP	902	28.85	1116.2
Hardisty	hayter	CP	949.8	29.44	1068.4
Hardisty	hughenden	CP	907.3	28.85	1110.9
Hardisty	cadogan	CP	934.6	29.44	1083.6
Hardisty	hardisty	CP	888	28.25	1130.2
Hardisty	czar	CP	914.6	28.85	1103.6
Hardisty	provost	CP	943	29.44	1075.2
Macleod	High-river	CP	681.5	23.44	1277.4
Macleod	stavely	CP	713.7	24.04	1245.2
Macleod	claresholm	CP	723.5	24.04	1235.4
Manning	Keg-river	CN	1125	33.67	1691.1
Manning	hotchkiss	CN	1066.4	32.42	1631.9
Manning	manning	CN	1052.6	32.42	1618.1
Manning	hawk-hills	CN	1081.4	33.01	1646.9
Maple-Creek	Med.-Hat	CP	817.1	26.41	1076
Maple-Creek	dunmore	CP	823.8	26.41	1069.3
Maple-Creek	irvine	CP	838.8	27	1054.3
Maple-Creek	walsh	CP	849.5	27	1043.6
Meander-riv	hi.-lev.	CN	1180.2	35.45	1745.7
Nelson	Creston	CP	692.1	23.44	1461.7
Okanagan	vernon	CP	380.3	16.18	1605.4
Okanagan	larkin	CP	372.5	15.58	1597.6
Okanagan	enderby	CP	357	15.58	1582.1
Okanagan	armstrong	CP	365.6	15.58	1590.7
Okanagan	grindrod	CP	351.7	15.58	1576.8
Oyen	hanna	CN	1125	33.67	1171.3
Oyen	cereal	CN	1179.7	35.45	1117.9
Oyen	chinook	CN	1173.9	34.86	1123.7
Oyen	richdale	CN	1142	34.26	1155.6
Oyen	youngstown	CN	1160.4	34.86	1137.2
Oyen	oyen	CN	1196	35.45	1101.6
Oyen	sibbald	CN	1211.8	36.05	1085.8

Peace-river	nampa	CN	967.2	30.04	1532.7
Peace-river	fairview	CN	1034.1	31.82	1599.6
Peace-river	roma	CN	994.2	30.63	1559.7
Peace-river	whitelaw	CN	1021.3	31.23	1586.8
Peace-river	peice-riv.	CN	985.3	30.63	1550.8
Peace-river	grimshaw	CN	1001.7	31.23	1567.2
Peace-river	brownvale	CN	1014.3	31.23	1579.8
Peace-river	blue-sky	CN	1028.5	31.82	1594
Peace-river	hines-creek	CN	1050	31.82	1615.6
Peace-river	berwyn	CN	1008.2	31.23	1573.7
Peace-river	reno	CN	960.6	30.04	1526.1
Peace-river	judah	CN	976.3	30.63	1543.8
Red-Deer	Red-deer-CP	CP	738.2	24.62	1280
Red-Deer	innisfall	CP	717.8	24.04	1300.4
Red-Deer	penhold	CP	726	24.62	1299.2
Red-Deer	bowden	CP	709.9	24.04	1308.3
Red-Deer	beddington	CP	651	22.85	1258.9
Red-Deer	balzac	CP	656.4	22.85	1264.3
Red-Deer	didsbury	CP	689	23.44	1296.9
Red-Deer	olds	CP	699	23.44	1306.9
Red-Deer	airdrie	CP	661	22.85	1268.9
Red-Deer	carstairs	CP	682	23.44	1290
Red-Deer	netook	CP	705.5	24.04	1312.7
Red-Deer	minaret	CP	695.6	23.44	1306.1
Red-Deer	crossfield	CP	671.4	22.85	1279.3
Red-Deer	niobe	CP	720.8	24.04	1297.4

Appendix D

US Railroad Rates

Table D.1 BN Rates for Wheat to Minneapolis, MN

DESTINATION STATION	ST	MILES	R1	R2	R3
BIRMINGHAM	AL	1154	14.12	14.12	14.12
DECATUR	AL	1154	14.88	12.85	0
INDIANTOWN	FL	1556	26.38	24.18	0
JACKSONVILLE	FL	1556	23.7	21.48	0
TAMPA	FL	1556	25.47	23.22	0
BURLINGTON	IA	265	6.15	6.15	6.15
CLINTON	IA	265	6.5	6.5	6.5
COUNCIL-BLUFFS	IA	265	2.5	2.5	2.5
DAVENPORT	IA	265	6.5	6.5	6.5
DES-MOINES	IA	265	4.25	4.25	4.25
KEOKUK	IA	265	6.18	6.18	6.18
BRISTOL	IL	430	4.61	4.61	4.61
CHICAGO	IL	430	2.38	2.38	2.38
PREORIA	IL	430	6.6	6.6	6.6
WOODLAWN	IL	430	4	4	4
MT.VERNON	IN	607	8.15	7.12	0
ABILENE	KS	572	8.4	8.4	8.4
ARKANSAS-CITY	KS	572	9.3	9.3	9.3
ATCHISON	KS	572	5.1	5.1	5.1
BAXTER-SPRINGS	KS	572	8.7	8.7	8.7
COFFEYVILLE	KS	572	9.8	9.8	9.8
COLUMBUS	KS	572	8.7	8.7	8.7
EMPORIA	KS	572	8.7	8.7	8.7
KANSAS-CITY	KS	572	5.1	5.1	5.1
NEWTON	KS	572	8.7	8.7	8.7
PITTSBURG	KS	572	8.7	8.7	8.7
SALINA	KS	572	9.35	9.35	9.35
TOPEKA	KS	572	7.18	7.18	7.18
WELLINGTON	KS	572	9.8	9.8	9.8
WICHITA	KS	572	8.7	8.7	8.7

Table D.2 BN Rates for Barley to Minneapolis, MN

DESTINATION STATION	ST	MILES	R1	R2	R3
DENVER	CO	928	35.83	34.03	33.28
KEENESBURG	CO	928	35.83	34.03	33.28
LONGMONT	CO	928	35.83	34.03	33.28
LOVELAND	CO	928	35.83	34.03	33.28
ADA	MN	152	15.36	13.56	12.81
ALBERTA	MN	152	9.55	7.75	7
ANGUS	MN	152	16.11	14.31	13.56
APPLETON	MN	152	10.3	8.5	7.75
ARGYLE	MN	152	16.11	14.31	13.56
ASBURY	MN	152	10.86	9.06	8.31
ASHBY	MN	152	10.56	8.76	8.01
AUDUBON	MN	152	12.05	10.25	9.50
AVERILL	MN	152	14.55	12.75	12
AVON	MN	152	9.55	7.75	7
BADGER	MN	152	16.5	14.7	13.95
BAGLEY	MN	152	11.05	9.25	8.5
BAKER	MN	152	14.98	13.18	12.4
BARNESVILLE	MN	152	14.98	13.18	12.4
BARRY	MN	152	11.05	9.25	8.5
BEARDESLEY	MN	152	11.23	9.43	8.68
BELLINGHAM	MN	152	11.05	9.25	8.5
BELTRAMI	MN	152	15.73	13.93	13.1
BENSON	MN	152	9.35	7.55	6.8
BOYD	MN	152	11.61	9.81	9.06
BRANSON	MN	152	9.85	8.05	7.3
BROWNS-VALLEY	MN	152	11.42	9.62	8.87
BRUSKVALE	MN	152	13.3	11.5	10.7
CAMPBELL	MN	152	11.98	10.18	9.43
CARLISLE	MN	152	13.11	11.31	10.5
CHARLESVILLE	MN	152	11.61	9.81	9.06
CHOKIO	MN	152	10.3	8.5	7.75
CLARA CITY	MN	152	9.92	8.12	7.37
ACTON	MT	853	31.97	30.17	29.42
ANTELOPE	MT	853	31.97	30.17	29.42
BAINVILLE	MT	853	31.97	30.17	29.42

BAKER	MT	853	31.97	30.17	29.42
BELGRADE	MT	853	31.97	30.17	29.42
BELT	MT	853	31.97	30.17	29.42
BENCHLAND	MT	853	31.97	30.17	29.42
BIG-SANDY	MT	853	31.97	30.17	29.42
BIG-TIMBER	MT	853	31.97	30.17	29.42
BILLINGS	MT	853	31.97	30.17	29.42
BLUFFPORT	MT	853	31.97	30.17	29.42
BOWDOIN	MT	853	31.97	30.17	29.42
BOX-ELDER	MT	853	31.97	30.17	29.42
BOZEMAN	MT	853	31.97	30.17	29.42
BRADY	MT	853	31.97	30.17	29.42
BROADVIEW	MT	853	31.97	30.17	29.42
BROCKTON	MT	853	31.97	30.17	29.42
BUFFALO	MT	853	31.97	30.17	29.42
CARTER	MT	853	31.97	30.17	29.42
CASCADE	MT	853	31.97	30.17	29.42
CHESTER	MT	853	31.97	30.17	29.42
CHINOOK	MT	853	31.97	30.17	29.42
CHOTEAU	MT	853	31.97	30.17	29.42
CIRCLE	MT	853	31.97	30.17	29.42
CLEIV	MT	853	31.97	30.17	29.42
COLLINS	MT	853	31.97	30.17	29.42
COLSTRIP	MT	853	31.97	30.17	29.42
COLUMBUS	MT	853	31.97	30.17	29.42
COMANCHE	MT	853	31.97	30.17	29.42
CONRAD	MT	853	31.97	30.17	29.42
CORDOVA	MT	853	31.97	30.17	29.42
CULBERTSON	MT	853	31.97	30.17	29.42
CUT-BANK	MT	853	31.97	30.17	29.42
DEVON	MT	853	31.97	30.17	29.42
DODSON	MT	853	31.97	30.17	29.42
DUNKIRK	MT	853	31.97	30.17	29.42
DUTTON	MT	853	31.97	30.17	29.42
EAST-BRIDGER	MT	853	31.97	30.17	29.42
EAST-HELENA	MT	853	31.97	30.17	29.42
EDGAR	MT	853	31.97	30.17	29.42
FAIRFIELD	MT	853	31.97	30.17	29.42
FALLOW	MT	853	31.97	30.17	29.42
FIFE	MT	853	31.97	30.17	29.42
FLAXVILLE	MT	853	31.97	30.17	29.42

FLOWEREE	MT	853	31.97	30.17	29.42
FORSYTH	MT	853	31.97	30.17	29.42
FRAZER	MT	853	31.97	30.17	29.42
FRESNO	MT	853	31.97	30.17	29.42
FROID	MT	853	31.97	30.17	29.42
FROMBERG	MT	853	31.97	30.17	29.42
FT.BENTON	MT	853	31.97	30.17	29.42
GALATA	MT	853	31.97	30.17	29.42
GERBER	MT	853	31.97	30.17	29.42
GEYSER	MT	853	31.97	30.17	29.42
GILDFORD	MT	853	31.97	30.17	29.42
GLASGOW	MT	853	31.97	30.17	29.42
GLENDIVE	MT	853	31.97	30.17	29.42
GREAT-FALLS	MT	853	31.97	30.17	29.42
HAMILTON	MT	853	31.97	30.17	29.42
HARDIN	MT	853	31.97	30.17	29.42
HARLEM	MT	853	31.97	30.17	29.42
HARRISON	MT	853	31.97	30.17	29.42
HAVRE	MT	853	31.97	30.17	29.42
HELENA	MT	853	31.97	30.17	29.42
HESPER	MT	853	31.97	30.17	29.42
HINGHAM	MT	853	31.97	30.17	29.42
HINSDALE	MT	853	31.97	30.17	29.42
HOBSON	MT	853	31.97	30.17	29.42
HOBSON-ELE.SPUR	MT	853	31.97	30.17	29.42
HOMESTEAD	MT	853	31.97	30.17	29.42
HUNTLEY	MT	853	31.97	30.17	29.42
HYSHAM	MT	853	31.97	30.17	29.42
INTAKE	MT	853	31.97	30.17	29.42
INVERNESS	MT	853	31.97	30.17	29.42
ISMAY	MT	853	31.97	30.17	29.42
JOPLIN	MT	853	31.97	30.17	29.42
KALISPELL	MT	853	31.97	30.17	29.42
KERSHAW	MT	853	31.97	30.17	29.42
KEVIN	MT	853	31.97	30.17	29.42
KREMLIN	MT	853	31.97	30.17	29.42
LAREDO	MT	853	31.97	30.17	29.42
LAUREL	MT	853	31.97	30.17	29.42
LEDGER	MT	853	31.97	30.17	29.42
LEWISTOWN	MT	853	31.97	30.17	29.42

LIVINGSTON	MT	853	31.97	30.17	29.42
LODGEGRASS	MT	853	31.97	30.17	29.42
LOTHAIR	MT	853	31.97	30.17	29.42
MACON	MT	853	31.97	30.17	29.42
MADOC	MT	853	31.97	30.17	29.42
MALTA	MT	853	31.97	30.17	29.42
MANHATTAN	MT	853	31.97	30.17	29.42
MCCABE	MT	853	31.97	30.17	29.42
MEDICINE-LAKE	MT	853	31.97	30.17	29.42
MERIWETHER	MT	853	31.97	30.17	29.42
MILES-CITY	MT	853	31.97	30.17	29.42
MISSOULA	MT	853	31.97	30.17	29.42
MOCCASIN	MT	853	31.97	30.17	29.42
MOORE	MT	853	31.97	30.17	29.42
NASHUA	MT	853	31.97	30.17	29.42
NAVAJO	MT	853	31.97	30.17	29.42
OSWEGO	MT	853	31.97	30.17	29.42
PABLO	MT	853	31.97	30.17	29.42
PERMA	MT	853	31.97	30.17	29.42
PLAINS	MT	853	31.97	30.17	29.42
PLENTYWOOD	MT	853	31.97	30.17	29.42
PLEVNA	MT	853	31.97	30.17	29.42
POMPEYS-PILLAR	MT	853	31.97	30.17	29.42
POPLAR	MT	853	31.97	30.17	29.42
PORTAGE	MT	853	31.97	30.17	29.42
POWER	MT	853	31.97	30.17	29.42
RAYNESFORD	MT	853	31.97	30.17	29.42
REDSTONE	MT	853	31.97	30.17	29.42
RESERVE	MT	853	31.97	30.17	29.42
RONAN	MT	853	31.97	30.17	29.42
RUDYARD	MT	853	31.97	30.17	29.42
SACO	MT	853	31.97	30.17	29.42
SAVAGE	MT	853	31.97	30.17	29.42
SCOBEY	MT	853	31.97	30.17	29.42
SHEFFELS	MT	853	31.97	30.17	29.42
SHELBY	MT	853	31.97	30.17	29.42
SIDNEY	MT	853	31.97	30.17	29.42
SILVER-BOW	MT	853	31.97	30.17	29.42
SPROLE	MT	853	31.97	30.17	29.42
STANFORD	MT	853	31.97	30.17	29.42

STEVENSVILLE	MT	853	31.97	30.17	29.42
SUNBURST	MT	853	31.97	30.17	29.42
SWEET-GRASS	MT	853	31.97	30.17	29.42
TERRY	MT	853	31.97	30.17	29.42
THREE-FORKS	MT	853	31.97	30.17	29.42
TIBER	MT	853	31.97	30.17	29.42
TOSTON	MT	853	31.97	30.17	29.42
TOWNSEND	MT	853	31.97	30.17	29.42
TUNIS	MT	853	31.97	30.17	29.42
ULM	MT	853	31.97	30.17	29.42
VALIER	MT	853	31.97	30.17	29.42
VANDALIA	MT	853	31.97	30.17	29.42
VAUGH	MT	853	31.97	30.17	29.42
WAYNE	MT	853	31.97	30.17	29.42
WHITEHALL	MT	853	31.97	30.17	29.42
WIBAUX	MT	853	31.97	30.17	29.42
WILLOW-CREEK	MT	853	31.97	30.17	29.42
WINDHAM	MT	853	31.97	30.17	29.42
WOLF-POINT	MT	853	31.97	30.17	29.42
ZURICH	MT	853	31.97	30.17	29.42
ABSARAKA	ND	435	16.11	14.31	13.56
ADRIAN	ND	435	17.8	16	15.25
ALEXANDRA	ND	435	31.12	29.32	28.57
ALICE	ND	435	16.11	14.31	13.56
AMENIA	ND	435	16.11	14.31	13.56
ANETA	ND	435	18.73	16.93	16.18
APPAM	ND	435	31.12	29.32	28.57
ARNEGARD	ND	435	31.12	29.32	28.57
ARTHUR	ND	435	16.11	14.31	13.56
ARVILLA	ND	435	17.05	15.25	14.5
AUBURN	ND	435	17.8	16	15.25
AYLMER	ND	435	23.99	22.19	21.44
AYR	ND	435	16.11	14.31	13.56
BANTRY	ND	435	24.18	22.38	21.63
BARLOW	ND	435	20.88	19	18.25
BARNEY	ND	435	13.54	11.74	10.99
BARTLETT	ND	435	18.73	16.93	16.18
BARTON	ND	435	23.43	21.63	20.88
BATHGATE	ND	435	19.86	18.06	17.31
BEACH	ND	435	31.12	29.32	28.57

BELFIELD	ND	435	29.99	28.19	27.44
BEREA	ND	435	17.61	15.81	15.06
BERLIN	ND	435	17.05	15.25	14.5
BERTHOLD	ND	435	26.65	24.85	24.1
BEULAH	ND	435	27.56	25.76	25.01
BINFORD	ND	435	19.68	17.88	17.13
BISBEE	ND	435	21.55	19.75	19
BISMARCK	ND	435	21.93	20.13	19.38
BOTTINEAU	ND	435	23.99	22.19	21.44
BOWBELLS	ND	435	29.1	27.3	26.5
BOWDON	ND	435	22.49	20.69	19.9
BOWMAN	ND	435	30.25	28.45	27.7
BREMEN	ND	435	22.49	20.69	19.9
BROCKET	ND	435	18.93	17.13	16.3
BUCHANAN	ND	435	18.93	17.13	16.3
BUCYRUS	ND	435	26.75	24.95	24.2
BUFFALO	ND	435	16.11	14.31	13.56
BUTTZVILLE	ND	435	16.11	14.31	13.56
BUXTON	ND	435	16.86	15.06	14.3
CALVIN	ND	435	22.3	20.5	19.7
CANDO	ND	435	20.88	19	18.25
CARRINGTON	ND	435	20.99	19.19	18.4
CARTWRIGHT	ND	435	31.12	29.32	28.57
CASHEL	ND	435	17.8	16	15.25
CASSELTON	ND	435	16.11	14.31	13.56
CAVALIER	ND	435	19.68	17.88	17.13
CAYUGA	ND	435	13.67	11.87	11.1
CHAFFEE	ND	435	16.11	14.31	13.56
CHURCHS-FERRY	ND	435	20.88	19	18.25
CLEVELAND	ND	435	19.68	17.88	17.13
CLIFFORD	ND	435	16.86	15.06	14.3
CLYDE	ND	435	22.11	20.31	19.5
COLFAX	ND	435	14.8	13	12.2
COLGATE	ND	435	16.86	15.06	14.3
COOPERSTOWN	ND	435	18.73	16.93	16.18
COTEAU	ND	435	29.1	27.3	26.5
COULEE	ND	435	28.11	26.31	25.5
CRARY	ND	435	19.68	17.88	17.13
CRETE	ND	435	14.93	13.13	12.3
CROCUS	ND	435	22.49	20.69	19.9

CROSBY	ND	435	31.12	29.32	28.57
CRYSTAL	ND	435	18.93	17.13	16.3
CUMMINGS	ND	435	16.11	14.31	13.56
DALRYMPLE-SPUR	ND	435	16.11	14.31	13.56
DAVENPORT	ND	435	16.11	14.31	13.56
DAWSON	ND	435	21.18	19.38	18.6
DAZEY	ND	435	17.98	16.18	15.4
DE-LAMERE	ND	435	13.88	12.08	11.3
DEERING	ND	435	25.31	23.51	22.7
DES-LACS	ND	435	25.95	24.15	23.4
DEVILS-LAKE	ND	435	20.88	19	18.25
DICKEY	ND	435	17.8	16	15.25
DICKINSON	ND	435	28.68	26.88	26.1
DOYON	ND	435	18.93	17.13	16.3
DRAYTON	ND	435	18.73	16.93	16.18
DRESDEN	ND	435	21.36	19.56	18.8
DRISCOLL	ND	435	21.93	20.13	19.38
DURBIN	ND	435	16.11	14.31	13.56
DWIGHT	ND	435	13.48	11.68	10.99
EASBY	ND	435	20.88	19	18.25
EAST-FAIRVIEW	ND	435	31.12	29.32	28.57
ECKELSON	ND	435	17.61	15.81	15.06
EDGELEY	ND	435	17.05	15.25	14.5
EDINBURG	ND	435	18.73	16.93	16.18
EDMORE	ND	435	19.86	18.06	17.31
ELDRIDGE	ND	435	18.73	16.93	16.18
ELLIOT	ND	435	16.3	14.5	13.7
EMBDEN	ND	435	16.11	14.31	13.56
EMERADO	ND	435	17.05	15.25	14.5
ENGLEVALE	ND	435	16.3	14.5	13.7
EPPING	ND	435	31.12	29.32	28.57
ERIE	ND	435	16.11	14.31	13.56
ESMOND	ND	435	22.49	20.69	19.9
FAIRMOUNT	ND	435	11.81	10.01	9.2
FARGO	ND	435	15.3	13.56	12.7
FINLEY	ND	435	17.8	16	15.25
FOREST-RIVER	ND	435	17.61	15.81	15.06
FORFAR	ND	435	26.24	24.44	23.6
GALCHUTT	ND	435	14.61	12.81	12
GALESBURG	ND	435	16.86	15.06	14.3

GARDNER	ND	435	16.11	14.31	13.56
GARSKE	ND	435	20.43	18.63	17.8
GASCOYNE	ND	435	28.57	26.7	25.9
GENESEO	ND	435	13.3	11.5	10.7
GENOA	ND	435	25.43	23.63	22.8
GILBY	ND	435	17.61	15.81	15.06
GLADSTONE	ND	435	28.11	26.31	25.5
GLASSTON	ND	435	18.93	17.13	16.3
GLENBURN	ND	435	26.06	24.26	23.5
GLENFIELD	ND	435	19.86	18.06	17.31
GOODRICH	ND	435	23.05	21.25	20.5
GRACE-CITY	ND	435	20.43	18.63	17.8
GRAFTON	ND	435	17.8	16	15.25
GRAND-FORKS	ND	435	16.86	15.06	14.3
GRAND-HARBOUR	ND	435	20.05	18.25	17.5
GRAND-RAPIDS	ND	435	17.05	15.25	14.5
GRANDIN	ND	435	16.11	14.31	13.56
GRANVILLE	ND	435	24.93	23.13	22.3
GRENORA	ND	435	31.12	29.32	28.57
GUTHRIE	ND	435	24.18	22.38	21.63
GWINNER	ND	435	14.23	12.43	11.6
HAMAR	ND	435	19.48	17.68	16.9
HAMBERG	ND	435	22.86	21.06	20.3
HAMILTON	ND	435	19.68	17.88	17.13
HAMLET	ND	435	31.12	29.32	28.57
HAMPDEN	ND	435	20.88	19	18.25
HANKINSON	ND	435	12.55	10.75	10
HANNAFORD	ND	435	18.73	16.93	16.18
HANNAH	ND	435	22.49	20.69	19.9
HANSBORO	ND	435	22.86	21.06	20.3
HARTLAND	ND	435	27.35	25.55	24.8
HARWOOD	ND	435	15.55	13.75	13
HASTINGS	ND	435	17.05	15.25	14.5
HATTON	ND	435	17.05	15.25	14.5
HAVANA	ND	435	14.23	12.43	11.6
HAYNES	ND	435	25.01	23.2	22.4
HAZELTON	ND	435	22.1	20.3	19.5
HAZEN	ND	435	27.18	25.38	24.6
HEBRON	ND	435	25.86	24.06	23.3
HEIMDAL	ND	435	22.86	21.06	20.3

HENSEL	ND	435	19.68	17.88	17.13
HETTINGER	ND	435	25.88	24.08	23.3
HILLSBORO	ND	435	16.11	14.31	13.56
HONEYFORD	ND	435	17.61	15.81	15.06
HOOPLE	ND	435	18.73	16.93	16.18
HOPE	ND	435	16.86	15.06	14.3
HORACE	ND	435	15.55	13.75	13
HOVING	ND	435	14.23	12.43	11.6
HUNTER	ND	435	16.11	14.31	13.56
HURDSFIELD	ND	435	22.86	21.06	20.3
INKSTER	ND	435	17.05	15.25	14.5
JAMESTOWN	ND	435	17.98	16.18	15.4
JOHNSTOWN	ND	435	17.61	15.81	15.06
JOLIETTE	ND	435	19.68	17.88	17.13
JUDSON	ND	435	22.86	21.06	20.3
KARLSRUHE	ND	435	24.93	23.13	22.3
KARNAK	ND	435	18.73	16.93	16.18
KATHRYN	ND	435	16.86	15.06	14.3
KEITH	ND	435	19.68	17.88	17.13
KELSO	ND	435	16.11	14.31	13.56
KEMPTON	ND	435	17.05	15.25	14.5
KENASTON	ND	435	28.68	26.88	26.1
KINDRED	ND	435	15.55	13.75	13
KLOTEN	ND	435	18.93	17.13	16.3
KNOX	ND	435	22.49	20.69	19.9
LA-MOURE	ND	435	16.86	15.06	14.3
LAKE-WILLIAMS	ND	435	21.93	20.13	19.38
LAKOTA	ND	435	18.73	16.93	16.18
LANDA	ND	435	25.68	23.88	23.1
LANGDON	ND	435	20.88	19	18.25
LANSFORD	ND	435	26.43	24.63	23.8
LARIMORE	ND	435	17.05	15.25	14.5

Source: Rates provided by Burlington Northern.

Appendix E

General Railway Analysis

The tables below show the difference between actual and regulated or maximum rates. As can be seen in Table E.1. the actual rates charged by CN and CP do differ at some points. Specifically. over 50 percent of the points are above (+) the legislated rates. The reasons for this are several. First. as mentioned below. Bill C-14. which now governs the Canadian railway industry. allows rates to exceed the maximum rate. with the Agency's approval. in cases of joint line movements. Higher rates. needed to defray additional costs. may also be charged with the Agency's approval. with respect to certain railway cars other than hopper cars. box cars. or shipper supplied tank cars (Bill C-14. p.68).

Table E.1 Rate Differences Between Actual and Maximum rates

Service Point	Average Actual Rate	Maximum Rate	(+, - ,=)
Acme, AB	23.74	23.44	(+)
Aldersyde, AB	23.92	22.85	(+)
Barrhead, AB	26.41	26.41	(=)
Bassano, AB	25.73	24.04	(+)
Burstall, Sk.	33.01	32.42	(+)
Edmonton, AB	25.22	25.22	(=)
Irricana, AB	24.77	22.85	(+)
Lomond, AB	24.87	25.22	(-)
Oyen, AB	34.94	30.41	(+)
Peace River, AB	31.03	30.63	(+)
Red Deer, AB	23.61	24.62	(-)
Sangudo, AB	26.31	26.41	(-)
Taber, AB	26.23	25.81	(+)
Three Hills, AB	29.05	28.04	(+)
Turin, AB	25.61	25.81	(-)
Vegreville, AB	26.71	27.00	(-)
Westlock, AB	26.41	26.41	(=)
Wetaskiwin, AB	26.96	25.81	(+)
Willingdon, AB.	28.58	28.25	(+)

Column three amounts are computed from Appendix D shown in Appendix C.

The tables in this appendix are explained as follows. The weights are the percentage of each cost element in combined total volume-related costs, and combined total line-related variable cost. These are shown in Table E.4. As seen under the *Weights* column, 0.4155 for labour means that labour is 41.55 percent of total volume-related cost, 0.1490 for fuel means that it is 14.90% of total volume related cost, and so forth. These weights are determined from Table E.5. For example, using the numbers under the COM. TOTAL column, in Table E.5, the weight for labour, in Table E.4, under the VOLUME-RELATED heading, of 0.4155 is the ratio 297.010/714.776. Likewise, the weight for fuel, under the VOLUME-RELATED heading, of 0.1490 is the ratio 106.497/714.776; and the weight for labour, under the LINE-RELATED heading, of 0.3235 is the ratio 33.337/103.048, and so forth. Once these weights are computed, the industry composite index can be determined. Note that the index numbers are not set by any specific formula. The index numbers are derived from meetings, special reports done for the NTA, OECD reports, submissions from CN and CP, etc., when all this information is taken into consideration, conclusions are made as to how much wages, say, increase in the following year. Thence, the number 1.0740, under the 1985/86 INDEX column, says that wages will increase by roughly 7.4 percent in 1985/86. This same procedure, of gathering information and making *educated guesses*, is how the index columns are computed. Knowing the weights and the index numbers, the industry composite index can be derived. This is done as follows. Under the VOLUME-RELATED heading, for the 1985/86 year, the industry composite of 1.0767 is derived as

$0.4155 \cdot 1.0740 = 0.4463$

$0.1490 \cdot 1.0290 = 0.1533$

$0.2337 \cdot 1.0610 = 0.2480$

$0.0383 \cdot 1.1219 = 0.0430$

$0.1605 \cdot 1.1382 = 0.1827$

$0.0030 \cdot 1.1607 = 0.0035$

SUM $= 1.0767$

the other industry composites are derived using the same method. The industry composite number of 1.0767 says that volume-related costs increase by 7.67 percent in 1985/86.

The method of computing weights leave much room for criticism. Take labour for example, if there are strikes or work stoppages that affect the share of wages in total volume-related costs then this may not be picked up in the index that adjusts upwards previous years rates. Note that 1984 is the base year, and from 1985/86 to 1986/87 the labour share is increasing, i.e. it goes from 1.0740 in 1985/86 to 1.1150 in 1986/87, but line-related costs are falling as can be seen from comparing columns four and six in Table E.4. This would make sense due to branchline abandonments.

Once the weights are determined, industry composite input price indices are computed, as shown above. This index method is now used, only, as the four year costing review is no longer done to determine freight rates. As was noted, using the index approach only, fails to take into consideration any productivity gains experienced by the railways. It is expected that the gap between freight rates and costs will increase as input prices continue to rise each year. Table E.5, shows costs by factor input. Any freight rate should cover total variable costs. Specifically, total variable costs, in Table E.5, of $461.719 million dollars and $356.105 million dollars, respectively, should be covered.

Freight rates charged in each subdivision will, in most cases, vary. The actual rates charged by CN and CP for the movement of grain to Vancouver can be seen in Appendix C under the VC MAX column: SUB is subdivisions, RWY is the railways, VC MILES is the number of miles to Vancouver, and TB MILES is the number of miles to Thunder Bay. Regulated rates can be seen in Appendix C.

Table E.2 CN Volume-Related Variable Costs for 1984 and 1980

Cost Element	1984 (M $)	1980 (M $)	C/T 1984	C/T 1980
Operating Costs				
Track and Roadway Property Maintenance	$61.304	$31.465	$3.51	$2.31
Freight Car Maintenance	67.808	42.583	3.87	3.13
Locomotive and Caboose Maintenance	47.453	21.165	2.72	1.56
Train Operations	125.132	69.320	7.16	5.10
Yard Operations	15.070	14.326	0.86	1.05
Billing and Customer Service	11.083	7.279	0.63	0.54
TOTAL OPERATING COSTS	327.850	186.138	18.75	13.69
Depreciation				
Track and Roadway Property	5.490	2.650	0.32	0.19
Locomotives, Cabooses and Freight Cars	4.369	4.409	0.25	0.32
Signals, Communications and Other Property	5.282	1.236	0.30	0.10
TOTAL DEPRECIATION	15.141	8.295	0.87	0.61
Cost of Capital				
Track and Roadway Property	40.226	18.412	2.30	1.35
Locomotives, Cabooses and Freight Cars	12.285	10.149	0.71	0.75
Signals, Communications and Other Property	11.421	5.287	0.65	0.39
Working Capital	3.751	0	0.22	0
TOTAL COST OF CAPITAL	67.683	33.848	3.88	2.49
TOTAL VOLUME-RELATED VARIABLE COSTS	410.674	228.281	23.50	16.79

Source: Canadian Transport Commission. *Report on the Variable Costs and Revenues of the Railway Companies for the Movement of Grain in 1984 under the Western Grain Transportation Act*. Railway Transport Committee. March 1986. p.20.
M=Millions. and C/T = Cost per Tonne.

Table E.3 CP Volume-Related Variable Costs for 1984 and 1980

Cost Element	1984 (M $)	1980 (M $)	C/T 1984	C/T 1980
Operating Costs				
Track and Roadway Property Maintenance	$31.768	$17.056	$2.05	$1.27
Freight Car Maintenance	50.641	42.252	3.28	3.15
Locomotive and Caboose Maintenance	40.461	20.667	2.62	1.54
Train Operations	100.066	52.260	6.48	4.20
Yard Operations	14.961	9.339	0.97	0.70
Billing and Customer Service	6.960	8.792	0.45	0.66
TOTAL OPERATING COSTS	244.857	154.366	15.85	11.52
Depreciation				
Track and Roadway Property	3.471	2.518	0.23	0.19
Locomotives, Cabooses and Freight Cars	6.498	4.406	0.41	0.33
Signals, Communications and Other Property	2.279	0.992	0.15	0.07
TOTAL DEPRECIATION	12.248	7.916	0.79	0.59
Cost of Capital				
Track and Roadway Property	21.641	15.751	1.40	1.18
Locomotives, Cabooses and Freight Cars	14.405	10.496	0.93	0.78
Signals, Communications and Other Property	7.090	5.353	0.46	0.40
Working Capital	3.861	0	0.25	0
TOTAL COST OF CAPITAL	46.997	31.600	3.04	2.36
TOTAL VOLUME-RELATED VARIABLE COSTS	304.102	193.882	19.68	14.47

Source: Ibid., p.21

Table E.4 Composite Input Price Indices For CN/CP

	Weights	1984 Index	1985/86		1986/87	
VOLUME-RELATED			**Index**	**Incr.**	**Index**	**Incr.**
Labour	0.4155	1.0000	1.0740	1.0740	1.1150	1.0382
Fuel	0.1490	1.0000	1.0290	1.0290	0.9610	0.9339
Material	0.2337	1.0000	1.0610	1.0610	1.0950	1.0320
Depreciation	0.0383	1.0000	1.1219	1.1219	1.1864	1.0577
Cost of Capital	0.1605	1.0000	1.1382	1.1382	1.0866	0.9547
Tank Car Rental	0.0030	1.0000	1.1607	1.1607	1.2605	1.0860
Industry Composite		1.0000	1.0767	1.0767	1.0860	1.0086
LINE-RELATED						
Labour	0.3235	1.0000	1.0740	1.0740	1.1150	1.0382
Material	0.2535	1.0000	1.0610	1.0610	1.0950	1.0320
Depreciation	0.0624	1.0000	1.0212	1.0212	1.0399	1.0183
Cost of Capital	0.3606	1.0000	1.0401	1.0401	0.9570	0.9201
Industry Composite		1.0000	1.0552	1.0552	1.0483	0.9935

Source: Canadian Transport Commission. *The Determination of the Annual Rate Scale for the Movement of Western Grain By Rail for Crop Year 1986/87.* Confidential Report NO. REA-CD-86-03. April 30, 1986, p.24. Incr=Increment.

Table E.5 CN and CP Costs By Factor Input in 1984

L-R VC	CN (M $)	CP (M $)	COM. TOTAL	PER CENT
Labour	$17.013	$16.324	$33.337	32.35%
Material	11.887	14.238	26.125	25.35
Depreciation	3.367	3.067	6.434	6.24
Cost of Capital	18.447	17.892	36.339	35.27
Working Capital	0.331	0.482	0.813	0.79
TOTAL L-R VC	51.045	52.003	103.048	100.00
V-R VC				
Labour	176.809	120.201	297.010	41.55
Material	93.194	73.832	167.026	23.37
Fuel	56.802	49.695	106.497	14.90
Tank Car Rentals	1.045	1.129	2.174	0.30
Depreciation	15.141	12.248	27.389	3.83
Cost of Capital	63.932	43.136	107.068	14.98
Working Capital	3.751	3.861	7.612	1.07
TOTAL V-R VC	410.674	304.102	714.776	100.00
TOTAL VC	461.719	356.105	793.300	

Source: Canadian Transport Commission. *Report on the Variable Costs and Revenues of the Railway Companies for the Movement of Grain in 1984 under the Western Grain Transportation Act.* Railway Transport Committee. March 1986. p.24. COM. TOTAL= COMBINED TOTAL L-R VC = LINE-RELATED VARIABLE COST. V-R VC=VOLUME-RELATED VARIABLE COST.

E.1 Approximating the Input Price Index

The calculation of the input price indices deserves more attention because it is used in current rate calculations. The calculation of the indices are done basically by taking the average of all relevant information. most of which comes from the railways, and private research groups, on expectations of price inflation. To be more specific, indices are estimated on a calendar year basis, but since the crop year is from August 1 of any year to July 31 of the next year, weights of 5/12 and 7/12 of the first and second calendar year, respectively, are allocated to the crop year in question (Farrow and Koh 1988, p.10.). For example, Table E.6 shows the railway input prices for the calendar year and crop year.

Table E.6 Railway Input Prices: Calendar and Crop year

Calendar Year Price Indices(1984=1)	**1984**	**1985**	**1986**	**1987**	**1988**	**1989**
Labour	1.0000	1.0500	1.0868	1.1194	1.1641	1.2222
Fuel	1.0000	1.0930	0.9269	0.9482	0.9254	0.960
Materials	1.0000	1.0410	1.0520	1.0657	1.1147	1.177
Crop Year Price Indices(1984=1)	**1984**	**1985/86**	**1986/87**	**1987/88**	**1988/89**	
Labour	1.0000	1.0714	1.1058	1.1455	1.1981	
Fuel	1.0000	0.9961	0.9393	0.9349	0.9454	
Materials	1.0000	1.0474	1.0600	1.0943	1.1508	

Source: Canadian Transport Commission, Re-estimation and Forecast by Economics Practice, The Coopers & Lybrand Consulting Group, 1988.

The computation of the crop year index, using the weights 5/12 and 7/12 are done as follows: For 1985 of the calendar year wages increased by 5 percent, and in 1986 it increased by 8.68 percent as compared to 1984. With this information the index for the crop year 1985/86 is $1.05 \cdot \frac{5}{12} = 0.4375$, and $1.0868 \cdot \frac{7}{12} = 0.6339$; by adding these two amounts $0.4375 + 0.6339 = 1.0714$ gives the index for the crop year 1985/86, other numbers are computed similarly.

E.2 Adjustments of Ceiling Freight Rates

The ceiling or maximum rates, described above, are adjusted for shipment of Board grains such as Wheat, Durum, Designated Barley and Feed barley. The Canadian Wheat Board (CWB) adjusts the maximum rates for Board grains due to specific pooling arrangements. The story is as follows. When farmers deliver grain to an elevator, the CWB makes the appropriate deductions for freight costs. Since the WGTA has been eliminated, farmers must now pay the full cost of freight. This means that freight deductions will be higher from now on, or at least in the 1995/96 crop year. Another factor affecting the increase in the freight deduction is the change in the CWB Act, which moved the eastern pooling point from Thunder Bay to the St. Lawrence (CWB 1995, p.2). The reasons for changing the pooling points is because of unequal grain prices at the Thunder Bay and Vancouver ports. The reason prices are higher at Vancouver relative to prices at Thunder Bay is due, for one, to greater demand for grain from Pacific Rim countries thus bidding grain prices up, and increasing costs through the Great Lakes system. So by moving the pooling point farther east to the lower St. Lawrence, it is hoped that this will restore the equal balance of prices between the two ports (Ibid., p.2).

Implicit in the Freight Adjustment Factor (FAF) is the portion of the costs of moving grain through the Great Lakes system for wheat, durum, and designated barley; an adjustment is also made for farmers delivering grain to country elevators close to the port of Churchill, or markets in the

U.S. (Ibid. p.2). A separate FAF exists for feed barley which provides an adjustment for those farmers delivering grain to country elevators close to markets in the U.S. (Ibid. p.2).

E.3 Computing Freight Rate Deductions

The specifics of this policy of freight deductions is as follows. Farmers shipping wheat and durum will be deducted the lesser of the freight rate to Vancouver or rail freight to Thunder Bay plus the FAF (Ibid. p.2). For feed barley, the deductions will be the lesser of rail freight to Vancouver plus the FAF or rail freight to Thunder Bay plus the full cost of using the Seaway ($23.75 per tonne) (Ibid., p.2). For designated barley, the deductions will be the lesser of rail freight to Vancouver or rail freight to Thunder Bay plus the FAF unless the farmer agrees to pay the additional freight costs (Ibid., p.2). The following tables demonstrate this freight deduction calculation. For Table E.7 freight deduction for a farmer in Carman, Alberta, is analysed, for Table E.8 deductions for a farmer in Watrous, Saskatchewan are analysed, and for Table E.9 deductions for a farmer in Pincher Creek, Alberta are analysed.

Table E.7 Freight Rate Deduction Calculations: Carman, Manitoba

Grain	RF To TBay	FAF	Total	RF To Vanc.	FAF	Total
Wheat	18.62	12.67	31.29	45.09	0.00	45.09
Durum	18.62	0.47	19.09	45.09	0.00	45.09
Designated Barley	18.62	0.04	18.58	45.09	0.00	45.09
Feed Barley	18.62	23.75	42.37	45.09	0.00	45.09

Source: Canadian Wheat Board. *How the Freight Deduction is Calculated.*

July 27, 1995, p.3. RF=Rail Freight. TBay=Thunder Bay. Vanc.=Vancouver

Table E.8 Freight Rate Deduction Calculations: Watrous, Saskatchewan

Grain	RF To TBay	FAF	Total	RF To Vanc.	FAF	Total
Wheat	27.00	12.67	39.67	34.26	0.00	34.26
Durum	27.00	1.78	28.78	34.26	0.00	34.26
Designated Barley	27.00	1.95	28.95	34.26	0.00	34.26
Feed Barley	27.00	23.75	50.75	34.26	0.00	34.26

Source: Ibid., p.3.

Table E.9 Freight Rate Deduction Calculations: Pincher Creek, Alberta

Grain	RF To TBay	FAF	Total	RF To Vanc.	FAF	Total
Wheat	36.64	12.67	49.31	25.81	0.00	25.81
Durum	36.64	1.78	38.42	25.81	0.00	25.81
Designated Barley	36.64	2.00	38.64	25.81	0.00	25.81
Feed Barley	36.64	23.75	60.39	25.81	3.91	21.90

Source: Ibid., p.3.

The numbers under the *Total* column are dollars per tonne. These numbers are exactly the ones you will find on the FBMInet system.[1]

[1]This system is an information bulletin which provides access to anyone on prairie freight rates for the 1995-96 crop year. Given a modem, one can dial-up using the number 438-2209.

Appendix F

The Survey

PART I

Size of Farm in acres:

WHEAT ______
BARLEY ______
CANOLA ______
OTHER ______
(If **OTHER** state: ____________________)

Distance to **nearest** delivery point: ______ km

PART II

SCENARIO 1: If rail freight rate increases by $4/tonne at my local delivery point.

I will ☐ increase
☐ decrease
☐ unchange
acres of **WHEAT** by ______%

I will ☐ increase
☐ decrease
☐ unchange
acres of **CANOLA** by ______%

I will ☐ increase
☐ decrease
☐ unchange
acres of **BARLEY** by ______%

I will ☐ increase
☐ decrease
☐ unchange
acres of **OTHER** by ______%

I am prepared to haul my grain
☐ 0-25 km
☐ 26-75 km
☐ 76-125 km
☐ 126 km and more
if the rate I am currently charged is available at another delivery point.

SCENARIO 2: If rail freight rate increases by $8/tonne at my local delivery point.

I will ☐ increase
☐ decrease
☐ unchange
acres of **WHEAT** by ______%

I will ☐ increase
☐ decrease
☐ unchange
acres of **CANOLA** by ______%

I will ☐ increase
☐ decrease
☐ unchange
acres of **BARLEY** by ______%

I will ☐ increase
☐ decrease
☐ unchange
acres of **OTHER** by ______%

I am prepared to haul my grain
☐ 0-25 km
☐ 26-75 km
☐ 76-125 km
☐ 126 km and more
if the rate I am currently charged is available at another delivery point.

SCENARIO 3: If rail freight rate increases by $16/tonne at my local delivery point.

I will ☐ increase
☐ decrease
☐ unchange
acres of **WHEAT** by ______%

I will ☐ increase
☐ decrease
☐ unchange
acres of **CANOLA** by ______%

I will ☐ increase
☐ decrease
☐ unchange
acres of **BARLEY** by ______%

I will ☐ increase
☐ decrease
☐ unchange
acres of **OTHER** by ______%

I am prepared to haul my grain
☐ 0-25 km
☐ 26-75 km
☐ 76-125 km
☐ 126 km and more
if the rate I am currently charged is available at another delivery point.

SCENARIO 4: If rail freight rate increases by $24/tonne at my local delivery point.

I will ☐ increase
☐ decrease
☐ unchange
acres of **WHEAT** by ______%

I will ☐ increase
☐ decrease
☐ unchange
acres of **CANOLA** by ______%

I will ☐ increase
☐ decrease
☐ unchange
acres of **BARLEY** by ______%

I will ☐ increase
☐ decrease
☐ unchange
acres of **OTHER** by ______%

I am prepared to haul my grain
☐ 0-25 km
☐ 26-75 km
☐ 76-125 km
☐ 126 km and more
if the rate I am currently charged is available at another delivery point.

PART III

What changes in your farm business would you make if faced with a major freight rate increase at your delivery point?

The following Tables F.1 - F.6. present comprehensive survey results. Table F.1 presents the characteristics of surveyed farms. The table is to be read horizontally respective to each farmer. Distances are the current distance farmers have to travel to deliver grain to their local elevator. Tables F.2.-F.5 are the reactions of farmers as indicated in the surveys. The tables should be read as follows: in Table F.2. farmer 1 would unchange (U) acres planted of wheat. if rates increased by $4/tonne: and would be willing to haul his grain 0-25 km to another delivery point if it realized a better rate. Other rows should be read in a similar manner.

Table F.1: Characteristics of Surveyed Farms

Farmer	Farm Size (acres)				Distance(Km)
	Wheat	Barley	Canola	Other	
1	6400				10
2	1300			360 (Mustard)	10
3	1500	1000	1000	400 (Summerfallow)	7
4	855	265	480		10
5					5
6	420	300	200	580 (Summerfallow)	7
7	1000	400	500	150 (Linola)	16
8	160	160			12
9	65				16
10	685	80	120		14
11	625	120	100		13
12	765	320	140		11
13	600			400 (Summerfallow)	4
14	700	300		1000 (Summerfallow)	10
15	1240		150	850 (Summerfallow)	12
16	727		230	80 (Flax), 793 (Fallow)	10
17	2200		1000		20

Table F.2 Survey Result for Scenario 1: $4/tonne Increase

Farmer	Wheat			Barley			Canola			Other			Haul
	I	D	U	I	D	U	I	D	U	I	D	U	
1			yes										0-25
2		20%		10%						10%			76-125
3			yes			yes			yes			yes	0-25
4		30%		20%			10%						26-75
5			yes			yes			yes			yes	0-25
6			yes			yes			yes			yes	0-25
7		30%			30%		30%			20%			76-125
8			yes			yes							26-75
9			yes			yes			yes				0-25
10			yes			yes			yes				0-25
11		yes		yes			yes						0-25
12		10%		20%			50%						0-25
13			yes									yes	0-25
14			yes			yes						yes	0-25
15			yes						yes			yes	0-25
16			yes						yes			yes	0-25
17			yes						yes				0-25

I=Increase, D=Decrease, U=Unchange

Table F.3 Survey Result for Scenario 2: $8/tonne Increase

Farmer	Wheat			Barley			Canola			Other			Haul
	I	D	U	I	D	U	I	D	U	I	D	U	
1			yes										0-25
2		50%		30%						20%			76-125
3			yes			yes			yes			yes	0-25
4		40%		30%			10%						26-75
5			yes			yes			yes			yes	0-25
6			yes			yes			yes			yes	0-25
7		50%			50%		60%			30%			126+
8			yes			yes							26-75
9			yes			yes			yes			yes	0-25
10			yes		5%				yes				26-75
11		yes		yes			yes						0-25
12		10%		20%			50%						26-75
13			yes									yes	0-25
14		100%			100%							yes	0-25
15			yes						yes			yes	26-75
16			yes						yes			yes	0-25
17			yes						yes				0-25

Table F.4 Survey Result for Scenario 3: $16/tonne Increase

Farmer	Wheat			Barley			Canola			Other			Haul
	I	D	U	I	D	U	I	D	U	I	D	U	
1		30%											76-125
2		60%		30%						30%			76-125
3		100%			100%			100%			100%		0-25
4		40%		30%			10%						26-75
5			yes			yes			yes			yes	0-25
6			yes			yes			yes			yes	0-25
7			yes			yes			60%	40%			126+
8		30%			30%								26-75
9			yes	yes					yes			yes	0-25
10			yes		5%				yes				26-75
11		yes		yes			yes						26-75
12		10%		20%			50%						76-125
13			yes									yes	26-75
14		100%			100%								0-25
15		20%					20%			10%			26-75
16			yes						yes			yes	0-25
17		20%							yes				0-25

Table F.5 Survey Result for Scenario 4: $24/tonne Increase

Farmer	Wheat			Barley			Canola			Other			Haul
	I	D	U	I	D	U	I	D	U	I	D	U	
1		50%											26-75
2													
3		100%			100%			100%			100%		0-25
4		40%		30%			10%						26-75
5			yes			yes			yes			yes	0-25
6			yes			yes			yes			yes	0-25
7			yes			yes			yes			yes	126 +
8		30%			30%								26-75
9			yes	yes					yes			yes	0-25
10	20%				10%		40%						26-75
11		yes		yes			yes						76-125
12		10%		20%			50%						76-125
13			yes									yes	26-75
14		100%			100%								0-25
15		30%					30%			yes			76-125
16			yes						yes			yes	0-25
17		20%							yes				0-25

Table F.6 Farmers' Comments

Farmer	Comments
1	Grow specialized crops. Increase livestock. Sell operation.
2	Seed some acres to forage production. Seed some acres to seed production. Rent to neighbours-if there are still any left.
3	Down size farm and seed it to grass. Or, sell to the Hutterites. Freight is killing the farmer now.
4	Cash rent land to someone else.
5	Sell farm.
6	Not prepared to haul grain any further than present. Not at risk at losing a delivery point because delivery is made to a mainline. Would consider a trucking program if freight rates were better elsewhere.
7	Grow grains that would sell locally such as feed barley and oilseeds.
8	With the little land, not much changes would be made.
9	Rent out land or sell farm.
10	Start feeding more grain to livestock if the price of livestock was high. Change seed to the highest yielding products found to make up volume, or more yield to compensate for the higher freight price. Currently paying \$40/tonne at elevator, combined with elevator fees and everything comes to \$65/tonne, which is very high. Farmer can get \$150/tonne on certain grains, take \$65 out of that leaves \$85/tonne. This is not much to go on.
11	Fight to get rid of the Wheat Board so I could market my own produce and pay actual shipping costs to domestic markets.

12	Explore other options. Feed to animals. Truck to USA.
13	Find alternate delivery points. Diversify livestock.
14	
15	I would grow more Canola. Sell more grain to cattle feeders. Have to purchase grainliner. Look to the US for selling grain. Live on a more modest scale.
16	
17	

Appendix G

Policy Changes in the Industry

G.1 The Western Grain Transportation Act (WGTA)

The reform of the *WGTA* aims at providing the grain industry with access to competitive transportation services which would enable prairie grain farmers and processors to compete effectively in international markets (Transport Canada 1995): In fact, farmers are now paying the full freight cost of grain transportation as a result of moving towards a more competitive railway and farming industry.

The proposed and actual changes to the Act are the following (Transport Canada 1995). Subsidies to the railways have been terminated effective August 1, 1995. Lower rates and efficiency improvements will be encouraged by applying all of the shipper-oriented provisions of the National Transportation Agency (NTA) to WGTA movements effective August 1, 1995. These provisions allow for captive shippers to have improved access to other transportation modes. Access to the NTA provisions will give shippers more power to negotiate rates based on volume, efficiency, and competitive considerations. To protect captive and smaller shippers, maximum rates will be regulated up to July 1, 2000.[1] These rate regulations will be sunsetted so that the NTA provisions apply after the transition period, subject to a review to determine whether the legislation be amended. To ease in the new rate regime, the WGTA rate adjustment (estimated at an extra \$1.80/tonne) for 1995-96 will be deferred. To simplify the rate regime, the following rate provisions will be eliminated: CN adjustment, port parity and route parity. The maximum rate scale will be adjusted annually starting in 1996-97 to reflect: 1) cumulative changes in the railways' volume-related composite price index (i.e. annual inflation adjustment, see Table E.4 in Appendix E) so that the maximum rate scale

[1] Bill C-14 states that the industry will be reviewed in 1999, at this time rates may be commercial.

reflects cost changes. 2) abandonment of grain-dependent branch lines causing a decrease in the costs of the railways: The adjustment will be based on a factor of $10.000 per mile. The restrictions on incentive rates will be eliminated. No other changes will be made to the maximum rates for productivity or changes in competitive and contiguous points. An industry-led assessment of revenue and cost performance will be undertaken prior to 1998-1999 crop year. A statuary review will be undertaken throughout 1999 to determine the overall effectiveness of the rate regulations and the NTA provisions in improving the efficiency of the grain transportation and handling system. Abandonnement protection was lifted on all lines (including non-grain lines) effective December 31. 1995. Funding assistance will be considered for trucking and for municipal roads when lines are abandoned. With the elimination of the cost-based rate regime and of rate payments to the railways. the role of the NTA in rate and payment matters will be eliminated except for the determination of the changes in the maximum rates. Policies related to car allocation. the disposal of the government grain cars. and the transportation function of the CWB will not be changed at this time. Regulated minimum compensatory rates for canola products were terminated effective August 1. 1995.

G.2 The Effects of Bill C-14

The changes in the structure of the railway industry. resulting from the elimination of the WGTA and the quadrennial costing review. help to move the industry closer towards deregulation. Once the government leaves the rate setting responsibility to the railways. rate deregulation. to a greater extent. will blanket the industry. Although. the government will most likely regulate codes of conduct in the industry (as will be discussed fully below).

Bill C-14. replaces the *National Transportation Act* and establishes the *Cana-*

dian Transportation Act. Also, the National Transportation Agency (NTA) is continued as the Canadian Transportation Agency (CTA). The key components of the Bill offers a "more commercially oriented process for railway companies to sell or lease surplus rail lines to new operators, rather than discontinue service" (Bill, p.1a). And, it continues protection for shippers using railways that would ensure good service at competitive rates (Ibid.).

A law most relevant to this thesis is introduced in Bill C-14 as the freight rate multiplier (FRM), used to compute the maximum (or ceiling) freight rate scale found in schedule III (Appendix A): In that, last years rates are multiplied by this multiplier thus giving this crop year rates. Therefore, rates are now indexed to inflation (see Chapter 2 for the implication of this new method). The freight rate multiplier is defined as (Bill C-14, p.71):

$$\left(1 + \frac{A - B}{B}\right) \cdot \left(1 - \frac{C \cdot \$10,000}{\$1,052,800,000}\right) \qquad (G.1)$$

where

A is the volume-related composite price index as determined by the Agency, for the crop year for which the Agency is determining the maximum rate scale

B is the volume-related composite price index for the 1994-1995 crop year

C is the number of miles of grain-dependent branch lines set out in Schedule I whose operation was discontinued from April 1, 1994 to April 1 before the crop year for which the Agency is determining the maximum rate scale

The amount of $10.000 is what is gained when a mile of branchline is abandoned, thus it is an incentive for railways to abandon branchlines: the amount $1.052.800.000 is the total combined cost of CN and CP. The crop year is the period beginning on August 1 in any year and ending on July 31 in the next year (Bill C-14, p.65). The maximum rate scale is the amount per tonne for the movement of grain[2] over each range of distance set out in Schedule III for the 1995-96 crop year.

Bill C-14 also states that rates charged by the railways for the movement of grain over the ranges described in Schedule III, must not exceed the maximum rate scale. Excluded from the rates for the movement of grain are a) demurrage; b) rates for the storage of railway cars loaded with grain; and c) benefits for loading or unloading grain before the expiration of the period agreed on for loading or unloading grain (Bill C-14, p.67). The railways may charge a rate higher than the maximum rate scale, with the Agency's approval, if it is a joint line movement[3]. Higher rates, needed to defray additional costs, may also be charged, with the Agency's approval, with respect to *special* railway cars other than hopper cars, box cars, or shipper supplied tank cars (Bill C-14, p.68).

G.3 Current Regulations as Outlined in Bill C-14

The current regulations which directly affect the railway companies are clearly outlined in Bill C-14. The general powers of the railways are limitless in terms of construction or operation of the railway (Bill C-14 (Bill), p.42). In terms of

[2]Grain is defined as any grain or crop or product included in Schedule II that is grown in the Western Division (Bill C-101, p.65).

[3]A joint line movement means any rail traffic that passes over a continuous route in Canada operated by two or more railway companies.

railway lines. CN and CP cannot construct railway lines without the approval of the Agency (Bill. p.44). In terms of rates and tariffs, the Bill states (p.50) "A rate or condition of service established by the Agency under this Division must be commercially fair and reasonable". These rates are the maximum rates for the railways. The Bill also states (p.54) "...a railway company shall not charge a rate in respect of the movement of traffic or passengers unless the rate is set out in a tariff that has been issued and published in accordance with this Division and is in effect". Also. "A railway company that proposes to increase a rate in a tariff for the movement of traffic shall publish a notice of the increase at least twenty days before its effective date" (Bill. p.55). Also the tariff must include any information that the Agency may prescribe by regulation (Bill. p.55). And. "The rates of a prescribed railway company for the movement of grain in a crop year must not exceed the rates set out in the maximum rate scale (shown above) for that crop year" (Bill. p.72). Each rate must also be derived from the rate applicable to the appropriate range of distance in the maximum rate scale for that crop (Bill. p.73). However. as mentioned earlier. higher (than maximum) rates may be granted for joint line movements (Bill. p.73).

With respect to confidential contracts. the Bill states (p.58) "A railway company may enter into a (confidential) contract with the shipper that the parties agree to keep confidential respecting a) the rates to be charged by the company to the shipper: b) reductions or allowances pertaining to rates in tariffs ...: c) rebates or allowance pertaining to rates...: d) any conditions relating to the traffic to be moved by the company".

The steps for discontinuing a line are also under the authority of the Agency. The Bill sets out a "Three year" plan which says that a railway company must keep a plan indicating whether it continues to keep or operate a line. or whether. within the next three years. it intends to sell. lease. transfer the line. or discontinue the line (Bill. p.66). Also, it must advertise the availability of the line to possible operators.

Moreover, the Agency still has full control over the quality of the rail service being provided by the rail companies. The Bill states (p.54) "If the Agency determines that a (rail) company is not fulfilling any of its service obligations, the Agency may a) order that i) specific works be constructed or carried out, ii) property be acquired, iii) cars, or other equipment be allotted, distributed or used as specified by the Agency, and iv) order the company to fulfill that obligation".

Lastly, and most importantly, the Bill promises a review during 1999, at which time "the Minister shall, in consultation with shippers, railway companies and any other persons that the Minister considers appropriate, conduct and complete a review of the effect of the Act, and in particular this Division, on the efficiency of the grain transportation and handling system and on the sharing of the efficiency gains as between shipper and railway companies" (Bill, p.74). It is, however, up to the Minister to determine whether the repeal of this Division (the Agency) and Schedules I, II, III (see pp.130-132 of Bill C-14 for I; see Appendix A for II and III) will have a significant adverse effects on shippers and whether they should be repealed (Bill, p.74). The repeal of Schedule III is important for this thesis, and means that railway companies can set their own rates: This is what is meant by rate deregulation, and is equivalent to full commercial rates. This thesis tests, in part, the impact of increases in these commercial rates on agricultural production in Canada.

Appendix H

Canadian and US Rate Analysis

This appendix compares Canadian and US railway rates. It should be noted that while these results are meant to be comprehensive, they are not, by any means, complete. The objective of this section is to give an indication of differences between rates in a (rate) deregulated industry, and a (rate) regulated industry.

H.1 Data

All data used for analysing rate differences are defined in Table H.1, and can be seen in appendices C and D.

Table H.1 Railway Data

Variables	Definitions
Canadian Rail Rates to Vancouver	Rates for the 95-96 crop year. Rates for 184 service points (see Appendix C).
US Rates to Minneapolis	Rates effective from July 1995, and include rates for Wheat and Barley. Rates for over 300 service points. (see Appendix D)

Source: Canadian Rates provided by an industry analyst.
US rates provided by Burlington Northern.

H.2 US and Canadian Freight Rate Analysis

The data used for Canada are the actual rates for transporting grain (wheat, durum, feed barley, designated barley) to the Vancouver port for CN and CP combined for the 1995-1996 crop year[1] For the US, actual rates set by Burlington Northern for shipping grain (wheat and barley) to Minneapolis, Minnesota. These rates were effective from June 1995. The results are presented for distances less

[1]These data do not indicate whether these are single or multi-car rate.

than or equal to five hundred miles, and greater than five hundred miles. The US rates are converted to Canadian rates by multiplying all US rates by $1.3410, the exchange rate quoted by the Bank of Nova Scotia rate April 18/1996. For the US, rates are segmented for cars 1-25, cars 26-51, and cars 52-300.

Table H.2 presents the total average rate differences between US and Canada. Again, US barley rates are higher than the Canadian rates, while US wheat rates are lower. In terms of percentages, the US barley rate is, at most, more than 22 percent higher than the Canadian rate; for wheat, the US rate is lower than 60 percent of the Canadian rate.

Table H.2 US and Canadian Total Average Rate Differences

Canadian		$28.23	
	1-25	**26-51**	**52-300**
US Barley	$34.57 (22.46%)	$32.16 (13.92%)	$31.10 (10.17%)
US Wheat	$18.75 (-33.58%)	$17.25 (-38.90%)	$11.14 (-60.54%)
Average US Rates	$26.66 (-6%)	$24.71 (-13%)	$21.12 (-25%)

Number of US service points, for barley, used were 348, for wheat 30.
Number of Canadian service points used were 184.
All amounts have been rounded off to the nearest decimal place.
Source: see Table H.1.

The last row (numbers in brackets) of Table H.3 indicates that average US rates are all lower than the Canadian average rate of $28.23. This is interesting since it gives some support to the argument that in deregulation Canadian rates are likely to fall, assuming the level of competition in Canada is similar to that in the US.

Appendix I

The Logit Model

The logit model, used to determine the probability of decreasing acres planted, uses a logistic function to model the dependent variable (White 1993, p.252):

$$P_t = E(Y = 1|X_i) = F(X_t'\beta) = \frac{1}{1 + e^{(-X_t'\beta)}} \quad (\text{I.1})$$

where e is the base of the natural logarithm, X_t is a n by n matrix of independent variables, DISTANCE, HAUL, and RATE, including a constant column, and β is an n by 1 vector of coefficients. The above equation is clearly nonlinear in the $X's$ as well as the $\beta's$, as a result, OLS can not be used. To see how to apply OLS to the above equation, some manipulations are required to get a linear expression on the right hand side of the equation. Proceed as follows. Since P_t is the probability that the dependent variable is 1, then $1 - P_t$ is the probability that the dependent variable is not 1, rather 0. So,

$$1 - P_t = \frac{1}{1 + e^{X_t'\beta}} \quad (\text{I.2})$$

dividing equations (I.1) by (I.2) and after simplification, get

$$\frac{P_t}{1 - P_t} = \frac{1 + e^{(X_t'\beta)}}{1 + e^{(-X_t'\beta)}} = e^{X_t'\beta}. \quad (\text{I.3})$$

By taking the natural log of eq.(I.3) the appropriate estimating equation is determined

$$L_i = ln(\frac{P_t}{1 - P_t}) = X_t'\beta \quad (\text{I.4})$$

where L_i is the log of the odds ratio (Gujarati, 1988), which means that the slope coefficients measure the change in L for a unit change in the $X_i's$, that is, it tells how the log-odds ratio change as X_i changes by a unit. The intercept is the log-odds ratio when $X_i = 0$–but has no physical meaning (Gujarati, 1988). The odds ratio $\frac{P_t}{1-P_t}$ is simply the probability of decreasing acres planted to the probability of increasing/unchanging acres planted (explained below). So if $P_t = 0.8$, then $\frac{0.8}{1-0.8} = 4$ says that odds are 4 to 1 in favor of a farmer decreasing acres planted.

It can be shown that the error term in the logit model is heteroscedastic (it also follows the binomial distribution due, primarily, to the dichotomous nature of the dependent variable). To see this and to simplify the analysis, without loss of generality, let the regression equation be given by

$$Y_i = \beta_o + \beta_1 X_i + \epsilon_i$$

solving for ϵ_i get

$$\epsilon_i = Y_i - \beta_o - \beta_1 X_i$$

noting that if $Y_i = 1$, $\epsilon_i = 1 - \beta_o - \beta_1 X_i$, and if $Y_i = 0$, $\epsilon_i = -\beta_o - \beta_1 X_i$. Y_i has the distribution that when $Y_i = 0$, the probability is $1 - P_i$, and when $Y_i = 1$ the probability is P_i, where $P_i = E(Y_i|X_i) = \beta_o + \beta_1 X_i + \epsilon_i$. Now, by definition (Gujarati, p.470)

$$var(\epsilon_i) = E(\epsilon_i - E(\epsilon_i))$$

$$= (-\beta_o - \beta_1 X_i)^2(1 - P_i) + (1 - \beta_o - \beta_1 X_i)^2(P_i)$$

$$= (\beta_o + \beta_1 X_i)(1 - \beta_o - \beta_1 X_i)$$

or

$$var(\epsilon) = E(Y_i|X_i)(1 - E(Y_i|X_i)) = P_i(1 - P_i)$$

which shows that the variance of ϵ is heteroscedastic because it is dependent on the conditional expectation of Y, which is dependent on the value taken by X (Gujarati, p.471), and so the variance depends on X. But this can be resolved by conventional methods. The cause of the heteroscedasticity was believed to be the DISTANCE variable.[1] To get efficient estimates for the coefficients, weighted least

[1] The reason for choosing the distance variable is because it is believed that in this cross-sectional study distance to delivery point effects the farmers choice of whether or not to change production: the greater the distance between farmer and elevator, the greater the chances that farmers will decrease production. For example, consider Tables F.1-F.5, in

squares (WLS) is used on the above model (eq.(I.1)). Since it is believed that ϵ is effected by the DISTANCE ($=X_1$) variable, for example,

$$E(\epsilon_i^2) = \sigma^2 X_1^2.$$

To minimize for this effect, the variables were weighted by the inverse[2] of the DISTANCE variable:

$$w = \frac{1}{DISTANCE}. \qquad (I.5)$$

Thus, the estimating model becomes

$$wCHOICE = w\beta_{o,k} + w\beta_{1,k}\ \text{DISTANCE} + w\beta_{2,k}\ \text{HAUL} + w\beta_{3,k}\text{RATE} + w\epsilon \quad (I.6)$$

The expected sign on the HAUL variable is not easily explained because it would depend on how low the rate is at the other delivery point and whether the cost savings in the lower rate can make the longer distance to that elevator worthwhile. If the cost saving is significant, farmers may be willing to go the distance to this point. Thus the effect of significant cost savings as opposed to insignificant cost savings will increase production levels, or decrease production levels, respectively.

Table F.1 farmer 17 is 20 km away from the elevator, whereas farmer 13 is 4 km away. in the tables to follow it can be seen how these two farmers react to freight rate increases: farmer 17 is willing to reduce wheat production whereas as farmer 13 keeps things unchanged. Another example is to compare farmer 13 and farmer 5, both keep things unchanged as expected. Furthermore, this assumption seems to be valid because after correcting for heteroscedasticity, the t-values, the likelihood ratio test values, and the R^2 values improved significantly. In addition, conventional diagnostic tests for heteroscedasticity (which use the error term in some form or another) are not reliable in the LOGIT case because of the dichotomous nature of the dependent variable and hence the non-normality of the error term (White, 1993).

[2]The reasons for this choice is as follows (let $X_1 = DISTANCE$):

$$E(v^2) = E(\frac{\epsilon}{X_1})^2 = \frac{1}{X_1^2}E(\epsilon^2) = \sigma^2$$

which is what is needed.

So the sign on this coefficient remains indeterminate in all regressions.[3]

This relationship also measures the effects of changes in freight rates on production changes. The coefficient on this variable (RATES) is expected to be positive for all crop regressions. As seen above, farmers seem to be more willing to increase canola production and somewhat decrease barley production, and clearly decrease wheat production. This effect, of likely decreasing wheat production, translates into a positive coefficient on freight rates in the wheat regression; a negative coefficient (likely increasing production) in the canola regression; and either a positive or negative coefficient in the barley regression, since barley production seemed to both increase and decrease as rates increased. Since the regressions are run separately, it can not be concluded statistically that, for example, a fall in wheat production per tonne will mean a rise in canola or barley production per tonne. Although this seems to be the case from the survey results, to suggest a substitution effect between canola and wheat would be statistically incorrect since the relationship between wheat and canola is not established here.

The values of the coefficients, $\beta_{1,k}$, $\beta_{2,k}$, and $\beta_{3,k}$ would indicate that as distance, haul or (freight) rates increases, the log of the odds of increasing/unchanging or decreasing acres planted would change by β_i, where i=o,1,2,3. So that if $\beta_1 = 0.05$, and distance increased by 1 Km, the log-odds ratio in favor of decreasing acres planted goes up by 0.05. To give a further meaning to this, say

$$L_i = ln(\frac{P_t}{1 - P_t}) = 0.03 \quad (I.7)$$

(assuming particular values for $DISTANCE$, $HAUL$, and $RATE$) the *probability*, (P_t), of a farmer decreasing acres planted can be found as follows. Take the antilog

[3] Just because the sign on this coefficient can not be determined *a priori* does not mean it should be excluded from the model. The variable still contributes to explaining the dependent variable because farmers have based their decision of modifying production with this variable in mind. Moreover, the HAUL variable was statistically significant in the Wheat results that are to follow.

of both sides of eq.(I.7) to get

$$\frac{P_t}{1-P_t} = e^{0.03} \tag{I.8}$$

solve for P_t to get

$$P_t = \frac{e^{0.03}}{1+e^{0.03}} = 0.508 \tag{I.9}$$

which says that there is a 51 percent probability that a farmer will decrease acres planted. To actually compute this value, first estimate eq.(I.6), then put in point values (that can be average values of DISTANCE, HAUL, and RATE) for the independent variables, then solve for P as done above.

I.1 Elasticities and Probabilities

Elasticities and probabilities, representing the effects of the independent variables on the dependent variable, are presented. Since in the logit model each observation has a different effect on the dependent variable, it becomes more convenient to compute the elasticities at mean values (White 1993). The formula for the elasticities are (White 1993, p.253):

$$\eta_{ik} = \left(\frac{\partial P_t}{\partial X_{ikt}}\right)\frac{X_{ikt}}{F(X_t'\beta)}$$

for the ith coefficient on the X_ith independent variable, where

$$\frac{\partial P_t}{\partial X_{ikt}} = \frac{\beta_{ik}e^{-X_t'\beta}}{[1+e^{-X_t'\beta}]^2}.$$

Interpret these numbers, η_{ik} where i=RATE, and k=wheat, as follows: if η_{ik} = 1.44 this would mean that given a 1 percent increase in freight rates, the probability of decreasing acres of wheat planted increases by 1.44 percent.

Table I.1 Probabilities and Elasticities

Crop	Probabilities	Elasticities	Comments
Wheat	0.496	$\eta_{o,1}$ = -2.3 $\eta_{1,1}$ = 0.9 $\eta_{2,1}$ = 0.6 $\eta_{3,1}$ = 0.4	49.6 percent chance that wheat acres will fall if shippers are faced with a $13 average rate increase. are on average 11 km away from their nearest delivery point. and are willing to haul on average 40.51 km to another delivery point. As DISTANCE increases by 1 percent. probability of decreasing acres planted increases by 0.9 percent. As willingness to HAUL increases by 1 percent. the probability of decreasing acres planted increases by 0.6 percent. and as freight RATES rise by by 1 percent the probability of decreasing acres planted increases by 0.4 percent.
Barley	0.475	$\eta_{o,2}$ = -2.7 $\eta_{1,2}$ = 1.3 $\eta_{2,2}$ = -0.2 $\eta_{3,2}$ = 0.7	47.5 percent chance that barley acres will fall if shippers are faced with a $13 average rate increase. are on average 11.06 km away from the nearest delivery point. and willing to haul on average 45.24 km. As DISTANCE increases by 1 percent. the probability of decreasing acres planted increases by 1.3 percent. As willingness to HAUL increases by 1 percent. the probability of decreasing acres planted decreases by -0.2 percent. and as freight RATES increase by 1 percent the probability of decreasing acres planted increases by 0.7 percent.

Canola	0.161	$\eta_{0.3} = 4.5$ $\eta_{1.3} = -1.6$ $\eta_{2.3} = -20.6$ $\eta_{3.3} = 2.1$	16.1 percent chance that canola acres will fall if shippers are faced with a $13 average rate increase, are 11.75 km away from the nearest delivery point, and are willing to haul 37.47 km. As DISTANCE increases by 1 percent, the probability of decreasing acres planted decreases by -1.6 percent. As willingness to HAUL increases by 1 percent, the probability of decreasing acres planted decreases by -20.6 percent, and as freight RATES increase by 1 percent the probability of decreasing acres planted increases by 2.1 percent.

One observation that should be immediately apparent from Table I.1 is that the probability of canola acres *increasing* is high. The reason for this may be because the value of canola in relation to freight rates is higher than wheat. Specifically, more canola can be shipped at the same dollar rate of wheat and barley. Furthermore, the elasticity on rates in the canola regression is 2.1, 0.4 in the wheat regression, and 0.7 in the barley regression. This would imply that as rates, in the canola regression, increase by 1 percent the odds of decreasing acres planted of canola increase by 2.1 percent, the odds of decreasing acres planted of wheat increase by 0.4 percent, and the odds of decreasing acres planted of barley increase by 0.7 percent. In summary, the main result in this section suggests that changes in the odds of decreasing acres planted is more sensitive in the canola regression than it is in the wheat and barley regressions. This result would confer with the main elasticity results in chapter four, that canola is more sensitive to rate changes than wheat and barley.

Appendix J

Functional Form Estimation Data

Table J.1 Wheat Regression

Percent	Distance	Rate	Haul
0	10	4	12.5
-.2	10	4	100.5
0	7	4	12.5
.3	10	4	50.5
0	5	4	12.5
0	7	4	12.5
.3	16	4	100.5
0	12	4	50.5
0	16	4	12.5
0	14	4	12.5
-.23	13	4	12.5
-.1	11	4	12.5
0	4	4	12.5
0	10	4	12.5
0	12	4	12.5
0	10	4	12.5
0	20	4	12.5
0	10	8	12.5
-.5	10	8	100.5
0	7	8	12.5
-.4	10	8	50.5
0	5	8	12.5
0	7	8	12.5
-.5	16	8	126
0	12	8	50.5
0	16	8	12.5
0	14	8	50.5
-.51	13	8	12.5
-.1	11	8	50.5
0	4	8	12.5
-1	10	8	12.5
0	12	8	50.5
0	10	8	12.5
0	20	8	12.5
-.3	10	16	100.5
-.6	10	16	100.5
-1	7	16	12.5
-.4	10	16	50.5
0	5	16	12.5
0	7	16	12.5
0	16	16	126
-.3	12	16	50.5

0	16	16	12.5
0	14	16	50.5
-.49	13	16	50.5
-.1	11	16	100.5
0	4	16	50.5
-1	10	16	12.5
-.2	12	16	50.5
0	10	16	12.5
-.2	20	16	12.5
-.5	10	24	50.5
-.51	10	24	100.5
-1	7	24	12.5
-.4	10	24	50.5
0	5	24	12.5
0	7	24	12.5
0	16	24	126
-.3	12	24	50.5
0	16	24	12.5
.2	14	24	50.5
-.51	13	24	100.5
-.1	11	24	100.5
0	4	24	50.5
-1	10	24	12.5
-.3	12	24	100.5
0	10	24	12.5
-.2	20	24	12.5

Table J.2 Barley Regression

Percent	Distance	Rate	Haul
.1	10	4	100.5
0	7	4	12.5
.2	10	4	50.5
0	5	4	12.5
0	7	4	12.5
-.3	16	4	100.5
0	12	4	50.5
0	16	4	12.5
0	14	4	12.5
.17	13	4	12.5
.2	11	4	12.5
0	10	4	12.5
.3	10	8	100.5
0	7	8	12.5
.3	10	8	50.5
0	5	8	12.5
0	7	8	12.5
-.5	16	8	126
0	12	8	50.5
0	16	8	12.5
-.05	14	8	50.5
.27	13	8	12.5
.2	11	8	50.5
-1	10	8	12.5
.3	10	16	100.5
-1	7	16	12.5
.3	10	16	50.5
0	5	16	12.5
0	7	16	12.5
0	16	16	126.5
-.3	12	16	50.5
.27	16	16	12.5
-.05	14	16	50.5
.27	13	16	50.5
.2	11	16	100.5
-1	10	16	12.5
-.6	10	24	100.5
-1	7	24	12.5
.3	10	24	50.5

0	5	24	12.5
0	7	24	12.5
0	16	24	126
-.3	12	24	50.5
.25	16	24	12.5
-.1	14	24	50.5
.25	13	24	100.5
.2	11	24	100.5
-1	10	24	12.5

Table J.3 Canola Regression

Percent	Distance	Rate	Haul
0	7	4	12.5
.1	10	4	50.5
0	5	4	12.5
0	7	4	12.5
.3	16	4	100.5
0	16	4	12.5
0	14	4	12.5
.3	13	4	12.5
.5	11	4	12.5
0	12	4	12.5
0	10	4	12.5
0	20	4	12.5
0	7	8	12.5
.1	10	8	50.5
0	5	8	12.5
0	7	8	12.5
.6	16	8	126
0	16	8	12.5
0	14	8	50.5
.4	13	8	12.5
.5	11	8	50.5
0	12	8	50.5
0	10	8	12.5
0	20	8	12.5
-1	7	16	12.5
.1	10	16	50.5
0	5	16	12.5
0	7	16	12.5
0	16	16	126
0	16	16	12.5
0	14	16	50.5
.27	13	16	50.5
.5	11	16	100.5
.2	12	16	50.5
0	10	16	12.5
0	20	16	12.5
-1	7	24	12.5
0	10	24	50.5
0	5	24	12.5
0	7	24	12.5

0	16	24	126
0	16	24	12.5
0	14	24	50.5
0	13	24	100.5
0	11	24	100.5
.33	12	24	100.5
0	10	24	12.5
0	20	24	12.5

Bibliography

[1] Alexis, Marcus (1982). "Progress and Prospects of Regulatory Reform in Surface Transportation." *in Deregulation: Appraisal before the fact* eds. Thomas G. Geiss and Werner Sichel.

[2] Bill C-14. Statutes of Canada. 1996. c.10.

[3] Boyer, Kenneth D. (1987). "The costs of price regulation: lessons from railroad deregulation". *RAND Journal of Economics* 18(3). pp.408-416.

[4] Canada Gazette. "Annual Rate Scale Order, 1995-1996". SOR/95-207. Vol.129. No.10. May 17. 1995.

[5] CP Rail System (1994). *Annual Report.*

[6] Canadian Transport Commission (March 1986). *Report on the Variable Costs and Revenues of the Railway Companies for the Movement of Grain in 1984 under the Western Grain Transportation Act.* Railway Transport Committee.

[7] Canadian Transport Commission (April 30, 1986). *The Determination of the Annual Rate Scale for the Movement of Western Grain By Rail for Crop Year 1986/87.* Confidential Report NO. REA-CD-86-03.

[8] Canadian Wheat Board (July 27, 1995). *How the Freight Deduction is Calculated.*

[9] Farrow, M.A. and A. Koh (March 22, 1988). *Forecasting of Rail Inputs, Costs and Revenues Associated with the Western Grain Transportation Act.* The Coopers & Lybrand Consulting Group.

[10] Friedlaender, A.F. and R.H. Spady (1978). "Derived Demand functions for Freight Transportation" in A.F. Friedlaender, ed., *Alternative Scenarios for Federal Transportation Policy: Second Year Report, Volume I.* Center for Transportation Studies, Massachusetts Institute of Technology.

[11] Globe & Mail (July 31, 1995a). "Ottawa ponders sale of grain cars".

[12] Globe & Mail (August 1, 1995b). "No tears for the Crow Rate".

[13] Globe & Mail (August 4, 1995c). "CP rail moving ahead in sale of branch lines".

[14] Globe & Mail (August 29, 1995d). "CN to chop debt, 2,500 Jobs".

[15] Gujarati, D. (1988). *Basic Econometrics, Second edition* (New York: McGraw-Hill Book Company).

[16] Kennedy, Peter (1992). *A Guide to Econometrics, third ed.* (Cambridge, Mass.: The MIT Press).

[17] Levin, Richard (1978). "Allocation in Surface freight transportation: does rate regulation matter?". *Bell Journal of Economics* 9, pp.18-45.

[18] Levin, Richard (1981a). "Railroad rates, profitability, and welfare under deregulation". *The Bell Journal of Economics* 12(1), pp.1-26.

[19] Levin, Richard (1981b). "Railroad Regulation, Deregulation, and Workable Competition". *American Economic Review Papers and Proceedings* 12, pp.394-398.

[20] Locklin, D. Philip (1972). *Economics of Transportation* (Homewood, Illinois: Richard D. Irwin, Inc.).

[21] MacDonald, J.M. (1987). "Competition and rail rates for the shipment of corn, soybeans, and wheat". *Rand Journal of Economics* 18(1), pp.151-164.

[22] MacDonald, J.M. (1989a). *Effects of Railroad Deregulation on Grain Transportation*, United States Department of Agriculture, Economic Research Service, Technical Bulletin Number 1759.

[23] Macdonald, J.M. (1989b). "Railroad Deregulation, Innovation, and Competition: Effects of the Staggers Act on Grain Transportation". *Journal of Law & Economics* 32, pp.63-95.

[24] McFarland, Henry (1987). "Did Railroad Deregulation Lead to Monopoly Pricing? An Application of q^*". *Journal of Business* 60(3), pp.385-400.

[25] McFarland, Henry (1989). "The Effects of United States Railroad Deregulation on Shippers, Labour, and Capital". *Journal of Regulatory Economics* 1, pp.259-270.

[26] McKinnon, Sharon (1995). "Broken Promises: Are Reforms off the Rails" *Pro-Farm*, vol. 11 No. 4, July/August.

[27] Meilke, Karl D. and Alfons Weersink (September 1990). "The Impact of Support Programs on Crop Area Response". Working Paper WP90/23, University of Guelph.

[28] Meyer, John R. and William B. Tye (1988). "Toward Achieving Workable Competition in Industries Undergoing a Transition to Deregulation: A Contractual Equilibrium Approach". *Yale Journal on Regulation* 5, pp.273-97.

[29] National Transportation Agency of Canada (NTA) (1994). *Transportation Trends and Developments: An Economic Perspective, Annual Review* (Minister of Supply and Services Canada).

[30] National Transportation Agency of Canada (NTA) (March 1992). *Rail Competitive Access: A Staff Report to the Comprehensive Review Panel.*

[31] National Transportation Agency of Canada (NTA) (1988). *Report on Branch Line Abandonment Activities Under the National Transportation Act, 1987* (National Transportation Agency of Canada, Transportation Subsidies Branch).

[32] Producer Payment Panel (March 1994). "Analysis of CWB Pooling Alternatives".

[33] Producer Payment Panel: Technical Report (March 1994). *Implications of Changing the Western Grain Transportation Act Payment.*

[34] Producer Payment Panel: A Final Report (June 1994). *Delivering the Western Grain Transportation Act Benefits to Producers.*

[35] Producer Payment Panel: Technical (June 1994). *Delivering the Western Grain Transportation Act Benefits to Producers.*

[36] Sheikh, Yasmin (1993). "Comparison of the Performance of Class I Railways in Canada and the United States", in *Rail in Canada*, Statistics Canada, cat. 52-216.

[37] Smirlock, Michael, Thomas Gilligan and William Marshall (1984). "Tobin's q and the Structure-Performance Relationship". *The American Economic Review* 74(5), pp.1051-1060.

[38] Statistics Canada (1991). *Census of Agriculture.*

[39] Statistics Canada 1993/1994. *Canadian Economic Observer.* Cat. No. 11-210.

[40] Statistics Canada. *Agricultural Profile of Alberta Part I.* cat. 95-382.

[41] Statistics Canada. *Agricultural Profile of Alberta Part II.* cat. 95-383.

[42] The LeaderPost (July 6, 1995a). "SARM worried about Penalities".

[43] The LeaderPost (July 28, 1995b). "Crow benefit loss will be made easier".

[44] The LeaderPost (August 25, 1995c). "Farmers debate buying line".

[45] Tobin, J. (1978). "Monetary policies and the economy: The transmission mechanism". *Southern Economic Journal* 37, pp.421-31.

[46] Transport Canada (February 27, 1995). "Western Grain Transportation Reform: Proposed Changes to Policies Related to Grain Transportation Efficiencies" *Transportation Canada Home Page: http://www.aceis.agr.ca/budget/effice.html#RATES.*

[47] Tretheway, M.W., W.G. Waters II and Andy K. Fok (January 1997). "The Total Factor Productivity of the Canadian Railways, 1956-1991". *Journal of Transportation Economics and Policy*, pp.93-113.

[48] Varian, Hal (1990). *Intermediate Microeconomics: A Modern Approach, second edition* (New York: W.W. Norton & Company).

[49] Varian, Hal (1992). *Microeconomic Analysis, third edition* (New York: W.W. Norton & Company).

[50] Vercammen, James (Feb. 1, 1996). "Productivity Sharing and Car Ownership: A Critique of the SEO Proposal for Re-Regulating Western Grain Transportation". *Department of Agricultural Economics & Faculty of Commerce and Business Administration at the University of British Columbia.*

[51] White, Kenneth J. (1993). *SHAZAM User's Reference Manual, Version 7.0.* (New York: McGraw-Hill Book Company).

[52] Winston, Clifford (1993). "Economic Deregulation: Days of Reckoning for Microeconomists." *Journal of Economic Literature* 31(3): 1263-1289.

[53] Winston, Clifford, Thomas M. Corsi, Curtis M. Grimm, Carol A. Evans (1990). *The Economic Effects of Surface Freight Deregulation* (Washington, D.C.: The Brookings Institution).