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by

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Abstract

**Lisitza, Lyndon D. M.Sc. University of Saskatchewan, Saskatoon, May 2012.
The Welfare Effects of Regulatory Change on the Western Canadian Grain
Handling and Transportation System.**

Supervisor: Dr. Murray E. Fulton

In 1996, the federal government took a significant step toward redefining the regulatory framework for grain transportation on the Prairies with the passing of the *Canadian Transportation Act* (CTA). The CTA contained two significant aspects that were to have a major impact on the GHTS. The first aspect concerned rail line abandonment. Under the CTA, protections afforded to the discontinuance of grain dependent branchlines were removed. Instead, railways were simply required to generate a three-year plan to indicate whether they intended to continue operating a branchline or whether they intended to sell, lease or abandon it. The second aspect was the introduction of regulated maximum freight rates, which removed the federal government from direct financial intervention in the GHTS. This policy was designed to replace the remnants of the long-standing Crow rate for Canadian railways.

In order to determine if regulatory change has led to an overall improvement in GHTS welfare, and to determine if farmers have benefitted from regulatory change, this thesis examines the regulatory changes that have occurred since the passing of the *Canada Transportation Act*. To provide some context for this analysis, this thesis presents a historical overview of the legislation and regulations leading up to the passing of the Act and provided a historical and current description of the GHTS market structure.

Following the regulatory and industry overview, this thesis develops a theoretical framework capable of determining whether regulatory change has led to an overall

improvement in GHTS welfare and, if so, which industry participants have benefitted from this change. To help contextualize many of the concepts used in the theoretical framework, this thesis examines theories on the origin of regulation and looked specifically at two forms of thought: public interest theory and capture theory. As well, this thesis examines several 'rate of return' regulatory options available to the regulator, and provides an illustration of the 'rate of return' regulation of the WGTA in order to provide a regulatory baseline against which the 1996 CTA regulatory changes can be assessed.

The intent of this thesis is to quantify the changes in consumer and producer surplus associated with regulatory change. Specifically, this examines the welfare changes in grain and non-grain markets that can be attributed to the shift from the WGTA to revenue cap regulation, increased railway capacity, a reduction in railway marginal cost and the removal of grain dependent branch lines (GDBL's). When considering the welfare effects solely attributed to the regulatory shift, the results indicate that the move from the WGTA to the revenue cap decreases the consumer surplus of farmers. Farmers experience an overall reduction in consumer surplus, largely due to the fact that the price farmers' pay for grain transportation has risen and because the levels of output they receive is less than that received under the WGTA.

As a result of the regulatory shift, shippers in the non-grain market see an overall gain in consumer surplus. This increase is principally due to a shift in capacity allocation from the grain to the non-grain market as the railways respond to the higher marginal revenues they are able to earn in the non-grain market as opposed to the revenue cap regulated grain market. As such, shippers in the non-grain market are made better off.

Although the railways experience a loss in producer surplus due to the regulatory shift, this loss is more than offset by the increase in producer surplus that the railways earn through a reduction in marginal costs. As such, the railways see an

overall gain in producer surplus.

As well, the federal government also experiences a gain in overall surplus. These gains are the result of the elimination of the subsidy that was paid to the railways under the WGTA as well as the removal of the additional dead weight loss that is incurred by society resulting from raising the taxes required to pay the subsidy. As such, the government (i.e., taxpayers) are better off as a result of the regulatory change.

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Table of Contents

| | |
|--|-----------|
| Abstract | ii |
| Acknowledgements | v |
| List of Tables | ix |
| List of Figures | x |
| CHAPTER 1: INTRODUCTION | 1 |
| 1.1 Background | 1 |
| 1.2 Regulatory Reform in the GHTS | 3 |
| 1.3 Statement of Problem | 5 |
| 1.4 Study Objectives | 9 |
| 1.5 Methodology | 10 |
| 1.6 Organization of the Study | 12 |
| Chapter 2: Description of the GHTS | 15 |
| 2.1 Introduction | 15 |
| 2.2 The Grain Handling Industry Structure | 16 |
| 2.2.1 The Primary Elevator System | 16 |
| 2.2.2 Concentration in the Primary Elevator System..... | 18 |
| 2.2.3 Producer-Owned Inland Grain Terminals | 21 |
| 2.2.4 Producer Car Loading Facilities | 24 |
| 2.2.5 Terminal Elevator System | 25 |
| 2.3 Rail Industry Structure | 26 |
| 2.3.1 The Western Canadian Railway Industry | 26 |
| 2.3.2 Concentration in the Western Canadian Railway Industry | 26 |
| 2.3.3 Grain Dependent Branchline Discontinuance..... | 27 |
| 2.3.4 Captive Rail Shippers..... | 29 |
| 2.3.5 Shortline Railways | 29 |
| 2.3.6 Producer Cars | 31 |
| 2.4 Chapter Summary | 33 |
| Chapter 3: Regulatory History of the GHTS | 34 |
| 3.1 Introduction | 34 |
| 3.2 Factors and Events Leading Up to the Regulatory Changes | 34 |
| 3.2.1 The Crow's Nest Pass Agreement..... | 34 |
| 3.2.2 The MacPherson Commission..... | 35 |
| 3.2.3 The 1967 National Transportation Act (NTA)..... | 35 |
| 3.2.4 The Hall Commission | 37 |
| 3.2.5 The Snavely Commission | 37 |
| 3.2.6 The Gilson Report..... | 38 |
| 3.2.7 WGTA..... | 40 |
| 3.2.8 G.C. Hall Inquiry | 41 |
| 3.2.9 The National Transportation Act (1987)..... | 43 |
| 3.2.10 Change in Grain Handling Tariff Rates | 44 |
| 3.2.11 Elimination of the WGTA..... | 44 |
| 3.2.12 Elimination of Seaway Pooling | 45 |
| 3.3 The Canadian Transportation Act (CTA) | 46 |

| | |
|--|------------|
| 3.3.1 The Estey/Kroeger Process | 47 |
| 3.3.2 Bill C-34 | 49 |
| 3.3.3 The Revenue Cap | 50 |
| 3.4 Incentive Regulations and the CTA | 51 |
| 3.4.1 The Revenue Cap | 52 |
| 3.4.2 Elimination of the Four Year Costing Review | 53 |
| 3.4.3 Branchline Abandonment..... | 53 |
| 3.4.4 Multi-Car Block Incentives and Variable Rates | 53 |
| 3.5 Shipper Protection Regulation Under the <i>Canada Transportation Act</i>..... | 54 |
| 3.5.1 Confidential Contracts..... | 55 |
| 3.5.2 Interswitching..... | 55 |
| 3.5.3 Running Rights | 56 |
| 3.5.4 Competitive Line Rates | 56 |
| 3.5.5 Final Offer Arbitration (FOA) | 57 |
| 3.6 Chapter Summary | 58 |
| Chapter 4: Theoretical Framework..... | 60 |
| 4.1 Introduction..... | 60 |
| 4.2 Regulation: Public Interest and Capture Theory..... | 61 |
| 4.2.1 Public Interest Theory..... | 62 |
| 4.2.2 Regulatory Capture Theory | 63 |
| 4.2.3 Rent Seeking..... | 65 |
| 4.3 Applied Welfare Economic and Regulation..... | 67 |
| 4.4 Theoretical Model..... | 69 |
| 4.4.1 Regulatory Baseline | 69 |
| 4.4.2 Regulating the Rail Industry..... | 70 |
| 4.4.3 The WGTA..... | 73 |
| 4.5 Regulatory Change: The CTA..... | 75 |
| 4.5.1 The Revenue Cap | 76 |
| 4.5.2 Railway Efficiency Gain..... | 89 |
| 4.5.3 Elimination of Grain Dependent Branchlines (GDBL)..... | 92 |
| 4.5.3.1 Externalities and the Removal of GDBL's | 94 |
| 4.6 Chapter Summary | 96 |
| Chapter 5: Analysis and Findings..... | 100 |
| 5.1. Introduction | 100 |
| 5.2 Triangulation..... | 100 |
| 5.3. Proposition 1 | 104 |
| 5.3.1 Service Issues – A Historical Perspective..... | 105 |
| 5.3.1.1 Rail Service Issues (1996-2000)..... | 106 |
| 5.3.1.1.1 Canadian Wheat Board vs. CN and CP | 106 |
| 5.3.1.1.2 Naber Seeds vs. CN..... | 107 |
| 5.3.1.2 Rail Service Issues (Post -2000) | 108 |
| 5.3.1.2.1 Naber Seeds vs. CN..... | 108 |
| 5.2.1.3 Great Northern Grain vs. CN..... | 110 |
| 5.3.2 Federal Railway Level of Service Review | 114 |
| 5.3.3 Federal Shipper Survey | 115 |
| 5.3.4 Saskatchewan Shipper Survey..... | 119 |
| 5.3.5 Railway Fulfillment of Shipper Demand | 122 |
| 5.3.5.1 Car Supply..... | 122 |
| 5.4 Proposition 2 | 124 |

| | |
|---|------------|
| 5.4.1 Railway Productivity Gains..... | 125 |
| 5.4.1.1 High Horsepower and Fuel-Efficient Locomotives..... | 126 |
| 5.4.1.2 Wheel Flange Lubrication Systems | 126 |
| 5.4.1.3 Auto Engine Stop-Start..... | 127 |
| 5.4.1.4 Locatrol Distributive Power Technology..... | 127 |
| 5.4.2 GDP Deflated Average Rail Freight Costs..... | 127 |
| 5.5 Proposition 3 | 129 |
| 5.5.1 Average Farm Haul Length..... | 130 |
| 5.6 Proposition 4 | 134 |
| 5.6.1 Marginal Per Tonne Mile Cost of Moving Grain via Truck and Rail..... | 135 |
| 5.7 Proposition 5 | 136 |
| 5.7.1 Railway Capacity Increasing Efficiency Improvements | 137 |
| 5.7.2 Car Cycles..... | 138 |
| 5.7.3 Transit Times..... | 139 |
| 5.8 Summary | 140 |
| Chapter 6: Welfare Analysis..... | 143 |
| 6.1 Introduction..... | 143 |
| 6.2 Welfare Effects of Regulatory Change | 145 |
| 6.2.1 WGTA to Revenue Cap (Non-Differentiated Grain Shippers) | 145 |
| 6.2.2 Results..... | 147 |
| 6.2.3 WGTA to Revenue Cap (Differentiated Grain Shippers) | 149 |
| 6.2.4 Results..... | 151 |
| 6.3 Welfare Effects Resulting From Changes in Railway Productivity | 154 |
| 6.3.1 Reduction in Railway Marginal Cost..... | 155 |
| 6.3.1.1 Results..... | 157 |
| 6.3.2 Increased Capacity..... | 158 |
| 6.3.2.1 Capacity Increase in the Non-Grain Market..... | 159 |
| 6.3.2.2 Results..... | 160 |
| 6.3.2.3 Capacity Increase in the Grain Market..... | 161 |
| 6.4 Cost Transfer from Railways to Farmers | 163 |
| 6.5 Conclusion | 165 |
| Chapter 7: Conclusion | 168 |
| 7.1 Introduction..... | 168 |
| 7.2 Model | 170 |
| 7.3 Results..... | 171 |
| 7.4 Application of This Research..... | 174 |
| 7.5 Limitations and Recommendations for Further Study..... | 175 |
| References | 177 |

List of Tables

| | | |
|-----------|---|-----|
| Table 2.1 | Number of Primary Elevators by Province..... | 17 |
| Table 2.2 | Average Elevator Capacity by Province..... | 18 |
| Table 2.3 | Market Share and Herfindahl Index of Top Ten Grain Handling Companies..... | 20 |
| Table 2.4 | Total Number of Western Canadian Grain Delivery Points and Number of Single Company Delivery Points..... | 21 |
| Table 2.5 | Western Canadian Producer-Owned Terminals, as of 2011..... | 22 |
| Table 2.6 | Market Share and Herfindahl Index of Top Ten Railway Companies..... | 28 |
| Table 2.7 | CN and CP Total Miles of Discontinued Track..... | 30 |
| Table 2.8 | Western Canadian Shortline and Regional Railways..... | 31 |
| Table 4.1 | Changes in GHTS Welfare Resulting From the Introduction of the Revenue Cap..... | 82 |
| Table 4.2 | Welfare Changes in the GHTS..... | 98 |
| Table 5.1 | Denzin’s Taxonomy of Triangulation..... | 102 |
| Table 5.2 | Rail Service Attributes Ranked by Level of Shipper Importance..... | 117 |
| Table 5.3 | Overall Shipper Satisfaction and Satisfaction by Shipper Size..... | 118 |
| Table 5.4 | Overall Shipper Satisfaction by Level of Shipper Captivity..... | 119 |
| Table 5.5 | Saskatchewan Shipper Satisfaction Levels..... | 121 |
| Table 5.6 | Daily Grain Car Fulfillment Performance..... | 123 |
| Table 5.7 | Railway Revenues, Expenses and Income 1991-2010..... | 128 |
| Table 6.1 | Freight Costs, Freight Volumes and Demand Elasticities Used to Calculate Welfare Changes in GHTS Welfare..... | 146 |
| Table 6.2 | Welfare Changes Resulting From the Introduction of the Revenue Cap..... | 148 |
| Table 6.3 | Freight Costs, Freight Volumes and Demand Elasticities Used to Calculate Welfare Changes in a Differentiated Grain Market..... | 150 |
| Table 6.4 | Consumer Surplus Changes in the Grain Market Resulting from the Introduction of the Revenue Cap (Differentiated Shippers)..... | 154 |
| Table 6.5 | Marginal Costs and Freight Volumes Used to Calculate Welfare Changes Resulting From a Decrease in Railway Marginal Cost..... | 155 |
| Table 6.6 | Welfare Changes Resulting From a Reduction In Railway Marginal Cost..... | 157 |
| Table 6.7 | Freight Costs, Freight Volumes and Haul Lengths Used to Calculate Welfare Changes Resulting From an Increase In Railway Capacity (Non-Grain Market)..... | 160 |
| Table 6.8 | Freight Costs, Freight Volumes and Haul Lengths Used to Calculate Welfare Changes Resulting From an Increase In Railway Capacity in the Grain Market..... | 162 |
| Table 6.9 | Surplus Changes Resulting From Regulatory Change..... | 167 |

List of Figures

| | | |
|-------------|---|-----|
| Figure 2.1 | Map of the Western Canadian GHTS..... | 23 |
| Figure 2.2 | Rail Track Ownership by Railway Class, 1999-2009..... | 27 |
| Figure 2.3 | Producer Car Shipments From 1989-2008..... | 32 |
| Figure 4.1 | Marginal Cost Pricing and Subsidy Provision in a Declining Cost Industry..... | 72 |
| Figure 4.2 | Average Cost Pricing in a Declining Cost Industry..... | 73 |
| Figure 4.3 | Grain and Non-Grain Welfare Under WGTA Regulation..... | 75 |
| Figure 4.4 | Welfare Implications Resulting From the Implementation of the Revenue Cap..... | 80 |
| Figure 4.5 | Price Discrimination in the Presence of a Revenue Cap..... | 83 |
| Figure 4.6 | Welfare Implications Resulting From the Implementation of the Revenue Cap (Grain Market)..... | 86 |
| Figure 4.7 | Service Issues and the Revenue Cap..... | 88 |
| Figure 4.8 | Welfare Effects Resulting From a Reduction in Railway Marginal Cost..... | 89 |
| Figure 4.9 | Welfare Implications in the Non-Grain Market Resulting From an Increase in Railway Capacity..... | 91 |
| Figure 4.10 | Welfare Implications in the Grain Market Resulting From an Increase in Railway Capacity..... | 92 |
| Figure 4.11 | Welfare Effects Resulting From the Removal of Grain Dependent Branchlines..... | 93 |
| Figure 4.12 | Externalities Associated with Removing Grain Dependent Branchlines..... | 95 |
| Figure 5.1 | Canadian Transportation Total Factor Productivity by Mode (1981-2006)..... | 125 |
| Figure 5.2 | GDP Deflated Rail Freight Costs (1999-2010)..... | 128 |
| Figure 5.3 | Hypothetical Grain Delivery Point Distribution Prior to Rationalization..... | 133 |
| Figure 5.4 | Hypothetical Grain Delivery Point Distribution After Rationalization..... | 134 |
| Figure 5.5 | Western Canadian Railway Unit Train Movements..... | 138 |
| Figure 5.6 | Western Canadian Railway Car Cycle Times..... | 139 |
| Figure 5.7 | Western Canadian Loaded Railway Transit Times..... | 140 |
| Figure 6.1 | Welfare Implications Resulting From the Implementation of the Revenue Cap..... | 149 |
| Figure 6.2 | Welfare Changes in High Cost Market..... | 152 |
| Figure 6.3 | Welfare Changes in Low Cost Market..... | 153 |
| Figure 6.4 | Welfare Implications Resulting from a Reduction in Railway Marginal Cost..... | 158 |
| Figure 6.5 | Welfare Implications in the Non-Grain Market Resulting from an Increase in Railway Capacity..... | 161 |
| Figure 6.6 | Welfare Implications Resulting from an Increase in System Capacity (Grain Market)..... | 163 |
| Figure 6.7 | Welfare Effects Resulting from the Removal of Grain Dependent Branchlines..... | 167 |

CHAPTER 1: INTRODUCTION

1.1 Background

For over a century, the Canadian grain handling and transportation system (GHTS) has been subject to a variety of regulations designed to protect the competitive position of farmer's vis-à-vis other system stakeholders with market power. The consequence of this protection was that a number of high cost features were locked into the system, creating a GHTS that was considered by many to be inefficient and overbuilt.

The issue of system efficiency is of central importance to the GHTS. Each year, an average of 28.3 million tonnes of grain passes through the GHTS as it is shipped from the prairies to export position (CGC, 2010). The export basis (e.g., costs required to store, clean, elevate and transport grain to export position) represents a substantial portion of the selling price. Minimizing these costs through system efficiency can have a substantial effect on the profitability of producers, an important fact given that producers ultimately bear the costs of marketing, handling, transportation and storage of their grain.

On a macro-level, GHTS efficiency is essential for Canada to maintain a competitive position in the world grain markets. In a global economy, the Canadian grain and oilseed industry faces competition from other countries (Klein and Storey, 1998). System efficiency, as measured by the ability to effectively deliver to customers the right products that arrive on time, that retain quality attributes, and that are competitively priced is essential in such a competitive environment.

Over the past 15 years, the federal government has enacted several regulatory reforms in an effort to develop a more efficient, less costly and more responsive

grain handling and transportation system. Reforms, such as the deregulation of the branchline abandonment process and a cap on the revenues that a railway can earn on grain movements, were designed to improve system efficiency by providing the railways with the proper incentives to reduce transportation costs. Other reforms, such as the removal of the Crow Benefit transportation subsidy and the inclusion of several shipper protection provisions, such as interswitching, competitive line rates and final offer arbitration, marked the continuation of a federal objective to achieving transportation efficiencies through competitive and commercial practices rather than relying upon prior combinations of intense regulation and direct government intervention in freight rates.

The effects of these reforms have been a thorough restructuring of the GHTS. Between 1995 and 2009, the Class 1 railways have discontinued 2,522 route miles of grain dependent branch lines from their railway system (CTA, 2009). During the same period the total number of grain elevators across the prairies has decreased 76 per cent, from 1,339 to 320, as grain handling companies replaced small wooden elevators in favour of large, concrete high throughput elevators (HTEs) (CGC Grain Elevators in Canada, 2009).

While the rationalization of the rail and grain handling network has allowed some system stakeholders to benefit – the Class 1 railways have seen operating costs decline, while the switch to HTEs have allowed grain handling companies to improve upon grain handling to elevator capacity ratios (e.g., turnover ratio) – it is unclear whether rationalization has led to an overall improvement in GHTS welfare (Quorum, 2003). The reduction in grain dependent branch lines and fewer elevator delivery points means that many of the transportation costs associated with grain movement have simply shifted away from railways and elevators towards producers, who must pay to truck grain over increasing distances (Storey, *The Encyclopedia of Saskatchewan*, 2006).

In addition, the increase in truck traffic and trucking distances has given rise to several negative externalities that can have a significant impact on the overall system costs. These externalities arise because the total societal cost of grain transportation, which would include factors such as increased road damage, air pollution and higher green house gas (GHG) emissions, are not included in the prevailing prices that producers pay for grain transportation services. Failure to include these negative external costs in transportation pricing can potentially lead to over-consumption of transportation, which can compound the externalities further.

1.2 Regulatory Reform in the GHTS

The Canadian grain handling and transportation system has been regulated in one form or another during the last century. Early grain handling regulation, such as the *Canada Grain Act* of 1912, focused on the provisions of establishing fair grades and standards, establishing maximum elevator tariffs and providing producers with basic levels of payment protection (Fowke, 1957; Wilson, 1996). In the rail industry, early regulation concentrated on establishing statutory freight rates – through the signing of the Crow’s Nest Pass Agreement of 1897 – to support the Canadian federal government’s National Policy and emerging Western wheat economy.

Rapid inflation during the 1970s saw grain freight costs rise substantially above the statutory rates set out in the Crow’s Nest Pass Agreement. By 1977 it was estimated that of the total variable costs incurred by grain shippers, 32 per cent was covered by users and 18 per cent by federal branch line subsidies, with the remaining 50 per cent left to the railroad as loss (Schmitz, Highmoor and Schmitz, 2002; Gray and Khakbazan, 1997). As a result of these losses, the railroads had little incentive to replace or maintain the grain transportation network. Consequently, the entire GHTS suffered due to lost grain sales, additional on-farm storage costs and an

overall reluctance to invest in much needed grain handling and transportation technology (Swanson and Venema, 2006; Gray and Khakbazan, 1997).

In response to this lack of investment, the federal and Western provincial governments became involved in the grain transportation industry, purchasing hopper cars and investing in branchline rehabilitation. As well, the federal government passed the *Western Grain Transportation Act* (WGTA) in 1984, which replaced the fixed statutory freight rates on grain with rates that were meant to reflect the changing costs of grain transportation. Under the WGTA, the government subsidized a portion of farmer's annual freight costs with a payment – known as the Crow Benefit – made directly to the railroads. By the time the WGTA was eliminated in 1995, Western producers were responsible for roughly 50 per cent of the total estimated transportation costs (Vercammen et al. 1996).

The elimination of the WGTA in 1995 and the subsequent passing of the *Canada Transportation Act* in 1996 were accompanied by a series of regulatory changes that were to have a major impact on grain transportation. First, with the removal of the WGTA the Crow Benefit transportation subsidy was removed, marking the first time in nearly a century that farmers would be required to pay the full cost of transporting grain to export position (Klein and Storey, 1998). Second, the statutory grain rates that were settled upon under the Crow and subsidized under the WGTA were replaced with a structure of distance-based rates administered by the Canadian Transportation Agency (Agency). These rates used a scale that identified the maximum single car freight rates that could be charged by the railways for the movement of statutory grains based on distance, with rates adjusted annually based on a freight rate multiplier which took into account railway input costs and productivity. A third element was the deregulation of the branchline abandonment procedure, which made it easier for railways to abandon unprofitable portions of their networks. (Nolan, 2005; Khakbazan, 1999).

One year after the passing of the *Canada Transportation Act*, Justice Willard Z. Estey

was commissioned by the federal government to conduct a comprehensive review of Canada's grain handling and transportation system and to develop a series of recommendations for improving the overall efficiency, viability and competitiveness of the GHTS (Estey, 1998). Following the completion of the Estey Review, the Canadian federal government implemented additional grain-handling system and regulatory reforms that have been active up through the present (Government of Canada, 2000). These reforms include a cap on the average annual revenues that can be earned by a rail company for grain movement, the appointment of a third-party monitoring system for the regulatory framework and competitive provisions designed to protect producers from railway monopoly pricing (i.e. interswitching rates, competitive line rate (CLRs) and shipper/railway dispute mechanisms, such as final offer arbitration (FOA)).

1.3 Statement of Problem

Immediately following the elimination of the WGTA in 1995, the GHTS underwent a period of rapid rationalization, an event that both industry experts and scholars attribute largely to the regulatory reform implemented in the CTA (Quorum, 2003; Nolan et al, 2004; Khakbazan, 1999; Lang, 2006; Kroeger, 1999). The rationalization of the system was seen as a means of achieving a more flexible and efficient grain transportation system whose benefits of increased efficiency would be shared among farmers, shippers, and the railways (Estey, 1998; Doan, Paddock and Dyer 2003).

The effects of the GHTS rationalization are easily observable. Since 1995, thousands of miles of grain dependent branch lines have been uprooted or effectively discontinued throughout the prairies (CTA, 2009). In turn, these abandonments have precipitated the decommissioning or demolition of numerous small wooden grain elevators, which have been replaced by fewer and considerably larger high throughput elevators (HTEs) that average 25,000 metric tonnes of storage space

and are capable of loading 50 or more cars in 8 to 12 hours (CGC, 2004; Schroeder and Chim, 2003).

The switch to HTE technology has considerably influenced changes in the GHTS transportation sector. Large tractor-trailer units, capable of moving between 40 to 45 tonnes of grain per load have replaced smaller single and dual-axle trucks. As well, the extensive sidings at many HTEs have enabled the formation of grain trains of up to 112 cars, which carry as much as 10,000 tonnes of grain to export at a time. Prior to the development of large HTEs, such trains could only be assembled in the larger freight yards of the railways. Once assembled, these “unit trains” travel uninterrupted from the point of formation on the prairies to export position, resulting in the need for fewer pick-ups and reduced cost. The shift towards “unit trains” has also spawned the need for larger, more efficient locomotives that are capable of pulling 100 to 112 cars.

These changes have had a significant effect on the levels of efficiency in both the rail and grain handling sectors of the GHTS. Since 1997, railway productivity has grown at an average annual rate of 3.6 per cent per year. By comparison, productivity in the overall business sector in Canada during the same period grew by only 0.2 per cent per year (Conference Board of Canada, 2009). The grain handling industry has also seen a substantial increase in technical efficiency. Since 1999, the average elevator capacity turn ratio has increased from 4.8 turns to 6.6 turns (Quorum, 2009).

While efficiency in both the rail and grain handling sectors has increased since the rationalization of the system, recent evidence suggests that the efficiency gains in the rail and grain handling sector have not benefited all participants operating within the GHTS. A recent studies suggest that Prairie grain farmers have paid anywhere from \$4.61 to \$8.81 per tonne more than what the railways would have received under the terms deemed fair and adequate under the Western Grain Transportation Act (Travacon, 2010).

A level of service complaint initiated in 2007 saw several small and medium size grain shippers voice their frustrations to the CTA over the inadequate supply of rail cars and discriminatory changes made to car ordering policies (CTA *Decision No. 344-R-2007*, 2007; CTA *Decision No. 20-R-2008*, 2008; CTA, 2007; NFU, 2000; NFU, 2002; Vercammen, 2001). These complaints resulted in a federal rail freight Level of Service Review (Review) aimed at determining the satisfaction or dissatisfaction that rail shippers have with their current level of rail service. Completed in March, 2011, the Review developed recommendations designed to improve the efficiency and effectiveness of the rail-based logistics transportation system in Canada.

Reports from the Review have revealed a high level of shipper dissatisfaction with railway service. A survey of shippers carried out as part of the Review process has indicated elevated levels of discontent amongst smaller shippers, many of whom believed that the smaller size of their railcar orders is linked to untimely or delayed delivery and spotting of railcars. Survey respondents also indicated that an inadequate supply of equipment (including the ordering process and the actual provision of equipment at the shippers' sites), poor communication between shippers and the railway and the lack of predictability associated with the timely arrival and spotting of railcars ordered has resulted in shippers being unable to meet the delivery terms of their contracts with customers, financial penalties associated with being unable to meet contractual obligations and serious damage to a shipper's reputation.

The studies and level of service complaints mentioned above have given rise to concerns – especially at the producer level – over whether regulatory reform and the rationalization of the GHTS has resulted in an increase in farmer welfare or if the rationalization of the GHTS has strictly benefited the railways and large grain handling firms (NFU, 2002; Beingessner, 2009).

The GHTS regulatory environment is a key factor in determining the financial success of a producer, as it directly influences the service levels and cost associated

with moving grain through the supply chain. Industry regulation can also affect the competitiveness of Canadian grains and oilseeds in world markets. Western Canadian producers of grains and oilseeds are in direct competition with other countries that export these commodities, and must also compete with the domestic markets of countries they export to. If the export basis becomes too costly, if the timeliness of delivery is disrupted, or if grain standards are not met due to regulatory burden or regulatory oversight, importing countries can easily source their grains and oilseeds from other competing countries capable of meeting their demand.

The 1996 CTA identified competition and market forces as drivers that would make the GHTS more viable and efficient. It also recognized that effective competition does not exist in the rail industry and that government regulation was needed to achieve competitive market outcomes. To this end, the CTA implemented various forms of incentive regulations, such as a revenue cap, multi-car block incentives and changes to the branchline abandonment procedures that were intended to result in greater economic efficiency and welfare within the GHTS.

While several studies suggest that the 1996 CTA regulatory changes have resulted in increased efficiency for the Class 1 railways and large grain handling firms operating within the GHTS, it is unclear whether these changes have resulted in overall welfare gains for the entire system (Quorum, 2010; Travacon, 2010). Attempts to measure GHTS improvements, such as those conducted by the Federal Grain Monitor, tend to gauge system progress in terms of the improvements made in technical efficiency made by the railways and grain handling firms. While these metrics are excellent at summarizing year over year railway operational performance, they provide little insight as to how, or if, the benefit of improved system efficiency are shared amongst GHTS stakeholders. These metrics also fail to capture the presence and costs of negative externalities resulting from the rationalization of the GHTS.

1.4 Study Objectives

This thesis examines the regulatory changes that have occurred since the passing of the *Canada Transportation Act* to determine if regulatory change has led to an overall improvement in GHTS welfare and if all system stakeholders have benefitted from these changes.¹ Before this examination can begin, this thesis presents a historical overview of the legislation and regulations leading up to the passing of the CTA, a physical and spatial description of the GHTS, and a current description of the GHTS structure.

Establishing a connection between regulatory reform and overall system welfare may lead to suggestions for change if it can be determined that regulatory reform has negatively influenced the structure and efficiency of the GHTS. To this end, this thesis has two main objectives. First, this thesis presents a comprehensive physical description of the system, including an outline of the current and historical regulatory structure of the GHTS. Second, this thesis presents a theoretical framework that can be used in the design of analytical tests capable of examining these two null hypotheses:

- 1) The regulatory changes contained in the CTA have not lead to an overall improvement of the grain handling and transportation system.
- 2) The majority of farmers have not benefitted from the regulatory reform.

Note that these hypotheses have been stated as null hypotheses – i.e., that regulatory change has had no impact on system efficiency and/or the welfare of farmers.

¹ It is important to note that his thesis places a greater emphasis on the regulatory and welfare changes that occur in the grain transportation sector (i.e., movement of grain by road and rail) and less so on the grain handling system itself.

1.5 Methodology

The first objective of this thesis is to present an outline of the current and historical regulatory structure of the GHTS and to provide a comprehensive description of the physical and spatial components of the system. To accomplish this objective, this thesis uses a two-part approach. First, this thesis presents a description of the current system, which depicts the physical, spatial and regulatory structure of the GHTS. Second, this thesis employs a historical approach that details the regulatory developments that have occurred within the GHTS over the last 60 years. The historical approach draws from a range of sources that include academic books and journals, as well as non-academic publications, such as books, press releases, media and annual reports, and websites related to the rail and grain handling system.

The second thesis objective involves presenting a theoretical framework that can be used in the design of analytical tests capable of determining the validity of the two hypotheses listed above. Again, this thesis uses a two-part approach to achieve this objective. First, this thesis examines theories on the origin of regulation, looking specifically at public interest theory and capture theory. As well, this thesis examines several 'rate of return' regulatory options available to the regulator, and provides an illustration of the 'rate of return' regulation of the WGTA to provide a regulatory baseline against which the 1996 CTA regulatory changes can be assessed.

Second, after examining the theory behind regulation, this research develops a series of theoretical models to analyze the economic impacts of regulatory change on the GHTS. As a means of measuring the effects of regulatory change on GHTS welfare, this thesis looks at industry pricing and service levels in both grain and non-grain markets to determine the welfare gains or losses of system participants prior to and after the regulatory changes contained in the 1996 CTA. Specifically, these models are designed to examine the welfare effects resulting from the elimination of grain dependent branchlines and the introduction of the revenue cap.

Next, to ensure that the theoretical model captures the essence of these regulatory changes and their actual effects on GHTS welfare, this thesis develops a series of propositions derived from the theoretical outcomes of the model and compares them against actual events observed in the GHTS. Quantitative data on the GHTS is collected from a variety of sources, including the Canadian Grain Commission, Quorum Corporation, Transport Canada, and the Canadian Transportation Agency. These sources, along with information provided by the Government of Saskatchewan as part of the federal level of service review, are also utilized in the collection of qualitative data.

Finally, this thesis conducts a welfare analysis of both grain and non-grain markets prior to and after the implementation of the 1996 CTA. Specifically, this analysis examines the changes in consumer and producer surplus associated with moving from the WGTA to the revenue cap regulatory regime. These results are then used to determine how regulatory change has affected the welfare of different participants in the GHTS and which groups have benefitted the most from regulatory change.

As with all research topics, it is important to approach the topic of GHTS efficiency in an objective manner, thus eliminating the potential for bias to enter the research and analysis process. The potential for bias enters the research in at least two ways. First, the research topic and funding has been provided by the Canadian Wheat Board (CWB). In situations where both the research topic and research funding come from a particular institution, the potential exists for the researcher to tailor the results of the research towards those that reflect favourably towards the institution that has provided the funding. To remove this potential for bias, the researcher has taken two distinct steps. The first step involves subjecting this thesis to academic review. The second step involves approaching the subject in an objective fashion, using quantitative research methods that are closely aligned with what is viewed as the classical scientific paradigm. Quantitative research involves

gathering data that is absolute, such as numerical data, so that it can be examined in as unbiased a manner as possible. By analyzing and interpreting quantitative data, the researcher can remain detached and objective. The researcher would also like to emphasize that the views expressed in this thesis are those of the researcher and not the CWB.

The research is also at risk from personal bias, given that the researcher is currently employed as a transportation and marketing analyst by the Saskatchewan government within the Ministry of Agriculture. In this position, the researcher is asked to monitor the development of the GHTS, analyze developments related to 'institutional' files, which include institutions such as the Canadian Wheat Board (CWB) and the Canadian Grain Commission (CGC), and keep up to date with developments pertaining to the transportation of Western grain. Once this information is analyzed, it is the researcher's job to assemble the information and make recommendations on the subject. These recommendations are then used to shape government policy. This position often requires direct contact with the Saskatchewan Associate Deputy Minister and Deputy Minister of Agriculture. As a result, the researcher is exposed to a variety of topics and information that reflect the political views of the current Saskatchewan government. Again, I would like to reiterate that the use of quantitative research methods – as described above – are used to approach the subject matter in an objective fashion and that the views expressed in this thesis are those of the researcher and not the Government of Saskatchewan.

1.6 Organization of the Study

This chapter briefly introduces the regulatory reforms that have occurred within the GHTS within the last 25 years. It also provides a motive as to why an examination of regulatory change should be undertaken and outlines the methodology that will be used to conduct the study. The remaining chapters of this thesis are organized as

follows.

Chapter two provides an overview of the GHTS. This chapter describes the current structure of the grain handling sector by providing a breakdown of key industry participants, total primary storage capacity and the degree of market concentration found within the grain handling industry.

Chapter three provides a comprehensive review of the current regulatory structure of the Canadian grain handling and transportation system, beginning with a discussion on the role of incentive regulation and examples of incentive regulations contained in the 1996 CTA. In addition, this chapter includes an account of the regulatory developments that lead to the rationalization of the grain handling industry.

Chapter four presents economic theories that can be used to analyze and measure the economic impacts that the elimination of grain dependent branchlines and the introduction of the revenue cap have had on the GHTS. The first section of this chapter introduces two distinct theories on the origins of regulation: public interest and regulatory capture. This is followed by a brief discussion on applied welfare economics as a measure for evaluating the effectiveness of regulation. Next, this chapter tracks the evolution of regulatory solutions to market failures by examining different theories of public finance. Finally, this chapter develops a series of theoretical models to examine the welfare effects resulting from the elimination of grain dependent branchlines and the introduction of the revenue cap.

Chapter 5 examines several key propositions derived from the theoretical framework outlined in Chapter 4 that are used to test the hypotheses outlined in Chapter 1. Each proposition is tested for validity by finding supporting or refuting evidence using a triangulation approach. A discussion on how the key findings relate to the theoretical observations identified in Chapter 4 concludes the chapter.

Chapter 6 undertakes a welfare analysis of the GHTS. Chapter seven concludes this

thesis with observations from the analysis, some additional comments on the observations, suggestions for the application of this research, and recommendations for further study in this area.

Chapter 2: Description of the GHTS

2.1 Introduction

In recent years, the Canadian grain handling and transportation system has undergone a dramatic structural transformation marked by a significant rationalization of the GHTS. Noticeable effects of this transformation include the abandonment of GDBLs, a movement towards high throughput inland terminals, as well as a series of mergers and acquisitions amongst the grain handling companies. The reduction in both the number of elevators and firms has increased concerns over market concentration and market power being exercised within the system.

Over the last decade, Canada has seen new entrants in the grain handling industry with Cargill Limited, Bunge Canada and Louis Dreyfus Limited constructing grain-handling facilities on the Prairies, and Archer Daniels Midland (ADM) and Richardson Pioneer Limited investing in value added ventures throughout Western Canada. The grain handling industry has also undergone a variety of mergers and acquisitions, as Manitoba Pool Elevators and Alberta Wheat Pool merged to form Agricore Co-operative Limited, which merged with United Grain Growers Limited to form Agricore United. In 2007, Agricore United was acquired by Saskatchewan Wheat Pool (SWP) to become Viterra Inc.² In March of 2012, Glencore International obtained the support of Viterra's board to make a takeover offer for all outstanding Viterra shares and assets. Approval of the takeover is currently being considered by Industry Canada and the Competition Bureau of Canada.

During this same period, the rail system throughout Western Canada has also undergone an extensive transformation (Figure 2.1). Since 1995, the Class 1 railways have discontinued thousands of miles of grain dependent branch lines from their railway system. As well, the railways have removed a significant portion of

² Prior to 1996, the SWP was the largest cooperative grain handler in Western Canada, enjoying over 60 percent provincial market share from 1972 to 1992. In April 1996, SWP became a publicly traded company, with shares traded on the Toronto Stock Exchange.

producer car loading sites from their rail network. These events have coincided, and served as a catalyst for, the development of several producer owned shortlines across the Prairies.

The GHTS has also witness a dramatic change in the institutional structure of the industry. In December of 2011, the *Marketing Freedom for Grain Farmers Act* received Royal Assent and became law, removing the Canadian Wheat Board marketing monopoly effective August 1, 2012. While the economic implications of this change on the GHTS have yet to be determined, the 'for profit' nature of the new entity suggests that many of the industry good functions carried out by the CWB in the past (i.e., branding, railway and grain company countervailing) will no longer be offered.

This chapter provides a description of the current structure of the Western Canadian GHTS by providing a breakdown of key industry participants, total primary storage capacity and the degree of market concentration found within the grain handling industry. This chapter ends by identifying past and current industry trends, such as changes in firm composition, vertical integration, and value added initiatives that have taken place or that are occurring in the Western Canadian grain handling industry.

Significant to the development of this thesis is the recognition that the majority of changes to the structure of the GHTS have coincided with the regulatory changes made to the GHTS as part of the 1996 CTA.

2.2 The Grain Handling Industry Structure

2.2.1 The Primary Elevator System

The elevator system across the prairies has undergone a remarkable rationalization over the last decade as it consolidated from numerous smaller elevators to fewer,

larger elevators and inland terminals. In 1997, the prairies had 1,118 primary elevators at 749 delivery points with 6.44 million tonnes of capacity. In 2008, there were 321 elevators at 276 delivery points, with 5.36 million tonnes capacity (Table 2.1). This represents a 73 per cent drop in the number of elevators, a 64 per cent drop in the number of delivery points and a 17 per cent drop in capacity (Canadian Grain Commission, 2010). As well, the number of elevators per delivery point has declined from 1.49 to 1.16, indicating that there are fewer delivery points with multiple elevators.

Table 2.1- Number of Primary Elevators by Province

| Year | Number of Primary Elevators by Province | | | | Total Prairies |
|------|---|----|-----|-----|-------------------|
| | AB | BC | MB | SK | |
| 1987 | 543 | 12 | 291 | 923 | 1,769 |
| 1992 | 452 | 11 | 256 | 778 | 1,497 |
| 1995 | 388 | 7 | 236 | 708 | 1,339 |
| 1996 | 317 | 6 | 219 | 660 | 1,202 |
| 1997 | 284 | 6 | 213 | 615 | 1,118 |
| 1998 | 268 | 6 | 209 | 571 | 1,054 |
| 1999 | 244 | 7 | 209 | 518 | 978 |
| 2000 | 208 | 6 | 196 | 432 | 842 |
| 2001 | 153 | 6 | 161 | 299 | 619 |
| 2002 | 99 | 7 | 100 | 215 | 421 |
| 2003 | 83 | 7 | 90 | 198 | 378 |
| 2004 | 80 | 7 | 79 | 193 | 359 |
| 2005 | 82 | 6 | 73 | 182 | 343 |
| 2006 | 81 | 5 | 72 | 179 | 337 |
| 2007 | 81 | 6 | 78 | 171 | 336 |
| 2008 | 80 | 5 | 78 | 164 | 327 |
| 2009 | 73 | 5 | 75 | 161 | 314 |
| 2010 | 79 | 5 | 77 | 162 | 323 |

Elevators situated along grain dependent branchlines have seen the highest rates of decline. Since 1999, the number of primary and process elevators positioned along the grain-dependent network fell by 72.1 per cent, from 420 to 117. Primary and process elevators located alongside non-grain dependent networks have also declined, albeit at a lesser rate, falling 58.1 per cent from 559 to 234 (Quorum, 2009).

The reduction in overall system capacity and the number of prairie elevators has coincided with a significant increase in the capacity of the average elevator, as older

wooden elevators were replaced with large high throughput concrete structures. (Table 2.2) At the same time, the total tonnage of grain delivered into the system has remained relatively steady, resulting in an increase in annual average elevator turnover from 5.47 turns in 1997 to 6.5 turns in 2009 (Quorum, 2010).

Table 2.2 - Average Elevator Capacity by Province

| Year | Average Capacity (tonnes) | | | | Total Prairies |
|------|---------------------------|--------|--------|--------|-------------------|
| | AB | BC | MB | SK | |
| 1987 | 4,959 | 5,378 | 4,018 | 4,369 | 4,499 |
| 1992 | 5,281 | 6,249 | 4,244 | 4,803 | 4,862 |
| 1995 | 5,435 | 7,413 | 4,546 | 5,117 | 5,121 |
| 1996 | 5,915 | 7,548 | 4,740 | 5,443 | 5,450 |
| 1997 | 6,071 | 7,497 | 4,845 | 5,917 | 5,760 |
| 1998 | 6,037 | 7,497 | 5,089 | 6,011 | 5,843 |
| 1999 | 7,035 | 6,576 | 5,603 | 6,632 | 6,512 |
| 2000 | 8,982 | 6,307 | 6,383 | 7,923 | 7,815 |
| 2001 | 11,115 | 6,307 | 7,611 | 10,090 | 9,662 |
| 2002 | 13,948 | 8,454 | 9,922 | 13,199 | 12,518 |
| 2003 | 15,415 | 9,204 | 10,701 | 14,007 | 13,440 |
| 2004 | 16,802 | 9,204 | 11,913 | 14,691 | 14,443 |
| 2005 | 17,130 | 10,738 | 12,667 | 15,442 | 15,173 |
| 2006 | 17,285 | 12,886 | 12,753 | 15,716 | 15,418 |
| 2007 | 17,837 | 9,392 | 12,698 | 16,250 | 15,685 |
| 2008 | 18,726 | 10,388 | 12,894 | 17,059 | 16,353 |
| 2009 | 19,923 | 10,388 | 13,775 | 17,723 | 17,214 |
| 2010 | 20,430 | 10,368 | 13,696 | 18,139 | 17,520 |

2.2.2 Concentration in the Primary Elevator System

One method that is often used to determine the level of concentration in an industry is to examine the market share of the firms in the industry. In the grain handling industry, the primary storage capacity of elevator companies as a percentage of the total prairie elevator capacity is often used as a proxy for market share (Fulton, et al, 1998). In 2009/10, Viterra Inc. had the most elevator capacity at 2.01 million tonnes. Richardson Pioneer Limited was second with 893 thousand tonnes of storage capacity, while Cargill Limited was third with 709 thousand tonnes. Then came Parrish and Hiembecker Limited with 404 thousand tonnes, Patterson Grain at 378 thousand tonnes and Louis Dreyfus Canada Limited at 348 thousand tonnes. Finally, a number of smaller elevator companies and locally owned elevators together had 916 thousand tonnes. (Canadian Grain Commission, 2010)

In percentage terms, Viterra Inc. has 35.6 per cent of the total Prairie capacity, Richardson Pioneer Limited has 15.8 per cent, Cargill Limited has 12.5 per cent and Parrish and Heimbecker Limited has 7.2 per cent, giving the largest four companies 70.9 per cent of the market. If measured by province, the market concentration is highest in B.C, Alberta and Saskatchewan. In B.C., the largest four companies control 100 per cent of the total capacity, while the largest four companies in Alberta and Saskatchewan control 79.9 per cent and 71.6 per cent respectively. In Manitoba, the largest four companies represent 71.4 percent of the total capacity market share.

A second method often used in measuring the levels of concentration in an industry is the Herfindahl-Hirschman (H) index.³ The H index is designed to capture the size distribution of firms, in addition to their capacity shares. Larger values (over 1800) suggest an industry characterized by acute levels of concentration and, subsequently, an industry sector with a greater potential for market power (Wilson, 1996; Rhoades, 1993).

Over the last decade, the H Index for the grain handling industry has increased, rising from 1415 in 1998-99 to 1805 in 2008-09 (Table 2.3). The increase in the H index reflects an increase in the levels of consolidation within the grain handling industry during this period. The 2008-09 numerical value of H is very close to the number indicated by Rhoades (1993) as the point where an industry ceases to be competitive. This suggests that the potential for a grain handling firm to exercise market power is greater in 2008-09 than it was a decade ago (Wilson, 1996).

A potential factor contributing to the significant increase in the H index is the spatial nature of the grain handling market. Spatial markets are those where buyers and sellers are dispersed over a geographical region. In instances where spatial markets exist – as in agricultural commodity markets – it has been observed that market

³ The H index is calculated by summing the squares of the market share of each firm in the industry. For example, an industry made up of 100 equal-sized firms will generate an index of 100. If there are only four equal-sized firms, the H index will be 2,500. With only one firm in the market, a pure monopoly, the H index is 10,000.

formations tend towards structural oligopsonies, meaning that the industry is characterized by a limited number of firms operating, each with a certain degree of market power (Faminow and Benson, 1990).

Table 2.3 Market Share and Herfindahl Index of Top Ten Grain Handling Companies

| 1998/99 | | | 2008/09 | | |
|----------------------------|-------------------------------------|-------------|---------------------------|-------------------------------------|-------------|
| Company | Market Share as % of Total Capacity | H Index | Company | Market Share as % of Total Capacity | H Index |
| Saskatchewan Wheat Pool | 23.81 % | 567 | Viterra Inc. | 35.09 % | 1231 |
| Agricore Cooperative Ltd. | 21.42 % | 459 | Richardson Pioneer Ltd. | 16.23 % | 263 |
| United Grain Growers Ltd. | 12.82 % | 164 | Cargill Ltd. | 13.28 % | 176 |
| Pioneer Grain Ltd. | 9.41 % | 89 | Parrish & Heimbecker Ltd. | 6.63 % | 44 |
| Cargill Ltd. | 8.20 % | 67 | Louis Dreyfus Canada Ltd. | 6.46 % | 42 |
| Agpro Grain | 5.69 % | 32 | Paterson Grain Ltd. | 6.21 % | 39 |
| N.M. Paterson and Son Ltd. | 3.80 % | 14 | Weyburn Inland Terminal | 2.01 % | 4 |
| Parrish & Heimbecker Ltd. | 3.74 % | 14 | Great Northern Grain Ltd. | 1.59 % | 3 |
| Louis Dreyfus Canada Ltd. | 2.18 % | 5 | North West Terminals Ltd. | 1.15 % | 1 |
| ConAgra Ltd. | 1.88 % | 4 | Bunge Canada | 1.07 % | 1 |
| Total | 92.95 % | 1415 | | 89.75 % | 1805 |

Source – Canadian Grain Commission, 2010 Grain Elevators in Canada

An additional factor to consider when discussing market power levels in the GHTS is number of grain elevators located at a deliver point (Table 2.4). Given the spatial nature of the industry, firms operating at single company delivery points have the opportunity to exert greater levels of market power. In the GHTS, the high cost of transporting grain serves as the rationale as to why market power may be prevalent at single company delivery points. Rogers and Sexton (2004) suggest that the bulky/perishable nature of agricultural commodities and the high costs of transporting such goods acts to restrict the products' geographic mobility, thus

limiting farmers' to only those buyers located in proximity to the production site. Aware of this constraint, grain handling firms located at single company delivery points are able to exert market power by lowering their bids marginally without losing all their customers because, even at the lower price, many of their customers would still find that the next best alternative price net of transportation costs would still be lower than the now-lower local price.⁴

Table 2.4 Total Number of Western Canadian Grain Delivery Points and Number of Single Company Delivery Points

| Province | Grain Delivery Points | Grain Delivery Points With Single Company | % of Delivery Points with Single Company |
|--------------|-----------------------|---|--|
| Saskatchewan | 134 | 97 | 72.4 |
| Manitoba | 73 | 50 | 68.5 |
| Alberta | 58 | 44 | 75.9 |
| B.C. | 2 | 1 | 50.0 |
| Total | 267 | 192 | 71.9 |

Source – Canadian Grain Commission, 2012 Grain Elevators in Canada

2.2.3 Producer-Owned Inland Grain Terminals

The 1990's saw an increase in the construction and operation of producer-owned inland terminals across the prairies. As the name implies, producer-owned inland terminals are locally owned and operated by producers and are similar to the high-throughput elevators operated by the major grain handling firms. The increase in producer-owned terminals largely developed in reaction to producer dissatisfaction with the large grain handling firms and the GHTS as a whole (Herman, 2003).

Producer-owned inland terminal advocates typically believe that these terminals increase the level of competition within the grain industry by providing producers with more choice in how they market their grain (ITAC, 2010).

Canada's first producer-owned inland terminal, the Weyburn Inland Terminal (WIT), was completed in 1976 near the town of Weyburn, Saskatchewan. Built as a

⁴ The extent to which the bid price can be lowered is limited, however. If local bid prices fall by too much, then local sellers will simply ship their grain farther away. If one local buyer decides to lower price significantly, then the remaining local sellers would simply shift their business to the other local buyer(s).

response to the dissatisfaction that producers felt towards an inefficient and over-regulated system, WIT set the stage for numerous other producer-owned terminal ventures throughout the prairies (Saskatchewan Heritage Foundation, 2009).

Table 2.5- Western Canadian Producer Owned Terminals, as of 2011.

| Facility Name | Location | Year | Storage Capacity (tonnes) | Joint Owner/ Terminal Access |
|----------------------------|-------------------|-------------|--------------------------------------|---|
| CMI Terminal JV | Naicam | 2000 | 23,320 | Viterra |
| Gardiner Dam Terminal | Loreburn | 1999 | 17,000 | Viterra |
| Great Sandhills Terminal | Leader | 1999 | 20,800 | Alliance Terminal |
| Lethbridge Inland Terminal | Lethbridge | 2008 | 41,190 | none |
| North West Terminal | Unity | 1996 | 63,000 | Alliance Terminal |
| Prairie West Terminal | Plenty | 1998 | 50,750 | Alliance Terminal |
| Providence Grain Group | Fort Saskatchewan | 2002 | 27,630 | none |
| South West Terminal | Gull Lake | 1997 | 52,000 | Cargill |
| Westlock Terminals | Westlock | 2002 | 14,060 | none |
| Weyburn Inland Terminal | Weyburn | 1976 | 107,900 | Alliance Terminal |

Information in this table is summarized from that provided by the Inland Terminal Association of Canada (ITAC 2011)

There are currently ten producer-owned inland terminals in Western Canada, all of which belong to the Inland Terminal Association (Table 2.5). Of these terminals, seven are 100 per cent producer owned. In 2009-10, producer-owned terminals handled 1.7 million tonnes of CWB grain and represented approximately seven per cent of total primary elevator capacity.

While several producer-owned terminals have joint venture agreements with the major grain handlers (i.e., Viterra and Cargill) that allow them port access, there are some producer-owned terminals that do not. As a means of acquiring port access, four producer-owned inland terminals, in conjunction with Parrish and Heimbecker and Paterson Grain, have jointly purchased the Alliance Grain Terminal in Vancouver (Table 2.5). However, there still remains some producer-owned inland terminal operations without joint venture agreements or terminal ownership.

2.2.4 Producer Car Loading Facilities

The ability of producers to load their own rail cars and bypass the country elevator system has been a component of Western Canadian grain industry regulation since farmers won the right to load producer cars in the 1902 Sinaluta case (Wilson, 1996). The original objective of producer car regulation was to provide producers with an alternative to the elevator system, thus preventing grain companies from using market power to increase elevator charges or to impose arbitrary price discounts on grain purchased. Today, the return for the extra effort of loading one's own grain car is the saving of the elevation fees or tariffs that would otherwise be charged at the elevator. This is estimated in the range of \$11.00 to \$14.50 per tonne (CWB, 2010; Producer Car Association of Canada, 2010).

Over the last decade the railways have increased multiple car shipment incentive rates as a means of encouraging grain companies to load and ship larger blocks of cars. These incentives have made producer car loading sites that are unable to spot 25 or more cars less competitive. Producers have addressed this situation through the development of producer car loading facilities that capture both the benefits of loading producer cars and multiple car shipment incentive rates offered by the railways.

Producer car loading facilities are not required to be licensed or bonded by the CGC as long as they meet the following five conditions:

1. The facility only handles grain on behalf of producers.
2. The facility only handles grain that is intended for loading into producer cars.
3. The facility posts a notice advising producers that it is not licensed under the Act and that the Canadian Grain Commission will not be involved in disputes between the facility and the producer except when they arise at the port location.
4. The facility does not buy and sell grain.
5. The facility allows the Canadian Grain Commission access to its records.

There are currently 39 exempt from licensing loading facilities in operation throughout the prairies (CGC, 2010). Facility infrastructure ranges from trackside bin storage that allows for producers to segregate grain by grade to wooden elevators purchased from grain handling companies during the rationalization of the grain handling system.

2.2.5 Terminal Elevator System

In 2007-08, Canada's ports handled 22.76 million tonnes of grain. Of this, Vancouver received 12.54 million tonnes and Prince Rupert 4.46 million, making the total amount of grain shipped through the West Coast 17.00 million tonnes. Thunder Bay received 5.14 million tonnes and Churchill received 0.62 (Quorum2008). Use of West Coast ports has increased slightly during the last decade. In 1999-2000, only 71 per cent of Canadian grain went through Vancouver and Prince Rupert, whereas in 2007-08 West Coast movement had increased to 75 per cent. In 2009, the storage capacity at Thunder Bay was 1.17 million tonnes, while Churchill had a capacity of 140 thousand tonnes (Canadian Grain Commission, 2009).

Overall, the average turnover for all terminal elevators has decreased from 10.34 turns in 1999-2000 to 9.19 turns in 2007-08. Turnover at West Coast terminals is higher. In 2007-08, the turnover in Prince Rupert was 21.29 turns, compared with 15.89 turns in 1999-2000. In Vancouver turnover was 13.14 turns in 2007-08, down from 16.75 turns in 1999-2000. Turnover at Thunder Bay declined from 5.54 turns in 1999-2000 to 3.84 turns during 2007-08. In Churchill, the number of turns during 2007-08 equaled 4.41 turns, up from 3.34 turns in 1999-2000 (Canadian Grain Commission, 2009; Quorum, 2008).

In 2009, there were 15 terminal elevators at port position, owned by eleven elevator companies. Most owners of terminal facilities also own local elevators across the prairies. Producer owned elevators and other elevator companies that do not own terminal facilities pay for terminal handling.

2.3 Rail Industry Structure

2.3.1 The Western Canadian Railway Industry

The changes that have occurred in the rail industry are considerably more modest than those that have taken place in the elevator system over the last ten years. In 1999, the railway network in Western Canada covered nearly 19,500 route miles of track. Of this, Class 1 carriers (rail companies with annual revenues greater than \$250 million) operated 76.2 per cent, or just over 14,800 route-miles, while the smaller Class 2 and 3 carriers (rail companies with annual revenues under \$250 million) operated the remaining 23.8 per cent, or 4,600 route-miles.

At the beginning of 2009, Western Canadian railway infrastructure declined by approximately eight per cent, with the network's total mileage reduced to 17,924 route-miles (Quorum, 2009). The largest share of this 1,500 route-mile reduction came from the abandonment of light-density, grain-dependent branch lines.

2.3.2 Concentration in the Western Canadian Railway Industry

As mentioned previously, examining the market share of firms in an industry is a technique that is often used to determine the level of concentration in an industry. In the rail industry, the total amount of track that a company owns as a percentage of the total rail network can be used as a proxy for market share (Quorum, 2008). In 2009, the Class 1 railways owned 15,401 route miles of the total 17,904 miles of rail network. Of the total track owned by the Class 1 railways, CP accounted for 6,043 route miles, while CN made up the remaining 9,358 route miles of track. The remaining 2,523 miles of track is owed by numerous smaller Class 2 and 3 carriers.

In percentage terms, CN owns 52.2 per cent of the total Western Canadian track, while CP owns 33.7 per cent. This gives the largest two companies 85.9 per cent of the total rail market. If measured by province, the market concentration is higher in

Alberta and B.C.. In Alberta the Class 1 companies have 100 per cent of the total track, while in B.C they own a total of 90 percent of the market share. In Saskatchewan and Manitoba, the Class 1 railways own 83.5 per cent and 67.5 per cent respectively (Quorum, 2009).

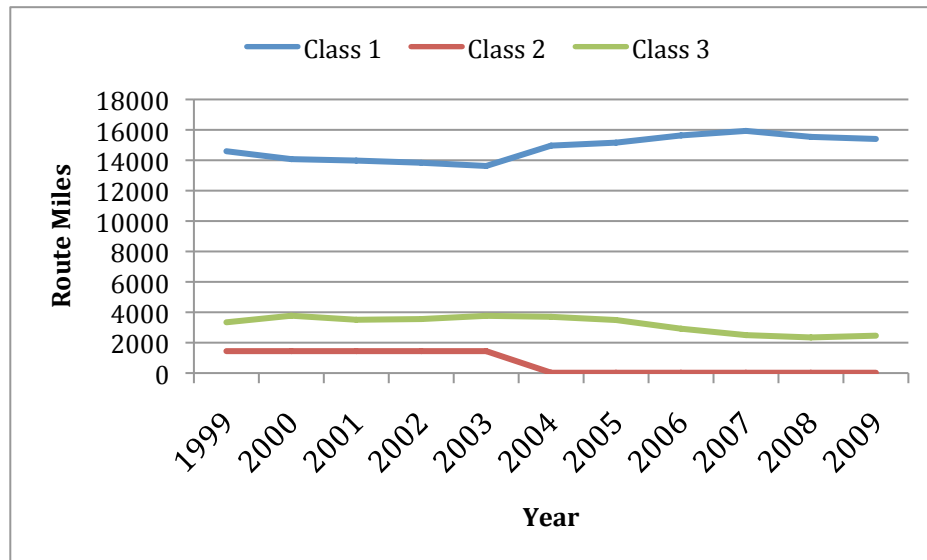


Figure 2.2 - Rail Track Ownership by Railway Class, 1999-2009

A Herfindahl index produced from data on total route miles of track indicates that the H for rail track has increased over the last decade from 2905 in 1998-99 to 3896 in 2008-09 (Table 2.6). The increase in the H index reflects an increase in the levels of consolidation within the rail industry between these periods. The 2008-09 numerical value of H is substantially higher than the number indicated by Rhoades (1993) as the point where an industry ceases to be competitive, suggesting that rail companies have a greater potential to exercise market power in 2008-09 than they did in 1999-2000 (Wilson, 1994).

2.3.3 Grain Dependent Branchline Discontinuance

Since 1995, the Class 1 railways have discontinued 2,522 route miles of grain dependent branch lines from their railway system (Table 2.7). Of the total miles

discontinued, CN has abandoned 1,242 miles, while CP has abandoned 1,280 miles (CTA, 2009). At the provincial level, Saskatchewan has seen the largest decline in grain dependent branchlines, losing 1,305 miles between 1995 and 2009. During the same period, Alberta has seen its total number of branchlines reduced by 615 miles, Manitoba has lost 586 miles and B.C. has lost 16 miles.

Table 2.6 Market Share and Herfindahl Index of Top Ten Railway Companies

| 1999/2000 | | | 2008/09 | | |
|-----------------------------|-------------------------------------|-------------|--------------------------------------|-------------------------------------|-------------|
| Company | Market Share as % of Total Capacity | H Index | Company | Market Share as % of Total Capacity | H Index |
| Canadian National Railway | 37.93 % | 1439 | Canadian National Railway | 52.27 % | 2732 |
| Canadian Pacific Railway | 37.03 % | 1371 | Canadian Pacific Railway | 33.75 % | 1139 |
| British Columbia Railway | 7.41 % | 55 | Hudson Bay Railway | 3.53% | 13 |
| Hudson Bay Railway | 4.20 % | 18 | Great Western Railway | 1.84 % | 4 |
| Mackenzie Northern Railway | 2.91 % | 9 | Carlton Trail Railway | 1.67 % | 3 |
| Lakeland and Waterways Rail | 2.30 % | 5 | Keewatin Railway Company | 1.03 % | 1 |
| Alberta RailNet | 1.91 % | 4 | Southern Railway of Vancouver Island | 0.99 % | 1 |
| Carlton Trail Railway | 1.42 % | 2 | Central Manitoba Railway | 0.67 % | 1 |
| E & N Railway | 0.91 % | 1 | Great Sandhills Railway | 0.65 % | 1 |
| Southern Manitoba Railway | 0.73 % | 1 | Kelowna Pacific Railway | 0.58 % | 1 |
| Total | 96.75 % | 2905 | | 96.98 % | 3896 |

Source – Railways Association of Canada

2.3.4 Captive Rail Shippers

The spatial nature of the railway network, coupled with the geographic distribution and the location of markets, means that in some market segments there are groups of shippers who are captive to a single rail service provider. Since 1998, the total number of grain delivery points that have access to more than one rail carrier has declined from 27 to 25. However, since the number of grain delivery points across the prairies has also declined (from 749 to 252), in percentage terms the number of grain delivery points with access to more than one rail carrier has actually increased from 3.6 per cent in 1998 to 9.9 per cent in 2009 (CGC, 2009).

Since 1998, Manitoba is the only province that has seen a decline in the number of shipping points with access to more than one railway, moving from seven to five. Saskatchewan, Alberta and British Columbia have all remained steady at thirteen, six and one, respectively. In percentage terms, Saskatchewan has seen a rise in the number of delivery points with multiple carriers, moving from 3.3 per cent in 1998 to 10.0 per cent in 2009. Alberta has increased from 3.1 per cent to 10.5 per cent, while B.C. has increased from 33.3 per cent to 50.0 per cent. Again, it is important to point out that these increases are largely due to the rapid decline in the total number of delivery points relative to the steady number of delivery points with access to multiple rail carriers.

2.3.5 Shortline Railways

The Western Canadian shortline rail industry has undergone a period of rapid change over the last two decades. Prior to the 1990s, the Western Canadian shortline industry was nearly non-existent. This changed with the introduction of the *Canada Transportation Act* in 1996, which removed regulatory provisions regarding governmental approval of rail line discontinuance and transfers. Between 1996 and 2000, eight new Western Canadian shortline rail companies emerged as CN and CP sold non-profitable and low volume rail lines to short line operators

across Western Canada (RAC, 2009; Transport Canada, *Transportation in Canada 2006*).

Table 2.7- CN and CP Total Miles of Discontinued Track

| Year | Discontinued Track by Company (miles) | | Total Track Discontinued (miles) |
|--------------|--|---------------|--|
| | CN | CP | |
| 1995 | 42.2 | 35.9 | 78.1 |
| 1996 | 261.2 | 262.7 | 523.9 |
| 1997 | 172.5 | 215.9 | 388.4 |
| 1998 | 105.9 | 166.2 | 272.1 |
| 1999 | 89 | 133.2 | 222.2 |
| 2000 | 130.0 | 14.8 | 144.8 |
| 2001 | 0 | 0 | 0 |
| 2002 | 46.2 | 97 | 143.2 |
| 2003 | 0 | 0 | 0 |
| 2004 | 0 | 80.4 | 80.4 |
| 2005 | 0 | 42 | 42 |
| 2006 | 5.9 | 15.9 | 21.8 |
| 2007 | 150.5 | 24.7 | 175.2 |
| 2008 | 230.8 | 192.1 | 422.9 |
| 2009 | 7.4 | 0 | 7.4 |
| Total | 1241.6 | 1280.8 | 2522.4 |

Sources – Canadian Transport Agency
Transport Canada

Since 2000, eleven new shortlines have been created, with the majority of these being producer owned. However, several of the shortline operations beginning operations prior to 2000 have reverted back to Class 1 ownership. The reason for this lies in the fact that although shortline companies are able to make profits from lines formerly considered low volume and unprofitable by the Class 1 railways, the profit margins are extremely small (Debrie and Gouvernal, 2007). Operational cost increases, such as increases in fuel and steel prices, which have had a serious negative financial impact on shortline rail companies, has prevented shortline

companies from making much needed investments in infrastructure and equipment (RAC, 2009).

There are currently 22 shortline railway companies operating over 2,900 miles of track within Western Canada. With average haul lengths of only 134 miles (Table 2.8), the revenues earned by these carriers totaled less than \$400 million and accounts for less than four percent of the \$10.5 billion generated by the industry at large (Transport Canada Addendum, 2008).

Table 2.8- Western Canadian Shortline and Regional Railways

| Province | Railway | Miles | Year Established |
|----------|--|-------|------------------|
| BC | Kettle Falls International Railway Company | 160 | 2004 |
| BC | Okanagan Valley Railway | 94 | 1998 |
| BC | Southern Railway of British Columbia Ltd. | 125 | 1897 |
| BC | Southern Railway of Vancouver Island Limited | 140 | 2006 |
| BC | International Rail Road Systems Inc. | 21 | 1998 |
| BC | Kelowna Pacific Railway Company | 104 | 2000 |
| BC | Grand Forks Railway Company | 4 | 1993 |
| MB | Boundary Trails Railway Company | 84 | 2009 |
| MB | Keewatin Railway Company | 185 | 2006 |
| MB | Central Manitoba Railway Inc. | 118 | 1999 |
| MB | Hudson Bay Railway | 810 | 1997 |
| SK | Fife Lake Railway | 60 | 2005 |
| SK | Great Western Railway Ltd. | 308 | 2000 |
| SK | Red Coat Road and Rail Ltd. | 74 | 1999 |
| SK | Southern Rails Cooperative Limited | 44 | 1990 |
| SK | Thunder Rail Ltd. | 20 | 2005 |
| SK | Torch River Rail Inc. | 30 | 2007 |
| SK | Wheatland Railway Inc. | 46 | 2002 |
| SK | Great Sandhills Railway | 116 | 2009 |
| SK | Carlton Trail Railway | 279 | 1997 |
| SK | Last Mountain Railway | 85 | 2009 |
| AB | Battle River Railway | 50 | 2010 |
| Total | | 2955 | |
| Average | | 134 | |

Source - Railway Association of Canada, 2011

2.3.6 Producer Cars

Producer cars must be loaded at designated producer car loading sites located throughout the prairies. The last decade has seen the total number of producer

loading sites decline by 45 per cent, falling from 709 sites in 1999 to 392 in 2010 (Quorum, 2009; Transport Canada, 2010). Much of this overall decline stems from the reduction in the number of sites served by the larger Class 1 rail carriers, which fell by 55 per cent during the same period, from 644 to 287.

Alberta and Manitoba have seen the largest decline in the number of producer car loading sites. From 1999 to 2010, the number of sites in Alberta decreased from 199 to 85 (57 per cent) while the number of sites in Manitoba decreased from 197 to 70 (65 per cent). In Saskatchewan, the rate of decline has been substantially less, with the number of sites falling from 310 to 234 (25 per cent) during the same period.

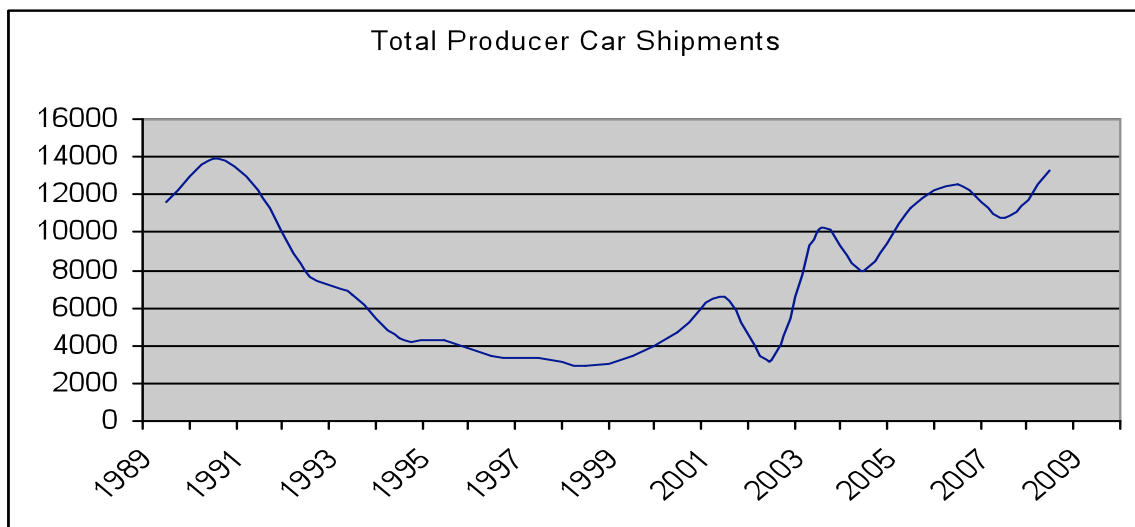


Figure 2.3 – Producer Car Shipments from 1989-2008
 Source - CWB and Quorum 2008-09 Annual Report; CGC Producer Car Statistics

In contrast with the reduction in the number of producer loading sites, producer car shipments have increased over the last decade. Since 1999-2000, producer car loadings have increased over 280 per cent from 3,441 cars to 13,243 cars by the end of the 2008-09 crop year (Figure 2.3). The increase in producer car shipments has come as a result of many factors, including the continued increase in the maximum tariff levels for grain handling and cleaning, closure of local elevators, increased

trucking distances, greater collaboration between producer car loading facilities and producer car administrators, and the advent of Canadian Grain Commission (CGC) license-exempt facilities.

2.4 Chapter Summary

The Western Canadian GHTS has undergone tremendous change over the past several decades. This section has identified the major changes to the railway and grain handling industry structure that have occurred within the GHTS throughout the 1990s up to the present. Of specific interest is the increase in the levels of concentration that have been observed in the GHTS over the last two decades. As indicated above, the rationalization of the grain handling industry has coincided with changes to the GHTS regulatory framework. This suggests that a link between the regulatory structure and the rationalization of the GHTS exists.

The following chapter begins by presenting a historical overview of government regulation leading up to the passing of the 1996 CTA. As well, it presents an overview of the current GHTS regulatory framework, including information on the incentive schemes contained in the CTA, procedures for branchline abandonment and shipper protection provisions under the 1996 CTA.

Chapter 3: Regulatory History of the GHTS

3.1 Introduction

The Canadian grain handling and transportation system has been regulated in one form or another for over the last 100 years. Early forms of regulation, such as the Crow's Nest Pass Agreement and the Canada Grains Act, were designed to protect farmers against the market power of grain handling and railway conglomerates.

By the 1950s and 1960s the focus of regulation began to change, as the federal government moved to increase transportation efficiencies through competitive and commercial practices rather than intense forms of regulation. This effort has continued over the last two decades, culminating in the passing of the CTA. This chapter identifies the components of the CTA that were intended to improve the efficiency of the GHTS, as well as a historical overview of government regulation leading up to the passing of the CTA.

3.2 Factors and Events Leading Up to the Regulatory Changes

3.2.1 The Crow's Nest Pass Agreement

In 1897 the Canadian government entered into an arrangement with the Canadian Pacific Railway (CP), an agreement known as the Crow's Nest Pass Agreement, in which the government ceded cash, land, and property rights to the CP in exchange for a freight rate structure for grain transport that was to be fixed in perpetuity.

Under the original agreement, CP was obligated to fix its rail rates on track that existed prior to the signing of the Crow's Nest Pass Agreement. Additional grain transportation legislation that was added in 1925, and again in 1927, made the rates statutory and extended them to the newer Canadian National Railway. As the years

progressed, the 'Crow rate' was extended to cover dozens of other crop-based products, including oilseeds, dehydrated alfalfa, and pulses (Klein and Kerr, 1996).

3.2.2 The MacPherson Commission

Growing competition from water and highway transport during the 1950s, a significant reduction in the levels of railway traffic and a period of rapid inflation meant that the statutory freight rates established under the Crow Agreement could no longer cover the costs associated with the transportation of grain, resulting in financial losses for both CN and CP (Heaver and Nelson, 1980). In 1959, the federal government appointed a Royal Commission on Transportation to reevaluate existing railway regulation and to recommend solutions to the problems faced by the railways.

M.A. MacPherson, whose name has become synonymous with the assessments of the Commission, chaired the Royal Commission on Transportation. The MacPherson Commission addressed the question of Canadian railway regulation in two important ways. First, it clearly established that regulated rail rates established under the Crow Agreement were inappropriate in light of the increased competition that the rail sector faced from other modes of competition. It recommended that the level of freight rates should be determined by market forces with minimal regulation, which would lead to a more effective and efficient transportation system. Second, the Commission addressed the matter of railway compensation for performing services that would probably not be undertaken under a competitive environment. This led to recommendations for explicit subsidies for uneconomic branch lines used in grain transportation.

3.2.3 The 1967 National Transportation Act (NTA)

The passage of the NTA in 1967 marked a shift in national transportation policy to

one based on the objectives of achieving transportation efficiencies through competitive and commercial practices rather than relying upon prior combinations of intense regulation and direct government intervention in freight rates.

The NTA was significant for four main reasons. First, the NTA acknowledged the growing competitiveness of the transportation industry and the reduced need for regulatory activity (Haritos and Elliot, 1983). To this end, the NTA followed the recommendations put forward by the McPherson Commission, allowing the railways more pricing freedom in the form of flexible freight rates that could be responsive to transportation market conditions.

Second, it established the Canadian Transport Commission (CTC) as a quasi-judicial, apolitical body to regulate all modes of transportation under federal jurisdiction. Prior to the passing of the NTA, transport regulation was conducted jointly by the Board of Transport Commissioners of Canada, the Canadian Maritime Commission and the Air Transport Board. Placing transportation regulation under a central body was seen as a means of fostering the concept of intermodal competition outlined in the MacPherson Commission report (Semotuk, 1972).

Third, the NTA acknowledged the MacPherson Commission's observation that in certain circumstances transportation services may be required in the public interest and that those services may not be profitable to carriers. In such circumstances, the NTA stated that carriers should be at least partially compensated for "imposed public duties."

Finally, with the passing of the NTA, the federal government instituted a moratorium on branch line abandonment, ensuring a basic network of rail service that would be thought of as more or less permanent (Hall, 1977). This moratorium was extended in 1974, as the federal government set up a protected basic rail network for Western Canada, placing over 12,000 miles of line under protection until the year 2000 and another 6,283 miles prohibited from abandonment until January 1, 1976 (Hall, 1977). As compensation for maintaining service on

uneconomic branch lines used in grain transportation, the federal government subsidized the operating costs and assumed the rehabilitation of guaranteed lines.

3.2.4 The Hall Commission

In 1975, a commission of inquiry headed by Emmett Hall – a retired Justice of the Supreme Court of Canada – was appointed to determine an action plan on the 6,283 miles of prairie branchlines under protection until January 1, 1976.

The Hall commission report, issued in May of 1977, recommended that of the 6,283 miles it had reviewed, 1,813 miles be placed in the permanent network established under the NTA. Of the remaining 4,470 miles, the commission suggested that 2,165 miles be abandoned, with the residual 2,344 miles placed under the jurisdiction of the Prairie Rail Authority (PRA), a new Crown corporation proposed by the commission that would operate and evaluate rail lines that were neither classified as permanent nor slated for abandonment.

In addition to its evaluation on prairie branchlines, the commission also provided commentary on the issue of statutory grain freight rates. Hall's report advocated for the retention of the Crow rate, citing that the removal or altering of the Crow rates would do irreparable harm to the prairie economy (Hall, 1977).

3.2.5 The Snavelly Commission

Rapid inflation during the early 1970s substantially increased the costs associated with the transportation of grain (Khakbazan and Gray, 1997). In an attempt to determine the actual cost of grain movement, the federal government appointed a Commission on the Costs of Transporting Grain by Rail to examine the issue. Carl M. Snavelly, head of the Commission, issued a 1975 report that showed statutory grain rates were only covering 38.9 per cent of the variable costs of moving grain.

Snavely's material, updated in 1977 and again in 1980, showed that the position of the railways continued to deteriorate throughout the 1970s. Snavely's 1977 report estimated that only 32 per cent of the variable costs associated with the movement of grain were being met by grain shippers, with the remainder covered through federal government branch line subsidies (18 per cent) and railway cross-subsidization (50 per cent) (Schmitz, Highmoor and Schmitz, 2002; Gray and Khakbazan, 1997). While the area of dispute in railway costing methodologies would allow some debate on Snavely's precise figures, the overall conclusions from examination were unarguable.

3.2.6 The Gilson Report

Shortly after the commencement of Snavely's 1980 cost examination, the Hon. Jean-Luc Pepin, Minister of Transport, announced that Dr. J.C. Gilson would head a formal consultation process with GHTS stakeholders - particularly Western farmer organizations and the two national railways - to find an acceptable means of implementing a new grain freight rate structure.

The consultation centered on the issue of the railway's gross revenue shortfall (GRS), a term used to describe the gap between railway revenues and variable costs. In his report, Gilson acknowledged the revenue shortfall, determining that the railways should be fully compensated for the variable costs incurred in the movement of grain as well as a contribution to fixed costs, set at 20 per cent of the volume related variable costs of moving grain.⁵ To offset these losses, Gilson recommended that the federal government provide an annual subsidy equal to the GRS amount experienced in the 1981/82 crop year.

⁵ Using data from the 1981/82 crop year, Gilson estimated the railway GRS at \$644.1 million. The GRS was an indicator of the revenues that the railways would need in order to cover variable costs of operation plus make an arbitrary contribution (20 per cent) to overhead expenses.

With the question of 'how much' aside, the report addressed the contentious issue of whether government subsidies on the movement of grain should be made directly to the railways or to producers. Under the 'pay the railway' option, statutory freight rates would be maintained, with the rail companies receiving the revenues earned from statutory rates plus the \$644.1 million GRS subsidy. Grain producers preferred this approach, arguing that paying the subsidy to the railways would provide the federal government with the necessary leverage to enforce service compliance and infrastructure standards on the railways. As well, this option allowed for retention of the Crow rates, meaning that grain transportation costs would remain below full cost by the extent of the base subsidy (Norrie, 1983).

The second option considered by Gilson was paying the subsidy directly to producers. Under this option, freight rates would be allowed to adjust upwards until they reached compensatory levels. For the reference 1981/82 crop year, farmers would receive payment from the federal government as compensation for the lower net returns resulting from increased freight costs, with the compensation payment continued in perpetuity.

The option to pay the producer was preferred by livestock producers and agricultural processors, who maintained that grain transportation subsidies were outdated, expensive, and an impediment to economic development on the prairies. Removal of the subsidy, they argued, would allow industry players to respond quickly to market signals through a diversification of crop patterns, an increase in livestock production, and investments in value-added processing.

In the end, Gilson's report recommended a compromise between the two options. The entire subsidy would be given to the railroads in 1982/83. It would then gradually be partitioned between them and the shippers until 1989/90 when the split would be 19 per cent and 81 per cent respectively. As well, the 20 per cent contribution to railway overhead would be phased in over a four year period to allow producers time to adjust to the new rate structure. Finally, Gilson

recommended that freight rates be distance related, with consideration given to a policy of tying freight rates to some arbitrary percentage of grain prices.

3.2.7 WGTA

The Western Grain Transportation Act (Bill C-155) replaced the Crow Rate on August 1, 1984. The Act implemented many of the recommendations contained in the Gilson report, including an annual payment of \$658.6 million – known as the Crow Benefit – which was issued by the federal government to the railways to cover revenue shortfalls (Vercammen, 1996).

Under the WGTA, freight rates were set each crop year for moving grain and grain products and oilseeds to various export destinations. Rates were distance-based, which meant that all delivery points with the same hauling distance to port had the same maximum rate per tonne. In addition, producers and the government shared the total cost of moving grain. For example, during the 1993/94 crop year, producers were responsible for 42.8 per cent of total grain transportation costs, with the government picking up the remaining 57.2 per cent. For a hauling distance of 976-1000 miles, rates were set at \$32.07/tonne (Vercammen, 1996; Lang, 2006; Turvey, Meilke, Weersink, Chen and Sarker, 1997). The rates also included Gilson's suggestion of a 20 percent contribution to the railways' fixed assets (Vercammen 1996).

In addition to distance-based rates, the WGTA also contained provisions for variable rates for grain transported in non-standard equipment, for joint line movements over more than one railway, and for lower rates agreed between the railway and the shipper (Vercammen, 1996; Lang, 2006; Heads, 1989). Initially, variable rates were limited to 47 points of origin, providing a rate reduction to the shipper of \$1.50 per tonne for shipments in blocks of eighteen cars to one destination. Each point had to be able to accommodate loaded cars of 250,000 lbs. and loading had to be completed within 24 hours or as train service dictated. Savings would be achieved through

reduced switching costs at origin, reduced car cycle time, greater train length and heavier loadings per car (Heads, 1989).

While freight transportation costs assigned to farmers increased under the WGTA, the Act also included a number of provisions designed to limit the charges that the railways could levy. For example, the WGTA included a shipper share limitation, which effectively ensured that a producer's share of the freight rate would not be allowed to exceed a fixed percentage of the weighted average price of the six major grains (Turvey, *et al.*, 1997). Initially set at four per cent in 1984, the limitation was increased to 10 per cent in 1988.

As well, the WGTA established the Grain Transportation Agency (GTA) and the Senior Grain Transportation Committee to promote overall system efficiency and to monitor railway performance, investment and rail car allocation. Under the WGTA, the GTA was given the power to withhold portions of the annual subsidy to the railways if they did not meet performance and investment standards (Turvey, *et al.*, 1997; Vercaemmen, 1996).

Finally, the WGTA required a review of the railway's costs to be conducted every four years. Each year between costing reviews, railway costs were indexed for inflation and the railways were allowed any productivity increases that had been made. While the productivity gains were captured every four years and transferred from the railways to government and possibly the shippers, the railways had the incentive to improve productivity through enjoying the results in the interim period.

3.2.8 G.C. Hall Inquiry

The debate over which group – producers or railways – should receive government contributions to the costs of moving grain reemerged in April, 1984. To examine the issue, the government appointed a five man committee headed by Mr. Justice

Gordon C. Hall of the Manitoba Court of Appeal. Hall and his colleagues submitted their report to the Minister of Transport in March, 1985. Their recommendation was in favour of paying the producer, with the railways allowed to recover their costs through higher freight rates. Government payments in support of grain transportation would be paid to individual grain producers through the creation of a special program known as the Grain Transportation Refund.

Under Hall's proposed Grain Transportation Refund, producers would be issued payments based on net sales of eligible grains in each crop year, regardless of whether these grains were used for export, for processing or for the feeding of livestock. Payments would vary depending on the producer's location in the various rail freight zones of Western Canada; thus producers faced with long distance movements would be compensated more than those faced with short distance movements. In essence, the Grain Transportation Refund planned to substitute the traditional Crow Rate subsidy with a variable per unit marketing subsidy.

The Hall Committee's 'pay the producer' recommendation received considerable support from a number of farm commodity organizations and prairie livestock producers, who felt that the 'paying the producer' option would allow freight rates to rise, removing artificial incentives for the transport of grain for export. As freight rates increased, market distortions between statutory grains and other types of agricultural and processing activities within the West would lessen.

Even with these groups advocating for the 'pay the producer' option, the federal government did not take any action following receipt of the Hall Report. This was due, in part, to the opposition to the 'paying the producer' option which had come from the Prairie Wheat Pools, who feared that the indiscriminant payments based on net sales of eligible grains in each crop year would convert a transport subsidy into an agricultural subsidy. The 'pay the producer' option also met considerable resistance from Quebec livestock producers, who feared a rise in the cost of feed grains.

3.2.9 The National Transportation Act (1987)

In 1987, the *National Transportation Act* was updated to further reflect the federal government's move towards a deregulated transportation system. One of the key changes to the NTA was the emphasis placed on competition as the prime force to drive the Canadian transportation industry. In addition to the importance placed on competitive forces, the NTA also recognized the needs of shippers as a key consideration in the development of transportation policy.

Central to the NTA was the allowance of more pricing freedom for the railways. Under the NTA, railway regulations were reduced so that shippers could negotiate confidential contracts with individual railways. The new NTA required only that rates be compensatory to cover the actual cost of shipping.

As well, the revised NTA made it easier for railways to sell an unprofitable line. In instances where a rail line was found to be uneconomic, under the NTA the railway had to give 90 days notice of abandonment, during which time the public had 60 days to appeal. If an appeal was made, the federal agency responsible for regulatory oversight (e.g., the National Transportation Agency) then had to make a decision within six months. If a line had future economic potential, the Agency could order the railway to continue service on a subsidy basis.

The NTA also recognized the needs of shippers as a key consideration in the development of transportation policy. One of the defining features of the 1987 NTA was a provision that allowed for some shipper relief, including interswitching, competitive line rates and final offer arbitration. While these provisions were seldom administered under the NTA, they are noteworthy in the sense that they are the first such provisions that acknowledged, albeit indirectly, the need for shipper protection from market power abuses.

3.2.10 Change in Grain Handling Tariff Rates

A year before the removal of the WGTA the CGC changed the way elevator tariff rates were set. Until 1994, the CGC controlled the maximum rates an elevator could charge a farmer for handling, elevation and cleaning (Fulton *et al*, 1998). While grain companies are now required to file maximum fees to the CGC each crop year, they are free to price below the maximum rate.

Grain handling firms are also free to price discriminate between provinces and locations (as long as they do not exceed the maximum tariff rate), with prices varying depending upon the levels of competition in a particular region. For several years, grain companies would have lower tariffs in Saskatchewan than in Alberta or Manitoba because they had to keep their tariffs in line with what Saskatchewan Wheat Pool was charging (Lang, 2006). By 2000, companies began to set standard fees for all their facilities across Western Canada and producers were compensated with trucking allowances as they seemed to react more favorably to a trucking incentive than to lower handling fees (Pratt, 2000).

3.2.11 Elimination of the WGTA

The WGTA was eliminated on August 1, 1995. With its removal, the federal government no longer provided payment to the railways for the movement of prairie grain. Instead, a one-time capital payment of \$1.6 billion was made to landowners as partial compensation for the loss of the WGTA.⁶ These producers were then deemed responsible for paying the full costs of shipping their grain by rail (Schmitz, Highmoor and Schmitz, 2002; Gray and Khakbazan, 1997; Lang, 2006).

⁶ Rosaasen and Schmitz (1985) estimate the true value of the lost Crow benefit to be three to four times above the amount that landowners received as compensation.

The removal of the WGTA provided the railways with greater freedom to restructure rates and to abandon grain dependent branch lines. To provide some rate protection for producers, a maximum freight rate was established and left in place until July 2001, which limited the amount railways could charge for the movement of a tonne of grain. Even with this protection, grain transportation costs increased substantially in the 1995–96 crop year (Schmitz, Highmoor and Schmitz, 2002; Lang, 2006). For example, the freight cost for moving grain out of some areas of Saskatchewan more than tripled after the Crow subsidy was removed, increasing from \$13.37 per tonne in 1994-95 to \$35.01 per tonne in the 1995-96 crop year (Lang, 2006). The result for grain farmers was that the net price received for their grains was lower than it would have been if the WGTA were still in place.

3.2.12 Elimination of Seaway Pooling

The discontinuance of the WGTA coincided with a change in the location where wheat and barley were priced in the Canadian Wheat Board (CWB) pool accounts. Prior to August 1995, the revenue from the sales of wheat and barley were calculated in terms of being sold from the West Coast or Thunder Bay. Since 1936, when most exports were from Vancouver or Thunder Bay, these were reasonable points to determine the price of wheat and barley. Furthermore, the export prices at each point were nearly the same. Over time, as more exports switched from the east coast to the west coast and ocean going vessels could not make it through the St. Lawrence Seaway, the price of grain increased on the west coast relative to Thunder Bay (Groenewegen, 1986).

Most export sales from the east coast were executed from the St. Lawrence ports and the CWB had to pay the handling and shipping charges to move the grain to the ocean going vessels loaded in the St. Lawrence. These costs were deducted from all grain sales in the pool accounts since the point of sale in the account was Thunder Bay. The solution was to move the basis points in the pool accounts to the West

Coast, Churchill, the St. Lawrence or Minneapolis. The basis depended upon the origin of the grain and one predetermined destination from which the grain was exported (Kraft and Doiron, 2000).

The net effect was the value of grain in the pool accounts increased since the freight costs associated with moving grain from Thunder Bay to the St. Lawrence were now paid by the farmer rather than being paid from the CWB pool account. The result of moving the Eastern pooling point from Thunder Bay to the St. Lawrence was that farmers in Manitoba and Eastern Saskatchewan had larger transportation deductions from their initial prices paid for wheat and barely. For feed grains sold from these areas, the CWB bids were lowered relative to the previous years in addition to farmers paying all tariffs charged by the railways.

3.3 The Canadian Transportation Act (CTA)

Following the demise of the WGTA, grain movement was briefly placed under the 1987 *National Transportation Act* (NTA) until the NTA was replaced with the *Canada Transportation Act* (CTA) in 1996. The CTA continued to forward the federal government's objective to move the GHTS toward a more deregulated, commercial environment. However, it still contained a number of provisions that regulated the movement of grain. One such provision was the grain freight rate cap. Under the freight rate cap, rates were prescribed according to distance, providing an equal rate for equal distance regardless of whether a particular delivery point was located on a high cost branch line or a lower cost main line.

The adoption of the CTA also removed the railways from their obligation to share efficiency gains with producers. Under the WGTA, rail rates were adjusted every four years based on a costing review that accounted for changes in railway costs and productivity gains. Setting rates this way ensured that any productivity gains made by the railways were passed back to the farmers (Transport Canada, 1999).

Under the CTA, the requirement for a quadrennial costing review was removed. Instead, freight rates were determined using 1992 costs and were adjusted annually by a rate multiplier determined by the Canada Transportation Agency. Essentially an inflation index, the multiplier accounted for changes in railway costs such as labour, fuel and capital investment (Estey, 1998). It also reflected a small adjustment for a portion of the cost savings realized by the railways when they discontinue branch line operations.

The CTA also introduced new measures that made it easier to abandon branchlines. Under the WGTA and the NTA '87, the abandonment procedure was highly regulated and minimal branchline abandonment was allowed (Khakbazan, 1999). The CTA legislation removed these protections and simply required that railway companies generate a three-year plan to indicate whether they intended to continue operating a branchline or whether they intended to sell, lease or abandon it. (Section 141, CTA). However, rail companies were allowed to amend their three-year plan at any time, with the result that the time horizon for closure can be much shorter than three years (Estey, 1998).

3.3.1 The Estey/Kroeger Process

In April of 1997, the Canadian Wheat Board (CWB) filed a complaint with the Canadian Transportation Agency alleging that CN and CP failed to meet previously established levels for the unloading of wheat and barley at Vancouver and Prince Rupert, British Columbia, and at Thunder Bay, Ontario. The CWB also alleged that CN and CP failed to meet timely delivery commitments for wheat and barley to eastern Canadian ports and that the railway companies failed to meet commitments for rail car supply for the transportation of wheat and barley to the United States.

The CWB submitted that as a result of these failures, CN and CP failed to meet their

service obligations and that substantial damage and losses occurred to the CWB, and thus to farmers. The CWB requested that the Canada Transportation Agency find that CN and CP had not fulfilled their service obligations from December, 1996 to the date of the complaint and also that the Canadian Transportation Agency order CN and CP to fulfill their service obligations as described in the complaint (Nolan, 2005)

Following the level of service complaint, the federal government ordered a performance review of the GHTS. Justice Willard Z. Estey was asked to conduct a comprehensive review of the grain handling and transportation system. Mandated to search for methods of improvement in the grain handling and transportation system, Justice Estey proposed a series of recommendations that he believed would move the grain industry towards a more competitive, commercial, market orientated system (Estey, 1998).

Amongst some of Estey's proposals were increases in logistical coordination between railroads, increased producer access to grain cars, open access to rail lines and a switch from the maximum rail rate towards a rail revenue cap. Also included in Estey's recommendations was a proposal to disband the CAPG car allocation process. The dissolution of CAPG signified a move towards a more commercial system, where rail companies and grain handling companies determine car allocation through a negotiation process.

Following the release of the Estey review, Arthur Kroeger was charged with the task of consulting industry stakeholders in order to reach a consensus on the recommendations in the Estey report (Government of Newfoundland and Labrador, 2000). Although stakeholders were able to reach consensus on many of Estey's recommendations, the Kroeger report indicated that consensus by stakeholders could not be reached on the issues of final offer arbitration (FAO) procedure, the level of the revenue cap, and changes to CWB's role in grain transportation (Kroeger, 1999).

In instances where consensus on a particular Estey recommendation was not reached, Kroeger was required to provide private counsel on the issue to the Minister of Transport. These recommendations included: switching from the rate cap to the revenue cap; implementing a FOA system designed to facilitate settlements between shippers and the railways; and reducing the CWB's role in grain transportation through the introduction of contract based transportation arrangements (Kroeger, 1999).

3.3.2 Bill C-34

The recommendations that came out of the Estey Review and Kroeger Report were used to draft Bill C-34, which amended the Canada Transportation Act and made way for additional change in the Western Canadian GHTS. Specifically, Bill C-34 focused upon changes to rail line abandonment procedures, CWB grain handling and shipping, and freight rate controls that were designed to move the GHTS towards a more commercial, market orientated system while still offering regulatory protection against railway market power (Nolan, 2005).

The rail line abandonment provisions contained in the 1996 CTA freed the railways from a variety of unprofitable common carrier obligations, which allowed both CN and CP to abandon unprofitable grain dependent branch lines throughout the prairies. Shortly after the passage of the updated transportation legislation, grain dependent branch line mileage on the prairies fell by approximately 18 per cent (Nolan, 2002). Bill C-34 set out to revise the abandonment provisions contained in the 1996 CTA by setting a clear definition of the abandonment process, making it more difficult for railways to abandon grain dependent branch lines.

Bill C-34 also required the CWB to implement a tendering process for the handling and movement of Board grain through the system. A Memorandum of

Understanding between the CWB and the Minister responsible for the CWB specified that a minimum of 25 per cent of Board shipments be allocated under tendering arrangements. The competition fostered through the tendering process was seen as a step toward commercial arrangements that applied to non-Board grain transportation.

Finally, Bill C-34 replaced the freight rate cap with the maximum revenue entitlement, or revenue cap, as a mechanism to regulate railway pricing behavior. The following section examines the revenue cap in detail.

3.3.3 The Revenue Cap

Effective August 1, 2000, the Canadian Transportation Agency no longer establishes maximum rates for the movement of Western grain by rail. CN and CP can price their Western grain movements in response to market conditions. However, their revenues must not exceed a certain entitlement (the "revenue cap"). Every year, the Agency determines each railway's revenue cap and whether each railway has met its obligation.

Currently, the revenue cap applies only to CN and CP since they are the only "prescribed railway companies". In order to determine the CN and CP revenue caps for a given crop year, railway-specific statistics are put into the formula. The only exception relates to input F, the volume-related composite price index (VRCPI), which is common to both CN and CP. A general explanation of the formula is given below.

$$\text{Revenue Cap} = [A / B + ((C - D) \times \$0.022)] \times E \times F$$

Where:

- A. is the company's revenues for the movement of grain in the base year;
- B. is the number of tonnes of grain involved in the company's movement of grain in the base year;

- C.* is the number of miles of the company's average length of haul for the movement of grain in that crop year as determined by the Agency;
- D.* is the number of miles of the company's average length of haul for the movement of grain in the base year;
- E.* is the number of tonnes of grain involved in the company's movement of grain in the crop year as determined by the Agency; and
- F.* is the volume-related composite price index (VRCPI) as determined by the Agency.

The revenue cap formula has four components. The first component, A/B , takes the company's base year revenues for the movement of grain A and divides it by the number of tonnes of grain B moved by the company in the base year. The result is the company's average base year revenue per tonne. Values for A and B are provided in subsections 151 (2) and (3) of the *CTA*.

The second component, $(C-D) \times \$0.022$, adjusts the above figure A/B in order to take into account the difference in the average length of haul (in miles) for a given crop year compared to the base year average length of haul. The variable C is the average length of haul for the given crop year and is determined by the Agency after the crop year has ended, while D is the average length of haul for the base year and is given in subsections 151 (2) and (3) of the *CTA*. If the two average lengths of haul are the same, the adjustment is zero. However, if the average lengths of haul differ by 10 miles, for example, then the average revenues for the given crop year would be adjusted by $\$0.22$ per tonne ($10 \times \$0.022$).

The third component, E , multiplies the adjusted revenue per tonne figure for the given crop year by the number of tonnes moved by the company in the given crop year. The result is a revenue cap figure, before an allowance for inflation. When this figure is multiplied by the fourth component, F , the VRCPI (which accounts for inflation), the final revenue cap figure is derived for the given crop year.

3.4 Incentive Regulations and the CTA

The premise of the CTA regulatory changes was to provide the railways with proper

incentives to seek out cost reductions and increase overall system efficiency (Estey, 1998). Incentive regulation is typically understood to be a form of regulation that provides regulated firms with incentives to reduce costs and increase their profit margin. The topic of incentive regulation is discussed more fully in Chapter 4.

Within the current regulatory structure there are many types of regulatory mechanisms that come under the label of incentive regulation, representing various degrees of departure from the traditional rate of return approach used to regulate the GHTS. These include a revenue cap, the elimination of the four-year costing review, changes to the branchline abandonment procedure and the provision of multi-car block incentives.

3.4.1 The Revenue Cap

Introduced in August of 2000, the revenue cap is a form of incentive regulation that enables CN and CP to set their own rates for services, provided the total amount collected remains below levels determined by the Canada Transportation Agency (Agency). Rail firms are permitted to retain any profits they are able to extract from the market as long as their revenues do not exceed the capped level. The revenue cap is designed to give the railways a greater degree of pricing flexibility than under the rate cap, while still offering producers regulatory protection against excessive pricing by the railways. In addition to setting the cap, the Agency monitors compliance with the cap and, if it finds that a railway has surpassed its revenue cap, specifies the amount of revenue that must be paid back to shippers and any penalty that may be levied.

Under the revenue cap, rail firms are permitted to retain any profits they are able to extract from the market as long as their revenues do not exceed the capped level. Thus, the potential for higher profits presents an incentive for the railways to reduce costs and increase their profit margin. It is widely accepted that firms are likely to retain any cost savings as additional profit unless forced to profit share by

regulatory rate reviews (Liston 1993; Braeutigam & Panzar, 1993).

3.4.2 Elimination of the Four Year Costing Review

Under the Western Canadian Transportation Act (WGTA) a railway costing review was done every four years to determine the cost base for the railways. The cost base was used to determine the level of freight rates paid by Western grain producers and to ensure railway productivity gains were passed back to shippers/producers.

With the passing of the CTA, the four-year costing review was eliminated, meaning that the mechanism for sharing railway productivity gains was also eliminated. As such, the railways are permitted to retain any profits they are able to extract from the market as long as their price does not exceed the capped level. Thus, the potential for higher profits presents an incentive for firms to reduce costs and increase their profit margin.

3.4.3 Branchline Abandonment

The CTA also introduced new measures that made it easier to abandon high cost, low-density branchlines. Under the WGTA and the NTA '87, the abandonment procedure was highly regulated and minimal branchline abandonment was allowed (Khakbazan, 1999). The CTA legislation removed these protections and simply required that railway companies generate a three-year plan to indicate whether they intend to continue operating a branchline or whether they intend to sell, lease or abandon it. (Section 141, CTA). However, rail companies were allowed to amend their three-year plan at any time, with the result that the time horizon for closure can be much shorter than three years (Estey, 1998).

3.4.4 Multi-Car Block Incentives and Variable Rates

Prior to 1980, rate changes required a 90-day notice for increases and there were fairly liberal procedures to challenge proposed changes. The net effect was that rates were rigid and changes were introduced only infrequently. Proposed changes were typically subject to a very long notice about the rate increase. As a result shippers had little risk related to rate changes. The SRA changed the dynamics of rate changes. Specifically, rate increases (decreases) required a 20-day notice. The effect was to allow greater flexibility for railroads to respond to market conditions, but also increased the exposure to increases in rail rates for shippers.

Variable rates have evolved to include trainload, single and multiple-origin rates, as well as programs to enhance efficiencies in the total movement – commonly called multi-car block incentives. Cost efficiencies allow railways to offer freight rate rebates to shippers who can assemble long trains; the rebates represent a sharing with shippers of the cost efficiency generated by a unit train. What is not well established is the total cost saving for the railway associated with a unit train, and how much of this is being passed along in the existing unit-train rebates. Currently, unit train rebates amount to approximately \$8.00 per tonne for a 100-car unit train (CN) and \$8.00 per tonne for 112-car unit train (CP) (Western Producer, 2009; Canadian Wheat Board, 2011).

3.5 Shipper Protection Regulation Under the *Canada Transportation Act*

Although there are more than 30 federally regulated railways in Canada, many freight rail customers are “captive” shippers; that is, only a single railway company offers direct service to their area. For these shippers, the rail transportation environment is not naturally competitive and, in the absence of adequate legislative measures, there might be a tendency for the railway company to take advantage of its position as a monopolist in the region. A monopolist railway would have an incentive to offer lower levels of service at higher prices than it would under more competitive market conditions.

A number of provisions exist in the *Canada Transportation Act* (CTA) to protect shippers from railway companies exercising market power in this way. For example, shippers currently have recourse to the Canadian Transportation Agency (the Agency) if they can prove that rail companies' levels of service or freight rates will cause them substantial commercial harm unless relief is granted. This section describes the provisions in the CTA that brings some competitive pressure to bear on the railways in the event that they exercise market power.

3.5.1 Confidential Contracts

Prior to the 1987 National Transportation Act (NTA), all rail rates had to be published, with CN and CP permitted to set rates collectively. The effect was that CN and CP acted together to compete against other modes of transportation; they tended to compete against each other on the basis of service rather than rates (Canada Transportation Act Review, 2000). Since 1987, shippers and railways that agree on rates and service conditions have been permitted to do so in a confidential contract. Giving shippers the option to negotiate a confidential contract is thought to prevent railways from colluding through the use of joint rates (Vercammen, 1996).

3.5.2 Interswitching

Interswitching is a competitive access provision that has been available to rail shippers for over 100 years. Under the competitive access provisions of the CTA, a shipper at the origin or destination of a haul may have its cars interswitched from one carrier to another at prescribed rates, if the shipper's siding is within a 30-kilometre radius of an official interchange point. Interswitching for distances greater than 30 kilometres may be permitted by the Agency if it is determined that the point of origin or destination is "reasonably close" to the interchange. Such "extended interswitching" may require the shipper to satisfy a "substantial commercial harm" test. Interswitching is covered in sections 127-128 of the CTA.

3.5.3 Running Rights

Running rights are contained in provisions that have been in existence since 1888 (Parliament of Canada, 2007). If awarded, they permit one railway to make use of another federally regulated railway's assets (e.g., land, terminals, track, etc.).

Specifically, the running rights contained in sections 138 and 139 of the CTA permit any federally regulated railway to apply to the Agency for the right to:

- a) take possession of, use or occupy any land belonging to another federal railway company;
- b) use the whole or any portion of the right-of-way, tracks, terminals, stations or station grounds of any other federal railway company; and
- c) run and operate its trains over and on any portion of the railway of any other railway company.

The request may originate from the railway company, a municipal council or any other interested party.

In order to rule in favour of running rights, the Agency must find them to be in the public interest. If the Agency grants running rights to a guest railway, the railways have an opportunity to negotiate a rate. If they cannot agree on a rate, the Agency sets one.

Since the passing of the Canada Transportation Act, two applications for running rights have been made. Both applicants – Ferroequus Railway Company Limited and the Hudson Bay Railway Company – sought the right to solicit traffic on the CN lines over which they proposed to operate. In both cases the Agency determined that the Act does not empower the Agency to grant running rights for the express purpose of soliciting as well as carrying the freight of shippers.

3.5.4 Competitive Line Rates

Competitive line rates (CLRs), a more recently available group of competitive access

provisions, were introduced in the 1987 NTA and amended in the 1996 CTA. A CLR may enhance rail competition for shippers if they:

- a) are located outside of the interswitching limits;
- b) have access to only one railway company at the origin or destination of the haul, and a continuous route is operated by two or more carriers.

A shipper may ask a railway company for a CLR to move freight to the nearest interchange point with a connecting carrier. If the railway company and the shipper do not agree on the rate, the shipper may apply to the Agency to set the rate. Before requesting a CLR, a shipper must have an agreement in place with the connecting carrier for the balance of the movement. Exceptions to the situations in which a CLR may be established include:

- a) movements of containers, trailers on flatcars or less than carload traffic, unless they are being shipped to or from a marine port in Canada; and
- b) movements where the CLR distance is greater than 50% of the total haul, or exceeds 1,200 kilometers, unless the Agency approves the application specifically.

The details of the CLR provision are contained in sections 129-136 of the CTA.

3.5.5 Final Offer Arbitration (FOA)

Since 1987, final offer arbitration provisions have been available to shippers with complaints about conditions of rail services or rates. For disputes over charges worth more than \$750,000, shippers with no alternative means of transporting goods can apply to the CTA for final offer arbitration following unsuccessful negotiations with their freight carrier. For disputes over charges worth not more than \$750,000 there is a simplified process where both captive and non-captive shippers can apply. In both cases, the railway and the shipper provide their respective final offers to the arbitrator (or panel of arbitrators), who chooses the one that both the railway and the shipper must abide by. FOA is covered in sections

159-169 of the CTA.

3.6 Chapter Summary

The Canadian grain handling and transportation system has been regulated in one form or another for over the last 100 years. This chapter presented a synopsis of government regulation leading up to the passing of the 1996 CTA. As well, it presents an overview of the current GHTS regulatory framework, including information on the incentive schemes contained in the CTA, procedures for branchline abandonment and shipper protection provisions under the 1996 CTA.

Since the 1950s, the focus of GHTS regulation has changed. The federal government has moved to increase transportation efficiencies through competitive and commercial practices rather than intense forms of regulation. The current regulatory framework contained in the *Canada Transportation Act* is a continuation of this policy, providing railways with greater freedoms – in the form of rate setting and branchline abandonments – to manage their rail operations.

The CTA, however, still contains a number of provisions that regulate the movement of grain. One such provision is the revenue cap, which limits the annual average revenues that a railway is able to earn. While typically viewed as a means of protecting farmers from predatory railway pricing, the revenue cap provides railways with a strong incentive for the railways to reduce costs and increase their profit margin.

The following chapter develops a theoretical framework that can be used to examine the economic impacts that regulatory change has had upon the GHTS. Specifically, this chapter focuses on two regulatory changes: the elimination of grain dependent branchlines and the introduction of the revenue cap. The first half introduces two distinct theories on the origins of regulation – public interest and regulatory capture – followed by a brief discussion on applied welfare economics as

a measure for evaluating the effectiveness of regulation. As well the next chapter develops a series of theoretical models that can be used to analyze and measure the welfare effects resulting from the elimination of grain dependent branchlines and the introduction of the revenue cap.

Chapter 4: Theoretical Framework

4.1 Introduction

In 1996, the federal government took a significant step toward redefining the regulatory framework for grain transportation on the Prairies with the passing of the *Canadian Transportation Act* (CTA). The CTA contained two significant aspects that were to have a major impact on the GHTS. The first aspect concerned rail line abandonment. Under the CTA, protections afforded to the discontinuance of grain dependent branchlines were removed. Instead, railways were simply required to generate a three-year plan to indicate whether they intended to continue operating a branchline or whether they intended to sell, lease or abandon it. The second aspect was the introduction of regulated maximum freight rates, which removed the federal government from direct financial intervention in the GHTS. This policy was designed to replace the remnants of the long-standing Crow subsidy for Canadian railways.

Service complaints brought against CN and CP by the Canadian Wheat Board in April 1997 initiated a federally ordered performance review of the GHTS, now known as the Estey/Kroeger process. The recommendations that came out of the Estey Review and Kroeger Report were used to draft Bill C-34, which amended the Canada Transportation Act applicable from the crop year 2000-2001 to the present. Under Bill C-34, the Federal government replaced the regulated maximum freight rate with a maximum revenue entitlement or “revenue cap” on grain movement.

The main distinction between the current revenue cap regulation and the previous rate cap regulation is that the revenue cap regulation enables CN and CP to set their own rates for services, provided the total amount collected remains below levels determined by the Agency. The move to allow the railways the freedom to set rates for grain movement on the Prairies represents a noteworthy shift in historical

Canadian transportation policy (Nolan, 2003).

Since these measures were introduced, the GHTS has undergone a period of significant change. Extensive system rationalization has occurred, with numerous smaller elevators consolidating into fewer, larger elevators and inland terminals. There has also been a significant reduction in the total route miles of grain dependent branchlines throughout the system. Freight rates, railway efficiency and rail service levels have also been affected.

The main purpose of this chapter is to present economic theories that can be used to analyze and measure the economic impacts that the elimination of grain dependent branchlines and the introduction of the revenue cap have had on the GHTS. The first section of this chapter introduces two distinct theories on the origins of regulation: public interest and regulatory capture. This is followed by a brief discussion on applied welfare economics as a measure for evaluating the effectiveness of regulation. Next, this chapter tracks the evolution of regulatory solutions to market failures by examining different theories of public finance. Finally, this chapter develops a series of theoretical models to examine the welfare effects resulting from the elimination of grain dependent branchlines and the introduction of the revenue cap.

4.2 Regulation: Public Interest and Capture Theory

Efficient allocation can be coordinated by the market mechanism in a perfectly competitive market environment. However, perfectly competitive market structures and optimal resource allocation rarely occur. More often, markets are characterized by differing degrees of market failure, resulting in situations where resource allocation is less than optimal (Bator, 1958; Arrow, 1985).

One method of achieving efficiency in the allocation of resources when a market

failure is identified is government regulation (Arrow, 1970, 1985; Shubik, 1970). In this regard, two broad traditions of economic theories of regulation have emerged. The first tradition assumes that regulators have costless access to sufficient information and enforcement powers to effectively promote the public interest. This tradition also assumes that regulators are benevolent and aim to pursue the public interest. Economic theories that proceed from these assumptions are therefore often called 'public interest theories of regulation'.

The second tradition of government regulation, known as capture theory, is premised on the assumptions that regulators do not have sufficient information with respect to cost, demand, quality and other dimensions of firm behavior. As such, regulators can only imperfectly – if at all – promote the public interest through regulation. Within this tradition, information, monitoring and enforcement costs also apply. As well, it is generally assumed that regulatory agents pursue their own interest, often working for the benefit of the industry. In effect, the regulator is "captured" by the industry it is regulating.

4.2.1 Public Interest Theory

The basic premise of public interest theory centres on the existence of market failure as a sufficient condition to explain government regulation (Baumol, 1952). Once market failure is identified, government regulation serves the public's interest by restricting or eliminating market failures arising from excessive monopoly power, asymmetric information, strategic behavior, and externalities. In this tradition, it is assumed that regulators are benevolent agents of the State, armed with the proper information on which to act and the appropriate motivation with which to do so (Ricketts, 2009).

However, this idyllic notion of an altruistic government intervening on the public's behalf to prevent market failures has been subject to increasing criticism. Demsetz

(1968) observed that many of the assumptions used in the development of public interest theory are not grounded in reality – information asymmetries are a part of life, people are susceptible to the human weaknesses subsumed in the term moral hazard and transactions are not costless. Comparing reality with a hypothetical ideal is not suitable for advising economic policy. Instead, Demsetz advocates for a comparative approach, suggesting the comparison of realistic outcomes as a means of developing effective forms of government regulation (Dixit, 1996).

It is this criticism that has led to the development of more serious theories of public interest (Ogus in Jordan and Levi-Faur, 2004, Rose-Ackerman, 1992; Noll, 1983). These versions of public interest theories do not assume that regulation is perfect. As well, these theories do not assume that politicians always act in the public interest or that the political process is efficient, or that information on the costs and benefits of regulation is widely distributed and available (Noll, 1989). However, they do assume the presence of a market failure and that government regulation is comparatively the more efficient convention for dealing with these failures (Wynes and Bowles, 1981). Goldberg (1979), for example, argues that, in the case of public utilities, the transaction costs of government regulation to establish fair prices and a fair rate of return are lower than the costs of unrestricted competition.

4.2.2 Regulatory Capture Theory

Early theories of regulatory capture developed during the 1950s and 1960s disputed the “public interest” theory of regulation and challenged the assumption of the benevolent regulator (Huntington, 1952; Berstein, 1955). Regulatory capture theories were based on the premise that a government agency established to regulate an industry for the benefit of society acts instead for the benefit of the industry. In effect, the regulator is "captured" by the industry it is regulating.

In its most simplistic form, capture theory suggests that regulators are supportive of

the interests of regulated communities out of vested self-interest (Downs, 1957). This sentiment is echoed by Buchanan and Tullock (1962), who suggest that politicians and bureaucrats are self-interested actors concerned only for their own wellbeing rather than the interests of society.

Stigler (1971) presents a theory of regulatory capture based on the argument of rent seeking, in that an industry may use – and abuse – the coercive public power of the State to establish and enforce rules in order to obtain private benefits. This is made possible due to the nontransparent political decision process, where well-informed and well-organized interest groups are able to provide rewards to politicians and bureaucrats. Politicians must then weigh the rewards they receive for providing beneficial industry regulation against the cost (e.g., reduced votes in future elections) of implementing regulations that the public may perceive as being against the public interests. However, Stigler contends that these costs are often mitigated by the fact that the majority of voters that are only marginally affected by the regulation would have poor incentives to be well informed about the regulation in question.

Another explanation for regulatory capture is provided by the so-called 'life-cycle theory of regulatory agencies (Huntington, 1952; Martimort, 1999). This argument is premised on the idea that regulatory agencies are 'born' as a response to industry issues receiving high levels of public attention. Initially, the regulatory agency is subject to close scrutiny by the government and even by the general public. However, as time progresses and public attention focuses on other topics, regulators shift their focus to address the pressures directed at them by the industry in which they are regulating. With this evolution, the regulator becomes more prone to be dominated by the interests of the regulated firms.

Bratten and McCahery (1995) hypothesize a theory of capture based on the social-psychological needs of the regulators to avoid interpersonal conflict. They suggest that regulators may try to eliminate some of the contention of the job by

compromising with industry, adopting its preferred positions more than it might in less contentious circumstances. This desire to avoid conflict may be reinforced by the regulator's sense of insecurity at imposing rules on parties better informed about the regulated conduct (Zinn, 2002).

Regulatory capture can also be perpetuated by the regulatory agency's scarcity of resources, which encourages regulators to turn to the regulated community itself for assistance (Zinn, 2002). Bradbury and Ross (1991) suggest that ex-employees of regulated firms may come to dominate the staffing of the regulatory body when regulators require, or are believed to require, very specialized knowledge concerning either the regulatory apparatus or the regulated industry. Often, the only individuals possessing this knowledge are themselves regulated producers, and this leads to the 'revolving door' problem under which government draws its regulators from the regulated producers, who as regulators then acquire skills making them still more valuable in the substantially-more-remunerative regulated sector, to which domain they return armed with both in-government contacts and deep knowledge of regulatory procedures (Dal Bo, 2006). The revolving door makes it more likely that regulators drawn from the ranks of regulated firms will retain their interest in the welfare of the regulated group (Bradburd and Ross, 1991).

4.2.3 Rent Seeking

Rent seeking behavior is the activity of influencing the political process to obtain favourable outcomes or to avoid unfavourable ones (Krueger, 1974). The central tenant of rent seeking is that individuals or groups utilize resources to lobby governments for policies from which they are able to accrue economic rent. These policies may be as straightforward as a subsidy or tariff, or more complex, such as regulations that create barriers to entry into an industry (Stigler, 1975). In all cases, the policies have the effect of making economic rents available to groups that otherwise do not receive them.

Rent seeking behavior can take many forms and can be engaged in by both industry and government. For example, industry interest groups in search of economic benefit offer incentives to politicians or bureaucrats to provide these benefits (Downs, 1957). In turn, politicians respond positively if it is in their own best interest to do so. These types of political rent seeking activities may occur when politicians decide on certain policies that support their chance for re-election.

There are additional components of rent seeking behavior. For example, rent seeking is not confined only to high-ranking industry officials and politicians. Bureaucrats involved in the policy process may also engage in rent-seeking behavior to facilitate – or not facilitate – policy change (Furtan, 2001). Traditionally, the decision to engage in bureaucratic rent-seeking is based on enhancing the financial resources of the bureaucratic institution (i.e., maximizing budget allocations). However, there are also examples of bureaucratic rent-seeking used to protect institutions from politicians eager to cut the size of bureaucracy, as well as for private gains such as higher salary or better positions within the bureaucracy (Mueller, 2003; Niskanen, 2001; La Porta et al. 1999; Williamson 1999; Kraan 1996; Blais and Dion, 1991; Milgrom, 1988; Tullock, 1965).

In addition, employees working in the private sector may also exhibit rent-seeking behavior for the maintenance of well-paying jobs. For example, Jensen and Meckling (1976) and Shleifer and Vishny (1989) suggest that employees may pursue specific objectives which increases the firm's demands for their particular skills even though these objectives may be detrimental to the overall welfare of the firm.

Rent-seeking behavior is generally viewed as a wasteful activity (Tullock, 1967). Interest groups or firms will take resources away from other productive endeavors and spend them on lobbying or other rent-seeking activities, decreasing overall economic efficiency. However, in some instances, rent-seeking activities can serve as a mechanism for increasing overall societal welfare. For example, regulators may rely on the specific information of a rent-seeking firm to aid in their determination

of an optimal social welfare function. Presumably, this situation would arise in instances where there is an asymmetry in information between the government and the rent-seeking firm with respect to public preferences or the specific effects of certain regulations. Thus, one must draw a distinction between productive and non-productive forms of rent-seeking behavior.

Rausser (1992) makes this distinction by separating rent-seeking behavior into two categories: rent-seeking behavior that is purely an economic transfer, which he calls political-economic seeking transfers (PESTs), and rent-seeking behaviors that seek to correct some market distortion, which he calls political-economic resource transactions (PERTs). Rausser contends that governments, in their attempt to acquire or to maintain political power, must balance the interests of different groups in the provisions of PESTs and PERTs.

4.3 Applied Welfare Economic and Regulation

Markets have long been recognized as effective mechanisms for the allocation of goods and services. Hayek (1945) pointed out that if competitive firms act in self-interest, the resulting market prices would act to guide the optimal production of goods and services. In instances where the market mechanism fails to deliver optimal resource allocation, governments often turn to regulation as a means of correcting these market failures (Gray, Fulton and Furtan, 2007).

But what if regulation leads to further inefficiencies? What if government policies prove to be costly to implement and ineffective in achieving their desired outcomes? What happens if intervention distorts markets still further leading to a further loss of allocative efficiency? To determine the effectiveness of government policies designed to correct for market failure, and to answer questions as to whether government intervention can be more detrimental than helpful in addressing instances of market failure, economists have turned to applied welfare economics.

As an applied science, welfare economics has a long history of assessing, comparing and ranking government policies (Griliches, 1958; Nerlove, 1958; Wallace, 1962; Gardner, 1983). The usefulness of applied welfare economics lies in its ability to use the notions of consumer/producer surplus as a means of measuring the efficiency and distributional effects of policy changes (Hovenkamp, 1988; Just, Hueth, Schmitz, 2004). As such, applied welfare economics is a practical tool that is capable of evaluating both the success and failures of government regulation (Barr, 2004).

From an applied welfare economics perspective, government failure occurs when the welfare losses associated with government intervention dominates a status quo point where government is absent. Even with good intentions, governments can still fail in designing and/or implementing a policy application correctly. They can tax, control and regulate, but the eventual outcome may be a deepening of the market failure. Even worse, a new failure may arise. These failures may range from the trivial, when the intervention is ineffective and harm is restricted to the cost of resources wasted by the intervention, to cases where intervention produces new and more serious problems that did not exist before.

It is this notion of harmful government intervention that has been a key driver in the development of theories related to public finance. Prior to 1970, it was a common belief in the economic public finance literature that the optimal or first best regulatory solution for market failures caused by natural or legal monopoly was that of the regulated marginal cost pricing/subsidy approach outlined by Hotelling (1938) and Dupuit (1952).

This view, however, was refuted by Baumol and Bradford (1971), who called for the consideration of additional welfare costs to be included in the determination of the optimal regulatory solution. These additional welfare costs, they argued, were the by-product of dead weight losses that emerge in the various markets that are taxed in order to raise the subsidy in the marginal cost pricing/subsidy regulatory solution. These dead weight losses can be minimized, they argue, by equating the

marginal dead weight loss that occurs in the principal market with marginal dead-weight losses that appear in the markets that are taxed. This is done through use of “second best” Ramsey pricing, where prices deviate from marginal cost prices by markups that are inversely proportional to demand elasticities (Baumol and Bradford, 1971).

The following sections uses applied welfare economics to examine the regulatory changes contained in the 1996 CTA. The notions of consumer and producer surplus are used to determine if the regulatory changes have had a positive or negative impact on the GHTS as a whole. These same concepts are also used to determine how regulatory change has affected the welfare of different participants in the GHTS and which groups have benefitted the most from regulatory change.

4.4 Theoretical Model

4.4.1 Regulatory Baseline

Before performing a welfare assessment of the impact of the regulatory change on the GHTS, it is first necessary to identify an appropriate regulatory baseline scenario to which the regulatory changes can be compared. The regulatory framework considered as the baseline in this comparison is the WGTA regulatory scheme, which was used to regulate the GHTS prior to the implementation of the CTA.

The following section begins by examining the rationale behind the use of regulation in the rail industry and looks at several potential regulatory options available to regulate the rail industry. Next, this section looks specifically at WGTA regulation and uses applied welfare economics to assess consumer and producer surplus in both the grain and non-grain market.

4.4.2 Regulating the Rail Industry

There is a longstanding belief in the economic literature that railway firms – due to their significant economies of scale – should be treated in the regulatory arena of natural monopoly. In regulating the rail industry, regulators are faced with a dilemma. On the one hand, a railway natural monopoly implies that efficiency in providing rail service is better served if a single firm supplies the entire market. On the other hand, in the absence of any competition, the railway will be tempted to exploit their natural monopoly power in order to maximize its profits. The challenge is to develop an appropriate regulatory mechanism that balances both the efficient supply and allocation of rail service (Depoorter, 1999; Joskow, 2005).

To gain a better understanding of the challenges that regulators face when developing an appropriate regulatory mechanism to govern a natural monopoly, consider the following model (Figure 4.1). Given the large sunk costs typically associated with the rail industry, rail firms generally operate under increasing returns to scale. This means that the railway's average cost (AC) continues to decline as the quantity of rail services provided increase. Marginal costs (MC) represent the unit railway cost of moving one tonne of grain over one mile of track and are assumed to be constant.

The demand for grain transportation (D) is treated as an input or derived demand. Treating transportation demand in this manner means that transportation services are used as an input to the production process of grain marketing. The finished product for grain handling firms located throughout the Prairies is grain delivered at export destination. Transportation is an input used to produce the finished product. Therefore, the demand for transportation is derived from its use as an input to the production process. Quantity represents the total output of grain transportation and is expressed in tonne miles.

In determining the demand for rail transportation services, it is necessary to

establish factors that affect the demand for transportation. The obvious first choice is the competitiveness of alternative modes of grain transport. For grain transportation throughout the Prairies, truck transportation is considered as the only alternative to rail. The underlying factor in modal choice is whether it is cost effective. A second factor capable of influencing the demand for rail service is the price of the commodity being shipped. For example, in instances where the world price for wheat is high, the demand for rail service to transport wheat to export position is likely to increase.

As shown in Figure 4.1, one option provided to the regulator is to set price equal to the marginal cost of production (P_{mc}). At this point, the total quantity of rail service demanded is equal to X . Regulating the rail industry in this manner maximizes the consumer surplus in the grain transportation market, with total consumer welfare equal to area $a + b + c + e$. However, setting price equal to marginal cost results in a situation where the firm's revenues are below the cost of production, meaning that a firm charging marginal cost will not be able to recover the fixed cost of their operations. This results in a situation where they are forced to exit the industry.

A second option open to the regulator would be the marginal cost pricing/subsidy approach outlined by Hotelling (1938) and Dupuit (1952). Again, regulating the rail industry in this manner would maximize the consumer surplus in the grain transportation market, with total consumer welfare equal to area $a + b + c + e$. However, at this price the railway experiences a revenue shortfall equal to area $b + c + d + e + f$ (Figure 4.1). In order for the rail firm to stay in business, the government must subsidize the firm at a level that covers this shortfall. As indicated by Baumol and Bradford (1971), providing the railway with a subsidy to cover the shortfall results in market distortions – and additional dead weight losses – in the various markets that are taxed in order to cover the subsidy.

A third option open to the regulator would be to set the price somewhere between marginal cost and average cost – price (P_f) – as shown in Figure 4.1. At this point,

the total quantity of rail service demanded is equal to (X'). However, at this price the railway still experiences a revenue shortfall equal to areas $b + d$. Again, for the rail firm to stay in business, the government must subsidize the firm at a level that covers this shortfall. This results in market distortions – and additional dead weight losses – in the various markets that are taxed in order to cover the subsidy.⁷

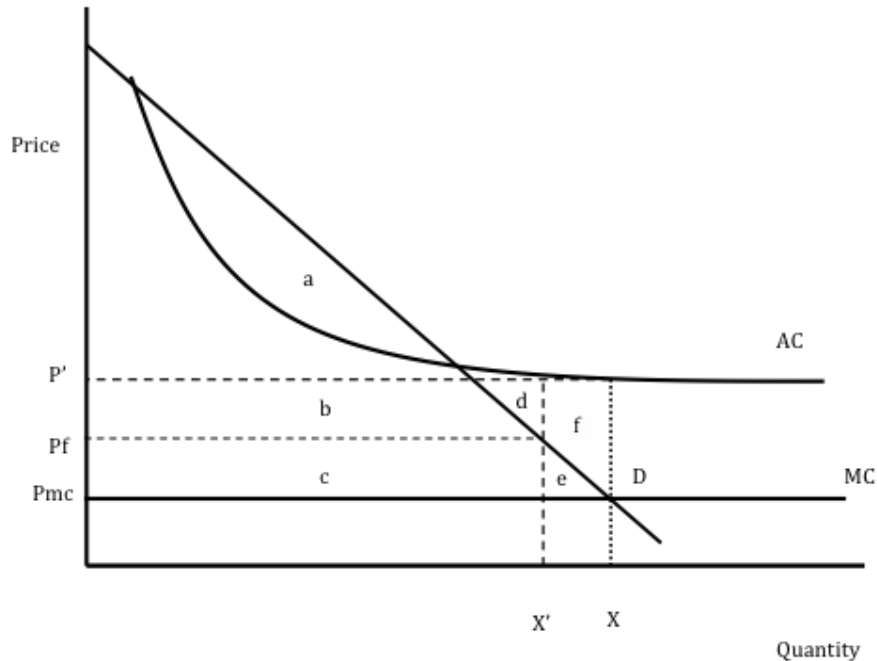


Figure 4.1 – Marginal Cost Pricing and Subsidy Provision in a Declining Cost Industry

A fourth option open to the regulator is to regulate prices equal to average cost. Doing so eliminates the need to subsidize the grain transportation market, as the railway earns enough revenues to cover their average costs. In turn, this eliminates the possibility of creating welfare distortions in the markets that would need to be taxed if a subsidy was needed. However, as shown in Figure 4.2, there is still a dead weight loss in the grain transportation market associated with this scenario, which is equal to area c .

⁷ It must be noted that while Figure 4.1 illustrates the dead weight loss to the market resulting from not pricing at marginal cost in the grain industry – equal to area e – it fails to show the total magnitude of the additional dead weight loss that is incurred by society resulting from taxation.

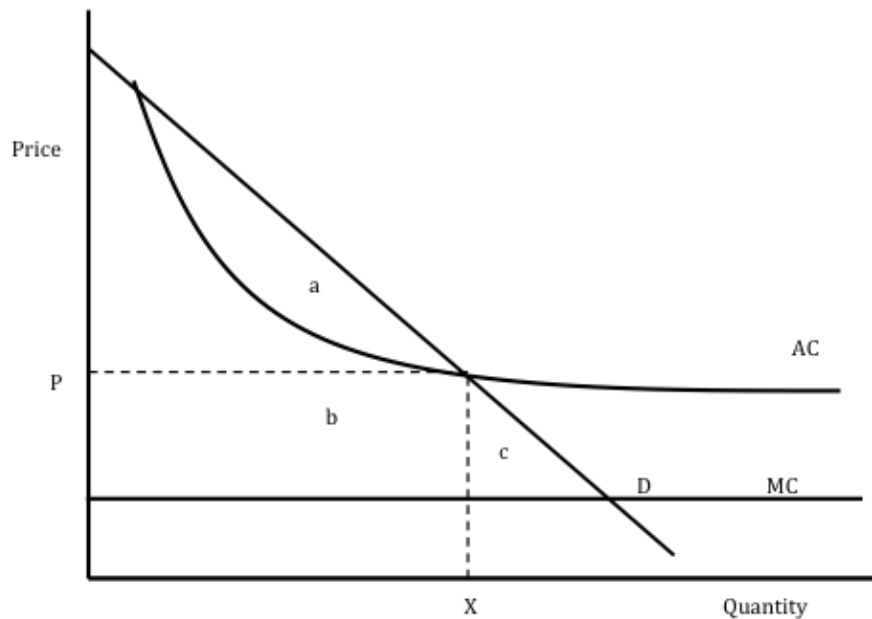


Figure 4.2 – Average Cost Pricing in a Declining Cost Industry

In instances where the marginal dead weight loss in the grain transportation market is low and the marginal dead weight loss elsewhere in the economy is high, an additional option open to the regulator is to set prices above average cost. Regulating prices in this manner would allow the railway to earn economic profit. These profits could then be taken by the government to offset taxes elsewhere in the economy, which in turn result in a lower deadweight loss in these other sectors.

4.4.3 The WGTA

In terms of the economic welfare associated with WGTA regulation, consider the following model (Figure 4.3) in which a monopolist railway provides service in two competing markets: grain (g) and non-grain (ng). The demand for transportation in both the grain and non-grain market (Dg and Dng) is derived from its use as an input in the respective production processes. Railway network capacity is fixed at \bar{X} , meaning that the railway has a finite number of cars to allocate between the two markets. In the non-grain market, the railway is free from any form of government

regulation and is able to determine quantity and price levels as they see fit. As such, the railway is free to exercise its monopoly power in the non-grain market.

However, the grain market is federally regulated and subject to WGTA regulation that effectively determines rail freight rates and service levels.

Under the WGTA, the 'price' that the railways received for providing rail service is denoted as ($PWGTA$). A portion of this price is paid for by farmers (Pf), with the remainder ($PWGTA - Pf$) paid by the federal government. The total revenues earned by the railways are equal to ($PWGTA * X$), or area $b + c + d + e + f + g$. Of this, area d goes to railway marginal cost, with the remaining area going towards the railways contribution to fixed costs from the grains industry. In the non-grains industry the railways have revenues (net of marginal costs) equal to area $i + l$. Thus, the total contribution to the railway's fixed costs – also defined as the producer surplus – is equal to area $b + c + e + f + g + i + l$.

The total consumer surplus in the grain market – calculated as the difference between the valuation for railway service and the actual price that is paid – is equal to area $a + b + e$. In the non-grain market, the consumer surplus is equal to area $j + k$. The government cost of maintaining the WGTA rate of return regulatory scheme is measured by area $b + e + f + g$.

As per the discussion on optimal departures from marginal cost pricing described by Baumol and Bradford (1971), in a situation where the government provides a subsidy to cover a firm's average costs, market distortions – and additional dead-weight losses – are created in the various markets that are taxed in order to cover the subsidy. An estimate of these distortions can be determined by multiplying the value of the government subsidy rectangle – area $b + e + f + g$ – by the marginal social welfare cost of a dollar of government spending.⁸ Overall, total surplus in the

⁸ That the opportunity cost of a dollar of government spending is not one dollar is generally well known to economists (Atkinson and Stiglitz, 1980; Stiglitz, 1986; Harberger, 1964; Mirrlees, 1976; Sandmo, 1976). While the profession has not reached total agreement on the magnitude of this cost,

GHTS under the WGTA was equal to area $a + b + c + e + i + j + k + l$ minus the marginal dead-weight loss associated with raising the subsidy through taxation.

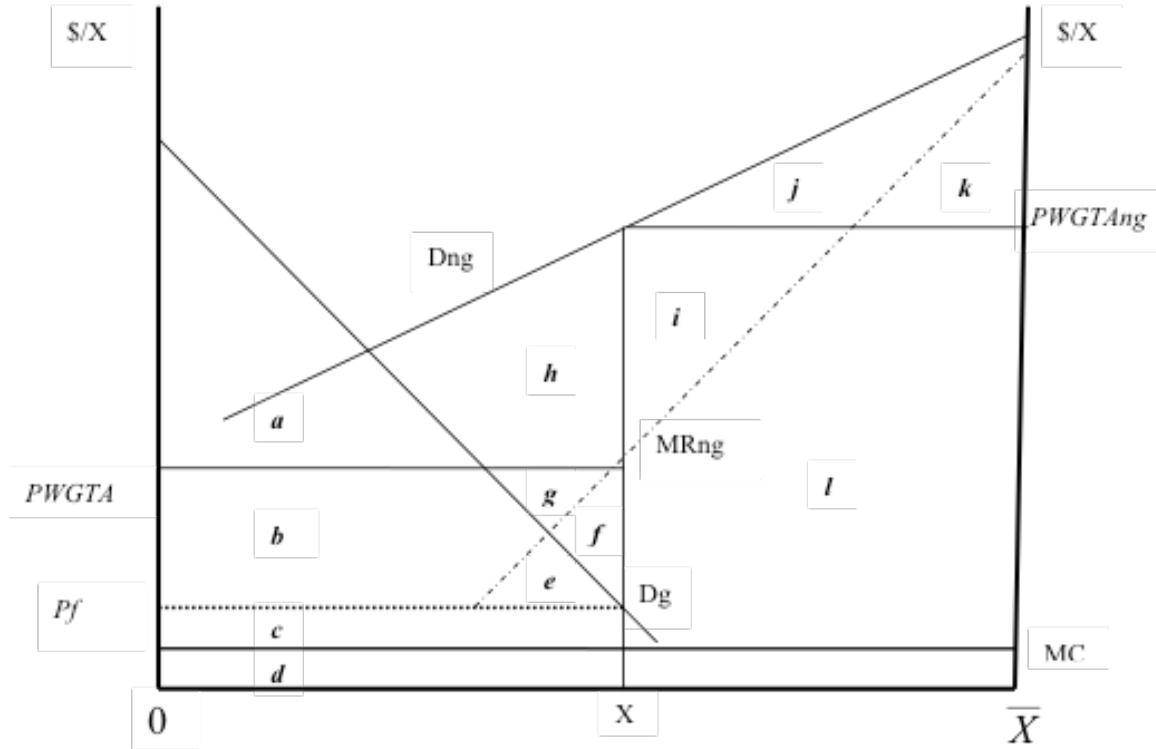


Figure 4.3 Grain and Non-Grain Welfare Under WGTA Regulation

4.5 Regulatory Change: The CTA

In 1996, the federal government redefined the regulatory framework for Prairie grain movement with the passing of the CTA. The following section examines the economic impact resulting from these regulatory changes. Specifically, this section develops a model to show the welfare changes resulting from the elimination of the WGTA and the introduction of the revenue cap regulation. Consumer and producer surplus are used to determine if the regulatory changes have had a positive or

various studies support the view that the marginal excess burden of taxation is significant, likely to fall between 20 – 50 per cent. Thus, the marginal social welfare cost of a dollar of government spending is likely to be between \$1.20 and \$1.50.

negative impact on the GHTS as a whole. These same concepts are also used to determine how regulatory change has affected the welfare of different participants in the GHTS and which groups have benefitted the most must from regulatory change.

4.5.1 The Revenue Cap

As discussed in the previous chapter, the formula used in the determination of the revenue cap has four components. The first component – the railway’s average base year revenue per tonne – takes the railway’s base year (2000/01) revenues for the movement of grain and divides it by the number of tonnes of grain moved by the railway in the base year. The second component is an adjustment factor, which adjusts the railway’s average base year revenue per tonne in order to take into account the difference in the average length of haul for a given crop year compared to the base year average length of haul. The third component multiplies the adjusted revenue per tonne figure for the given crop year by the number of tonnes moved by the company in the given crop year. The result is a revenue cap figure before an allowance for inflation.

The final component used in the determination of the revenue cap – the volume-related composite price index (VRCPI) – simply indexes the adjusted revenue cap figure for inflation. Unlike the previous three components, which are specific to each railway and their operation, the volume-related composite price index is the only portion of the revenue cap formula that is determined by the Agency. To capture the essence of the revenue cap, namely that the average revenue for each railway is fixed, a simplified version of the revenue cap can be expressed as follows:

$$R_t = I_t \frac{R_0}{x_0} x_t = AR_t x_t$$

Where:

$R_t = \text{the revenue cap in period } t$

$x_0 = \text{tonnage handled in base year}$

$I_t = \text{inflation index in period } t$

$R_0 = \text{revenues in the base year}$

$AR_t = I_t \frac{R_0}{x_0} = \text{average revenue base indexed to period } t$

$x_t = \text{tonnage handled in period } t$

As the system moves to revenue cap regulation, the railways are faced with the problem of determining how to maximize their profits in a situation where they are free to determine quantity and price levels in both grain and non-grain markets, but where average revenues are fixed in the grain market.

This problem is further complicated by the fact that the regulated grain market is comprised of two distinct types of shippers: 1) those capable of loading unit trains from their facility and 2) those unable to load unit trains from their facility.

If the railways did not differentiate between a shipper's ability or inability to load a unit train from their facility (i.e., all shippers are charged the same rate) the railway's profit maximization problem can be expressed as follows:

$$\begin{aligned} \text{Max } \pi &= R_g(x_g) + R_{ng}(x_{ng}) - mx_g - mx_{ng} & (4.2) \\ \text{s.t. } R_g &\leq \bar{R}_g, x_g + x_{ng} \leq \bar{x} \end{aligned}$$

Assuming the capacity constraints are binding (i.e., the total capacity in the system is fixed at \bar{X} , with the levels of output in both the grain and non-grain market unable

to exceed \bar{X} , which will normally be the case for a profit maximizing firm) the problem can be expressed as follows: (4.3)

$$\text{Max } \pi = AR_g x_g + R_{ng} (x - x_g) - mx$$

Solving the first order condition, it can be shown that: (4.4)

$$AR_g = R'_{ng}(x - x_g)$$

Where $R'_{ng}(\bar{x} - x_g)$ = marginal revenue in the non - grain market

The welfare implications associated with moving from a WGTA ‘rate of return’ regulatory scheme to one that limits the average annual revenues that the railways are allowed to earn are shown in Figure 4.4. Similar to Figure 4.3 above, a monopolist railway with a fixed network capacity provides service in two competing markets: grain (g) and non-grain (ng). In the non-grain market, the railway is not subject to any form of government regulation and is able to exercise monopoly power. The regulated grain market, however, has moved from a WGTA ‘rate of return’ regulatory scheme to revenue cap regulation.

As the system moves from WGTA to revenue cap regulation, the average freight rates that the railways are allowed to charge in the grain market declines from ($PWGTA$) to (ARg).⁹ As the ‘price’ that the railways are able to charge in the grain market is reduced from price ($PWGTA$) to (ARg), the railways are faced with the problem of determining how to maximize their profits in a situation where they are free to determine quantity and price levels in both markets, but where average revenues are fixed in the grain market.

⁹ In regulatory economic literature, it is commonly held that ‘rate of return’ regulation results in higher cost (and rates) as opposed to incentive schemes, such as price cap and revenue cap regulation (Sappington, 2002; Liston, 1993; Laffont and Tirole, 1993).

As shown above, the solution that maximizes railway profits is attained by setting the marginal revenue in the non-grain market (MR_{ng}) equal to the railway's allowable average revenue (AR_g) (Equation 4.4).¹⁰ Network capacity is divided between the two markets, such that capacity to the left of point (X^*) is allocated to the grain market, with the remaining capacity allocated to the non-grain market (Figure 4.4).

The move to the revenue cap regulatory scheme and subsequent changes in freight rates and capacity allocation in the grain market has several welfare implications for both the grain and non-grain market. Whereas farmers were required to pay only a portion of the total freight costs under the WGTA regulation (P_f), under the revenue cap (AR_g) they are responsible for the total cost of moving grain. As such, while freight rates in the grain market decline with the introduction of the revenue cap – from (P_{WGTA}) to (AR_g) – the rates that farmers must actually pay under the new regulatory scheme increase from (P_f) to (AR_g). The result is that consumer welfare in the grain market declines, from area $a + b + c + j + k + m$ to area $a + b$, for a total loss of consumer surplus equal to area $c + j + k + m$.

As well, the shift in capacity allocation from (X) to (X^*) means that rail shippers in the non-grain market benefit from increased rail capacity allocation. The result is that freight rates in the non-grain market decrease from ($P_{WGTA_{ng}}$) to ($P_{RC_{ng}}$), resulting in an increase in consumer surplus in the non-grain market from area $u + v$ to area $s + t + u + v + w$, for a net increase of area $s + t + w$.

¹⁰ The average revenues that the railway can earn remain constant due to the regulated revenue cap. Similar to the literature on average and marginal revenues found in the perfect competition literature, in instances where average revenues are constant, the marginal revenue is constant as well, and is equal to average revenue.

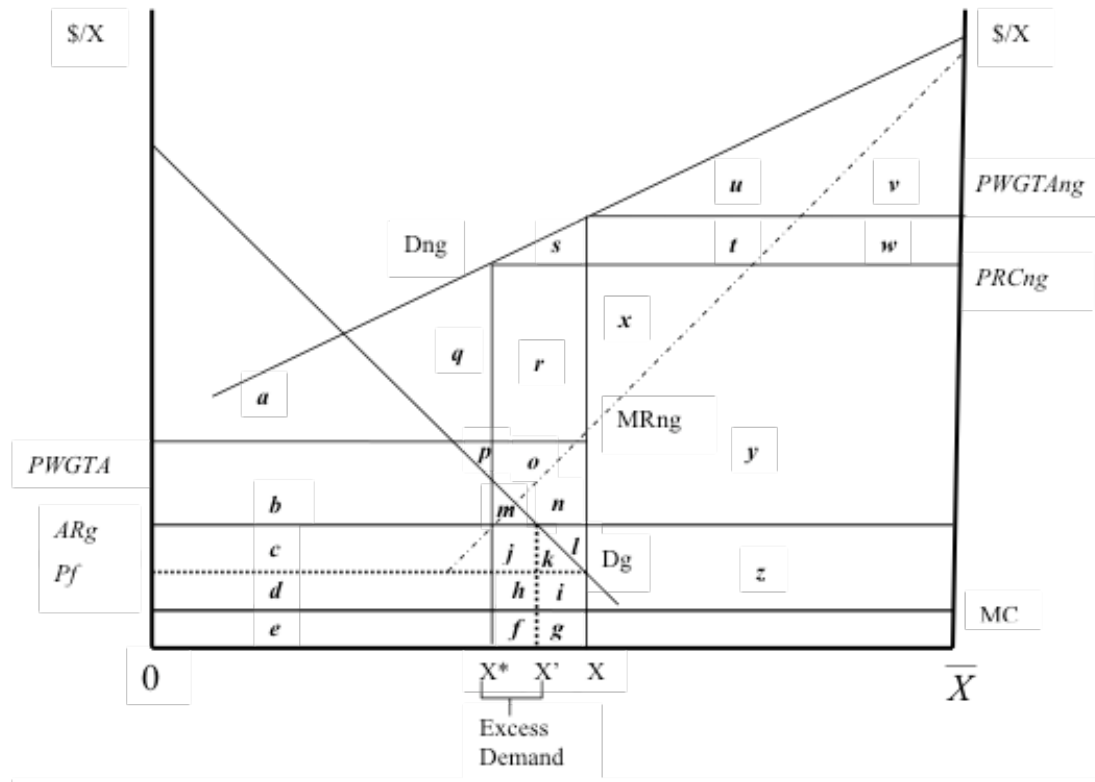


Figure 4.4 Welfare Implications Resulting From the Implementation of the Revenue Cap

With regards to the producer surplus, under the WGTA the total revenues earned by the railways in the grain market were equal to $(PWGTA * X)$, or area $b + c + d + e + f + g + h + i + j + k + l + m + n + o + p$ (Figure 4.4). Of this, area $e + f + g$ went to railway marginal cost, with the remaining area going towards the railways contribution to fixed costs from the grains industry. In the non-grains industry the railways had revenues (net of marginal costs) equal to area $t + w + x + y + z$. Thus, the total contribution to the railway's fixed costs – also defined as the producer surplus – is equal to area $b + c + d + h + i + j + k + l + m + n + o + p + t + w + x + y + z$ (Figure 4.4).

As the GHTS moves to the revenue cap, the total revenues earned by the railways in the grain market are reduced from $(PWGTA * X)$ to $(ARg * X^*)$. As such, the railway producer surplus in the grain market declines from area $b + c + d + h + i + j + k + l + m + n + o + p$ to area $c + d$ (Figure 4.4). In the non-grains industry, the railway's revenues (net of marginal costs) prior to the introduction of the revenue cap are

equal to area $t + w + x + y + z$. After the revenue cap is implemented, the railways lose area $t + w$ as the price in the non-grain market declines, but gain area $h + i + j + k + l + m + n + o + r$ as capacity is allocated from the grain market to the non-grain market. Thus, as the GHTS moves to revenue cap regulation, the railways gain additional producer surplus equal to area r , but lose area $b + p + t + w$ (Figure 4.4). Whereas the government incurred a cost associated with providing the railways with a subsidy to cover average costs under the WGTA, this cost was removed with the introduction of the CTA. As well, market distortions – and the dead-weight losses created in the various markets that are taxed in order to cover the subsidy – are eliminated. As such, the federal governments (i.e., taxpayers) gain area $b + c + j + k + l + m + n + o + p$, as well as the associated deadweight loss in the tax market that was incurred from providing this subsidy.

To recap, as the GHTS moves from WGTA regulation towards a revenue cap regime and in instances where the railways do not price discriminate between shippers in the regulated grain market, consumer surplus in the grain market experiences a decline. Compared to the WGTA case, farmers lose area $c + j + k + m$ due to the fact that the price they pay for grain transportation has risen and because the quantity of service they receive is less than what it was under the WGTA. Shippers in the non-grain market see a gain in consumer surplus equal to area $s + t + w$, while the railways lose area $b + p + t + w$, but gain area r . The federal government, which is no longer responsible for subsidizing the rail industry, also recovers area $b + c + j + k + l + m + n + o + p$, as well as the associated deadweight loss in the tax market that was incurred from providing the WGTA subsidy. Overall, the move from the WGTA to the CTA creates a new dead-weight loss equal to area p , but increases the total surplus in both the grain and non-grain market by area $l + n + o + r + s$. Thus, overall there is a gain in total system surplus (Table 4.1).

An additional observation from Figure 4.4 is in regards to the railway's profit maximizing capacity allocation and how this allocation is divided between the grain and non-grain markets. Under the WGTA, farmers demand grain transportation

equal to (X) at the point where the derived demand for grain transportation (Dg) is equal to the cost shared portion of the regulated WGTA freight rate (Pf).

Under the revenue cap, however, the railway maximizes profit when the marginal revenue in the non-grain sector (MR_{ng}) is equal to the average revenue cap (AR_g) in the grain market. If the marginal revenue in the non-grain sector intersects the average revenue cap to the right of the demand curve in the grain sector, the transportation demands in the grain sector are fully met. If, however, these two curves intersect to the left of the demand curve in the grain sector – as shown in Figure 4.4 – this will result in a situation where the rail capacity allocated to the grain market (to the left of X^*) at the revenue cap price is less than the actual capacity demanded by grain shippers (X'), creating a situation of excess demand ($X' - X^*$) in the grain market.

Table 4.1 Changes in GHTS Welfare Resulting From the Introduction of the Revenue Cap

| | WGTA | Revenue Cap | Welfare Change | |
|-----------------|---|-------------------------|---|---------------------|
| CS | | | Gain | Loss |
| Farmers | a+b+c+j+k+m | a+b | | c+j+k+m |
| NG Market | u+v | s+t+u+v+w | s+t+w | |
| Railway | | | | |
| Grain | b+c+d+h+i+j+k+l+m+n+o+p | c+d | | b+h+i+j+k+l+m+n+o+p |
| Non-Grain | t+w+x+y+z | h+i+j+k+l+m+n+o+r+x+y+z | h+i+j+k+l+m+n+o+r | t+w |
| Net | | | r | b+p+t+w |
| Subsidy | | | | |
| Grain* | b+c+j+k+l+m+n+o+p +(b+c+j+k+l+m+n+o+p)MSWC | none | b+c+j+k+l+m+n+o+p +(b+c+j+k+l+m+n+o+p)MSWC | |
| Net GHTS | | | l+n+o+r+s +(b+c+j+k+l+m+n+o+p)MSWC | |

- The letters denoted in Table 4.1 represent the lettered areas in Figure 4.4.

*In addition to the area of the subsidy represented above, taxpayers also gain the marginal excess burden of taxation associated with raising the subsidy through taxation. As noted previously, the marginal social welfare cost (MSWC) associated with providing the subsidy is likely to be between \$1.20 and \$1.50.

The model above outlines the railway's profit maximization solution and associated welfare impacts in a situation where the railways do not differentiate between high

and low cost shippers. Fulton (2012) adds an additional level of complexity to the profit maximization problem of the railways by removing the price homogeneity condition applied to shippers in the grain market. In his analysis, Fulton (2012) assumes a grain market comprised of two distinct groups of shippers: one of which can be served at relatively low cost (i.e., shippers that are able to load unit trains) and another that can be served at a higher cost (i.e., shippers that are unable to load unit trains) (Figure 4.5).

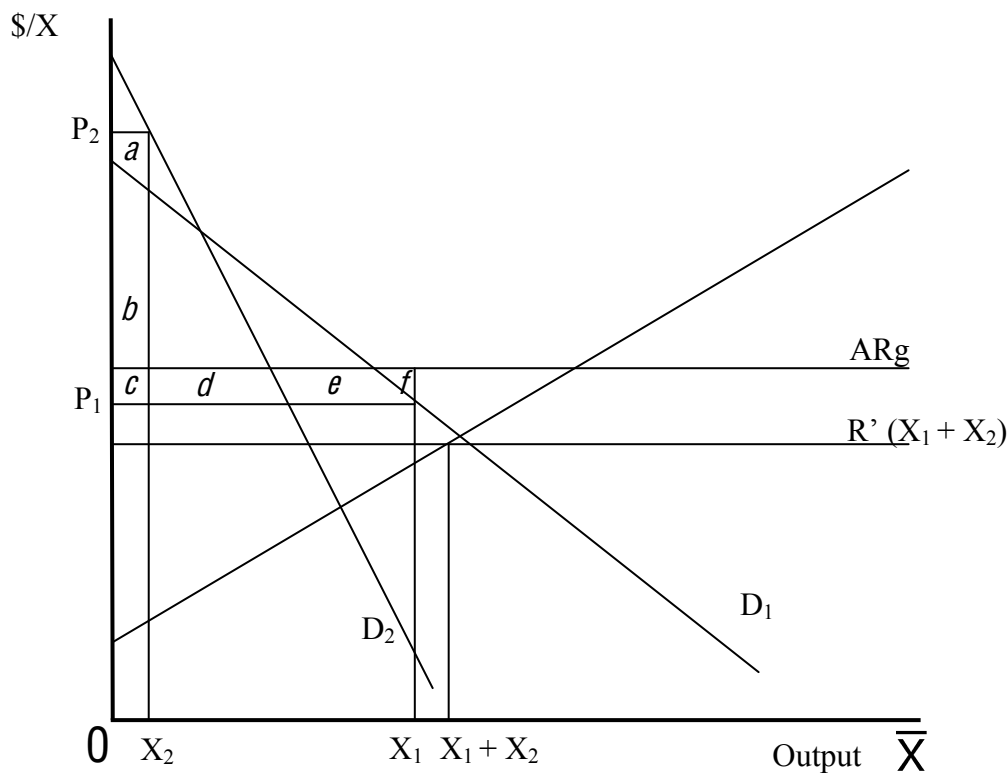


Figure 4.5 Price Discrimination in the Presence of a Revenue Cap

Following Fulton (2012), the demand curves for both the high and low cost shippers are constructed on the assumption that producers are distributed spatially vis-a-vis locations that are able to load unit trains and that those that are not. Thus, D_2 is the demand by shippers for the transportation of grain that is delivered by producers that have no option but to deliver to locations that are unable to load unit trains. In contrast, D_1 is the demand by shippers for the transport of grain that is delivered by

producers that have the option to deliver to locations that can load unit trains and have chosen to deliver to these locations. To ensure that producers do in fact deliver to the unit train locations, it is necessary that $p_1 + t_1 \leq p_2 + t_2$, where t_1 is the cost to the producer of delivering to location 1, t_2 is the cost of delivering to location 2 and $t_1 > t_2$ (i.e., it costs more for producers to deliver to location 1). This expression can be written as $p_1 \leq p_2 - \Delta t$, where $\Delta t = t_1 - t_2$ is the difference in the transportation cost to the two loading facilities.

Assuming the railway sets prices so as to maximize profits from both its grain and non-grain operations, that the prices are set so that the markets remain segmented (i.e., $p_1 \leq p_2 - \Delta t$) and that the revenue cap is not violated (i.e., $p_1 x_1 + p_2 x_2 \leq AR_g (x_1 + x_2)$, where AR_g is the average revenue cap that cannot be exceeded), and that there is a capacity limit on railway services provided to the two operations (i.e., $x_1 + x_2 + x_n \leq \bar{X}$), the railway's problem can be written as:

$$\max_{x_1, x_2, x_n} \pi = p_1(x_1) + p_2(x_2) + R(x_n) - c x_2 - m(x_1 + x_2 + x_n)$$

subject to

$$x_1 + x_2 + x_n \leq \bar{X}$$

$$p_1 x_1 + p_2 x_2 \leq AR_g (x_1 + x_2)$$

$$p_1 \leq p_2 - \Delta t$$

where x_n is the service provided to the non-grain sector, $R(x_n)$ is the revenue from the non-grain sector, AR_g is the average revenue cap that the railways must abide by under current regulations, m is the base level marginal cost of providing transportation services to both the grain and non-grain sector, and c is the additional cost of servicing facilities that cannot load unit trains.

Assuming the capacity constraint is binding and that $p_1 \leq p_2 - \Delta t$, the problem can be written as:

$$\text{Max}_{x_1, x_2, \lambda} L = p_1(x_1) + p_2(x_2) + R(\bar{X} - x_2 - x_1) - cx_2 - m\bar{X} + \lambda[AR_g(x_1 + x_2) - p_1 x_1 - p_2 x_2]$$

The first-order conditions to this problem are:

$$(1 - \lambda) MR_1 + \lambda_g = R'$$

$$(1 - \lambda) MR_2 + \lambda_g = R' + c$$

$$x_1(g - p_1) = x_2(p_2 - g)$$

where $MR_1 = p_1 + x_1 p_{1x_1}$, $MR_2 = p_2 + x_2 p_{2x_2}$, and $R' = x_n$.

Solving the above equations simultaneously gives the optimal values of x_1^* , x_2^* and λ^* .

Fulton (2012) shows that the solution to the above problem involves price discrimination. This price discrimination involves setting a higher price in market 2, all the while ensuring that the average revenue constraint is met. Compared with the unconstrained revenue cap situation, the price in market 1 is lower and the price in market 2 is higher. Additionally, in instances where the railways have the ability to fully price discriminate between high and low cost shippers, service issues attributed to excess demand are non-existent (Figure 4.6).

With regard to the welfare implications in instances where the railways differentiate between low and high cost shippers, the consumer surplus of high cost shippers is equal to area $a + b$ and the consumer surplus of low cost shippers is equal to area $b + c + d + e + f + g + h$ (Figure 4.6). When compared with the welfare changes outlined in Figure 4.4 it is evident that shippers in the grain market are worse off than they previously were under the WGTA.

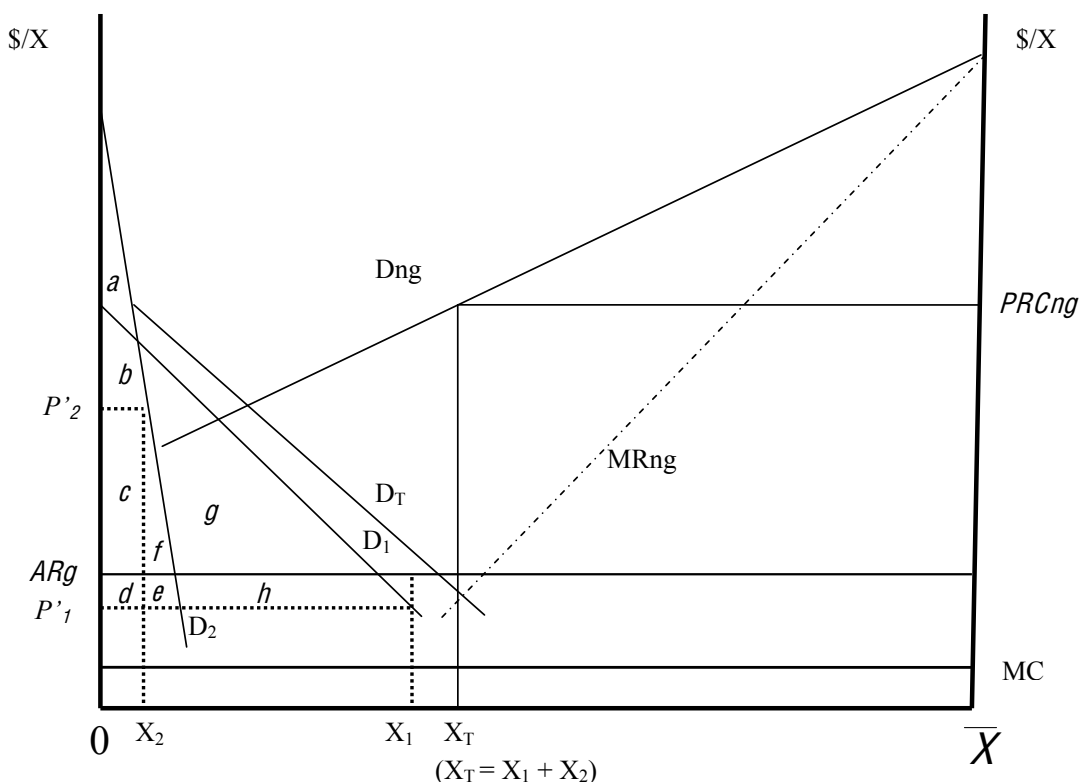


Figure 4.6 Welfare Implications Resulting From the Implementation of the Revenue Cap

If the cost of providing transportation service into market 2 is relatively low, the optimal strategy for the railway is to sell as much as possible in the higher cost market at price p'_2 and then adjust sales in the low cost market so as to achieve the revenue cap. With the cost of service provision in the higher cost market relatively low, maximizing sales to this market generates the largest revenue possible. Maximizing sales in the higher cost market at price p'_2 means that full service provision is achieved – i.e., all the shipper demand at price p'_2 is satisfied. Thus, poor service provision should not arise if the cost of providing the service in the higher cost market is relatively low. It is, however, important to note that this situation can change when full price discrimination is not possible. For instance, this situation is not possible if there is a limit on how high p'_2 can be set.

If the cost of service provision in the higher cost market is relatively large, then the railway's net return from selling to this market is relatively low. In these conditions it is more profitable to make additional sales to the lower cost market, even though doing so lowers the price p_1 . Of course, some sales will be made to the high cost market; this will occur when sales to the low cost market have sufficiently lowered the marginal revenues in the low cost market to the point where it would be more profitable to shift sales to the high cost market. However, as long as the cost of providing service to the higher cost market is relatively large, the service provided to the high cost market will be less than what the shippers in the market demand at price p'_2 . As a consequence, there will be unmet demand (i.e., the full level of service that is demanded will not be met) (Fulton, 2012).

In the extreme, the impact of restricting the degree of price discrimination can be seen by lowering p'_2 towards ARg . In the limit, as p'_2 approaches ARg , p'_1 approaches ARg . As seen in Figure 4.7, the output sold at $p_1 = ARg$ is given by x_1 . Suppose, for the moment, that the railway is not selling anything into the high cost market. Does it make sense to do so? If the railway sells one unit into the high cost market at price ARg (the railway has to sell at price ARg in order to meet the revenue cap), the net return on the sale is $ARg - c$, since there is an additional cost c associated with using this market (the $ARg - c$ line is shown in Figure 4.7). The marginal cost of selling this one additional unit, on top of the x_1 units already sold, is given by R' evaluated at x_1 . Since the net return is greater than the cost, this sale should take place. Indeed, the railway should keep supplying the high cost market until the point where the $ARg - c$ curve cuts R' (or equivalently, where the ARg curve cuts the $R' + c$ curve). Thus total output is given by $x_1 + x_2$.

If the railway provides a total of $x_1 + x_2$, then a portion of the high cost market is not supplied. Quantity x_T shows the amount demanded in the two markets together if the price in each market is ARg . Thus, $x_T - (x_1 + x_2)$ is the excess demand in the high cost market (i.e., the demand that goes unfilled).

Since there is unfilled demand in the high cost market at price AR_g , some way has to be found to ration the supply that is provided. One way would be to run a lottery – those shippers that were successful in the lottery would receive service while those that were not successful in the lottery would not receive service. Alternatively, the railway could provide only partial service (e.g., only deliver a portion of the cars that were ordered, delay service, and/or provide rail cars that are old and worn out). In short, the railways could reduce the level of service provided to high cost shippers (Fulton, 2012).

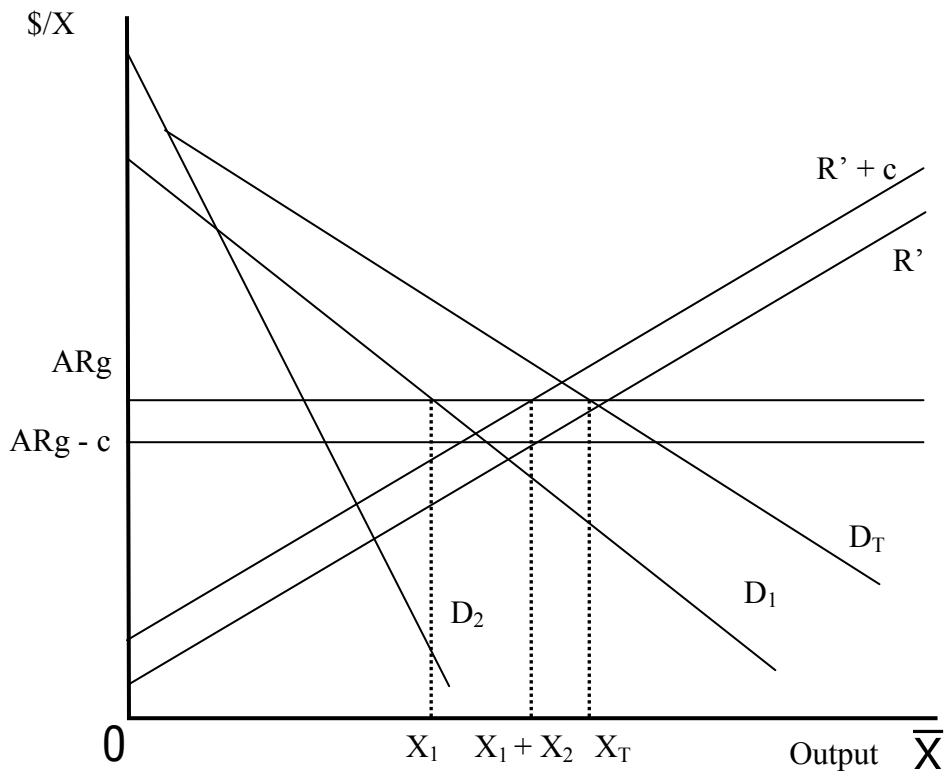


Figure 4.7 Service Issues and the Revenue Cap

The recognition of the effects of excess demand in the grain market and the subsequent need to turn customers away is important because it provides an understanding of how the railway's capacity allocation practices can negatively impact service levels in the grain market. Adequate rail service in the grain market,

typically measured by the consistency and capacity to move grain, is essential to the success of the industry, especially one where shippers have no other viable transportation option to move grain to export position.

4.5.2 Railway Efficiency Gain

A common feature of incentive regulatory schemes, such as the railway revenue cap, is to provide firms with an incentive to improve upon their levels of technical efficiency. Improvements in technical efficiency – sometimes referred to as ‘productive efficiency’ or ‘productivity’ – occurs when the physical process of the firm is modified so that the same amounts of inputs, or factors of production, produce a higher quantity of outputs. Conversely, technical efficiency can also occur if output remains constant when less of one or more inputs are used in the production process. The firm, by using its resources more efficiently, is able to lower its average cost curve through a decrease in its marginal cost.

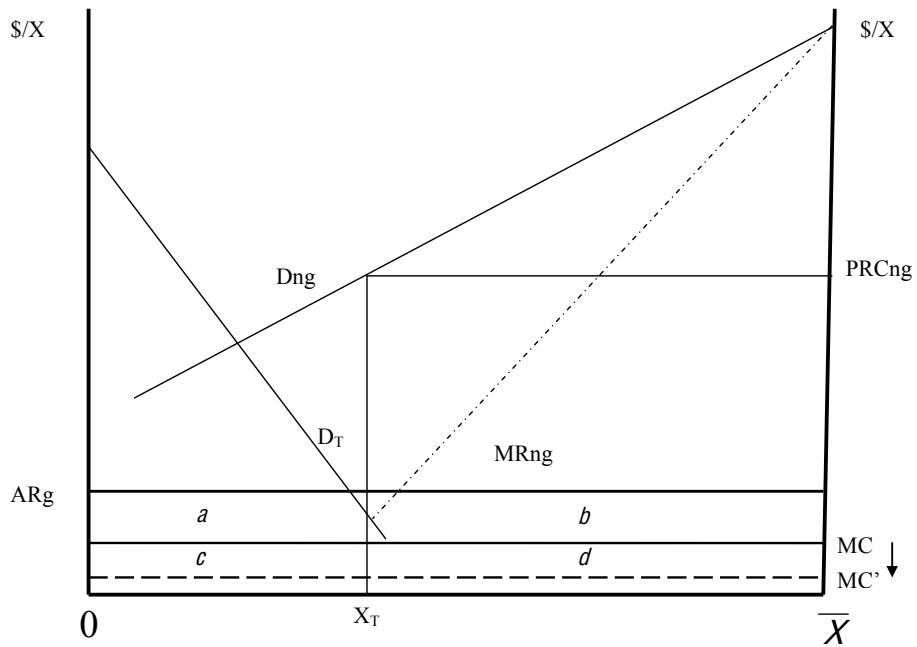


Figure 4.8 Welfare Effects Resulting From a Reduction in Railway Marginal Cost

The welfare impacts associated with making improvements in railway technical efficiency in order to lower marginal costs are shown in Figure 4.8. Prior to the efficiency improvements, railway producer surplus is equal to the area $a + b$. As railways invest in efficiency improvements and the marginal cost of the railway declines from (MC) to (MC') , the railway producer surplus increases by area $c + d$.

An additional note of interest from Figure 4.8 is that the reduction in railway marginal cost has no impact on the consumer surplus received in either the grain and non-grain markets. As such, the benefits associated with improvements in railway technical efficiency can be considered the strict property of the railways and are not shared with consumers of transportation services in either the grain or non-grain markets *if* they are used only as a means of reducing railway marginal cost.

The exclusivity of benefits is not the case in instances where the efficiency improvements made by the rail firm are used to produce a higher quantity of outputs with the same amounts of inputs or factors of production. As shown in Figure 4.9, if railway efficiency improvements are aimed at producing a higher quantity of outputs with the same amounts of inputs, as output increases there is an increase in the total capacity of the system from \bar{X} to \bar{X}' . Assuming that there is no change in demand in the non-grain sector, the demand curve (Dng) and marginal revenue curve $(MRng)$ in the non-grain sector – which are anchored to the non-grain axis – are repositioned as (Dng') and $(MRng')$.

From this model, a number of conclusions can be drawn. First, as system capacity increases, the ability of the railway to fully serve the capacity needs of the grain market also increases. Whereas prior to the capacity shift, the railways optimal capacity allocation between markets was set at X_T , after the capacity shift the new optimal capacity becomes X'_T .

Second, as capacity in the system increases, so too does the producer surplus earned

by the railway. Prior to the capacity shift, the railway's producer surplus in the non-grain market was equal to $[(PRCng^* - MC) * (\bar{X} - X_T)]$. While the railways do lose a portion of this producer surplus (area $a + b + c + d + e + f + g + h + i + j + k$) as system capacity is increased, this is more than offset by the additional producer surplus (area $l + m$) resulting from the capacity increase.

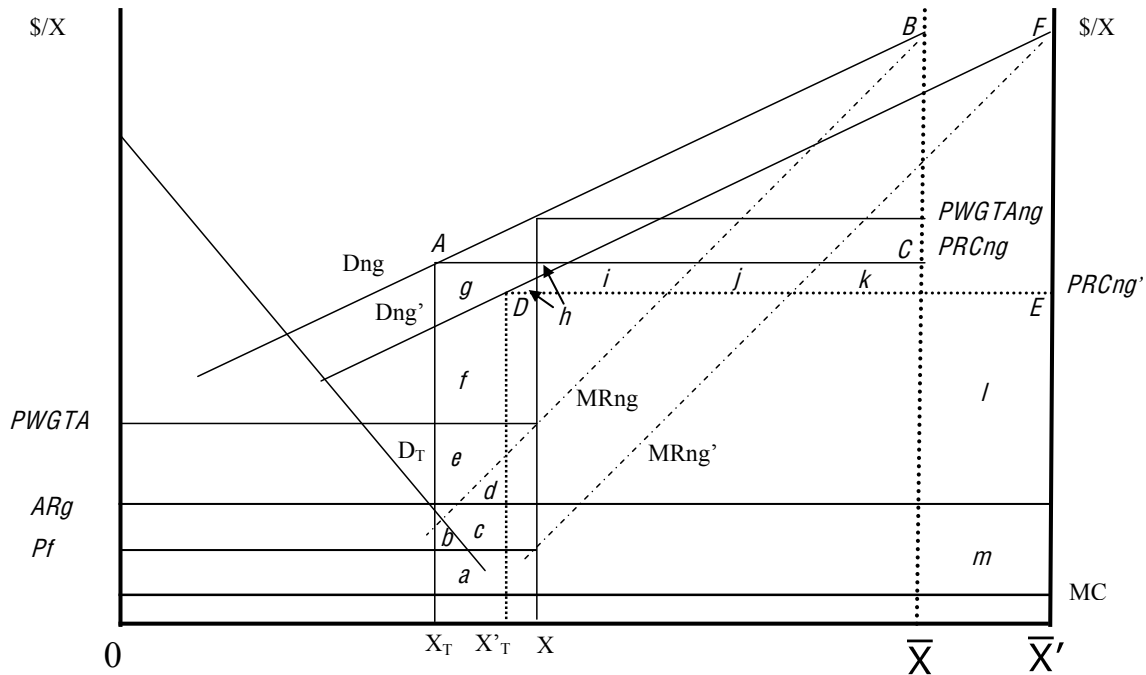


Figure 4.9 Welfare Implications in the Non-Grain Market Resulting From an Increase in Railway Capacity

Finally, the increase in system capacity also increases the consumer surplus of shippers in the non-grain market. Whereas non-grain shippers earned consumer surplus equal to triangle ABC prior to the increase in capacity, after the shift occurs non-grain shippers now earn consumer surplus equal to triangle DEF . As such, non-grain shippers see a distinct benefit as a result.

In regards to the welfare changes in the grain sector, an increase in \bar{X} results in an overall increase in the total capacity allocated to the grain market. This increase in total capacity is comprised of an output increase in x_2 – via a decrease in price in the higher cost market – and a decrease in output x_1 , with the increase in x_2 greater than

the increase in x_1 (Figure 4.10). As such, overall revenues earned by the railways in the grain market increases as total output increases from X_T to X'_T . As for changes in consumer surplus, higher cost shippers see an increase from area $a + b$ to area $a + b + c + g$, while shippers in the low cost market lose area $f + j + n + o$.

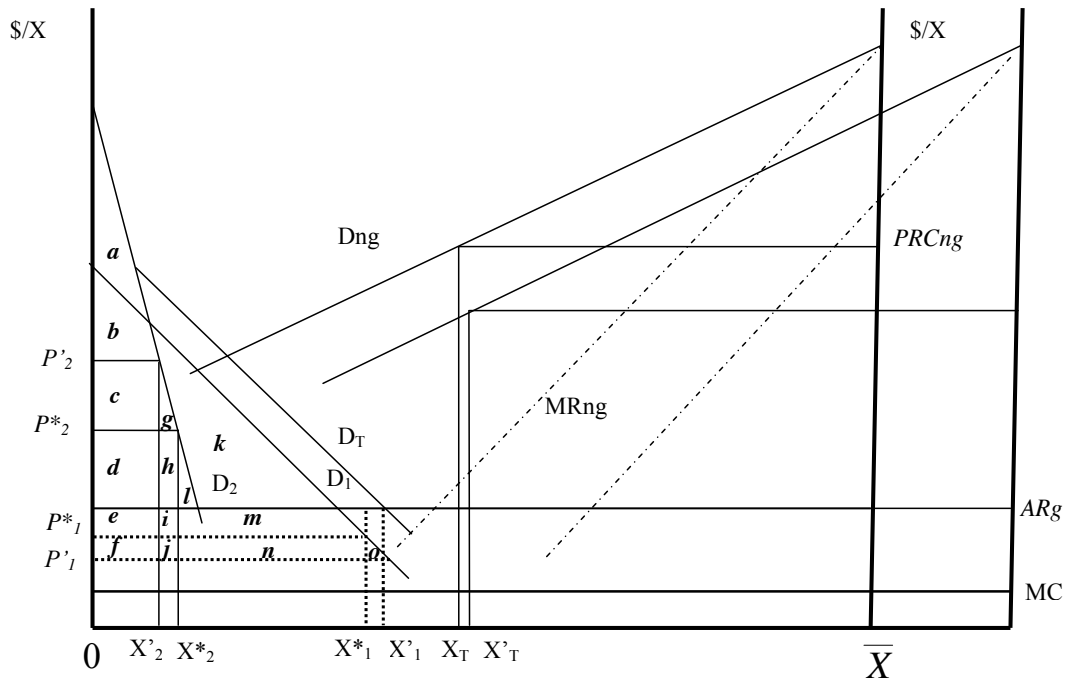


Figure 4.10 Welfare Implications Resulting From an Increase in System Capacity

4.5.3 Elimination of Grain Dependent Branchlines (GDBL)

The economic consequences resulting from the discontinuance of GDBL's are shown in Figure 4.11. As the railway eliminates low density/high cost GDBL's from the system, marginal cost declines from (MC) to (MC') . As track is removed from the system, the cost of transporting grain to market is shifted on to farmers located far from the main lines, who are required to haul grain further by truck in order to access delivery points.

If the shifting of cost from the railways to producers is calculated on a 1:1 ratio (i.e.-

a one dollar reduction in the railway's marginal cost equals an additional dollar that producers will have to spend to transport their grain), then the removal of GDBL's results in a shift down of the demand curve (D_2) in the high cost market. This shift down has the effect of reducing the quantity of rail service provided to market 2 (X_2)– via an decrease in price from (P'_2) to (P^*_2) – and decreasing the quantity of rail service in market 1 – via an increase in price from (P'_1) to (P^*_1). It is important to note that although the price charged by the railway decreases, the price paid by farmers actually increases since they have to incur greater costs associated with hauling grain longer distances. It is this overall price increase that leads to a reduction in quantity demanded.

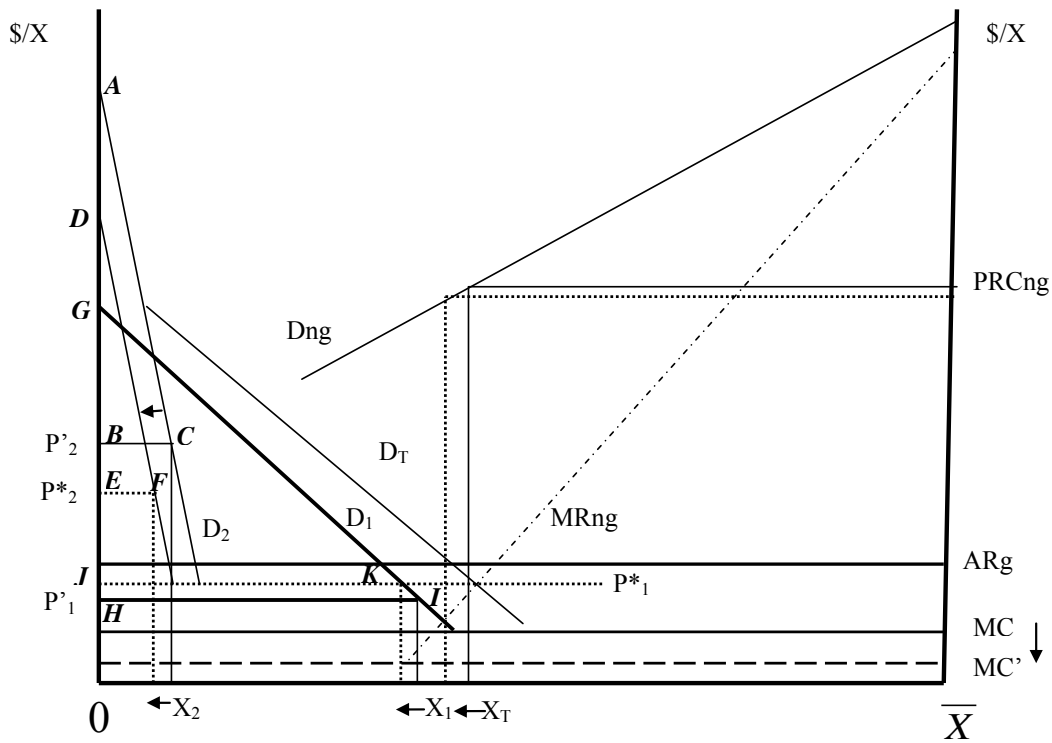


Figure 4.11 Welfare Effects Resulting from the Removal of Grain Dependant Branchlines (1:1 Ratio)

The result is that consumer surplus in the high cost market decreases from triangle

ABC to triangle *DEF*, while consumer surplus in the low cost market decreases from triangle *GHI* to triangle *GJK*, with the total consumer surplus being less than it was in instances where GDBL's were maintained.

While the shifting of costs from railway to farmers lessens the consumer surplus in the grain market, it also has the effect of reducing railway revenue – and producer surplus – in the grain market, since total output is reduced and rail rates remain constant under the revenue cap. This reduction in producer surplus in the grain market, however, is recaptured by the railways in the non-grain market.

A final observation from Figure 4.11 relates to instances where the shifting of cost from the railways to producers is greater than a 1:1 ratio. Given that the costs associated with moving grain by truck can be at least twice as high as the cost of moving grain by rail (i.e., the cost shifting ratio is greater than 1:1) these welfare changes become even more pronounced.

4.5.3.1 Externalities and the Removal of GDBL's

A key consequence resulting from the removal of GDBL's from the GHTS has been the increase in truck haul distances and volumes (Karadininas, 1985; Karadininas and Storey, 1986; Khakbazan, 1999; Wilson, 1988; Stabler, 1985). As track is removed and truck distances and volumes increase, so too does road damage, road maintenance costs and greenhouse gas (GHG) emissions (Khakbazan, 1999). These costs are generally considered as a negative externality, since these costs are not borne directly by the trucking firms. Instead, these costs are endured by other road users, by taxpayers and by society as a whole.

Figure 4.12 illustrates the welfare implications associated with the presence of externalities resulting from the removal of GDBLs from the GHTS. To ease in the exposition of this model without losing the critical features, assume that the marginal private costs of grain transportation firms (e.g., rail and truck) operating

within the GHTS are equal to zero. Again, the demand for grain transportation (Dg) is considered as derived demand.

Prior to the 1996 regulatory changes, the externalities associated with trucking distances and volumes were limited due to the presence of GDBLs. As such, the marginal social cost (which takes into account the limited externalities) imposed upon society is slightly higher than the marginal private cost and is equal to (MSC) When these marginal social costs are taken into account, there is a reduction in overall system welfare equal to area a .

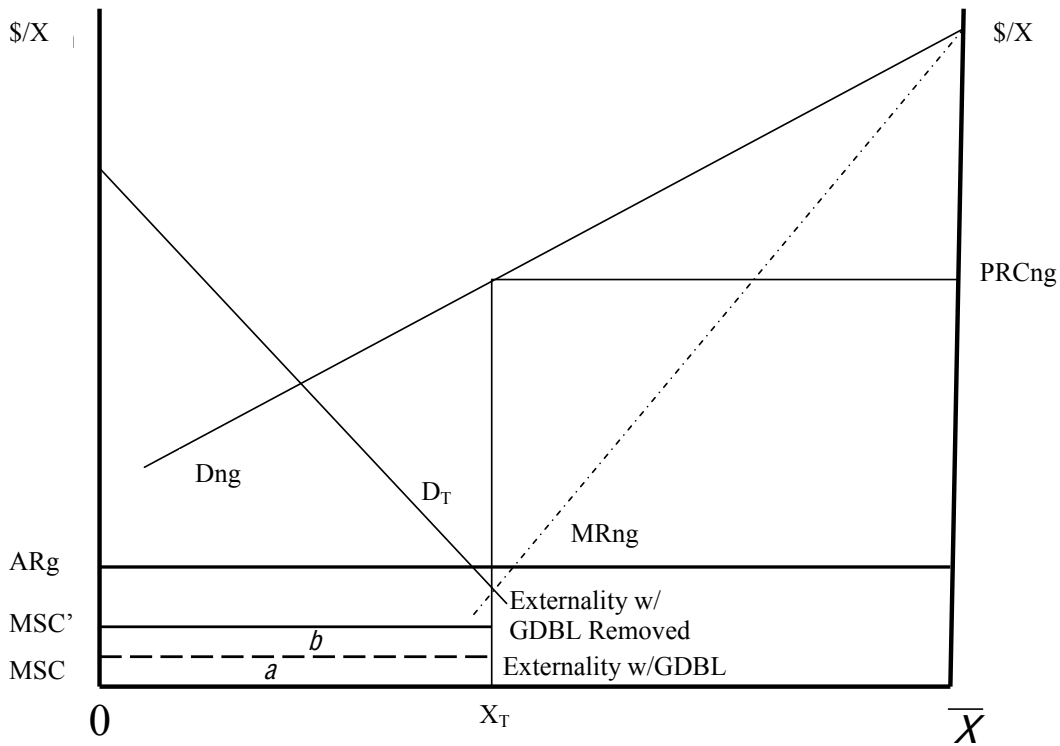


Figure 4.12 Externalities Associated with Removing Grain Dependiant Branchlines from the GHTS

As GDBLs are removed from the system and the externalities associated with grain transportation are increased due to the increase in trucking distances and volumes, the marginal social cost associated with grain transportation also increases from

(*MSC*) to (*MSC'*). As the marginal social cost increases, overall welfare in the grain market is further reduced by area *b* (Figure 4.12).

4.6 Chapter Summary

Over the years, government policymakers have developed a variety of different mechanisms and procedures to regulate the GHTS. Two particular regulatory changes – the removal of grain dependent branchline protections and the introduction of the revenue cap – have had a significant impact on the GHTS. Since these measures were introduced, the GHTS has seen an increase in rail service issues, a significant reduction in the total route miles of grain dependent branchlines throughout the system, while numerous smaller elevators have consolidated into fewer, larger elevators and inland terminals.

The chapter developed economic theories to analyze the economic impacts of regulatory change on the GHTS. Before this analysis could take place, it was first necessary to examine theories on the origin of regulation. Section 4.2 presents two polar extremes as to why regulation is formed. Public interest theory contends that regulation is created in the public's interest to mitigate adverse economic effects resulting from market failures. Capture theory asserts that regulations are designed in the interests of regulated communities by the regulator out of vested self-interest.

As with most extremes, it cannot be expected that either the purely altruistic or self-serving rationales for government regulation are strictly correct. Instead, truth lies somewhere between these extremes. In their attempt to acquire or to maintain political power, governments must balance the interests of different groups when developing and implementing legislative and regulatory provisions (Rausser, 1992).

Section 4.3 examined the historical use of applied welfare economics as a means of determining whether regulatory capture or public interest serves as the basis for regulatory design. Applied welfare economics serves as a means for measuring the

societal welfare effects resulting from policy implementation. This section also looked at the evolution of regulation through the lens of public finance theory.

This chapter also developed a series of theoretical models to examine the welfare effects resulting from the elimination of grain dependent branchlines and the introduction of the revenue cap. Section 4.4 examined several 'rate of return' regulatory options available to the regulator, along with an illustration of the 'rate of return' regulation of the WGTA in order to provide a regulatory baseline against which the 1996 CTA regulatory changes could be measured.

Section 4.5 illustrated the theoretical results of the welfare changes resulting from regulatory change. In summary, it seems that many of the changes resulting from the regulatory reforms have provided notional benefits to the railways, non-grain shippers and the federal government (Table 4.2). Whereas the government incurred a cost associated with providing the railways with a subsidy to cover average costs under the WGTA, this cost is removed with the introduction of the CTA. As well, market distortions – and the dead-weight losses created in the various markets that are taxed in order to cover the subsidy – are also eliminated.

Shippers in the non-grain market see a gain in consumer surplus as capacity is allocated from the grain to the non-grain market. As such, shippers in the non-grain market are made better off. And while the producer surplus earned by the railways in the grain market is reduced, it appears that the railways re-capture at least a portion of this surplus as capacity is shifted to the unregulated non-grain market. Thus, as the GHTS moves to revenue cap regulation, the railways gain additional producer surplus.

| Table 4.2 Welfare Changes in the GHTS | | | | |
|--|---------------------------|-------------------------|-------------------------------|-------------------------|
| Theoretical Proposition | Grain Market (+/-) | | Non-Grain Market (+/-) | |
| | Consumer Surplus | Producer Surplus | Consumer Surplus | Producer Surplus |
| Implementation of the Revenue Cap | | | | |
| - Non-Differentiated Shippers | - | - | + | unsure |
| - Differentiated Shippers | - | - | + | unsure |
| Railway Efficiency Gains | | | | |
| - Reduction in Marginal Cost | No change | No change | No change | + |
| - Increase in System Capacity | + | - | + | + |
| Elimination of GDBL's | - | - | + | unsure |

When considering the grain market, as the GHTS moves from WGTA regulation towards a revenue cap regime and in instances where the railway's do not price discriminate between shippers in the regulated grain market, consumer surplus in the grain market experiences a decline. Compared to the WGTA case, farmers see a decrease in consumer surplus largely due to the fact that the price they pay for grain transportation has increased compared to freight rates under the WGTA. In instances where the railways differentiate between high and low cost shippers, high and low cost shippers also see a decrease in consumer surplus due to increased freight rates, with a greater loss in consumer surplus experienced by high cost shippers.

In instances where GDBL's are removed from the system, as transportation costs are passed from the railways to farmers, the resulting inward shift/price decrease in the high cost market and the subsequent price increase in the low cost market reduce the degree of consumer surplus in the grain market beyond the levels where GDBL's were maintained. While the shifting of costs from railway to farmers lessens the consumer surplus in the grain market, it also has the effect of reducing railway revenue – and producer surplus – in the grain market, since total output is reduced and rail rates remain constant under the revenue cap. This reduction in producer surplus in the grain market, however, is recaptured by the railways in the non-grain market.

The model also suggests that the beneficiary of welfare gains associated with

improvements in railway technical efficiency differ depending on whether output remains constant while using less inputs (i.e., a reduction in marginal cost) or if the same amounts of inputs produce a higher quantity of outputs (i.e., an increase in capacity). In instances where railways invest in efficiency gains that lower marginal cost, the welfare gains associated with the reduction in marginal cost are the strict property of the railway.

In instances where railway efficiency improvements increase total system capacity, while non-grain shippers and the railways see a distinct increase in surplus, the surplus changes in the grain market are mixed. The increase in total capacity is comprised of an output increase in the high cost market, which increases the consumer surplus experienced by high cost shippers. The low cost market experiences a decrease in output, which decreases the consumer surplus earned by low cost shippers.

On the basis of these theoretical results, it appears that the regulatory changes have benefitted the railways and non-grain shippers more than farmers. While the revenue cap does protect farmers from predatory pricing by the railways, the railways receive the largest welfare gains from the implementation of the 1996 CTA regulations. This theoretical outcome suggests that railways have some power in influencing regulators to draft regulations which favour their operations and/or that farmers have very little ability in influencing regulators.

Chapter 5: Analysis and Findings

5.1. Introduction

The major propositions derived from the theoretical framework outlined in the previous chapter are used to test the hypotheses outlined in Chapter 1. Each proposition is tested for validity by finding supporting or refuting evidence using a triangulation approach. Key principles for a successful triangulation approach – blending and integrating a variety of data and methods – and its application in the thesis research will be discussed. A description of the methodologies, data sources, data collection, analysis and key findings are included in this chapter. Surveys and submission from the Federal Railway Level of Service Review, as well as a variety of secondary studies on railway costing, served as major data sources for the analysis. A discussion on how the key findings relate to the theoretical observations identified in Chapter 4 concludes the chapter.

5.2 Triangulation

Although the concept of triangulation (i.e., taking measurements from two separate locations to derive, or predict, a third measurement or location) has its applied origins in navigation and surveying, it has also gained prevalence in the social sciences (Smith, 1975; Olson, 2004). In the social sciences, the use of triangulation can be traced back to Campbell and Fiskel (1959), who developed the concept of ‘multiple operationism’ methodology. They argued that more than one method should be used in the research validation process in order to ensure that the variance of an outcome reflected that of the trait and not of the method. Thus, the convergence or agreement between two or more methods enhances the belief that results are valid and not a methodological artifact (Bouchard, 1976).

As noted by Downward and Mearman (2004), there are two main arguments put forward to justify triangulation. The first, initially purported by Webb et al. (1966), is that triangulation increases the 'persuasiveness' of quantitative evidence. Early studies tended to emphasize the use of triangulation as a means of enhancing the empirical reliability of quantitative measures (Campbell and Fiske, 1959). More recently, the emphasis of triangulation methodologies has grown to include a greater concern for enhancing the validity of insights and for adding completeness to existing research methodologies (Shih, 1998). Used in this manner, triangulation increases understanding and confirms the accuracy of data (Jick, 1979; Denzin, 1989). More explicitly, triangulation allows quantitative analysis to test the validity of qualitative insights, or to use qualitative work as preparation for quantitative work, allowing a research topic to be explored in as much detail as possible (Denzin, 1978; Danermark et al., 2002).

In the social sciences, triangulation has most commonly been used in efforts to integrate fieldwork and survey methods. The feasibility and essential nature of such an approach have been advocated by various social scientists who collectively argue that quantitative methods can make important contributions to fieldwork, and vice versa (Vidich and Shapiro, 1955; Reiss, 1968; McCall and Simmons, 1969; Spindler, 1970; Diesing, 1971; Sieber, 1973). Thus, researchers using qualitative methodology are encouraged to systematize observations, to utilize sampling techniques, and to develop quantifiable schemes for coding complex data sets. Denzin (1970) provides a useful taxonomy on the different forms of triangulation. These forms are frequently referred to in triangulation literature, though it should be recognized that this list is not exhaustive, nor necessarily mutually exclusive (Table 5.1).

Table 5.1 – Denzin's Taxonomy of Triangulation

| Triangulation Types | Description |
|------------------------------|--|
| Data Triangulation | Involves gathering data at different times and situations from different subjects. Surveying relevant stakeholders about the impact of a policy intervention would be an example. An alternative would be to address concerns about the inadequacy of available data. Economic forecasters who rely upon national accounts for their modeling exercises may find that there is a lag between their data and the prevailing market economic conditions. They often make use of different data sources (and types) to fill this gap. In this case, different types of data may be used; for example, survey data might be used alongside time series data. |
| Investigator Triangulation | Involves using more than one field researcher to collect and analyze the data relevant to a specific research object. Asking scientific experimenters to attempt to replicate each other's work is an example. |
| Methodological Triangulation | Involves the combination of different research methods. From Denzin, there are two forms of methodological triangulation. <i>Within method</i> triangulation involves making use of different varieties of the same method. Thus, in economics, making use of alternative econometric estimators would be an example. <i>Between method</i> triangulation involves making use of different methods, such as qualitative and quantitative methods in combination. |
| Theoretical Triangulation | Involves making explicit reference to more than one theoretical tradition to analyze data. This is intrinsically a method that allows for different disciplinary perspectives upon an issue. This could also be called <i>pluralist</i> or <i>multi-disciplinary</i> triangulation. |

The previous chapter developed theoretical models that predict the welfare effects arising from two specific GHTS regulatory changes – the introduction of the revenue cap and the removal of grain dependent branchlines. In regards to the revenue cap, the model expects that a regulatory regime that limits the average revenues of the railways will create excess demand in the grain market, resulting in a situation where the quantity of rail service in the grain market is reduced. The model also

predicts an increase in railway efficiency, as the railways respond to incentives in the revenue cap regulation that allows the railways to keep all of the benefits associated with efficiency improvements and cost reductions. In regards to the removal of grain dependent branchlines, the model predicts that as track is removed from the GHTS, the cost of transporting grain to market is shifted on to farmers located far from the main lines, who are required to haul grain further by truck in order to access delivery points. Further to this, the model predicts that societal costs also increase as longer trucking distances result in higher levels of GHG emissions and road damage.

To ensure that the models capture the essence of these regulatory changes and their actual effects on GHTS welfare, this chapter examines five key propositions derived from the theoretical models developed in the previous chapter. Propositions 1 and 2 compare the models' prediction of regulatory change as a cause of reduced GHTS service levels and increased railway efficiency against actual events observed in the GHTS. For example, in order to conclude if the revenue cap has actually resulted in a situation where the quantity of rail service in the grain market has declined, this chapter compares GHTS data on railway service levels prior to and after the introduction of the revenue cap.

Propositions 3, 4 and 5 set out to determine the magnitude of changes to the GHTS that have inevitably result from the introduction of the revenue cap and the removal of GDBLs. For example, propositions 3 and 4 develop a method for measuring and comparing the current average distance between GHTS grain delivery points with the average distance prior to the 1996 regulatory changes. Doing so provided a means for determining the magnitude of the changes in external system costs (i.e., road damage and GHG emissions) and the transfer of transportation costs from railway to farmer. Proposition 5 examines the magnitude of changes in railway efficiency that have resulted due to regulatory change.

Quantitative data was collected from a variety of sources, including the Canadian Grain Commission, Quorum Corporation, Transport Canada, and the Canadian Transportation Agency. These sources, along with information provided by the Government of Saskatchewan as part of the federal level of service review, were also utilized in the collection of qualitative data. These multiples sources of data are used to provide supporting evidence to the theoretical observations introduced in Chapter 4.

5.3. Proposition 1

If the grain market is differentiated between high cost and low cost shippers and if the level of price discrimination that can be practiced is constrained, than there exists a point where excess demand, and service issues, begin to emerge.

The previous chapter developed a theoretical model that showed how excess demand in the grain market is caused by constraints placed on the level of price discrimination that the railways are able to exercise in the grain market. Furthermore, the model also showed that high cost grain shippers (i.e., those shippers unable to load unit trains) are the recipients of reduced service levels resulting from excess demand (Fulton, 2012).

As pointed out by Bitner (1992) in a service based industry such as the rail industry, when the demand for rail service in the grain market is greater than the railway's capacity, the rail firm must turn customers away. This results in decreased service levels in the grain market, as customers that are turned away do not receive grain transportation services. As shown in figure 4.???, a consequence arising from excess demand, and the reduction in railway service it creates, is a loss of consumer surplus in the grain market.

Proposition 1 builds upon the work of Bitner (1992) by examining the issue of excess demand in the grain market resulting from the railway's profit maximizing allocation decisions and can be investigated through the examination of GHTS service levels. If it can be determined that GHTS service levels have declined since the implementation of the 1996 CTA regulatory framework, this would work towards validating the predictive capacity of the theoretical model developed in the previous chapter.

5.3.1 Service Issues – A Historical Perspective

Prior to the introduction of the 1996 CTA, the numbers of service level complaints in the GHTS were relatively few. Between 1988 and 1995, only seven agricultural related rail service complaints were brought forward to the Agency. Of these complaints, four were in regards to the failure of the railways to provide farmers with adequate access to producer cars; two were concerned with rate negotiations between grain companies and the railways and one was focused on the failure of CP to provide forward routing of a grain shipment over CN lines (CTA, 2011).

While the introduction of the 1996 CTA did not bring about a substantial increase in the number of service complaints *per se*, it does mark a period of change in the nature of service complaints made against the railways. Whereas complaints prior to the 1996 regulatory changes dealt with relatively minimal issues, such as rate negotiations and the occasional failure of the railways to spot producer cars, complaints initiated after 1996 highlight the increased inability of the railway's to meet the service needs of their customers, both big and small. These service issues become even more pronounced after the introduction of the revenue cap in 2000. In addition to continued complaints regarding inadequate car supply and missed delivery dates, new service issues related to unannounced changes in service dates and car allocation programs begin to emerge.

The following section presents a description of the railway level of service complaints brought before the Agency following the 1996 regulatory changes. This section begins with an overview of some of the major level of service complaints brought against the railways between 1996 and 2000 (i.e., after the introduction of the 1996 regulatory changes and before the introduction of the revenue cap) and is followed by an examination of the railway level of service complaints following the introduction of the revenue cap in 2000. The intent of this exercise is to show a marked escalation in the nature of the service issues experienced by rail shippers, as well to document the changes in the Agency's rationale as to the factors responsible for the escalation of service issues.

Next, this section documents the origins of the Federal Railway Level of Service Review (Review) and provides results from both the Federal and Saskatchewan rail shippers surveys that were conducted as part of the Review process show how producers perceive the levels of rail service they receive. This section then examines examples from the shippers submission collected during the Review process that indicate how shippers feel railway service level are impacting them. Finally, this section examines results from the QGI Analysis of Railway Fulfillment of Shipper Demand and Transit Times study.

5.3.1.1 Rail Service Issues (1996-2000)

5.3.1.1.1 Canadian Wheat Board vs. CN and CP

In April of 1997, the CWB filed a complaint with the Canadian Transportation Agency alleging that CN and CP failed to meet previously established levels for the unloading of wheat and barley at Vancouver and Prince Rupert, British Columbia, and at Thunder Bay, Ontario. The CWB also alleged that CN and CP failed to meet timely delivery commitments for wheat and barley to Eastern Canadian ports and

that the railway companies failed to meet commitments for rail car supply for the transportation of wheat and barley to the United States. The CWB submitted that as a result of these failures, CN and CP failed to meet their service obligations and that substantial damages and losses occurred to the CWB. The CWB requested that the Agency find that CN and CP had not fulfilled their service obligations from December, 1996 to the date of the complaint and also that the Agency order CN and CP to fulfill their service obligations as described in the complaint.

In April of 1998, during the course of proceedings, the CWB notified the CTA that a confidential commercial resolution of the matter between itself and CN had been achieved, and consequently, the CWB filed a Notice of Discontinuance against CN. As a result, the CWB complaint was continued against CP alone.

5.3.1.1.2 Naber Seeds vs. CN

In October of 1998, the Naber Seed & Grain Company Limited (NSG) filed a complaint with the Agency over car supply problems that NSG experienced with CN. In their complaint, NSG alleged that CN's failure to provide sufficient rolling stock during the periods of Grain Week 9 through 13 of the 1998-99 crop year forced it to shut down its processing plant operations, resulting in significant financial losses.

In total, NSG requested that 132 hopper cars be spotted at its Melfort and Star City facilities during Grain Weeks 9, 12 and 13. Of this total, the evidence showed that NSG received 35 hopper cars, or only 27 percent of its requirement, considerably below NSG's needs. The Agency found that in spotting only 35 cars at NSG's facilities during those weeks, CN failed to supply NSG with a reasonable number of cars. This failure, the Agency determined, resulted in significant disruption of NSG's operations, not the least of which was an elevator that was forced to close for a period. The Agency also found that CN's actions represented a pattern of

inconsistent and unreasonable treatment to NSG. This was found to be especially important given that CN was the only practical transportation option available to NSG in delivering its product to port.

In its recognition that shippers require regular, reliable train service for the conduct of their business, the Agency also acknowledged the fact that the grain supply chain is comprised of multiple players, each with its own rules, requirements and conditions. As such, the Agency reasoned that service issues might result due to circumstances beyond the control of either the carrier or the shipper. For example, weather problems and the fact that ocean vessels do not always meet their estimated times of arrival can also affect the rate of unloads at ports, which in turn may affect the rate at which empty hopper cars are returned to the grain transportation system.

5.3.1.2 Rail Service Issues (Post -2000)

5.3.1.2.1 Naber Seeds vs. CN

On November 22, 2000, NSG filed a second complaint with the Agency, pursuant to section 116 of the *Canada Transportation Act*, which alleged that CN had failed to provide adequate and suitable accommodation for the carriage of bulk products from its facilities at Melfort and Star City, Saskatchewan, and Kathryn, Alberta, to the Port of Vancouver by refusing to deliver the car allocation required by NSG for Grain Shipping Weeks 6 to 17 of the 2000-2001 crop year.

As part of *Decision No. 282-R-2001* dated May 29, 2001, the Agency determined that the lack of predictability and reliability in the car allocation at its three processing plants had severe repercussions on NSG's operations. Moreover, the facilities operated by NSG suffered from more severe car rationing over an extensive period of time than comparable shippers in the non-administered grain market. Consequently, the Agency concluded that CN had not provided NSG with a reasonable level of service and had not fulfilled its common carrier obligations

under the CTA. The Agency also determined that NSG had “no practical transportation alternative and is captive to rail service provided by CN” at its three processing plants.

In October 2001, NSG again filed a complaint with the Agency, in which NSG raised similar concerns. The complaint relates to the car allocation provided to NSG by CN for Grain Shipping Weeks 18 to 38 of the 2000-01 crop year. The Agency determined that CN failed to provide adequate and suitable service by rationing hopper cars for Naber's facilities at Melfort and Star City, Saskatchewan, and Kathryn, Alberta.¹¹

One of the critical issues raised in these complaints was the right of CN to ration hopper cars and in particular, whether CN failed to meet its common carrier obligations by rationing the delivery of hopper cars to NSG. CN contended that in the grain transportation and handling system, there are occasions where the demand may exceed the available supply of assets and resources to accommodate that demand; it is then necessary for CN to ration cars among shippers' grain car order requests because the available supply of empty equipment is insufficient to meet the excess demand for hopper cars. On the other hand, NSG's position in respect of CN's practice of car rationing was concerned principally with the degree of car rationing exercised by CN and in particular, whether the rationing of the car allocation was legitimate in the circumstances of the complaint period.

It has been established in a number of decisions of the Agency outlining the nature of a railway company's common carrier obligations that the statutory service obligations of a rail carrier are not absolute but are in fact tempered by the test of

¹¹ The Act contains no provision conferring on the Canadian Transportation Agency the power, duty or function of administering the whole Act and that the Agency is mandated specifically to administer only parts of the statute. In instances where the Act imposes an obligation or prohibition without naming the Agency as a body to which complaint can be made in the event of breach, the decision means that the Agency has no jurisdiction to deal with the matter and that complainants would presumably have to seek a remedy in the court system (Canada Transportation Act Review, 2001). Such was the case in the instance of Naber Seeds. As such, the Agency did not have the ability to order CN to reimburse Naber's for the losses incurred due to poor service.

reasonableness in all circumstances. The Agency was of the view that rationing the cars cannot constitute *per se* a failure on the part of CN to meet its common carrier obligations. Rather, the Agency expressed that it is the careful examination of the circumstances surrounding the practice of rationing, in particular, whether there are legitimate reasons for this practice, that would determine whether rationing of cars in a specific case can constitute a breach of the common carrier obligations.

In general terms, the Agency determined that car rationing is a practice that can only be considered appropriate where there are exceptional circumstances, such as extreme peak demand periods, by which the available supply of equipment is insufficient to meet the excess demand. In the grain transportation and handling system, traditionally, the peak grain-shipping season extends from September to December. However, the evidence from this proceeding and the previous complaint filed by NSG confirmed that CN had been rationing hopper cars from the month of September to April inclusively. While the practice of car rationing should be considered as a short-term measure to manage excess demand in extraordinary circumstances, the Agency noted that CN practiced car rationing over a period of eight months during the 2000-2001 crop year and that this practice has become part of CN's regular operations for a substantial part of the crop year.

5.2.1.3 Great Northern Grain vs. CN

A good example of a railway attempt to introduce a significant degree of price discrimination into the grain market can be found in the case of Great Northern Grain Terminals (GNG). During the 2006-07 crop year, changes made by CN to its car allocation programs sparked several grain shippers into filing a level of service complaint with the Agency. Much of the controversy centered on the elimination of a popular car allocation program known as the GT Secure Export, which allowed grain companies to order cars in 50 car blocks. At the beginning of the 2006-07 crop year, the GT Secure program was replaced with a program known as the GX 100,

which offered only 100-car units that had to be booked for 42 consecutive weeks to secure supply.

The first of these complaints was filed in March 2007 by Great Northern Grain Terminals Ltd. (GNG). GNG alleged that CN's changes to its car allocation programs discriminated against it and other small shippers, putting them at a competitive disadvantage vis-à-vis facilities capable of loading large unit trains (CTA *Decision No. 344-R-2007*, 2007). For instance, CN's GT Pro Export program, which was the only program that was open to GNG, "applies to cars allocated in 50-car blocks for shipments to the Vancouver and Prince Rupert corridors. Prior notice is given by CN that 50-car blocks are available for one contracted allocation week. Shippers must then bid to pay a premium above the posted tariff rates on the available cars, which are subsequently allocated to the highest bidder. Loading is from one origin for shipment to one destination on one corridor" (CTA *Decision No. 344-R-2007*, 2007).

GNG also argued that the changes made to CN's car allocation program led to an inadequate supply of rail cars for general distribution, which resulted in restricted access to rail cars, raised operational costs and limited grain marketing opportunities.

In July 2007, the Agency determined that CN's changes to its car allocation programs were responsible for a significant deterioration in the service levels received by GNG. In its ruling, the CTA noted that GNG "... must bid against other shippers for cars. GNG emphasizes that car supply under this program is limited, not only because there is no certainty that GNG's bid will win the car supply, but because during certain periods of the grain year, when demand is high for additional rail capacity, the program is very expensive, rendering GNG uncompetitive in the marketplace. GNG stresses that the practice of auctioning rail cars to the highest bidder impacts negatively on service and has resulted in GT Pro Export cars being priced between \$250 and \$829 per car over tariff" (CTA *Decision No. 344-R-2007*, 2007).

Furthermore, the Agency concluded that under normal competitive circumstances, a business experiencing such deterioration in service levels would be able to seek alternative service providers. However, given that GNG was a captive rail shipper, it had no viable competitive alternative for its transportation requirements and was forced to accept the service decisions implemented by CN for grain movements from its Nampa facility.

Further to the determination as to the cause of service issues experienced by GNG, the Agency also concluded that CN's actions had negatively impacted GNG's business operations and caused them substantial commercial harm by breaching its statutory obligation to provide all grain shippers, whatever their size, with adequate and suitable accommodation for the movement of their products. In determining an appropriate solution to the grievances presented by GNG, the Agency directed CN to allocate rail cars to GNG under the terms and conditions of its previous GT Secure Export program.

Following the level of service complaint, CN made several adjustments to its car allocation programs. The railway suspended its contentious GX 100 program and re-introduced its GT Secure Export program. CN also permitted shippers to trade rail cars obtained through its advance products and general allocation programs, and implemented a modified rationing process to ensure all shippers who submitted offers for a product receive a minimum level of advance car supply (*CTA Decision No. 20-R-2008, 2008*).

In September 2007, the CWB and North East Terminals Ltd. (NET) filed a complaint with the Agency similar to the one filed by GNG. In the complaint, the CWB and NET alleged that an inadequate supply of rail cars for general distribution and CN's increased emphasis on its GX 100 advanced car program had caused them substantial commercial harm during the 2006-07 crop year. Both the CWB and NET argued that the move towards the GX 100 program put shippers unable to assemble large multi-car blocks at competitive disadvantage, since they were forced to pay a premium above tariff rates to secure car supply.

In addition to the allegation surrounding substantial commercial harm, the CWB also indicated that these programs frequently led to the movement of the wrong classes and grades of grain in relation to market demand. As well, the CWB and NET claimed that the adjustments made by CN to its 2007-2008 car allocation programs did not address the service issues found by the Agency in the GNG case and that service shortfalls continued prior to the traditional harvest peak. Two days later, Parrish & Heimbecker Ltd. (P&H), Paterson Grain, Providence Grain Group Inc. and North West Terminal Ltd. (NWT) filed similar complaints.

In an interim ruling released in January 2008, the Agency decided in favour of the CWB and the grain companies, finding that CN was in breach of its level of service obligations and that the changes made to its car allocation program had caused the shippers substantial commercial harm during the 2006-07 crop year. However, limited data on the service levels following car allocation changes prevented the Agency from finding a breach of CN's common carrier obligations for crop year 2007-2008. As a result, a final decision on the level of service complaint was deferred until all of the necessary data could be assembled and analyzed.

On 25 September 2008, the CTA released its final decision, deciding in favour of four of the six companies that filed complaints. The Agency judged that CN's failure to provide shippers with an adequate, timely and predictable number of rail cars had hindered NET's, NWT's, P&H's and Paterson Grain's ability to plan and execute their grain transportation and marketing strategies. As a remedy, the Agency ordered CN to provide these companies with a minimum of 80% of their requested rail cars. Additionally, 90% of these cars were to be delivered either on time or in the subsequent two weeks. Finally, CN was to meet these performance standards on a 12-week rolling average throughout each crop year (*CTA Decision No. 488-R-2008, 2008*).

In the midst of these level of service complaints, the federal government introduced Bill C-8, which proposed a variety of changes to the shipper protection provisions contained within the *Canada Transportation Act*. Suggested amendments included

changes that allowed groups of shippers to ask for final offer arbitration on disputes over rates or service, the removal of the clause that entitled only shippers who suffer substantial commercial harm to relief under the Canada transportation Act and changes in railway notice times for rate increases and site de-listings.

During the negotiations with shipper groups on proposed amendments contained within Bill C-8, federal Transport Minister Laurence Cannon committed to initiating a review of rail service levels within 30 days after the passage of the Bill. With the passing of Bill C-8 in February of 2008, the federal government publicized the start of the rail freight Level of Service Review (Review) in April 2008.

5.3.2 Federal Railway Level of Service Review

In September 2009, the federal government announced the appointment of a panel to conduct the Review. The panel examined the current state of Canada's rail-based logistics system (including shippers, terminal operators, ports and vessels) and made several recommendations aimed at improving the overall efficiency, effectiveness and reliability of service within the system. As well, the recommendations worked towards facilitating economic growth and trade expansion and improving accountability among stakeholders. The recommendations included both commercial and regulatory solutions. The panel submitted its final report in mid-2010 (Transport Canada, 2010).

Next, this section documents the origins of the Federal Railway Level of Service Review (Review) and provides results from both the Federal and Saskatchewan rail shippers surveys that were conducted as part of the Review process to show how producers perceive the levels of rail service they receive. This section then examines examples from the shippers submission collected during the Review process that indicate how shippers feel railway service level are impacting them.

Finally, this section examines results from the QGI Analysis of Railway Fulfillment of Shipper Demand and Transit Times study.

5.3.3 Federal Shipper Survey

To illustrate the levels of service within the GHTS, this thesis considers survey data and shipper submissions collected during the Federal Railway Level of Service Review (Review). The Review was conducted by the Government of Canada in response to concerns from shippers and other stakeholders about railway service over the last few years. The Review examined the service performance of the rail-based logistics system including the railways, shippers, terminal operators, and ports, with the intent of improving the efficiency, effectiveness and reliability of the overall system (Quorum, 2009).

The shipper surveys sought the views of rail shippers on problems with system performance, best practices as well as possible solutions to address the problems. In addition, shippers were asked to evaluate their own performance as well as the performance of the other four groups within the system (railways, terminal operators, ocean shipping companies and ports).

The research methodology selected for the Federal Survey of Shippers study was a quantitative survey approach. In the terms of reference, Transport Canada expressed the desire that the data collected be statistically representative of the Canadian shipper population at large. To confirm that the sample collected closely resemble the actual characteristics of the Canadian shipper population (i.e, in regards to shipper size, type of business, level of shipping captivity) partial survey results captured during the data collection phase were cross-referenced against the actual established shipper population characteristics as developed for Transport Canada.

A total of 262 shippers participated in the study. A sample of this size out of the broader shipper population in Canada provided results which, in theory, are statistically reliable plus/minus 6 percent, 19 times out of 20 (Quorum, 2010). The sample size of this study was considered sufficiently large enough to provide a reliable assessment of shipper opinions on the questions asked. The survey results do indicate, however, that the margin of error does increase somewhat when examining subsets of the main survey population.

A key component of the survey process involved asking the survey respondents to provide, in their own words, the factors or actions that were most important for ensuring that their rail service needs were met. Table 5.2 identifies 16 specific rail service factors that were identified by at least two or more respondents as being important. Of the factors identified, on time delivery of cars at origin ranked the highest, with 58 per cent of respondents identifying this as a key component in ensuring their rail service needs were met.

Survey respondents were then asked to provide a rating, using a numeric scale of 'one' to 'seven', of their level of satisfaction with the railways in providing their service needs. These results were then categorized using a Top Box and Low Box methodology. Based upon the seven-point scale used in the survey, ratings of 'six' or 'seven' were combined into the Top Box stratum to denote a 'very satisfied' response. Conversely, the Low Box comprised a grouping of 'one' and 'two' rating responses, which denoted a 'very dissatisfied' response.

| Attribute | Total Sample % (n=262) |
|---|-----------------------------------|
| 1. On Time Delivery of Cars at Origin | 58 % |
| 2. On Time Delivery of Cars at Destination | 49 % |
| 3. Price | 48 % |
| 4. Reliability of Car Supply | 46 % |
| 5. Consistent Transit Times | 35 % |
| 6. Responsiveness of Railways when Problems Arise | 26 % |
| 7. Frequency of Service | 19 % |
| 8. Demurrage | 18 % |
| 9. The Right Number of Cars at Origin | 8 % |
| 10. Accurate Billing | 8 % |
| 11. Equipment Condition | 7 % |
| 12. Suitability of Equipment | 6 % |
| 13. Safety Record | 4 % |
| 14. Tracking Shipment | 3 % |
| 15. Car Cycle Times | 3 % |
| 16. The Right Type of Cars at Origin | 2 % |
| 17. Other | 11 % |

Source – Transport Canada Federal Survey of Shippers, 2010

Table 5.3 outlines the overall satisfaction levels of several types of shippers. Overall, shipper satisfaction levels with primary rail freight providers were not very high, with less than 20 per cent of shippers expressing a ‘very satisfied’ rating.¹² Sixteen per cent of shippers rated their satisfaction a ‘one’ or ‘two’ out of ‘seven’. When the rating of ‘three’ was included in the Low Box total, which is often done as an indication of a ‘somewhat dissatisfied’ rating, the total climbs to 35 per cent. These results suggest that there is a significant portion of Canadian shippers that are dissatisfied with the levels of rail service that are provided to them.

¹² Typically, customer satisfaction results in other service industries tend to be much higher – usually in the 50 to 70 per cent range. Low Box percentages are usually very small, often less than 10 per cent. In addition, the fact that Low Box ratings (1 or 2 out 7) are almost equal to the Top Box ratings is somewhat unusual (Quorum, 2010).

| Shipper Size (determined by number of cars shipped per year) | Low Box (1 - 2) | Mid Box (3 - 5) | High Box (6 - 7) |
|--|-----------------|-----------------|------------------|
| Large Shippers (< 5000) | 13 % | 65 % | 21 % |
| Medium Shippers (1001 - 5000) | 7 % | 71 % | 22 % |
| Small Shippers (301 - 1000) | 24 % | 66 % | 10% |
| Very Small Shippers (1 - 300) | 19 % | 64 % | 17 % |
| Total Sample | 16 % | 68 % | 17 % |

Source – Transport Canada Federal Survey of Shippers, 2010

As well, satisfaction levels significantly decline as the size of the shipper declines, particularly for small volume shipper. While over 20 per cent of large to medium sized shippers indicated that they were ‘very satisfied’ with their overall freight service from Canada’s Class 1 rail providers, only 10 per cent of small shippers provided a ‘very satisfied’ rating of their overall service. Of these small shippers, 24 per cent indicated that they were ‘very dissatisfied’ with the overall level of rail service they received. Of the very small shippers surveyed, 17 per cent provided a ‘very satisfied’ rating, while 19 per cent indicated that they were ‘very dissatisfied’.

Shippers were also surveyed on whether having access to alternative shipping options has a bearing on their level of satisfaction with railway service. Of the survey population, 43 per cent indicated they have access to both of Canada’s Class 1 railways along with other viable shipping options when it came to the movement of their primary commodity, while 29 per cent of respondents indicate that they have access to only one railway, but do have other viable shipping alternatives. The remainder of shippers interviewed (28 per cent) had access to one rail line and indicated having either limited or no shipping alternatives. These shippers perceive themselves to be ‘captive’ shippers.

The survey found that shippers served by multiple railways have a higher level of satisfaction with the rail service provided to them compared to those shippers that identified as captive shippers (Table 5.4). Of the shippers with multiple rail options, 23 per cent were ‘very satisfied’ with their freight service compared to 14 per cent of shippers with access to only one rail line. Satisfaction levels decline further when

looking at the population of shippers who had access to only one rail line and limited or no shipping options (i.e., captive shippers). Of these, only 11 per cent indicated that they were ‘very satisfied’ with the level of rail service they received.

| Shipper Captivity Level | Low Box (1 - 2) | Mid Box (3 - 5) | High Box (6 - 7) |
|--|--------------------|--------------------|---------------------|
| Multiple Railways and Other Options | 10% | 66 % | 23 % |
| One Railways and Other Options | 15 % | 70 % | 14 % |
| One Railways and Limited or No Options | 25 % | 65 % | 11% |
| Total Sample | 16 % | 68 % | 17 % |

Source – Transport Canada Federal Survey of Shippers, 2010

Although the survey results indicate that 28 per cent of the survey population are captive to one railways, the issue of shipper captivity becomes more pronounced when looked at exclusively in the context of the GHTS. Of the total 323 grain elevators situated in the GHTS, only three per cent are served by more than one railway, while 17 per cent have access to both railways through proximity to an interchange point (CGC, 2010). The remaining 80 per cent are considered captive. Given the survey results suggest that shipper dissatisfaction is more prevalent among captive shippers, it is reasonable to conclude that the grain handling industry experiences substantially higher levels of dissatisfaction than other industries.

5.3.4 Saskatchewan Shipper Survey

In the summer of 2009, the Province of Saskatchewan’s Ministry of Agriculture and Ministry of Highways & Infrastructure (Ministries) commissioned Metropolitan Knowledge International to conduct a Saskatchewan rail shippers’ survey. The overall goal of the survey was to determine the satisfaction or dissatisfaction that Saskatchewan-based rail shippers had regarding levels of rail service and to identify any potential implications that rail service issues may have had with respect to the competitiveness of the provincial and national economies as a whole. The results of

the survey were used in Saskatchewan's submission to the Federal Level of Service Review Panel.

Overall the findings of the Saskatchewan survey were consistent with the findings of the survey conducted for the federal government by NRG Research Group as part of the Federal Level of Service Review process (Table 5.5). Small and large shippers expressed relatively high levels of dissatisfaction with railway service, both with the supply of equipment and the movement of railway traffic. The survey also indicated higher levels of dissatisfaction amongst smaller shippers, many of whom believed that the smaller size of their railcar orders was linked to consistently untimely or delayed delivery and spotting of railcars.

Most comments from the respondents were related to the supply of equipment, including the ordering process and the actual provision of equipment at the shippers' sites. There were fewer comments related to the movement of traffic, partly because there seemed to be a somewhat higher level of satisfaction with this aspect of rail service, and partly because some interviewees were not responsible for the product after it was loaded at their origin.

A clear theme of shippers' dissatisfaction that emerged from the survey regarded the lack of communications, together with poor or confusing communication, received from railways. Communication issues most especially involve ignorance of when railway cars would be spotted and changing plans by the railways regarding when cars would be spotted. Lack of communication regarding the movement and disposition of loaded shipments was also cited, although less frequently.

As well, the survey identified a gap between small and large shippers' levels of familiarity with both the Shipper Protection Provisions under the CTA as well as the mediation processes available to resolve disputes with the railways. However, it was generally viewed that the existing dispute resolution mechanisms available to shippers are long, complex, expensive and unlikely to provide results that address

the problem. As a result, these dispute resolution mechanisms were not viewed as viable options for settling disputes.

Table 5.5 Saskatchewan Shipper Satisfaction Levels

| | Movement of Railway Traffic | | | |
|--|-----------------------------|----------|-------------------|------|
| | Poor or Very Poor | Adequate | Good or Very Good | NA |
| Movement of Empty Car to Origin | 60 % | 29 % | 7 % | 4 % |
| Car Spotting at Origin | 54 % | 36 % | 7 % | 4 % |
| Movement to Destination | 61 % | 18 % | 14 % | 7 % |
| Car Spotting at Destination | 25 % | 36 % | 11 % | 29 % |
| Movement of Multiple Cars | 37 % | 30 % | 11 % | 22 % |
| Communication During Normal Circumstances | 25 % | 39 % | 32 % | 4 % |
| Communication During Exceptional Circumstances | 54 % | 25 % | 18 % | 4 % |
| Overall Movement of Railway Traffic | 57 % | 25 % | 14 % | 4 % |

Source – Saskatchewan Government Submission to the Federal Level of Service Review Panel, 2010

Many shippers also noted service improvements during the six to twelve months leading up to the Review compared to several years earlier. Shippers surveyed attributed this to the economic slowdown in other sectors of the economy, and the railways' resulting devotion of more assets and attention to the agricultural sector. Many shippers were concerned with the prospect that, as other economic sectors improve, the rail transportation improvements seen in the agricultural sector could disappear as the railways shift resources from agricultural service to other sectors.

According to the shippers surveyed, the lack of railway service predictability is associated with the timely arrival and spotting of railcars ordered, the number of railcars that could be expected (different from the number ordered), transit times to destination (often to the point of loading of a vessel at port) and to a lesser extent,

the shortfall in container availability and the quality of railcars. The survey results indicate that this lack of predictability resulted in:

- Lost sales opportunities (i.e., from the loss of purchase orders and/or sales contracts);
- An inability to plan for adequate staffing, scheduling, & processing programs for different commodities; inadequate storage capacity as commodities pile up waiting for cars to be delivered; and
- An overall inability to achieve potential levels of business activity (e.g., missing an optimal time-bound market opportunity to maximize profit margins when prices peak because of the risk of cars not being supplied on time).

In addition, delays in railcar movement and spotting were mentioned by many shippers as having pushed them outside the delivery terms of their contracts with customers, resulting in financial penalties and serious damage to reputation. Shippers also cited instances where they were faced with a shortage of cars delivered and then a sudden surge in deliveries. These shippers identified a variety of financial impacts resulting from these actions, including: paying demurrage on some of the cars (as they could not load all of the cars delivered fast enough to avoid demurrage); releasing some empty cars to avoid demurrage (thereby not capitalizing on sales opportunities); and being forced to pay farmers to delay their deliveries in instances where the shipper lacked adequate storage space while awaiting the delivery of cars.¹³

5.3.5 Railway Fulfillment of Shipper Demand

5.3.5.1 Car Supply

On an aggregate level, the performance of both Class 1 railways in fulfilling shipper demand for empty grain cars is almost identical. Between the two-year period of

¹³ As previously mentioned, as a quasi-judicial administrative body, the Agency has a very limited ability to impose obligations or prohibitions in instances where a breach of obligation has been determined. As such, the Agency does not have the ability to order a railway company to compensate shippers for financial damages incurred as a result of poor railway service.

October 1, 2006 through September 30, 2008, CN and CP fulfilled 98 per cent and 97 per cent of their total order, respectively. However, examining railway performance on a week-to-week basis shows significant variability, with each railway able to provide shippers with at least 90 per cent of the empty cars they requested at a specific location only half of the time (Quorum, 2010).

When viewed on a daily basis, the railways fulfillment of shipper demand for empty grain cars is even worse. As part of the railways planning process, CN and CP review orders submitted by shippers, provide shippers with a confirmation that their orders have been accepted and develop operating plans to deliver the rail cars during a specified grain service week. Once these plans are established, the railways then communicate their service plans to shippers, identifying the specific days that they are planning to deliver rail cars to each shipper’s facility.

As shown in Table 5.6, while both CN and CP fulfilled more than 90 per cent of their planned empty car supply during the study period, the performance of both railways decreases significantly when performance is measured on a daily basis. The four shippers included in the analysis received 90 per cent of planned car supplies on the day they were planned only 12 to 28 per cent of the time. These results seem to validate shippers’ perception from the shipper’s survey regarding the poor quality of service provided by the railways.

| Table 5.6 - Daily Grain Car Plan Fulfillment Performance | | | | |
|---|------------------|------------------|------------------|------------------|
| | CN | | CP | |
| | Shipper 1 | Shipper 2 | Shipper 1 | Shipper 2 |
| Plan Fulfillment (Service Review Period) | | | | |
| # of cars planned | 6,730 | 4,271 | 7,095 | 5,112 |
| # of planned cars supplied | 6,423 | 3,896 | 7,095 | 5,109 |
| % of total planned cars supplied | 95 % | 91 % | 100 % | 99 % |
| | | | | |
| % planned cars supplied on planned service day | 32 % | 14 % | 19 % | 22 % |
| % planned cars available by planned day | 49% | 37 % | 87 % | 79 % |
| | | | | |
| Daily Plan Fulfillment | | | | |
| 100% Performance standard Daily Plan Fulfillment | 21 % | 12 % | 18 % | 17 % |
| 90% Performance standard Daily Plan Fulfillment | 28 % | 12 % | 18 % | 19 % |
| 75% Performance standard Daily Plan Fulfillment | 31 % | 12 % | 18 % | 19 % |

Source – Quorum Analysis of Railway Fulfillment of Shipper Demand and Transit Times, 2010

5.4 Proposition 2

The benefits associated with railway efficiency gains that result in a reduction in railway marginal cost can be considered the strict property of the railways and are not shared with consumers of transportation services in both the grain and non-grain markets.

Proposition 2 examines whether efficiency gains that lower the railways marginal cost are shared with farmers or if they can be considered the strict property of the railways. If it is shown that the railways have made efficiency gain that reduce marginal cost and that they are the sole beneficiaries of these gains, this would further validate the predictive capacity of the model outlined in Chapter 4.

Additionally, this would suggest that the railways have had some degree of power in influencing the regulatory framework for their benefit and would point towards the possibility of political rent-seeking behavior and regulatory capture within the GHTS.

This section takes a two-step approach to assess whether the railways have made cost reducing efficiency gains and to determine if any of these gains have been passed on to farmers. The first step involves an examination of railway efficiency over the last 15 years. This section begins by looking at a recent study on railway efficiency conducted by the Conference Board of Canada. This section then examines several examples of cost saving efficiency improvements made by the railways over the last 15 years.

The second step involves an examination of the average rail freight cost that farmers are required to pay in order to ship one tonne of grain to export position. If the railways are passing on to farmers any of the benefits from efficiency gain, it is expected that they would do so either in terms of better service or reduced price. Since the previous section has provided strong evidence to suggest that rail service

levels have declined over the past 15 years, it is reasonable to presume that any efficiency gains passed on to farmers would be done so by a reduction in freight costs. If it is shown that the average freight cost of farmers have not declined, this would indicate that the railways have not passed on their efficiency gains and are the sole beneficiaries of these gains.

5.4.1 Railway Productivity Gains

In June, 2009, the Conference board of Canada released a study on the productivity performance of the different transportation modes within Canada (Figure 5.1). Results from the study indicate that between 1981 and 2006, the total factor productivity (TFP) of Canada's railways more than doubled – with the majority of these gains occurring since 1995 (Conference Board of Canada, 2009).

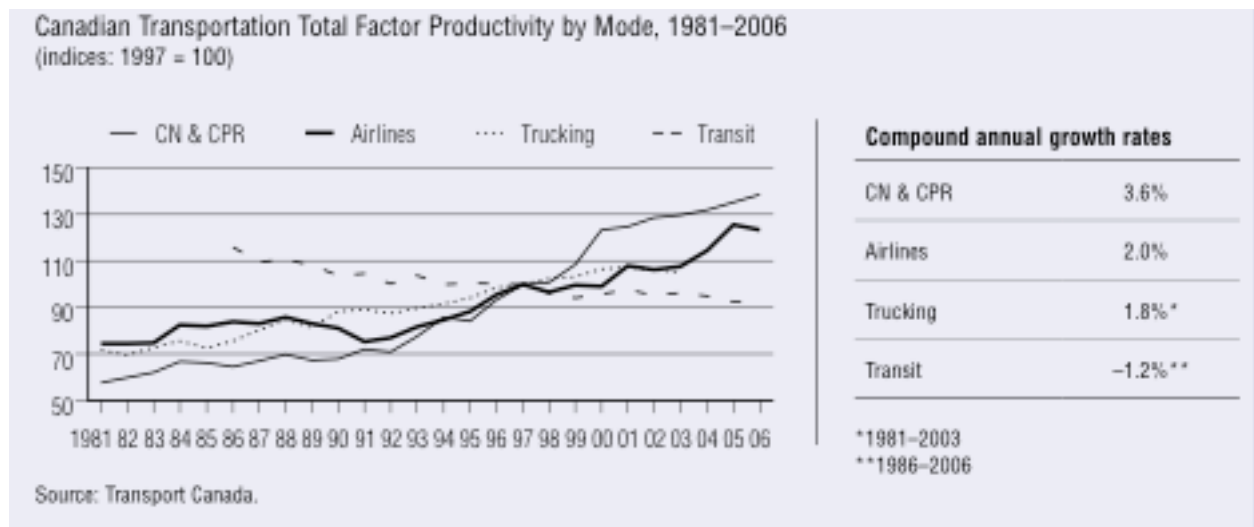


Figure 5.1 – Canadian Transportation Total Factor Productivity by Mode (1981-2006)
Source – Transport Canada

While the study determines that a continued focus on asset utilization (i.e., multiple car blocks and longer trains) has been the driving force behind the increase in railway efficiency, it also indicates that railways have made significant moves to reduce costs through the removal of cabooses; investment in safety technology such

as hotbox detectors and other in-track sensor devices; and a focus on fuel-saving technologies. These advancements have allowed the railways to drastically reduce their fuel and labour costs while simultaneously allowing them to move heavier loads (Besso, 2008). The following section outlines several examples of cost saving efficiency improvements made by the railways over the last 15 years.

5.4.1.1 High Horsepower and Fuel-Efficient Locomotives

The large majority of trains used in-line haul operations are diesel-powered locomotives with a horsepower range of 4,000 to 4,400 per unit. These high horsepower units have replaced the 1970s vintage 3000 HP and are considered to be approximately 20 per cent more fuel-efficient (Blevins, 2009). As of 2008, 1,110 of the 2,193 (46.4 per cent) line-haul locomotives in Canada met the stringent U.S. Environmental Protection Agency Tier 0, Tier 1 and Tier 2 emissions standards (RAC, *Locomotive Emissions Monitoring Program*, 2008).

5.4.1.2 Wheel Flange Lubrication Systems

For many years, North American railroads have applied lubrication to the wheel/rail interface to control wheel and rail wear, which reduces lateral forces in curves and produce substantial savings in train energy (fuel) consumption. Traditionally, wheel flange lubricant was applied to rail tracks through wayside lubricators. However, recent improvements in wheel flange lubrication technology – such as solid stick flange lubricant – has improved equipment reliability, reduced maintenance requirements, and minimized lubricant waste (Sroba, 2001). Wheel flange lubrication systems have the potential to provide substantial savings to railroads through reduced wheel and rail wear, minimized track deterioration and reduced fuel consumption.

5.4.1.3 Auto Engine Stop-Start

Over the last decade, railways have increased installations of auto engine stop-start devices on locomotives for both line-haul and yard switching services. These devices automatically shut down and restart the diesel engine when the locomotive is stationary. The device is regulated by several locomotive system parameters such as water temperature, oil temperature and battery condition. It will restart the engine to idle for a time to prevent freezing and to charge the batteries. Monitoring of line-haul locomotives equipped with a properly operating automatic stop-start system has shown average annual fuel savings of 30,000 litres per locomotive (Gaines, 2003).

5.4.1.4 Locatrol Distributive Power Technology

Locatrol distributed power is a rail transport term describing the physical distribution of separate, remotely controlled locomotive power units throughout the length of a train. A key benefit of locatrol distributed power technology is the reduction in drawbar pull on the front cars of a train versus what would be required if all the power exerted were at the front end. The reduction in drawbar pull reduces the lateral force between the wheels and rail on curves, which minimizes wear on both of these components. The reduction in friction can result in fuel savings and/or the capability of running heavier trains.

5.4.2 GDP Deflated Average Rail Freight Costs

The examination on railway efficiency indicates that the railways have made several strides to increase their productivity over the past 15 years. However, it is unclear as to whether these gains have been passed on to farmers. As discussed at the beginning of this section, if the railways are passing on efficiency gains to farmers, it

is expected that they would do so either in terms of better service or reduced price. Given the evidence presented in the previous sections regarding the decline in rail service levels, providing farmers with a lower price remains as the sole method in which the railways may pass any efficiency gains back to farmers.

To determine if railway efficiency gains that result in lower railway marginal cost are being returned to farmers, this section examines the average rail freight cost that farmers are required to pay in order to ship one tonne of grain to export position. Railway freight cost data, collected by Quorum through the GMP over a 10-year period (1999-2009), is analyzed to determine if farmers have seen a decline in their average rail shipping costs. To ensure a fair comparison of year over year freight costs, the freight cost data has been converted into 2009 dollars using a GDP currency deflator.

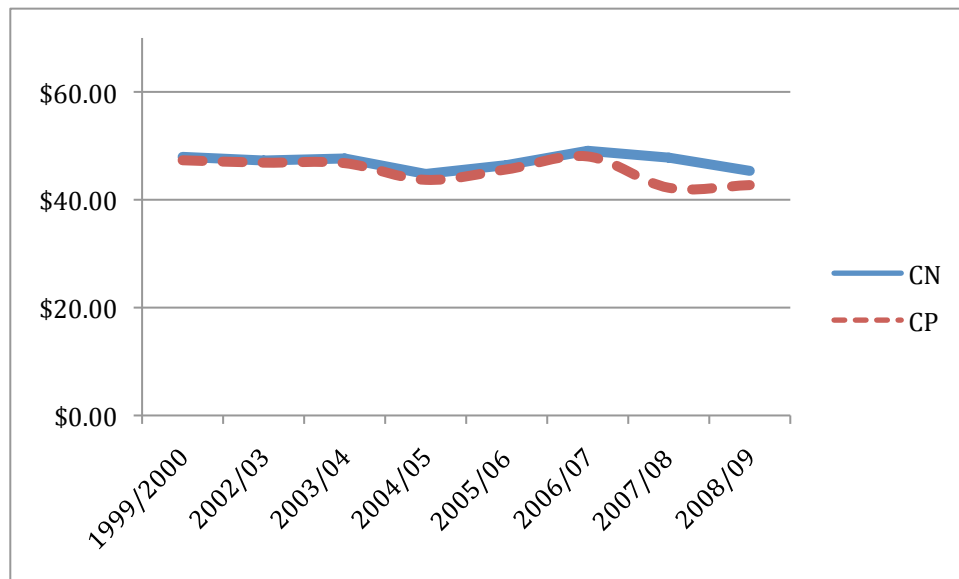


Figure 5.2 – GDP Deflated Rail Freight Costs (1999-2010)
 Source – 2009/10 Quorum Annual Report

As shown in Figure 5.2, the average per tonne freight rate costs charged by both CN and CP has remained relatively steady over the 10-year period. Between 1999 and 2009, average freight rates oscillated between \$42.22/tonne and \$48.03/tonne for CP and \$44.79/tonne and \$49.08/tonne for CN. Given these results, and taking into

account that railway productivity has consistently increased over the same time period, it appears that railway efficiency gains are not being returned to farmers.

| Year | Revenues | Expenses | Income |
|------|----------|----------|--------|
| 1991 | 6,577 | 6,101 | 475 |
| 1995 | 7,055 | 6,675 | 380 |
| 2000 | 8,031 | 6,455 | 1,576 |
| 2005 | 9,940 | 7,776 | 2,164 |
| 2010 | 10,768 | 9,172 | 1,596 |

Source - Railway Association of Canada

The finding on railway profits illustrated in Table 5.7 further validates the conclusion that railway efficiency gains are not being passed on to farmers. As shown in Figure 5.7, railway income (i.e., operating revenues minus operating costs) remained relatively low prior to 1995. Since 1995, right around the time when railway began to invest in efficiency improvements (Figure 5.1), railway profits have increased substantially. Given that freight costs have remained relatively constant between 1999 and 2009, these results strongly suggest that the railways are the main beneficiaries of efficiency gains.¹⁴

5.5 Proposition 3

As GDBLs are removed from the system, the externalities associated with grain transportation are increased.

The previous chapter developed a theoretical model that showed how negative externalities, such as road maintenance costs and greenhouse gas (GHG) emissions, increase as trucking distances increase due to the removal of GDBLs from the

¹⁴ Railway profits shown in Table 5.7 are a compendium of the different railway market segments and are not exclusive to the grain market.

system. Proposition 3 examines the average farm haul length to determine how the removal of GDBLs has impacted the distance that farmers are required to haul their grain. If it can be shown the average farm haul length has increased due to the removal of GDBLs, this would indicate that the level of negative externalities have also increased since the implementation of the 1996 CTA regulatory framework.

5.5.1 Average Farm Haul Length

The logistics of grain movements from the farm to the country elevator have changed. Over the past decade, transportation policy reform has led to a dramatic restructuring of rail and truck haul traffic in Western Canada. A reduction in rail branch lines, and a consolidation of grain elevators, caused 80% of the grain to shift from 645 delivery points to 178 between 1995 (the end of the Western Grain Transportation Act, WGTA) and 2005. As a result, the distance that producers transport grain from farm to delivery point has lengthened, with producers using much larger trucks that carry substantial grain haul weights (Quorum, 2010). The result has been a transformation in grain handling from a system formerly dependent on 'rail' to a system now dependent on 'road and rail'.

To determine the extent to which the average farm haul length has increased since the introduction of the 1996 CTA, this thesis estimates the change in distance from the farm to the closest elevator using data available through the Federal Grain Monitor Program (GMP) Producer Netback Calculator (PNC). The PNC is a web-based tool developed through the GMP and offered to producers for the calculation and recording of CWB grain delivery options from farm to elevator. It allows the producer to determine the most cost effective delivery option based on the GMPs export basis methodology.

In order for a producer to use the PNC they must provide an origin “home quarter” where the grain being delivered is to originate from. The analysis that was

undertaken references the PNC tables for all the origins of movements that have been used. Based on those origins, and the inventory of elevators that were in existence in 1999, calculations were made to determine what the distance to the nearest elevator was from each of the origins that were collected within the PNC database. The same calculations were made against the elevator network that exists in 2011. The comparison of these distances forms the basis of this analysis.

The GMP analysis provides an estimate of the average distance from the farm gate to the nearest elevator by province and the total for all of Western Canada. The results indicate that the average distance between the farm gate and the closest country elevator has increased from 22.5 miles to 29.5 miles between 1999 and 2011 – an increase of 31 per cent.

It is important to note that this analysis portrays the average distance to the nearest elevator rather than the average of the distance that grain is actually delivered. The producer decision on where to deliver grain is influenced by many different commercial factors, ranging from the blending and trucking premiums a particular elevator is offering, to the back haul opportunities that may be available. Many grain companies are now offering to arrange all aspects of the movement of grain from the farm gate, including the coordination, hiring and payment of commercial truckers. It is also important to note that other, socially related and preferences of a personal nature play into a producer choice of delivery location, such as the relationship they have built with the elevator's management or other personal or familial obligations that may coincide with a grain delivery to a specific area.

To substantiate the results obtained through the PNC, this thesis also examines the results of grain transportation studies conducted by the Government of Saskatchewan (GOS), the University of Manitoba Transport Institute (UMTI) and an alternative grain transportation study on commercial trucking rates conducted by the Quorum in 2003 (Heads, 2004; GOS, 1999; Quorum, 2003) . Both the GOS and the UMTI studies calculate the average farm haul length prior to the rationalization of the GHTS (1993-94) to be 14.9 miles. This distance is compared against the GMP

study conducted post-rationalization in 2002, which places the average length of farm haul at 39.1 miles.¹⁵ Using these results, the average distance between the farm gate and the closest country elevator increased 163 per cent between 1994 and 2002.

While these results clearly indicate that the average farm haul distance has increased since the introduction of the regulatory changes, they do not specify how much of the increase can be attributed to the abandonment of GDBLs throughout the system. For example, there is another factor (i.e., the consolidation of the grain elevator system) that has also contributed to the increase in the average farm haul distance. The issue then becomes finding a way to isolate the contribution that GDBL abandonment has had upon increasing the average farm haul length.

One method that can be used in concluding the impact of GDBL abandonment on average farm haul length is to determine the impact that elevator rationalization has on average farm haul length. Given that the increase in the average length of farm haul is largely dependent upon these two factors, determining how much one factor has contributed to the average farm haul increase should also provide the necessary information for determining the other.

Leading up to the 1996 regulatory changes there were approximately 1,000 grain delivery points on the Prairies (Quorum, 2003). By 2012, the number was reduced by a factor of four to 267, with approximately 25 per cent of the total number of grain delivery points remaining (CGC, 2012). The implications of reducing the total number of grain delivery points by 75 per cent are shown below. To ease in the exposition of this analysis without losing the critical features, suppose that dots inside the squares in Figure 5.3 represents the grain delivery points that existed prior to the rationalization of the system. Also suppose the distance between each

¹⁵ As part of the 2002 study conducted by GMP, Agricore agreed to review its computer records to aid the GMP in gauging the typical haulage distance for local grain deliveries. Agricore data indicated that an average movement involved a haul of 63 kilometres (39.1 miles), with a payload weight of 33 tonnes.

of the 16 locations is equal to (d) and that (d) is also the length of each of the small squares. Then, assuming the roads only run north and south (and thus the diagonals are not available), the average distance that grain has to travel is $(d)/2$.

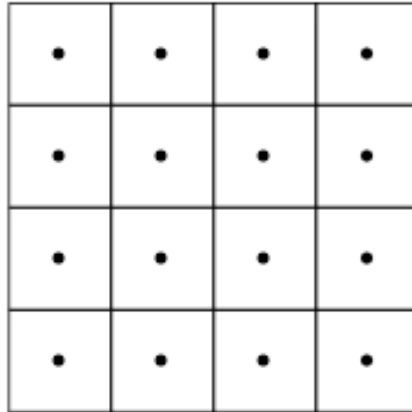


Figure 5.3- Hypothetical Grain Delivery Point Distribution Prior to Rationalization

Now consider that the 16 smaller grain delivery points are replaced with four larger ones, as shown in Figure 5.4. When this occurs the average distance travelled becomes (d) , while average the distance between the elevators becomes $2(d)$. Thus, reducing the number of grain delivery points by a factor of four increases the average distance by a factor of two – or more generally, reducing the number of grain delivery points by a factor of n increases the average distance by a factor of the \sqrt{n} .¹⁶

¹⁶ It is important to note that the illustration of grain delivery points after rationalization shown in Figure 5.4 represents a simplified hypothetical outcome. Locating grain delivery points at the centre of each square represents the most efficient outcome that can be achieved. In reality, the location of GHTS grain delivery points post rationalization was much less advantageous for all farmers, meaning that some farmers were more affected than other in terms of increased hauling distance and trucking costs.

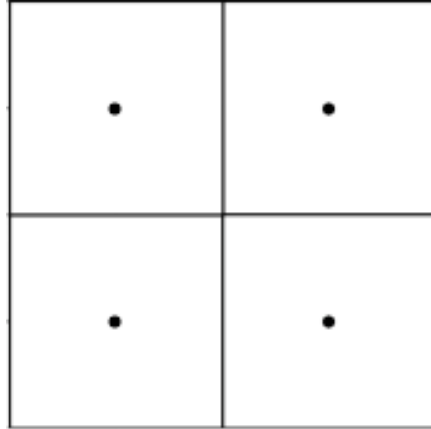


Figure 5.4- Hypothetical Grain Delivery Point Distribution After Rationalization

From the discussion above, it is known that the average farm haul distance prior to and after the regulatory changes was 15 miles and 39 miles, respectively. It is also known that a portion of this increase can be attributed to the rationalization of the grain handling industry, while the remainder is attributed to the removal of GDBLs from the system. Using the results above, if the rationalization of the grain handling is responsible for increasing the average pre-regulation farm haul distance (i.e., 14.9 miles) by a factor of two, then 29.8 miles of the 39 miles in the post-regulation average length of farm haul can be attributed to grain elevator consolidation, with the remaining 9.2 miles associated with the removal of GDBLs from the system.

5.6 Proposition 4

As GDBLs are removed from the system, the cost of transporting grain to market is shifted from the railways on to farmers located far from the main lines, who are required to haul grain further by truck in order to access delivery points.

The previous chapter developed a theoretical model that showed how a shifting of transportation costs from the railway to farmers effectively increases the producer surplus of the railways and reduces the consumer surplus of farmers. The model predicts that if the shifting of transportation cost is not performed on a 1:1 basis (i.e., a one dollar reduction in the railway's marginal cost equals more than an

additional dollar that producers will have to spend to transport their grain), any gain in producer surplus resulting from a reduction in railway marginal cost will be more than off-set by a loss in consumer surplus and will result in an overall reduction in GHTS total welfare.

Proposition 4 examines the issue of cost shifting from the railways to farmers and can be investigated through a comparison of the marginal tonne mile cost of moving grain by rail and by truck. If it is shown that the marginal tonne mile cost of moving grain is greater in the trucking industry than it is in the rail industry, this would indicate that the transfer of transportation costs associated with the removal of GDBLs is greater than 1:1 and that the models prediction regarding the decline of GHTS resulting from the removal of GDBLs is correct.

5.6.1 Marginal Per Tonne Mile Cost of Moving Grain via Truck and Rail

The previous section examined the issue of increased farm haul lengths resulting from the removal of GDBLs. As indicated, the removal of GDBLs was responsible for increasing the average length of farmer haul by 9.2 miles (or 39 per cent) between 1995 and 2002. As the average length of farmer haul increases due to the removal of GDBLs, the cost of transporting grain to market is shifted away from the railways – since they no longer have to maintain the high cost/low density GDBL – and on to farmers located far from the main lines who have to haul their grain further. What remains to be determined is if the railway/farmer cost transfer associated with removing GDBLs from the system are conducted on a 1:1 basis.

To determine if the transfer ratio is greater than 1:1, this thesis compares data from a 1994 ATKearney study on the railway's marginal costs of moving grain (per tonne mile) against the marginal cost of moving grain by truck (per tonne mile). To make this comparison, it is assumed that that the grain haul rates in the trucking industry,

assuming that it is a competitive industry, are set at marginal cost. As well, to ensure the fairness of the comparison, the rail per unit cost is adjusted into 2010 dollars using a GDP deflator and is compared against the 2010 cost of trucking grain over a similar distance. If it is shown that the marginal tonne mile cost of moving grain is greater in the trucking industry than it is in the rail industry, this would indicate that the transfer of transportation costs associated with the removal of GDBLs is greater than 1:1 and that the model's prediction regarding the decline of GHTS resulting from the removal of GDBLs is correct.

Because of the lower volume shipped, the marginal cost per tonne mile of rail transportation is generally considered to be higher on GDBLs than on mainlines (Baylis, 1998). A 1994 study conducted by ATKerney estimated branch-line hauling costs to be \$0.11 per tonne mile over a 47-mile length of haul. Adjusting this value upwards into 2010 dollars, the per tonne mile cost of moving grain via rail is calculated at \$.152. Over the same length of haul, trucking rates are \$12.97 per tonne, or \$.276 per tonne mile (WIT, 2010).¹⁷ As such, the cost of moving grain by truck is approximately 82 per cent greater than the cost of moving grain via GDBL.

5.7 Proposition 5

In instances where railway efficiency improvements increase total system capacity, it appears that railways, along with both grain and non-grain shippers see a distinct increase in surplus, with the majority of these gains captured by the railway.

In addition to productivity enhancements that reduce marginal cost, the railways have also initiated several efficiency improvements aimed at increasing their overall system capacity. The purpose of this section is to identify key efficiency improvements adopted by the railways that have allowed them to increase overall

¹⁷ The cost per tonne of moving of grain by truck is taken from the Weyburn Inland Terminal Dial-a-Truck rates. The per tonne mile cost is derived by using the cost of moving grain by truck over a distance of 46-50 miles(\$12.97) divided by 47 miles.

system capacity (i.e., increase total system tonne miles) over the last 15 years. Once identified, this section examines two railway efficiency metrics – car cycles and transit times – as a means of gauging the impact that these efficiency improvements have had on the railway’s ability to better utilize their infrastructure and increase system capacity.

Proposition 5 suggests that, while improvements in railway efficiency that allow the railways to increase overall system capacity are shared with farmers and non-grain shippers, it is the railways that are the largest beneficiary of these efficiency improvements. While a determination as to which groups benefit from an increase in railway capacity is conducted in Chapter 6, the intent of this section is to show that the railways have made efficiency improvements that have added to the overall system capacity, that these changes have had measurable consequences on the railways ability to move freight more efficiently on their track and that this efficiency has allowed the railways to increase the total tonne miles of freight moved along their network.

5.7.1 Railway Capacity Increasing Efficiency Improvements

Over the last 15 years, the railways have adopted two key efficiency measures that have allowed them to increase the total capacity (i.e., total tonne miles) in the system. The most beneficial initiative has likely been the move to heavier weights on rail, which allowed for the move to 263,000 lb loading (Quorum, 2010). Already underway in the early 1980s, this has since seen another increase to 286,000 lb loading. Effectively, this has moved the average carload from under 75 tonnes in the 1970s to in excess of 90 tonnes today. These actions collectively allow the railcar fleet to carry almost 50 percent more using the same number of railcars.

In addition to hauling heavier loads, the railways have also adopted the use of large (50-112 car) unit trains (Figure 5.4). Unit trains are composed of ‘blocks’ of cars carrying a single type of commodity that are all bound for the same destination. By

hauling only one kind of freight to a single destination, a unit train does not need to switch cars at various intermediate junctions, which allows the railways to make non-stop runs between destinations. As is shown below, the switch to heavier, longer trains has increased track utilization, which has had a significant impact towards reducing railway car cycles and transit times.

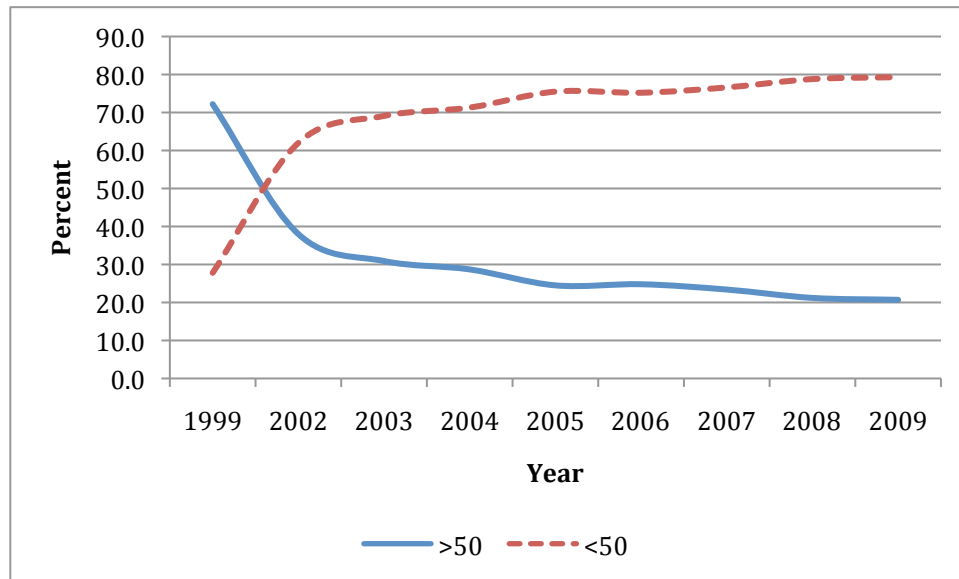


Figure 5.5 – Western Canadian Railway Unit Train Movements
Source – 2009/10 Quorum Annual Report

5.7.2 Car Cycles

One of the key indicators used within the railway industry to gauge the efficiency with which rail traffic is moved is the car cycle. In the context of the GHTS, a car cycle effectively measures the time taken by a railway to deliver a load of grain to port and then return the empty car to the prairies for reloading. The car cycle for the regulated movement of Western Canadian grain averaged 13.2 days during the 2009-10 crop year (Quorum, 2010). This represents a 33.7 per cent reduction from the 1999-2000 crop year average of 19.9 days (Figure 5.5). Examined in terms of the principal corridors, movements to Vancouver show a corresponding improvement

of 13.4% – falling from an average of 19.4 to 16.8 days.

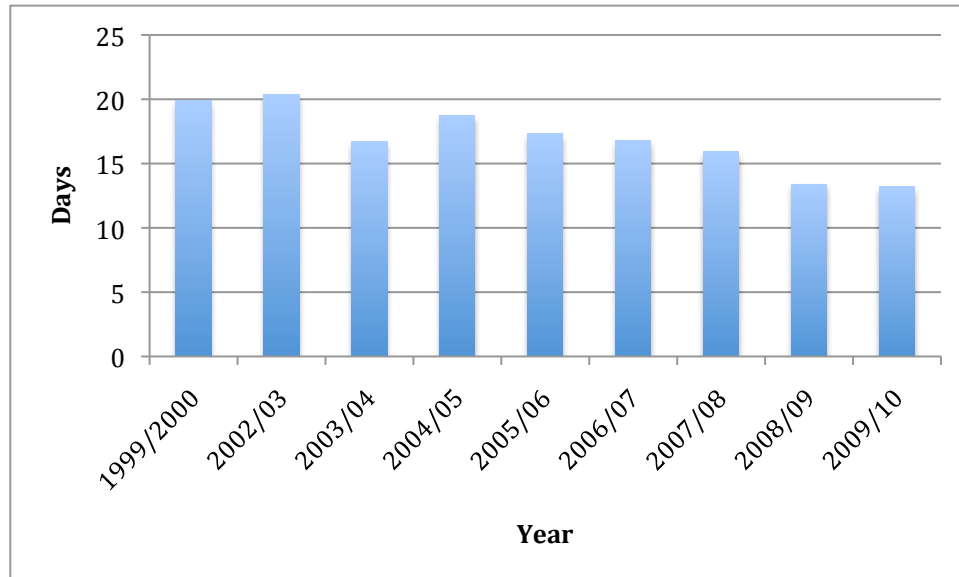


Figure 5.6 – Western Canadian Railway Car Cycle Times
Source – 2009/10 Quorum Annual Report

5.7.3 Transit Times

More important than the railways' average car cycle, is the average loaded transit time. The length of haul and the speed of movement of the car between origin and destination determine the transit time for an individual car trip. This speed is a function of the time that a car spends in rail yards and the time spent on trains and the speed of movement of those trains. Speed is a critical element of transit time analysis as the range of transit times achieved by a railway will be determined by both the average speed of the traffic and the level of transit time consistency for a particular origin/destination pair.

Over the last eleven years, the railways' loaded transit time has shown a 29.8 per cent improvement, falling to an average of 5.5 days in the 2009-10 crop year against the 7.8-day average during the 1999-2000 crop year (Figure 5.6). Moreover, the variability in the underlying distributions has shown an equally significant

reduction, with the coefficient of variation falling to 30.8 per cent from 42.9 per cent.¹⁸ All of this suggests that, while the railways have improved the efficiency of their in-transit services, there is still a high degree of variability in railway transit times.

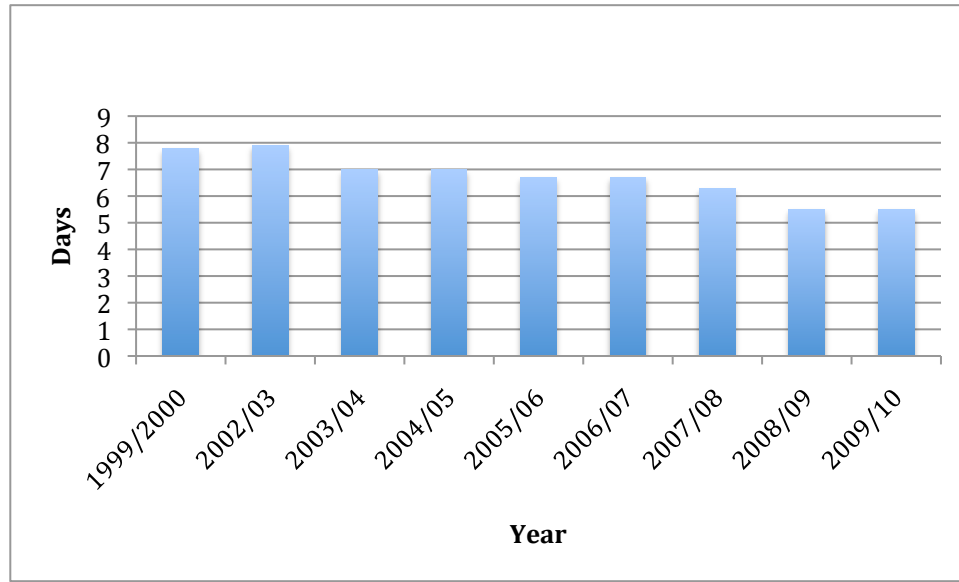


Figure 5.7 – Western Canadian Loaded Railway Transit Times
Source – 2009/10 Quorum Annual Report

5.8 Summary

This chapter examined a variety qualitative and quantitative data sources related to GHTS railway performance in order to determine the validity of five key propositions derived from the previous chapter’s theoretical framework. To test the legitimacy of each proposition, this chapter compared the theoretical outcomes of the model against actual events observed in the GHTS. Proposition 1 suggested that

¹⁸ The coefficient of variation (CV) simply expresses the standard deviation as a percentage of the mean of a population. For example, if an origin/destination pair had an average transit time of 150 hours with a standard deviation of 20 hours, the CV would be $(20/150 * 100) = 13.3$ per cent. A lower CV is better.

the railway's profit maximizing capacity allocation decision creates excess demand in the grain market, which reduces the levels of service of grain shippers. Through a comparison of GHTS data on railway service levels prior to and after the introduction of the revenue cap, it was shown that GHTS service levels have generally declined since the implementation of the 1996 CTA regulatory framework, an observation that supports the prediction made by the theoretical model.

Proposition 2 examined whether efficiency gains that lower the railways marginal cost are shared with farmers or if they can be considered the strict property of the railways. Through an examination of technological advancements adopted by the railways, it was shown that the railways have made efficiency gains that reduce marginal cost. It was also shown that the average rail freight cost (in deflated dollars) that farmers are required to pay in order to ship one tonne of grain to export position has remained relatively constant over the last ten years, suggesting that the railways have not passed on to producers any of the efficiency gains associated with a reduction in marginal cost.

Proposition 3 examined the issue of cost shifting from the railways to farmers and was investigated through a comparison of the marginal tonne kilometer cost of moving grain by rail and by truck. It was shown that the marginal tonne kilometer cost of moving grain is greater in the trucking industry than it is in the rail industry, indicating that the transfer of transportation costs associated with the removal of GDBLs is greater than 1:1. This result validated the models prediction regarding the decline of GHTS welfare resulting from the removal of GDBLs.

Proposition 4 suggested that negative externalities associated with grain transportation, such as road maintenance costs and greenhouse gas emissions, increase as GDBLs are removed from the system. This proposition is premised on the notion that the average farm haul length increases due to the removal of GDBLs from the system. By examining the average length of farm haul prior to and after the regulatory change, it was shown that average trucking distances have increased

since the introduction of the CTA and that the removal of GDBL's are at least partially responsible for this increase.

Finally, proposition 5 suggested that while improvements in railway efficiency that allow the railways to increase overall system capacity could be shared with farmers and non-grain shippers, it is the railways that are the largest beneficiary of these efficiency improvements. An examination of railway operations show that the railway's adoption of two key efficiency measures – the move to heavier car weights and the increased use of unit trains – have allowed the railways to increase the utilization of their assets by reducing car cycle and transit times. The adoption of these efficiency measures indicates that the railways have taken steps to increase the overall system capacity, which suggests that the railways, along with farmers and non-grain shippers, could potentially benefit.

Based on the examination of actual GHTS occurrences regarding rail service levels, increased farmer haul lengths, marginal transportation costs and improvements in railway efficiency, it appears that these observations are congruent with several of the predictions made by the theoretical model developed in Chapter 4. Given this support, the model's capacity to track changes in consumer and producer surplus resulting from changes in GHTS regulation can be viewed as representative of the actual changes in consumer and producer surplus experienced in both the grain and non-grain markets.

Chapter 6: Welfare Analysis

6.1 Introduction

Chapter 4 presented economic theories that could be used to analyze and measure the economic impacts that the elimination of grain dependent branchlines and the introduction of the revenue cap have had on the GHTS. As well, it developed a theoretical model to examine the welfare effects resulting from the elimination of grain dependent branchlines and the introduction of the revenue cap. Regulatory options available to the regulator were also examined, along with a description of the 'rate of return' regulation of the WGTA in order to provide a regulatory baseline against which the 1996 CTA regulatory changes could be measured. The theoretical results of these welfare changes indicated that many of the changes resulting from the regulatory reforms have provided benefits to the government, railways and non-grain shippers (Table 4.1).

In Chapter 5, the major propositions derived from the theoretical framework outlined in Chapter 4 were used to test the hypotheses outlined in Chapter 1. Each proposition was tested for validity by finding supporting or refuting evidence using a triangulation approach. A description of the methodologies, data sources, data collection, analysis and key findings were also provided in this chapter. This chapter examined a variety of qualitative and quantitative data sources related to GHTS railway performance in order to determine if the predictions made by the theoretical model presented in Chapter 4 are valid. Based on an examination of GHTS occurrences of rail service levels, increased farmer haul lengths, marginal transportation costs and improvements in railway efficiency, it was concluded that the observations are congruent with the predictions made by the theoretical model developed in Chapter 4.

The purpose of this chapter is to quantify the changes in consumer and producer

surplus associated with moving from the WGTA to the revenue cap regulatory regime. To do this, this chapter takes a four-part approach. Section one of this chapter examines, with all other factors held constant, the welfare changes associated with shift from the WGTA to the revenue cap regulatory regime. Specifically, this section examines two separate cases. The first looks at instances where the railways do not differentiate between high and low cost shippers in the grain market. The second examines the welfare changes that occur when the railways do differentiate between high and low cost shippers. This section does not account for other factors, such as system externalities or system efficiency gains that may also due to regulatory change. These factors are dealt with separately in the following sections. Once this examination is complete, this section will then turn its attention to studying the welfare changes in instances where price differentiation between shippers exists.

Section two examines welfare changes associated with gains in railway efficiency. Specifically, two types of railway efficiency gains are examined: 1) efficiency gains that lead to a reduction in railway marginal cost; and 2) efficiency gains that result in an increase in railway capacity. For the purpose of this analysis, the welfare effects resulting from railway efficiency gains are examined independently, with the resulting changes in welfare considered as being cumulative to the welfare changes determined in section one.

Finally, section three examines the changes in GHTS welfare that are attributed to the removal of GDBLs from the system. Specifically, this section examines the transfer of transportation costs from the railways to farmers as GDBLs are removed from the system. Again, these results are added to the results from section one and two as a means of determining the overall welfare costs associated with GHTS regulatory change.

6.2 Welfare Effects of Regulatory Change

This section begins by quantify the welfare changes associated with moving from the WGTA to the revenue cap regulatory regime in a situation where the railways do not differentiate between high and low cost shippers (i.e., all shippers are charged the same rate). Once this examination is complete, this section will then turn its attention to studying the welfare changes in instances where price differentiation between shippers exists.

6.2.1 WGTA to Revenue Cap (Non-Differentiated Grain Shippers)

To determine the welfare effects associated with the movement from the WGTA to the revenue cap in instances where the railways do not differentiate between high and low cost shippers, this section examines the dollar per tonne mile rail freight costs in both the grain and non-grain market prior to elimination of the WGTA in 1994 and again in 2000 when the revenue cap is introduced (Table 6.1). These costs are further delineated in terms of regulatory regime (i.e., WGTA or revenue cap) and portion of cost that farmers were required to pay under the WGTA. The dollar per tonne mile WGTA freight costs in Table 6.1 are based on values from Vercammen, Fulton and Gray's 1996 publication 'The Economics of Western Grain Transportation and Handling' and are calculated by taking 1995 WGTA freight costs and dividing them by the average rail length of haul in 1995. The average rail length of haul in 1995 was 1,012 miles (Vercammen, Fulton and Gray, 1996; Kroeger, 1999). To ensure a fair comparison between the revenue cap and WGTA regulatory regimes, WGTA freight costs have been adjusted into 2000 dollars.

Table 6.1 also shows the freight volumes shipped in both the grain and non-grain market prior to the elimination of the WGTA in 1995 and after the implementation of the revenue cap in 2000. As shown, the total tonne miles in the GHTS decline by

approximately 23 per cent, from 34.9 million in 1994 to 25.4 million in 2000. The 1994 grain market freight volumes in Table 6.1 are based on values from the 1996 publication ‘The Economics of Western Grain Transportation and Handling’ and Kroeger’s 1999 “Report on the Movement of Western Grain”. The 2000 grain market freight volumes are based on data collected by Quorum Corporation acting as the Federal Grain Monitor. Non-grain freight volumes are based on statistics compiled by the Railway Association of Canada’s annual ‘Railway Trends’ report (Railway Association of Canada, 2001).

| Table 6.1 – Freight Costs, Freight Volumes and Demand Elasticities Used to Calculate Changes in GHTS Welfare | | |
|---|------------------------|---|
| Freight Costs (\$/tonne mile) | (\$/tonne mile) | Source |
| - PWGTA | \$0.0315 | (Vercammen, Fulton and Gray, 1996) |
| - ARg | \$0.0290 | (Quorum, 2010) |
| - Pf | \$0.0151 | (Vercammen, Fulton and Gray, 1996) |
| - PWGTAng | \$0.0408 | (Railway Association of Canada, 2001) |
| - PRCng | \$0.0360 | Author’s Calculation* |
| Freight Volumes (tonne miles) | | |
| - Grain Market | | |
| - 1994 | 34,934,240,000 | (Vercammen, Fulton and Gray, 1996; Kroeger, 1999) |
| - 2000 | 25,435,746,000 | (Quorum, 2010) |
| - Non-Grain Market | 162,660,400,000 | (Railway Association of Canada, 2001) |
| Demand Elasticity (Value) | | |
| • Grain Market | -0.25 | (Oum <i>et al.</i> , 1990) |
| • Non-Grain Market | -.50 | (Oum <i>et al.</i> , 1990) |
| Marginal Cost of Taxation (Factor) | 1.35 | (Atkinson and Stiglitz, 1980; Stiglitz, 1986) |

*PRCng is estimated by dividing the percentage increase in quantity in the non-grain market by the elasticity of demand in the non-grain market (-.50). This model assumes that capacity increases (tonne miles) in the non-grain market are equivalent to the capacity decreases in the grain market. The decrease in capacity in the grain market between 1994 and 2000 is calculated at 9.49 billion tonne miles, meaning that the percentage increase of tonne miles in the non-grain market is equal to 5.84 percent (see appendix).

In addition to freight costs and volumes, Table 6.1 shows the elasticity of the demand curves (the extent to which transportation demand is sensitive to price changes) in both the grain and non-grain market.¹⁹ For the purpose of this analysis,

¹⁹ The World Bank sponsored Oum et al (1990) review of rail and road freight market elasticities arguably remains one of the most comprehensive to date. It summarizes 17 freight studies, covering all major commodity groupings across North America, UK and the Asia-Pacific. Notably, Oum et al (1990) provide estimates for all commodities and grains only.

the chosen demand elasticity is the middle point of each demand elasticity range. As such, the elasticity of demand in the grain market is equal to -0.25, while the elasticity of demand in the non-grain market is set at -0.50 (Table 6.1). Finally, Table 6.1 shows the marginal cost of taxation factor used to determine the overall cost of the government subsidy under the WGTA.

6.2.2 Results

To aid in the exposition of the welfare changes associated with regulatory change, this section recalls the theoretical model first introduced in Chapter 4, which illustrates the welfare changes associated with moving from the WGTA to the revenue cap (Figure 6.1). The data outlined above is then inserted into the model to solve for changes in consumer and producer surplus resulting from regulatory change. This section presents the results of the welfare changes in Table 6.2.

The column in Table 6.2 labeled “WGTA” detail the areas of consumer and producer surplus (Figure 6.1) captured under the WGTA regulatory regime. Taking the consumer surplus (measured in dollars) of farmers under the WGTA as an example, the results indicate that farmers lost \$418.2 million as a result of shifting from the WGTA to the revenue cap regulatory regime. In the non-grain market, shippers see an increase in consumer surplus, gaining \$797.7 million. In regards to producer surplus, the railways lose a combined \$840.1 million in both the grain and non-grain markets, but gain an additional \$42.9 million in the non-grain market, for a net loss in producer surplus equal to \$797.2 million. Finally, the federal government sees an overall gain equal to \$572.9 million as the subsidy that was needed to maintain the WGTA is no longer required.

In general, the following conclusions can be drawn from the results in Tables 6.2. As the system moves from WGTA to revenue cap regulation, farmers experience a loss in overall welfare. This welfare loss is largely due to the fact that under the revenue cap farmers are responsible for the total cost of shipping grain. As such, farmers are

worse off due to the regulatory change.

| Table 6.2 Welfare Changes Resulting From the Introduction of the Revenue Cap | | | | |
|---|--------------------------|-------------------------|--|-----------------------------------|
| | WGTA | Revenue Cap | Welfare Change | |
| CS | | | Gain | Loss |
| Farmers | a+b+c+j+k+m | a+b | | c+j+k+m \$418.2 million |
| NG Market | u+v | s+t+u+v+w | s+t+w \$797.7 million | |
| Railway | | | | |
| Grain | b+c+d+h+i+j+k+l+m+n+o+p | c+d | | b+h+i+j+k+l+m+n+o+p |
| Non-Grain | t+w+x+y+z | h+i+j+k+l+m+n+o+r+x+y+z | h+i+j+k+l+m+n+o+r | t+w |
| Net | | | r \$42.9 million | b+p+t+w \$840.1 million |
| Taxpayers | b+c+j+k+l+m+n+o+p | none | b+c+j+k+l+m+n+o+p \$572.9 million | |
| Societal Cost | (b+c+j+k+l+m+n+o+p)*MSWC | none | (b+c+j+k+l+m+n+o+p)*MSWC \$200.5 million | |
| Net Welfare Change | | | l+n+o+r+s +(b+c+j+k+l+m+n+o+p)*MSWC \$355.7 million | |

- As noted previously, the marginal social welfare cost associated with providing the subsidy is likely to be between \$1.20 and \$1.50. For the purpose of determining the calculation above, the average of the range (i.e., \$1.35) is used.

Shippers in the non-grain market see a marked increase in consumer surplus as capacity is allocated away from the grain market in favour of the non-grain market. The resulting shift in capacity allocation results in lower average freight costs for non-grain shippers. As such, shippers in the non-grain markets are made better off.

The railways see an overall decrease in producer surplus. This welfare loss is partly due to the decrease in price in the grain market as the new regulatory regime is implemented and partly due to lower prices in the non-grain market that result due to the increase of capacity allocation in the non-grain market. As such, the welfare changes associated with moving from the WGTA to the revenue cap regulatory regime means that, with all other factors being equal or held constant, the railways are worse off.

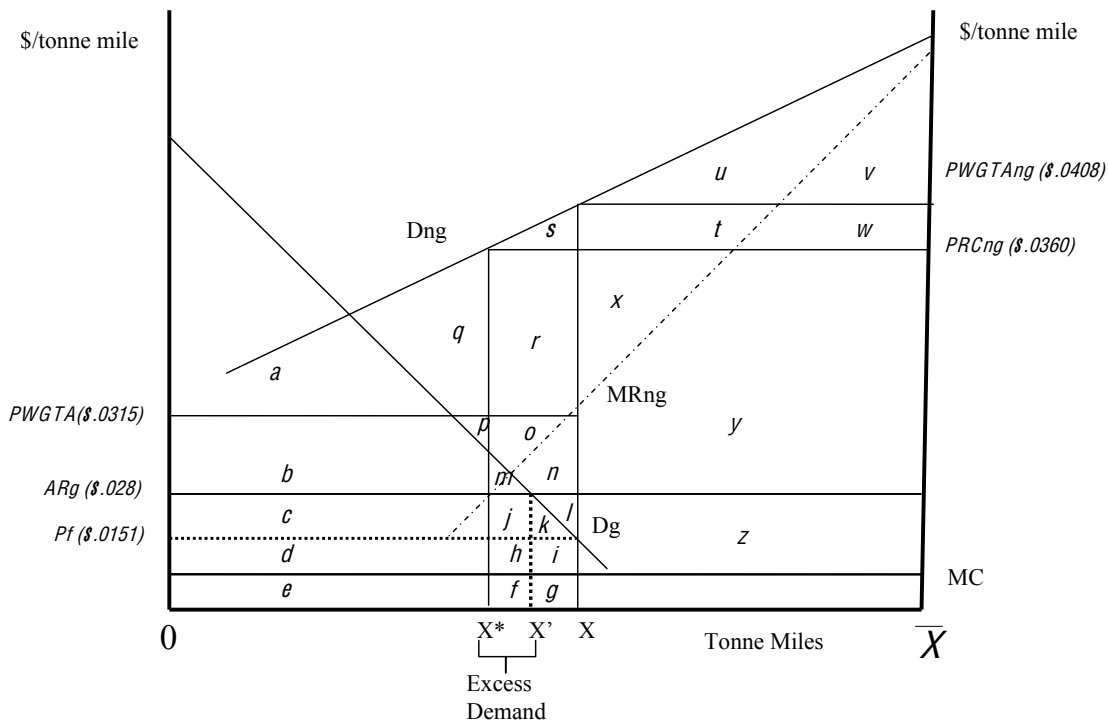


Figure 6.1 Welfare Implications Resulting From the Implementation of the Revenue Cap

Along with non-grain shippers, another beneficiary of the regulatory change is taxpayers, who gain as a result of the elimination of the federal subsidy that was paid to the railways under the WGTA. In addition to the gains seen by taxpayers, society as a whole also gains as a result of the elimination of the dead weight loss that is incurred by others in the economy resulting from taxation.

6.2.3 WGTA to Revenue Cap (Differentiated Grain Shippers)

To determine the welfare effects associated with the movement from the WGTA to the revenue cap in instances where the railways differentiate between high and low cost shippers, this section examines the dollar per tonne mile rail freight costs incurred by farmers prior to elimination of the WGTA in 1994, as well as the dollar per tonne mile single car and multi-car block incentive rates in 2000 when the revenue cap is introduced (Table 6.3).

Table 6.3 – Freight Costs, Freight Volumes and Demand Elasticity Used to Calculate Welfare Changes in a Differentiated Grain Market

| Freight Costs (\$/tonne mile) | (\$/tonne mile) | Source |
|--------------------------------------|------------------------|------------------------------------|
| - ARg | \$0.0290 | (Quorum, 2010) |
| - Single-Car Rate (P ₁) | \$0.0342 | (Author's Calculation) |
| - Multi-Car Rate (P ₂) | \$0.0279 | (Author's Calculation) |
| - P _f | \$0.0151 | (Vercammen, Fulton and Gray, 1996) |
| | | |
| Freight Volumes | (tonne miles) | |
| - High Cost Market | | |
| • 1994 | 31,440,816,000 | (Author's Calculation) |
| • 2000 | 12,209,158,080 | (Quorum, 2010) |
| - Low Cost Market | | |
| • 1994 | 3,493,424,000 | (Author's Calculation) |
| • 2000 | 13,226,587,920 | (Quorum, 2010) |
| | | |
| Demand Elasticity | (Value) | |
| • Grain Market | -0.25 | (Oum <i>et al</i> , 1990) |

The dollar per tonne mile farmer portion of the WGTA freight costs in Table 6.3 are based on values from Vercammen, Fulton and Gray's 1996 publication 'The Economics of Western Grain Transportation and Handling' and are calculated by taking the farmer's share of the 1995 WGTA freight costs and dividing it by the average rail length of haul in 1995. The average rail length of haul in 1995 was 1,012 miles (Vercammen, Fulton and Gray, 1996; Kroeger, 1999). To ensure a fair comparison between the revenue cap and WGTA regulatory regimes, this freight cost has been adjusted into 2000 dollars.

The single-car and multi-car dollar per tonne mile freight costs in Table 6.3 are based on figures contained in 2011 Annual Report of the Monitor of the GHTS and the 2004-2009 Western Canadian Rail Rates & CWB Deductions published by the Government of Alberta. The single car rate is calculated by converting the posted 2004 single car rate from Moose Jaw, Saskatchewan into 2000 dollars and dividing it by the average length of haul in 2000 (944 miles). The multi-car rate is determined by reducing the single-car rate calculated above by the dollar per tonne mile

incentive rate offered by the railways in 2000 (Quorum, 2011).

Table 6.3 also shows the freight volumes shipped in the grain market prior to the elimination of the WGTA in 1995 and after the implementation of the revenue cap in 2000. As shown, the tonne miles in the GHTS are segmented for each time period to reflect the total amount of tonne miles shipped by high cost shippers (i.e., those not capable of loading unit trains) and low cost shippers (i.e., those able to load unit train). The 1994 grain market freight volumes in Table 6.3 are divided on a 90/10 basis, meaning that 90 per cent of the total grain volumes shipped under the WGTA was single car shipments, with the remaining 10 per cent of the volume shipped via unit train. The division of grain volumes is based on values contained in Prater and Sparger's 2007 publication 'Grain and Oilseed Shipment Sizes and Distance Hauled by Rail'.

The 2000 grain market freight volumes in Table 6.3 are divided on a 48/52 basis, meaning that 48 per cent of the total grain volumes shipped in 2000 was single car shipments, with the remaining 52 per cent of the volume shipped via unit train. The divisions of grain volumes are based on values contained in the 2011 Annual Report of the Monitor of the Canadian GHTS (Quorum, 2011).

In addition to freight costs and volumes, Table 6.3 shows the elasticity of the demand curves (the extent to which transportation demand is sensitive to price changes) in the grain market. For the purpose of this analysis, the chosen elasticity of demand in the grain market is set at -0.25 (Table 6.3).

6.2.4 Results

As indicated in Chapter 4, the welfare effects resulting from the regulatory shift are the same in both the differentiated and non-differentiated shipper model with one exception: the consumer surplus changes in the grain market. To aid in the exposition of the changes to consumer surplus in the grain market, this section

introduces Figure 6.2 and Figure 6.3, which illustrates the welfare changes associated with moving from the WGTA to the revenue cap in instances where the railways differentiate between high and low cost shippers. The data outlined above is then inserted into the model to solve for changes in consumer surplus resulting from regulatory change. This section presents the results of the welfare changes in Table 6.4.

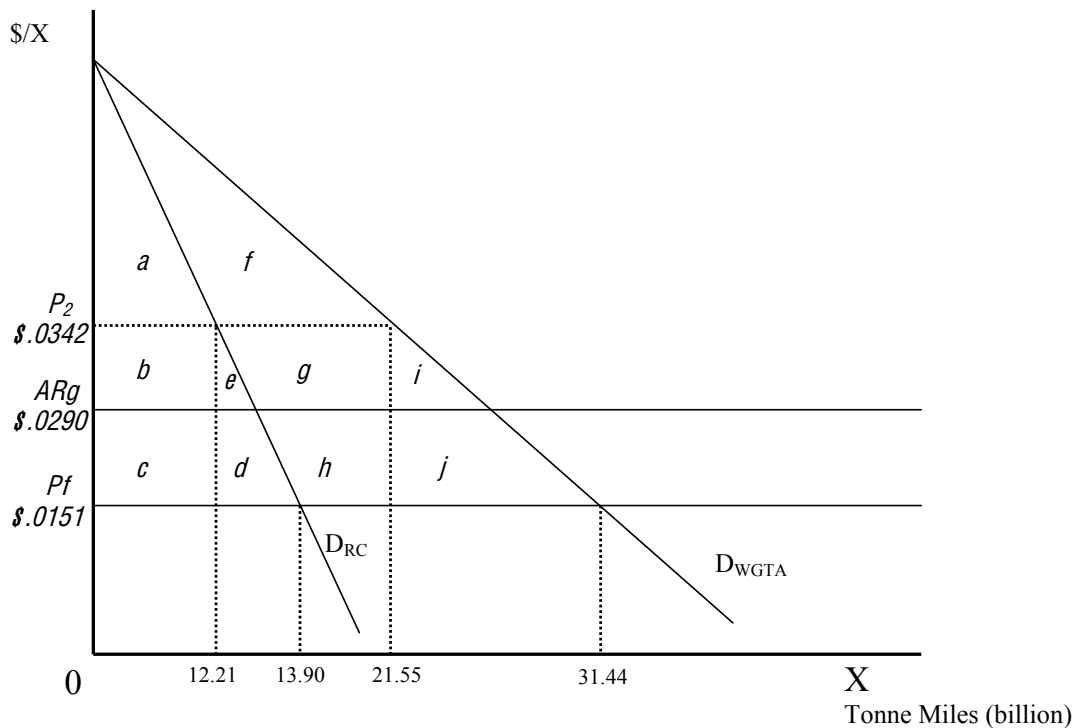


Figure 6.2 Welfare Changes in High Cost Market

As indicated in Table 6.3, between 1994 and 2000 there was a substantial decrease in the total volume of tonne miles shipped through the GHTS. The difference in the grain volumes shipped under the WGTA and the revenue cap makes it difficult to conduct a welfare analysis in the high and low cost market – *ceteris paribus* – that accurately outlines the changes in consumer surplus resulting from the regulatory change. To overcome the discrepancy in freight volumes, this thesis conducts the welfare analysis using two distinct scenarios. Scenario one examines the change in consumer surplus in both the high and low cost markets by calculating the loss in consumer surplus that grain shippers would experience with the freight volumes

shipped under the WGTA. Scenario 2 performs a similar analysis using the freight volumes shipped under the revenue cap.

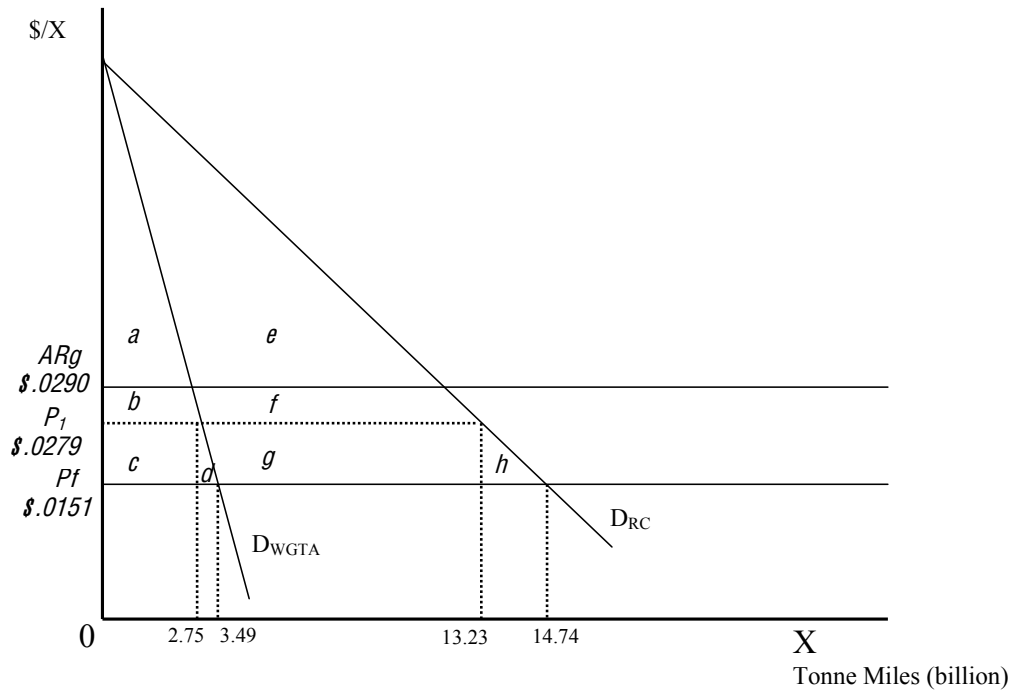


Figure 6.3 Welfare Changes in Low Cost Market

The column in Table 6.4 labeled “Consumer Surplus Change” outlines the consumer surplus (measured in dollars) under each of the scenarios outlined above. Taking the consumer surplus of shippers under Scenario 1 (i.e., using WGTA demand) as an example, the results indicate that high cost shippers paying the single car rate lost \$504.2 million compared with the consumer surplus they would have earned under the WGTA. In the low cost markets, shippers lose \$40.0 million in consumer surplus compared to what they would have earned if WGTA freight costs remained in effect. In total, the total loss of consumer surplus in Scenario 1 is calculated at \$544.2 million.

Under Scenario 2 (i.e., using demand under the revenue cap) the results indicate that high cost shippers paying the single car rate lost \$248.5 million compared with the consumer surplus they would have earned if WGTA freight costs remained in

effect. In the low cost markets, shippers lose \$179.3 million in consumer surplus compared to what they would have earned if WGTA freight costs remained in effect. In total, the total loss of consumer surplus in Scenario 1 is calculated at \$427.8 million.

| Table 6.4 Consumer Surplus Changes in the Grain Market Resulting From the Introduction of the Revenue Cap (Differentiated Shippers) | | |
|--|---|--|
| Consumer Surplus Change | | |
| | Scenario 1 (WGTA Demand and Freight Volumes) | Scenario 2 (CTA Demand and Freight Volumes) |
| High Cost Market | (\$504.2 million) | (\$248.5 million) |
| Low Cost Market | (\$40.0 million) | (\$179.3 million) |
| Total CS Change | (\$544.2 million) | (\$427.8 million) |

In general, the following conclusions can be drawn from the results in Tables 6.4. In both scenarios outlined above, shippers – and ultimately farmers – experience a loss in overall welfare. Although the precise value of this loss is unknown, it is bracketed by the results presented in Table 6.4 (i.e., the loss in consumer surplus ranges from \$427.8 million to \$544.2 million). While shippers in the low cost market experience a reduction in consumer surplus, the loss in consumer surplus is more pronounced amongst shippers in high cost markets, largely due to the substantial price difference between the single car rate shippers are required to pay under the revenue cap and the price enjoyed under the WGTA. As such, farmers are worse off in circumstances where the railways are able to differentiate between high and low cost shippers compared to instances where differentiation does not take place.

6.3 Welfare Effects Resulting From Changes in Railway Productivity

As discussed in the previous chapter, a key aspect of incentive regulatory schemes such as the railway revenue cap is to provide firms with an incentive to improve upon their levels of technical efficiency. Improvements in technical efficiency – also

referred to as ‘productive efficiency’ or ‘productivity’ – occurs when the physical process of the firm is modified so that the same amounts of inputs, or factors of production, produce a higher quantity of outputs. Productivity gains can also occur if output remains constant when less of one or more inputs are used in the production process. By using its resources more efficiently, a firm is able to lower its average cost curve through a decrease in its marginal cost. The following sections quantify the overall system welfare effects that have stemmed from changes in railway productivity.

6.3.1 Reduction in Railway Marginal Cost

To quantify the change in producer surplus associated with a decrease in railway marginal cost, this section looks at railway marginal costs in 1994 prior to elimination of the WGTA and again in 2000 when the revenue cap is introduced (Table 6.5). Changes in producer surplus are quantified (in terms of dollars) using industry data on railway marginal costs and freight volumes in the grain and non-grain market. All figures are adjusted into 2000 dollars using a GDP deflator.

| Marginal Cost (\$/tonne mile) | (\$/tonne mile) | Source |
|--------------------------------------|------------------------|---------------------------------------|
| - MC (1994) | \$0.0199 | (ATKearney, 1994) |
| - MC' (2000) | \$0.0148 | (Author's Calculation) |
| Freight Volumes | (tonne miles) | |
| - Grain Market | | |
| • 2000 | 25,435,746,000 | (Quorum, 2010) |
| - Non-Grain Market | | |
| • 2000 | 213,581,569,000 | (Railway Association of Canada, 2001) |

One of the challenges associated with quantifying the change in producer surplus associated with a decrease in railway marginal cost is estimating the degree to which marginal costs have declined as a result of the regulatory change. For example, there may be other factors (i.e., technological advancements) that have contributed to the decrease in railway marginal cost. For the purpose of this

analysis, it is assumed that the regulatory change is completely responsible for the decrease in railway marginal costs. The analysis of the case where only a portion of the decrease in marginal cost is attributable to the regulatory change can be easily done, since the welfare changes are directly proportional to the degree to which the regulatory change affects the marginal cost. Thus, if only 80 per cent of the cost reduction is due to regulatory change, then the welfare changes can be calculated by taking 80 per cent of the estimates provided here.

Table 6.5 shows the dollar per tonne mile railway marginal cost. For the purpose of this analysis, it is assumed that the marginal costs in both the grain and non-grain market are the same. These costs are further defined by year, with 1994 representing the marginal cost under the WGTA regulatory regime and 2000 representing the marginal cost under the revenue cap. The WGTA dollar per tonne mile marginal costs in Table 6.5 are based on values contained in a 1994 final report conducted by ATKearney entitled 'Grain Logistics Strategy' and are calculated by taking the railway's marginal costs in 1994 and dividing them by an average rail length of haul of 1,012 miles (Vercammen, Fulton and Gray, 1996; Kroeger, 1999).

The railway marginal cost in 2000 is calculated by determining the dollar per tonne mile rate at which railway marginal costs declined between 2007 and 1994. The rate of decline is then used to determine the discounted railway marginal cost in 2000. Railway marginal costs in 2007 are based on values contained in a 2007 final report conducted by Transport Canada entitled 'Estimation of Unit Costs of Rail Transportation in Canada'. All values have been converted in 2000 dollars to ensure an accurate comparison.

Table 6.5 also shows the freight volumes shipped in both the grain and non-grain after the implementation of the revenue cap in 2000. The 2000 grain market freight volumes are based on data collected by Quorum Corporation acting as the Federal Grain Monitor. Non-grain freight volumes are based on statistics compiled by the Railway Association of Canada's annual 'Railway Trends' report (Railway

Association of Canada, 2001).

6.3.1.1 Results

To help clarify the results of the welfare changes associated with a reduction in railway marginal cost, this section recalls the theoretical model first introduced in Chapter 4, which illustrates the welfare changes associated with a decrease in railway marginal cost (Figure 6.3). The data outlined above is then inserted into the model to solve for changes in producer surplus resulting from the change in marginal cost. This section presents the results of the welfare changes in Table 6.6.

| Table 6.6 Welfare Changes Resulting From a Reduction in Railway Marginal Cost | | | | |
|--|---------------------|-------------------------|--------------------------|-------------|
| | Grain Market | Non-Grain Market | Welfare Change | |
| | | | Gain | Loss |
| Consumer Surplus | | | | |
| - Farmers | No Change | No Change | No Change | No Change |
| - Non-Grain Shippers | No Change | No Change | No Change | No Change |
| Producer Surplus | | | | |
| - Railways | | | | |
| - Area | a + b | c + d | a + b + c + d | - |
| - (\$) | \$129.7 million | \$1,089.3 million | \$1,219.0 million | - |
| Net Gain/Loss | | | \$1,219.0 million | |

The column in Table 6.6 labeled “WGTA” detail the areas of producer surplus (Figure 6.1) captured under the WGTA regulatory regime. With regards to consumer surplus, the results show that neither farmers nor non-grain shippers experience a gain or loss in welfare as the result of a reduction in railway marginal cost. With regards to producer surplus, the railways gain \$129.7 million in the grain market and \$1,089.3 million in the non-grain market, for a combined gain in producer surplus equal to \$1,219.0 million.

In general, the following conclusion can be drawn from the results in Tables 6.6.

As the railways make efficiency improvements that reduce their overall marginal cost, farmers and non-grain shippers do not share in any of the benefits associated with efficiency improvements as capacity increases. On the other hand, the railways see a substantial increase in their producer surplus in both the grain and non-grain market. As such, the railways can be viewed as the sole beneficiary of railway efficiency improvements that reduce marginal cost.

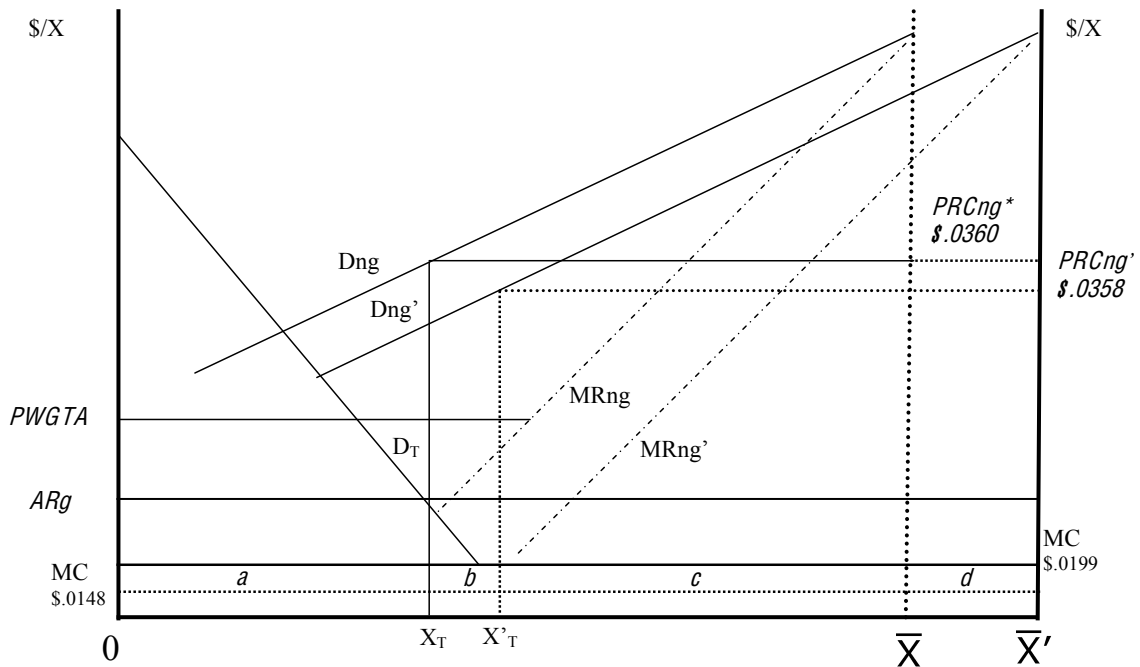


Figure 6.4 Welfare Implications Resulting From a Decrease in Railway Marginal Cost

6.3.2 Increased Capacity

The previous section examined the welfare changes in the grain and non-grain markets resulting from a decrease in railway marginal cost. A subsequent measure following the passing of the 1996 CTA was a significant increase in railway capacity. Prior to the implementation of the 1996 CTA, the railways moved a total of 241.9 million tonnes of freight over an average haul length of 784 miles. By 2000 this number increased substantially, with the railways moving 297.7 million tonnes over

an almost identical average haul length (Table 6.7).

The following section sets out to determine grain and non-grain market welfare changes associated with an increase in railway capacity. As with determining the welfare effects associated with a decrease in railway marginal cost, one of the challenges associated with quantifying the change in producer surplus stemming from an increase in railway capacity is estimating the degree to which capacity has increased as a result of the regulatory change. Again, there may be other factors (i.e., technological advancements) that have contributed to the increase in railway capacity. For the purpose of this analysis, it is assumed that the regulatory change is completely responsible for the increase in railway capacity. The analysis of the case where only a portion of the increase in railway capacity is attributable to the regulatory change can be carried out by assuming that the welfare changes are roughly proportional to the degree to which capacity changes.

6.3.2.1 Capacity Increase in the Non-Grain Market

Table 6.7 shows that freight volumes in the non-grain market increased 31.3 per cent, from 162.6 billion tonne miles in 1994 to 213.6 billion tonne miles in 2000. The dollar per tonne mile WGTA freight costs in Table 6.7 are based on values from the 1996 publication 'The Economics of Western Grain Transportation and Handling' and are calculated by taking 1995 WGTA freight costs and dividing them by the average rail length of haul in 1995. The average rail length of haul in 1995 was 1,012 miles (Vercammen, Fulton and Gray, 1996; Kroeger, 1999).

| Table 6.7 – Freight Costs, Freight Volumes and Haul Lengths Used to Calculate Welfare Changes Resulting from an Increase in Railway Capacity (Non-Grain Market) | | |
|--|------------------------|---|
| Freight Costs (\$/tonne mile) | (\$/tonne mile) | Source |
| - MC (2000) | \$0.0148 | (ATKearney, 1994; Author’s Calculation) |
| - PRCng | \$0.0360 | (Author’s Calculation) |
| - PRCng* | \$0.0358 | (Railway Association of Canada, 2001) |
| Average Length of Haul | (miles) | |
| - Non-Grain Market | | |
| • 1994 | 784 | (Railway Association of Canada, 2001) |
| • 2000 | 787 | (Railway Association of Canada, 2001) |
| Freight Volumes | (tonne miles) | |
| - Non-Grain Market | | |
| • 1994 | 162,660,400,000 | (Railway Association of Canada, 2001) |
| • 2000 | 213,581,569,000 | (Railway Association of Canada, 2001) |
| Demand Elasticity | (Value) | |
| • Grain Market | -0.50 | (Oum <i>et al.</i> , 1990) |

6.3.2.2 Results

Based on the data made available in Table 6.7, the degree to which consumer and producer surplus in the non-grain sector have been influenced by the increase in railway capacity is difficult to ascertain. One of the key challenges in performing this analysis is determining the degree to which regulatory change has influenced the increase in system capacity. Even if the extent of the regulatory influence was known, it would require complete knowledge of the price changes and shifts in the demand curve in the non-grain market to accurately portray the changes in producer and consumer surplus resulting from the increase in capacity (Figure 6.6). As such, while this thesis recognizes the impact that an increase in railway capacity can have upon non-grain sector welfare, the inability to isolate the necessary factors required to calculate these changes precludes the author from estimating these changes.

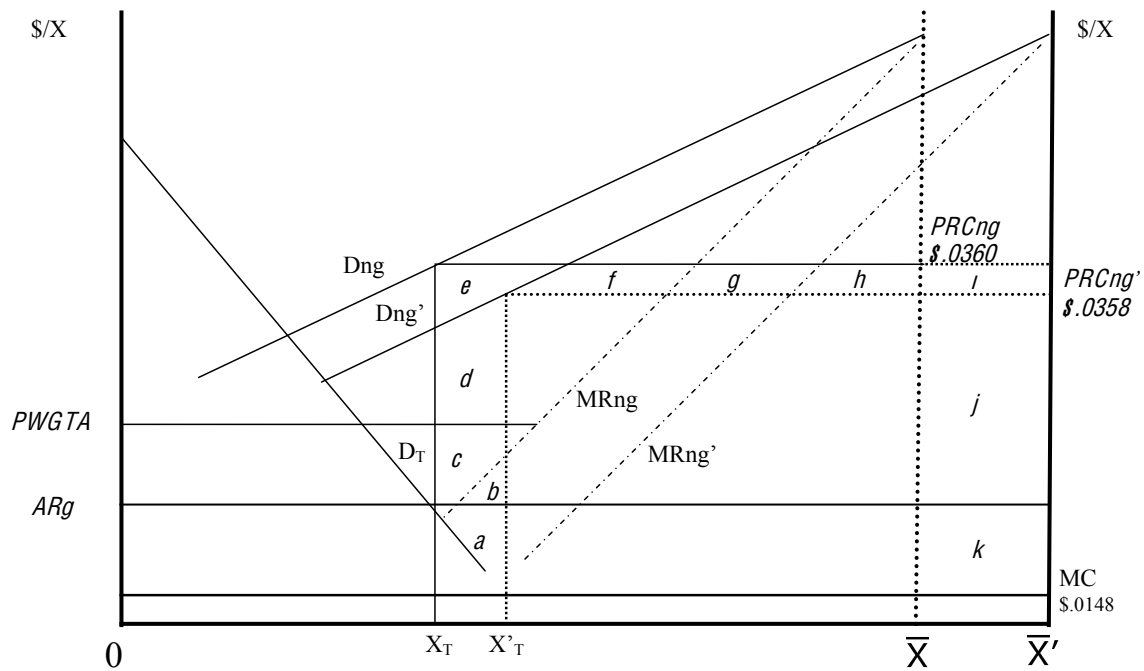


Figure 6.5 Welfare Implications in the Non-Grain Market Resulting From an Increase in Railway Capacity

6.3.2.3 Capacity Increase in the Grain Market

Table 6.8 shows the freight volumes shipped in the grain sector under the WGTA and after the implementation of the revenue cap in 2000. As indicated, freight volumes in the grain market declined by 27.2 per cent, from 34.9 billion tonne miles in 1994 to 25.4 billion tonne miles in 2000. The WGTA freight volumes in Table 6.9 are based on values from the 1996 publication 'The Economics of Western Grain Transportation and Handling', while the 2000 grain market freight volumes are based on data collected by Quorum Corporation acting as the Federal Grain Monitor (Vercammen, Fulton and Gray, 1996; Kroeger, 1999).

While the theoretical model outlined in Chapter 4 predicted that farmers would see an increase in output as capacity is added to the entire system, the data presented above shows evidence to the contrary. Although the reason for the decline in grain market tonne miles is not known, one possible reason for the decline may be due to

an increase in the demand for transportation in the non-grain market as total system capacity increases.

| Table 6.8 - Freight Costs, Freight Volumes and Haul Lengths Used to Calculate Welfare Changes Resulting from a Change in Railway Capacity in the Grain Market | | |
|--|------------------------|---|
| Freight Costs (\$/tonne mile) | (\$/tonne mile) | Source |
| - ARg | \$0.0290 | (Quorum, 2010) |
| - Single-Car Rate (P ₁) | \$0.0342 | (Author's Calculation) |
| - Multi-Car Rate (P ₂) | \$0.0279 | (Author's Calculation) |
| Average Length of Haul (miles) | | |
| - Grain Market | | |
| • 1994 | 1,012 | (Kroeger, 1999) |
| • 2000 | 966 | (Quorum, 2010) |
| Freight Volumes (tonne miles) | | |
| - Grain Market | | |
| • 1994 | 34,934,240,000 | (Vercammen, Fulton and Gray, 1996; Kroeger, 1999) |
| • 2000 | 25,435,746,000 | (Quorum, 2010) |

Another unknown, similar to the welfare analysis regarding the reduction in marginal cost and the non-grain increased capacity analysis, is the degree to which the grain sector system capacity has been affected by regulatory change. The challenge in attempting to determine the welfare changes in the grain market is that, even if the degree to which the grain sector system capacity has been affected by regulatory change was known, it would require complete knowledge of the price changes and shifts in the demand curve in both the high and low cost market to accurately portray the consumer surplus changes resulting from the increase in capacity (Figure 6.6). As such, while this thesis recognizes the impact that a change in capacity can have upon the consumer surplus in the grain sector, the inability to isolate the necessary factors required to calculate this change precludes the author from estimating these changes.

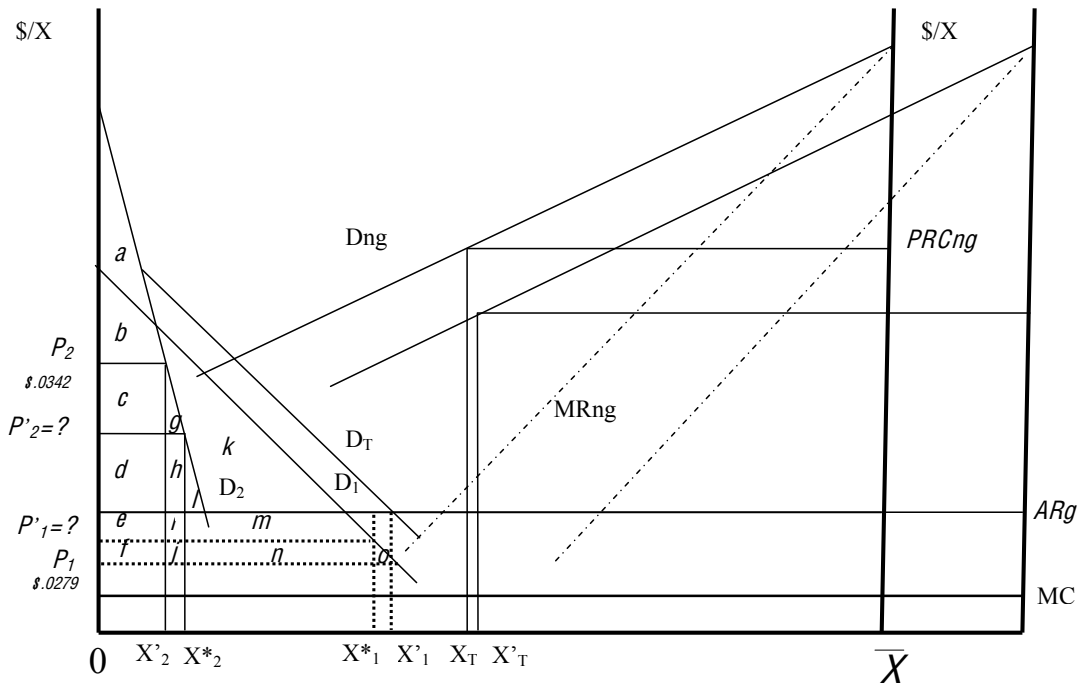


Figure 6.6 Welfare Implications Resulting From an Increase in System Capacity

6.4 Cost Transfer from Railways to Farmers

The theoretical model outlined in Chapter 4 predicted that the removal of GDBL's would result in a downward shift of the demand curve in the high cost market, which would effectively reduce the price and quantity of rail service provided to the high cost market. The model also predicted that the decrease in price in the high cost market would lead to a decrease in the quantity of rail service in the low cost market via an increase in price. The resulting decrease in output in both markets leads to a situation where the total consumer surplus in both markets is less than it would be in instances where GDBL's were maintained.

In addition to lessening the consumer surplus in the grain market, the model also indicated that the removal of GDBL's would have the effect of reducing railway revenue - and producer surplus - in the grain market, since total output is reduced

low cost market to accurately portray the consumer surplus changes resulting from the increase in capacity (Figure 6.7). As such, while this thesis recognizes the impact that the removal of GDBL's can have upon both grain and non-grain sector welfare, the inability to isolate the necessary factors required to calculate these changes precludes the author from estimating these changes.

6.5 Conclusion

This chapter used industry data to quantify the changes in consumer and producer surplus associated with regulatory change. Specifically, this chapter examined the welfare changes attributed to the shift from the WGTA to revenue cap regulation in the non-grain market and in instances where the railways do and do not differentiate between high and low cost shippers in the grain market. As well, this chapter also examined the welfare effects resulting from increased railway capacity, a reduction in railway marginal cost and the removal of GDBLs.

In instances where the regulatory change was the sole factor for changes in system welfare, as in Section 6.2, determining the welfare changes was relatively straightforward (Table 6.9). Performing a welfare analysis, however, became more complex as the examination turned to the additional consequences of regulatory change, such as the increase in system capacity and the removal of GDBL's from the system.

A key challenge in quantifying the welfare changes resulting from an increase in system capacity and the removal of GDBL's was determining the degree to which regulatory change was responsible for affecting changes in producer and consumer surplus. As well, limited knowledge of the price changes and shifts in the demand curve in both the high and low cost market and the inability to isolate the necessary factors required to accurately calculate changes in system welfare served to prevent the quantification of all of the welfare changes that could be attributed to regulatory

change.

While the precise changes in producer and consumer surplus resulting from the increase in system capacity and the removal of GDBL's are unknown, based on the theoretical models developed in Chapter 4 and the knowledge that the total tonne miles in the grain market decreased between 1994 and 2000, it is reasonable to assume that the welfare estimates provided in Table 6.9 underestimates the losses to grain shippers and benefits to railways and non-grain shippers. As well, by ignoring the externalities that inevitably arise as haul distances increase, it is likely that these results overestimate social gains.

However, when considering the welfare effects solely attributed to the regulatory shift in both the differentiated and non-differentiated case, it is clear that the move from the WGTA to the revenue cap decreases the consumer surplus of farmers. In instances where the railways do not differentiate between grain shippers, the grain market sees a \$418.2 million reduction in consumer surplus, largely due to the fact that the price farmers' pay for grain transportation has risen and because the level of output they receive is less than what they received under the WGTA.

In instances where the railways differentiate between shippers, the loss in consumer surplus becomes more pronounced. Grain shippers – and ultimately farmers – experience a loss in overall welfare between \$427.8 million and \$544.2 million. While shippers in the low cost market experience a reduction in consumer surplus, the loss in consumer surplus is more pronounced amongst shippers in high cost markets, largely due to the substantial price difference between the single car rate shippers are required to pay under the revenue cap and the price enjoyed under the WGTA. As such, farmers are worse off in circumstances where the railways are able to differentiate between high and low cost shippers compared to instances where differentiation does not take place.

| Table 6.9 Surplus Changes Resulting From Regulatory Change | | | | | | |
|---|--|---------------------------|------------------|------------------|------------------------|--------------------------------------|
| | Farmers | Non-Grain Shippers | Railways | Taxpayers | Rest of Society | Total |
| Regulatory Change | (\$427.8) - L (\$544.2) - H | \$797.7 | (\$797.2) | \$572.9 | \$200.5 | \$346.1 - L \$229.7 - H |
| Reduction in Marginal Cost | - | - | \$1,219.0 | - | - | \$1,219.0 |
| Total | (\$427.8) - L (\$544.2) - H | \$797.7 | \$421.8 | \$572.9 | \$200.5 | \$1565.1 - L \$1448.7 - H |

Source – Author’s Calculations²⁰

Shippers in the non-grain market see a \$797.7 million gain in consumer surplus as a result of the regulatory shift. This increase is principally due to a shift in capacity allocation from the grain to the non-grain market as the railways respond to the lower average marginal revenues they are able to earn in the revenue cap regulated grain market. As such, shippers in the non-grain market are made better off.

Although the railways experience a \$797.2 million loss in producer surplus due to the regulatory shift, the results show that this loss is more than offset by the increase in producer surplus that the railways earn through reducing marginal costs. In these regards, the railways see a gain in producer surplus of \$1,219.0 million.

In addition to the gains of the railways and non-grain shippers, taxpayer also experiences a \$572.9 million gain in surplus. These gains are the result of the elimination of the subsidy that was paid to the railways under the WGTA. In addition to the gains experienced by taxpayers, society also gains as the additional dead weight loss that is incurred by society from raising the taxes required to pay the subsidy that was removed.

²⁰ Not included in this analysis is the producer surplus earned by shortline railways operating within the GHTS. However, given that shortline railways typically operate at a breakeven point (i.e., zero profit), this is not a major adjustment to the results provided in this analysis.

Chapter 7: Conclusion

7.1 Introduction

The Canadian grain transportation and handling industry is changing. An important part of this change is a result of a shift in government policy away from direct regulation to a more market driven system. Reforms, such as the deregulation of the branchline abandonment process and a cap on the revenues that a railway can earn on grain movements, were designed to improve upon system efficiency by providing the railways with the proper incentives to reduce transportation costs. Other reforms, such as the removal of the Crow Benefit transportation subsidy and the inclusion of several shipper protection provisions, such as interswitching, competitive line rates and final offer arbitration, marked the continuation of a federal objective to achieving transportation efficiencies through competitive and commercial practices rather than relying upon prior combinations of intense regulation and direct government intervention in freight rates.

The effects of these reforms have been a thorough restructuring of the GHTS. Between 1995 and 2009, the Class 1 railways have discontinued 2,522 route miles of grain dependent branch lines from their railway system (CTA, 2009). During the same period the total number of grain elevators across the prairies has decreased 76 per cent, from 1,339 to 320, as grain handling companies replaced small wooden elevators in favour of large, concrete high throughput elevators (CGC Grain Elevators in Canada, 2009).

While the rationalization of the rail and grain handling network has allowed some system stakeholder to benefit – the Class 1 railways have seen operating costs decline, while the switch to HTEs have allowed grain handling companies to improve upon grain handling to elevator capacity ratios (e.g., turnover ratio) – it is unclear whether rationalization has led to an overall improvement in GHTS welfare (Quorum, 2003). The reduction in grain dependent branch lines and fewer

elevator delivery points means that many of the transportation costs associated with grain movement have simply shifted away from railways and elevators towards producer. (Storey, *The Encyclopedia of Saskatchewan*, 2006).

In order to determine if regulatory change has led to an overall improvement in GHTS welfare, and to determine if farmers have benefitted from regulatory change, this thesis examined the regulatory changes that have occurred since the passing of the *Canada Transportation Act*. To provide some context for this analysis, this thesis began with a historical overview of the legislation and regulations leading up to the passing of the Act and provided a historical and current description of the GHTS market structure.

Following the regulatory and industry overview, this thesis developed a theoretical framework capable of determining whether regulatory change has led to an overall improvement in GHTS welfare and, if so, which industry participants have benefitted from this change. To help contextualize many of the concepts used in the theoretical framework, this thesis examined theories on the origin of regulation and looked specifically at two forms of thought: public interest theory and capture theory. As well, this thesis examined several 'rate of return' regulatory options available to the regulator, and provided an illustration of the 'rate of return' regulation of the WGTA in order to provide a regulatory baseline against which the 1996 CTA regulatory changes could be assessed.

After examining the theory behind regulation, this research developed a series of theoretical models to analyze the economic impacts of regulatory change on the GHTS. As a means of measuring the effects of regulatory change on the GHTS welfare, this thesis looked at industry pricing and service levels in both grain and non-grain markets to determine the welfare gains or losses of system participants prior to and after the regulatory changes contained in the 1996 CTA. Specifically, these models were designed to examine the welfare effects resulting from the elimination of grain dependent branchlines and the introduction of the revenue cap.

7.2 Model

The model developed in this thesis allows a measurement of the welfare changes arising from two key regulatory changes: the introduction of the revenue cap and the removal of GDBLs. The concepts of consumer and producer surplus are used to determine if the regulatory changes have had a positive or negative impact in both the grain and non-grain markets. The concepts of consumer and producer surplus are also used to determine how regulatory change has affected the welfare of different participants in the grain and non-grain markets and which groups have benefitted the most from regulatory change.

Specifically, the model breaks down the welfare effects of regulatory change into three distinct scenarios. For the purpose of this analysis, the welfare effects from each scenario are examined independently, with the resulting welfare changes in each scenario considered as being cumulative in the determination of the overall welfare effects resulting from regulatory change.

Common to all scenarios, a monopolist railway with a fixed network capacity provides service in two competing markets: grain and non-grain. In the non-grain market, the railway is not subject to any form of government regulation and is able to exercise monopoly power. The regulated grain market, however, has moved from a WGTA 'rate of return' regulatory scheme to revenue cap regulation. This scenario examines, with all other factors held constant, the welfare changes associated with shift from the WGTA to the revenue cap regulatory regime in instances where the railways are able to differentiate between high and low cost shippers and a situation where shippers in the grain market are homogeneous.

Scenario two examines the welfare changes associated with gains in railway productivity. Specifically, two types of railway productivity gains are examined: 1) productivity gains that result in an increase in railway capacity; and 2) productivity gains that lead to a reduction in railway marginal cost. In each instance, the premise

developed in scenario one is expanded to include a situation where total rail capacity – in terms of total system tonne miles – has increased and where the railway sees a reduction in marginal cost.

Scenario three examines the externality costs associated with the removal of GDBLs. Specifically, this scenario looks at two externalities arising from the removal of GDBLs: road damage costs and green house gas emissions. The external costs associated with the removal of GDBLs are determined by multiplying the additional tonne miles that farmers must haul grain due to the removal of GDBLs by the dollar per tonne mile GHG emissions cost and the dollar per tonne mile road damage cost for each tonne mile of grain shipped on the prairie road network as a result of GDBL abandonment. These results are added to the results of the previous scenarios as a means of determining the overall welfare costs associated with GHTS regulatory change.

7.3 Results

The intent of this thesis was to quantify the changes in consumer and producer surplus associated with regulatory change. Specifically, this thesis examined the welfare changes in grain and non-grain markets that can be attributed to the shift from the WGTA to revenue cap regulation (differentiated and non-differentiated grain shippers), increased railway capacity, a reduction in railway marginal cost and the removal of GDBLs.

Several conclusions can be drawn from the results outlined in the previous chapter. The first is that on a net basis, the economic surplus available to the Canadian economy has increased as a result of the regulatory change. In essence, the size of the economic pie has increased. In total, the surplus change in the Canadian economy has increased between \$1.45 billion and \$1.56 billion dollars as a result of

the change in GHTS regulation.

A second conclusion that can be drawn from the results in the previous chapter is that it is likely that the welfare estimates underestimate the losses to grain shippers and benefits to railways and non-grain shippers. While welfare changes resulting from an increase in rail capacity, the removal of GDBL's and system externalities were not determined, the theoretical models developed in Chapter 4 and knowledge pertaining to the decrease in grain market tonne miles between 1994 and 2000 strongly suggest that the results shown in Table 6.9 are undervalued.

A third conclusion that can be draw from the previous chapter's results is that the economic impacts associated with the regulatory change went beyond those intended by the regulator, to the detriment of the farmers and GHTS (Karadininis and Storey, 1986). Overall, welfare gains associated with the regulatory change could have been higher if industry regulators had prevented, or at least limited, the railways from removing GDBLs from the system. The decision to eliminate GDBLs from the system should be viewed as an example of regulatory failure on the part of the regulator. Keeping the GDBLs in place and allowing the railways to increase freight rates on these lines to a level that covered railway shortfalls would have resulted in lower transportation costs for farmers, as well as reduced GHG emission and road damage costs resulting from increased trucking.

A fourth conclusion that can be derived from the results are that the distributions of the benefits associated with the regulatory change were not uniform. Some stakeholders identified in this analysis have gained more than others, while others have lost. Shippers in the non-grain market have seen an overall increase in consumer surplus as capacity allocation has shifted from the grain to the non-grain market. Shippers in the non-grain market have also seen an increase in consumer surplus as a result of additional capacity being added to the system as the railways increase their overall productivity. In total, shippers in the non-grain market are made better off.

The railways are also clear beneficiaries of regulatory change. Although the railways experience a loss in producer surplus due to the regulatory shift, this loss is more than offset by the increase in producer surplus that the railways earn through increasing capacity, reducing marginal costs and removing GDBLs from the system. As such, the railways see a substantial gain in producer surplus.

Taxpayers also experience a gain in overall surplus. These gains are the result of the elimination of the subsidy that was paid to the railways under the WGTA. As well, society as a whole also gains due to the removal of the additional dead weight loss that is incurred by society that arises from raising the taxes required to pay the subsidy.

In contrast to the system stakeholders listed above, farmers have seen their surplus levels decline between \$427.8 million and \$544.2 million as a result of the regulatory change. This reduction in consumer surplus is largely due to an increase in the price farmers' pay for grain transportation and because the quantity of service they receive is less than the service they received under the WGTA.

The implementation and consequences of the regulatory changes outlined in this thesis are largely consistent with Rausser's theories pertaining to predatory and productive government and the development of agricultural policy. Rausser's (1991) observation that there will be situations where the political timing may be especially ripe, perhaps because of an economic crisis caused by outside factors, to change the institutional structure of agricultural programs is particularly poignant when ascribed to the regulatory changes that have occurred within the GHTS. Evidence of this was certainly true in the mid-1990's when the Canadian government was faced with the challenge of eliminating a very large fiscal deficit. All Canadians were sharing the burden of budget reductions, and there was public support for the reform of costly government programs – such as the WGTA – that allowed the federal government to reduce costs and better target expenditures

toward those who needed it most (Doan, Paddock and Dyer, 2003). This, coupled with dismal railway performance during the 1996/97 crop year, set the stage for the GHTS regulatory reform that was justified on basis of improving economic and GHTS efficiency.

Further to this observation, Rausser (1991) also points out that the development of agricultural policy is often a balancing act between those forces trying to improve efficiency through the implementation of productive policies and those attempting to influence policy out of vested self-interest. Policy outcomes typically reflect a trade-off between various groups, each asking for fundamentally different things. Differences in the distribution of political power of these groups are often critical in determining whether policies can be considered as PERTs (productive, or public interest) or PESTs (predatory, or special interest) (Rausser and Zusman, 1992).

In terms of determining the distribution of political power amongst GHTS stakeholders, it is clear that the equilibrium of policy influence has shifted away from farmers in favour of the railways. While the size of the overall economic pie has increased as a result of the regulatory change, farmers are the only group who see a decrease in total welfare. From this result, it is reasonable to suppose that farmers must be limited in their capacity to influence the regulatory change in a manner that is beneficial to them. Whether this was due to a lack of resources or the inability to effectively organize a campaign to counter the regulatory change is unknown.

7.4 Application of This Research

The findings of this research, apart from contributing to a general understanding of GHTS regulation and the catalysts behind the development of regulation may have some practical applications.

Government or other agencies that develop GHTS policy and regulations will likely find value in understanding how regulation affects not only the participants operating within the GHTS, but also those operating in non-grain markets. Being able to apply the various theories developed in this thesis towards the development of new GHTS policies may prove beneficial.

In addition, the results of this thesis may provide those most negatively affected by GHTS policies (i.e., farmers) with a clearer understanding of how GHTS policy is formed and why the policies enacted over the last 15 years have adversely affected them. Quantifying the negative welfare effects that farmers have incurred may aid farmers in discussions regarding future policy development.

7.5 Limitations and Recommendations for Further Study

The models developed in this thesis are predicated on the notion of two sectors – grain and non-grain – competing for a finite allocation of rail car capacity. Each model assumes that the railway, as a monopolist, has the ability to exercise market power while shippers in the grain and non-grain sectors do not. In reality, system stakeholders are not so easily defined. Shippers within the grain and non-grain sector have varying degrees of market power based on the nature of their commodity, their size and location. This affords well-positioned companies an opportunity to negotiate better prices and terms of service with the railways.

To determine the importance that shipper market power may have on the distribution of welfare in the grain and non-grain sectors, it would be useful to premise the models developed in this thesis on a situation where shippers in the grain and non-grain market have varying degrees of market power.

Another possibility is a more detailed examination regarding the role that regulatory capture plays in the development of GHTS policy. Based on the conclusions of this thesis, it is difficult to deny the influence that railways have upon

the development of policies favourable to themselves. A cursory search of registered lobbyists on the Office of the Commissioner of Lobbying in Canada website shows that of the 5,179 lobbyists that are registered, 661 work in the field of transportation.²¹ As well, several ex-senior level employees of Transport Canada are now registered lobbyists working for the railways. A question that comes out of this involves determining how one could design railway regulatory bodies so that they develop a strong sense of mission and remain insulated from the pressures of regulatory capture.

Finally, the issue of farmer bargaining power deserves more attention. Of particular interest would be a study of past and current farmer advocacy groups that examines their motives for becoming involved in farm advocacy (i.e., ideology, economic welfare concerns), the levels of influence held by these groups and how levels of influence could be increased. Existing farm groups could convert this knowledge into a method of ensuring that they remain relevant at the political level and that any benefits that they do provide are enhanced. These issues are left for others to explore.

²¹ The Office of the Commissioner of Lobbying in Canada website does not provide a breakdown of the transportation mode that registered lobbyists represent.

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